MTC Connectors with Removable Contacts and Jackscrew Coupling Hardware

1.0 Introduction

1.1 Scope. This specification covers the design, performance and qualification requirements for Raychem MTC connectors with jackscrew coupling using rear insertion, rear removal, contacts. This specification forms a part of Master Specification C-6100 for the Raychem Integrated-Interconnection System (I^2S).

1.2 Description. The Raychem MTC connectors covered by this specification consist of environment-resistant plugs and receptacles. Options include electromagnetic effects (EME) shielding and pressure sealing. The shells assure proper orientation of the mating halves and electrical continuity between shells prior to contact engagement. Connectors are mated with jackscrew coupling hardware. Connectors covered by this specification have inserts that accept size 22-20, size 16, or size 12 contacts. Contact cavities are arranged in rows, and contacts are installed, released and removed from the rear of the connector.

1.3 Classification. Connectors covered by this specification are classified in accordance with sections 1.3.1 and 1.3.2.

1.3.1 Connectors.

a. Series:

MTCP: MTCP-122, Size 22-20 contacts on 0.1-inch nominal centers or
MTCP-116, Size 16 contacts on 0.2-inch nominal centers
MTCR: Size 12 contacts on 0.25-inch nominal centers

b. Types:

Plugs: Cable mounting
Receptacles: Unflanged for cable and panel mounting
Flanged for panel mounting

c. Classes:

Environment resistant
Environment resistant, EME shielded
Environment resistant, pressure maintaining

d. Shell Finish:

Anodic (nonconductive)
Electroless nickel (conductive)
Cadmium plated (conductive)

e. Shell Size:

Size 1: 1-inch nominal insert width
Size 2: 2-inch nominal insert width

1.3.2 Inserts

a. Types:
Removable
Fixed

b. Cavities:
For pin contacts
For socket contacts

1.4 Temperature Range. Connectors covered by this specification are suitable for use over the temperature range -65 to 150°C. Connectors are rated for 1000-hour service when the operating temperature of the connector is the maximum rated temperature. Operating temperature is the maximum temperature reached by any point of the connector as a result of electrical current flow and ambient temperature.

1.5 Units. SI units in parentheses are for information only.

2.0 Applicable Documents

2.1 Issues of Documents. The following documents, of the issue in effect on date of order or request for proposal, form a part of this specification to the extent specified herein. However, this specification takes precedence over the referenced documents.

Raychem

C-6100	System Overview and General Requirements for Integrated Interconnection System (I^2S) Components

American National Standards Institute (ANSI)

ASQC Z1.4	Sampling Procedures and Tables for Inspection by Attributes
NCSL Z540-1	Calibration Laboratories and Measuring and Test Equipment - General Requirements

American Society for Testing and Materials (ASTM International)

A484	Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings
A582/A582M	Standard Specification for Free-Machining Stainless Steel Bars
A967	Standard Specification for Chemical Passivation Treatments, Stainless Steel Parts
B85	Standard Specification for Aluminum Alloy Die Castings
D570	Standard Test Method for Water Absorption of Plastics
D638	Standard Test Method for Tensile Properties of Plastics
D648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
D740	Standard Specification for Methyl Ethyl Ketone
D770	Standard Specification for Isopropyl Alcohol (99%)
E662	Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
E1119	Standard Specification for Industrial Grade Ethylene Glycol

Federal

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

Military

MIL-A-8625	Anodic Coatings for Aluminum and Aluminum Alloys
MIL-C-39029	Contacts, Electrical, Connector, General Specification For
MIL-C-85485	Cable, Electric, Filter Line, Radio Frequency Absorptive
MIL-DTL-5624	Turbine Fuel, Aviation, Grades JP-4, JP-5 and JP-5/JP-8
MIL-DTL-18240	Fastener Element, Self-Locking, Threaded Fastener, 250°F Maximum
MIL-DTL-38999	Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect (Bayonet, Threaded and Breech Coupling), Environment Resistant, Removable Crimp and Hermetic Solder Contacts, General Specification For
MIL-DTL-83723	Connectors, Electric, (Circular, Environment Resisting), Receptacles and Plugs, General Specification For
MIL-HDBK-454	General Guidelines for Electronic Equipment
MIL-I-81969	Installing and Removal Tools, Connector Electrical Contact, General Specification
MIL-P-83800	1,2 Propanediol
MIL-PRF-680	Degreasing Solvent
MIL-PRF-5606	Hydraulic Fluid, Petroleum Base; Aircraft, Missile and Ordnance
MIL-PRF-23699	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number O-156
MIL-PRF-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537

MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-1344	Test Methods for Electrical Connectors
MS27488	Plug, End Seal, Electrical Connector

National Aeronautics and Space Administration (NASA)

JSC SP-R-0022	Vacuum Stability Requirements of Polymeric Material for Spacecraft Application

Society of Automotive Engineers (SAE International)

AMSC26074	Coatings, Electroless Nickel, Requirements For
AMSQQP416	Plating, Cadmium (Electrodeposited)
AMSQQS763	Steel Bars, Wire, Shapes, and Forgings, Corrosion Resistant
J1966	Lubricating Oils, Aircraft Piston Engine (Non-Dispersant Mineral Oil)

Underwriters Laboratories

UL 94	Tests for Flammability of Plastic Materials

3.0 Requirements

3.1 Specification Control Drawings. The requirements for connectors under this specification shall be as specified herein and in the applicable specification control drawing. In the event of conflict between the requirements of this specification and those of the specification control drawing, the latter shall govern.

3.2 Classification of Requirements. The requirements for the connectors are classified herein as follows:

Requirement	Paragraph
Qualification	3.3
Materials	3.4
Design and Construction	3.5
Performance	3.6
Identification	3.7
Workmanship	3.8

3.3 Qualification Requirements. Connectors furnished under this specification shall be products which are qualified to this specification in accordance with the requirements of Specification C-6100.

3.4 Materials Requirements. All materials used in the manufacture of these connectors shall be of the quality and form best suited for the purpose intended.

3.4.1 Dissimilar Metals. When dissimilar metals are used in intimate contact with each other, protection against electrolytic corrosion shall be provided as specified in Guideline 16 of MlL-HDBK-454.

3.4.2 Fungus Resistance. Finishes and materials shall be fungus-inert (0 or 1 rating) in accordance with Guideline 4 of MlL-HDBK-454 and encompassing the fungus species listed in MIL-STD-810, Method 508.

3.4.3 Hydrolytic Stability. All nonmetallic materials shall be selected to meet the hydrolytic reversion resistance requirements specified in Guideline 47 of MIL-HDBK-454.

3.4.4 Vacuum Stability. Connectors shall meet the vacuum stability requirements of NASA Specification JSC SP-R-0022 when baked seals are used.

3.4.5 Component Materials. Materials for specific components of the connector shall be as follows:

3.4.5.1. Connector Shell. Standard connector shells shall be die-cast aluminum per ASTM B85. Shell finish shall be in accordance with 3.4.5.1.1, 3.4.5.1.2 or 3.4.5.1.3.

3.4.5.1.1 Anodic Finish. Anodic (nonconductive) shell finish shall be black, hard and in accordance with MIL-A-8625, Type II, Class 2.

3.4.5.1.2 Electroless Nickel. Electroless nickel (conductive) shell conductive finish shall be in accordance with SAE AMSC26074 Class 3 or 4, Grade B.

3.4.5.1.3 Cadmium Plating. Cadmium plating (conductive) shell finish shall be olive drab to yellow and in accordance with SAE AMSQQP416 over a suitable underplate to withstand the 500-hour salt spray test.

3.4.5.2 Mounting and Mating Hardware. Mounting and mating hardware shall be corrosion-resistant steel per SAE AMSQQS763, ASTM A484 or ASTM A582/A582M. Hardware parts for use with anodic and electroless nickel shell finishes shall be passivated per ASTM A967. Hardware parts for use with cadmium plated shells shall be cadmium plated per SAE AMSQQP416.

3.4.5.3 Elastomeric Seals. Elastomeric seals shall be resilient dielectric material per the applicable specification control drawing.

3.4.5.4 Connector Inserts. Connector inserts shall be rigid thermoplastic dielectric material per the applicable specification control drawing.

3.5 Design and Construction Requirements. Connectors shall be designed and constructed to withstand handling during installation and maintenance. Complete connectors shall

consist of a rectangular plug or receptacle shell; fixed or removable insert(s) for use with pin or socket contacts; mounting/ mating hardware and, where appropriate, a cable clamp.

3.5.1 Shells. Plug and receptacle shells shall meet the following requirements:

3.5.1.1 Shells for EME-Shielded Connectors. Plug shells for EME-shielded connectors shall have spring fingers which contact the receptacle shell prior to engagement of the contacts.

3.5.1.2. Shells for Pressure-Maintaining Connectors. Shells for pressure maintaining connectors shall have mounting flanges and elastomeric gaskets for sealing the flange to a panel.

3.5.1.3 Coupling. Coupling between mating connectors shall be accomplished by means of two captive jackscrews on the plug shell. Jackscrew threads shall conform to FED-STD-H28 and shall be self-locking per MIL-DTL-18240. Jackscrews shall provide sufficient force to effect a moisture seal between the socket contact-insert and the elastomeric interfacial seal on the pin contact insert. Complete coupling shall occur when the jackscrews are torqued to 9 lbf-in. (1.0 N-m).

3.5.1.4 Polarization. Shell polarization shall prevent the mating of any plug and receptacle shells if the connectors are not in the correct mating position. Polarization of shells shall occur before connector keying.

3.5.1.5 Connector Keying. Insertable keying pins shall provide a minimum of 16 different keying combinations. Keying shall prevent the mating of any plug and receptacle not properly keyed. Connector keying shall occur before engagement of contacts or coupling hardware.

3.5.1.6 Insert Retention. Shells shall retain inserts by mechanical means. Adhesives may be used as a supplementary means for retention of fixed inserts.

3.5.1.7 Cable Clamps. Receptacle shells suitable for cable mounting and all plug shells shall have provisions for attachment of cable clamps. Cable clamp screws shall have threads conforming to FED-STD-H28 and shall be self-locking per MIL-DTL-18240.

3.5.1.8 Mounting Hardware. Mounting hardware shall be provided with each receptacle shell. Mounting hardware screw threads shall conform to FED-STD-H28 and shall be self-locking per MIL-DTL-18240. Mounting hardware may also function as coupling hardware.

3.5.2 Inserts. Connector inserts shall be either fixed in the shell or removable. Inserts shall have cavities for pin or socket contacts, and the cavities shall contain contact locking devices. Removable inserts shall have polarizing keyways to ensure proper orientation within the shell. Pin contact inserts shall have an elastomeric interfacial seal bonded to the mating face.

3.5.2.1 Contact Arrangement. Contact arrangement shall be in accordance with the applicable specification control drawing, and is shown in Table I for reference only.

Table I. Contact Arrangement

Connector Series	Center to-Center Contact Spacing		Contact Rows	Contacts Per Connector	
	Inches	(Millimeters)		Shell Size 1	Shell Size 2
MTCP-122	0.10	(2.5)	2	20	40
MTCP-116	0.20	(5.0)	1	5	10
MTCR	0.25	(6.4)	1	4	Not available

3.5.3 Contacts. Sizes 16 and 12 contacts shall conform to MIL-C-39029 and be compatible with the circular connectors shown in Table II. Size 22-20 contacts shall be of blade (pin contact) and tuning fork (socket contact) design. Socket contacts shall have a corrosion resistant steel hood to protect the spring member from handling damage. Contacts shall be capable of being installed using tools conforming to MIL-I-81969. Connectors shall be suitable for use with other contacts as required by the applicable specification control drawing.

Table II. Contact Compatibly

Connector Series	Contact Size	Circular Connector
MTCP-122	22-20	N/A
MTCP-116	16	MIL-DTL-38999, Series II
MTCR	12	MIL-DTL-83723, Series III

3.5.4 Seals.

3.5.4.1 Interfacial Seal. The elastomeric interfacial seal shall be designed to eliminate leakage paths between adjacent contacts and between contacts and the shell when the connector is fully mated. The interfacial sea shall be permanently bonded to the mating face of the pin-contact insert. Suitable marking shall be provided on the mating face of the interfacial seal to identify the contact positions.

3.5.4.2 Wire Seal. The rear of each insert shall have an elastomeric wire seal. The wire seal shall be designed to meet the requirements of this specification using wire having an outer diameter within the ranges specified in Table III.

Table III. Wire Diameter

Connector Series	Contact Size	Finished Wire Outside Diameter	
		Inches	(Millimeters)
MTCP-122	22-20	0.030 to 0.065	(0.82 to 1.65)
MTCP-116	16	0.065 to 0.109	(1.65 to 2.77)
MTCR	12	0.097 to 0.158	(2.46 to 4.01)

3.5.4.3 Sealing Plug. Plugs for sealing the rear openings of unused contact cavities shall be provided when specified. Sealing plugs shall conform to MS27488.

3.5.5 Interchangeability. All components having the same part number shall be completely interchangeable with each other in regard to installation performance.

3.5.6 Intermateability. All plug and receptacle connectors of the same series, type and shell size and containing the appropriate inserts and keying pin combinations and contacts shall mate with each other.

3.6 Performance Requirements. Connector components and assemblies shall conform to the requirements specified herein and on the applicable specification control drawings. Unless otherwise specified, room temperature shall be within 25 ± 5°C. Values given as "after conditioning" values refer to requirements after any of the environmental exposures of Table XII.

3.6.1 Insulation Resistance. When connector assemblies are tested as specified in 4.5.3, the insulation resistance at 23°C between any pair of contacts and between any contact and the shell shall be 5000 megohms minimum, unless otherwise specified. The insulation resistance at the maximum rated temperature shall be 1000 megohms, minimum.

3.6.2 Dielectric Withstanding Voltage. When connector assemblies are tested as specified in 4.5.4, there shall be no evidence of breakdown or flashover. The leakage current shall be 1.0 mA maximum.

3.6.3 Contact Resistance.

3.6.3.1 Contact Resistance at Specified Current (Size 22-20 contacts only). When connector assemblies are tested as specified in 4.5.5.1 or 4.5.5.2, mated contacts shall meet the requirements of Table IV.

Table IV. Contact Resistance At Specified Current

Connector Series	Contact Size	Wire Size, AWG	Test Current, Amps	Voltage Drop, max, millivolts		
				At Room Temperature		At Max. Rated Temperature
				Initial	After Conditioning	After Conditioning
MTCP-122	22-20	20	7.50	55	66	83
		22	5.00	73	88	110
		24	3.00	45	54	68
		26	2.00	53	64	80

3.6.3.2 Low Signal Level Contact Resistance (Size 22-20 contacts only). When connector assemblies are tested as specified in 4.5.5.3, mated contacts shall meet the requirements of Table V.

Table V. Low Signal Level Contact Resistance

Connector Series	Contact Size	Wire Size, AWG	Resistance, max, milliohms	
			Initial	After Conditioning
MTCP-122	22-20	20	9	11
		22	15	17
		24	20	23
		26	30	38

3.6.4 Shell to Shell Conductivity (conductive finish only). When mated connectors are tested as specified in 4.5.6, the measured voltage drop shall be as shown in Table VI.

Table VI. Shell to Shell Conductivity

Connector Class	Voltage Drop, max, millivolts	
	Initial	After Conditioning
Environment resistant, EME shielded	1.0	1.5
Other Classes	2.5	5.0

3.6.5 Electrical Engagement. When connector assemblies are tested as specified in 4.5.7, the electrical engagement shall be as shown in Table VII.

Table VII. Electrical Engagement

Connector Series	Contact Size	Electrical Engagement, min.	
		Inches	(Millimeters)
MTCP-122	22-20	0.050	(1.27)
MTCP-116	16	0.034	(0.86)
MTCR	12	0.040	(1.02)

3.6.6 Contact Engagement and Separation Forces (Size 22-20 contacts only). When socket contacts are tested as specified in 4.5.8, the largest value of the engagement force and the smallest value of the separation force measured on any contact shall be as shown in Table VIII. The mean value of the engagement forces measured on the individual contacts shall be as shown in Table VIII.

Table VIII. Contact Engagement and Separation Forces

Connector Series	Contact Size	Engagement Force, max. oz-force (N)				Separation Force, min. oz-force (N)	
		Mean Value		Largest Value		Smallest Value	
		Ounces	(Newtons)	Ounces	(Newtons)	Ounces	(Newtons)
MTCP-122	22-20	9.0	(2.5)	12.0	(3.3)	0.7	(0.19)

3.6.7 Durability. After conditioning as specified in 4.5.9, connector assemblies shall meet the subsequent performance requirements of Table XII and shall show no evidence of damage detrimental to performance or handling.

3.6.8 Termination Tensile Strength (Size 22-20 contacts only). When individual wire terminations are tested as specified in 4.5.10, the tensile load required to separate each wire from its terminal shall be in accordance with Table IX.

3.6.9 Insert Retention. When connector assemblies are tested as specified in 4.5.11, the inserts shall not be damaged or dislocated from their fully seated positions. The inserts shall retain their normal positions in the shell for at least 5 seconds at the specified load.

3.6.10 Contact Retention. When inserts with contacts are tested as specified in 4.5.12, the axial displacement of contacts shall not exceed 0.012 inch (0.30 mm) while the load is applied.

3.6.11 Coupling Torque. When terminated connector assemblies are tested as specified in 4.5.13, the connector halves shall become fully mated, shall meet the subsequent performance requirements of Table XII, and shall show no evidence of damage detrimental to performance or handling of the connectors.

Table IX. Termination Tensile Strength

Connector Series	Contact Size	Wire		Tensile Load, minimum			
		Type	Size	Prior to Thermal Conditioning		After Thermal Conditioning	
				Lbf	(Newtons)	Lbf	(Newtons)
MTCP-122	22-20	Annealed Copper	20	20.0	(89.0)	14.0	(62.0)
			22	12.0	(53.0)	7.5	(33.0)
			24	8.0	(36.0)	6.0	(27.0)
			26	5.0	(22.0)	4.0	(18.0)
MTCP-122	22-20	High Strength Copper Alloy	22	22.0	(98.0)	17.0	(76.0)
			24	18.0	(80.0)	14.0	(62.0)
			26	10.0	(44.0)	8.0	(36.0)
			28	6.0	(27.0)	4.0	(18.0)

3.6.12 Coupling Over-torque. When terminated connector assemblies are tested as specified in 4.5.14, there shall be no evidence of mechanical damage to shells or mating hardware.

3.6.13 Maintenance Aging. After conditioning as specified in 4.5.15, connector assemblies shall meet the subsequent performance requirements specified in Table XII, and shall show no evidence of damage detrimental to performance or handling.

3.6.14 Random Vibration. When terminated, mated connector assemblies are tested as specified in 4.5.16, there shall be no electrical discontinuities and no evidence of cracks, breaks or loosening of parts.

3.6.15 Mechanical Shock. When terminated, mated connector assemblies are tested as specified in 4.5.17, there shall be no electrical discontinuities and no evidence of cracks, breaks, or loosening of parts.

3.6.16 Thermal Shock. When terminated, mated connector assemblies are tested as specified in 4.5.18, there shall be no evidence of damage detrimental to performance or handling.

3.6.17 Temperature Life. When terminated, mated connector assemblies are tested as specified in 4.5.19, the insulation resistance at the maximum rated temperature shall be 1000 megohms, minimum.

3.6.18 Humidity. When terminated, mated connector assemblies are tested as specified in 4.5.20, the insulation resistance at 90 to 98 percent humidity shall be 100 megohms, minimum, and the mated connectors shall meet the dielectric withstanding voltage requirements of 3.6.2.

3.6.19 Altitude Immersion. When terminated, mated connector assemblies are tested as specified in 4.5.21, the insulation resistance shall be 1000 megohms minimum, and the mated connectors shall meet the dielectric withstanding voltage requirements of 3.6.2.

3.6.20 Altitude-Low Temperature. When terminated, mated connector assemblies are tested as specified in 4.5.22, the connectors shall withstand the applied potential at low pressure with no evidence of dielectric breakdown. Insulation resistance and dielectric withstanding voltage requirements at ambient conditions shall be as specified in 3.6.1 and 3.6.2.

3.6.21 Salt Spray. When terminated, mated connector assemblies are tested in accordance with 4.5.23.1 or 4.5.23.2, the specimens shall show no evidence of damage detrimental to performance or handling.

3.6.22 Ozone Exposure. When terminated, unmated connector assemblies are tested as specified in 4.5.24, the connectors shall show no evidence of damage detrimental to performance or handling.

3.6.23 Fluid Immersion. When terminated connector assemblies are tested as specified in 4.5.25, the connectors shall show no evidence of damage detrimental to performance or handling.

3.6.24 Magnetic Permeability. When unmated connector assemblies are tested as specified in 4.5.26, the relative permeability shall be 2.0 maximum.

3.6.25 Industrial Gas (Size 22-20 contacts only). When terminated, unmated connector assemblies are tested as specified in 4.5.27, the connectors shall meet the subsequent performance requirements of Table XII. The contacts shall show no evidence of damage detrimental to performance or handling.

3.6.26 Removable Insert Material Requirements. Insert material requirements are applicable only to material used for removable inserts.

3.6.26.1 Tensile Strength. When tested as specified in 4.5.28.1, the tensile strength shall be 13,000 psi (90 MPa) minimum.

3.6.26.2 Deflection Temperature. When tested as specified in 4.5.28.2, the deflection temperature shall be 185°C, minimum.

3.6.26.3 Water Absorption. When tested as specified in 4.5.28.3, the water absorption shall be 0.5 percent maximum.

3.6.26.4 Flammability. When tested as specified in 4.5.28.4, the insert material shall meet the requirements of UL flammability classification 94V-0.

3.6.26.5 Smoke Generation. When tested in accordance with 4.5.28.5, the corrected specific optical density shall be 15 maximum for each specimen tested.

3.6.27 Deleted.

3.6.28 Deleted.

3.6.29 Deleted.

3.6.30 Contact Walkout. When tested as specified in 4.5.32, contacts shall not become dislodged from their normal position.

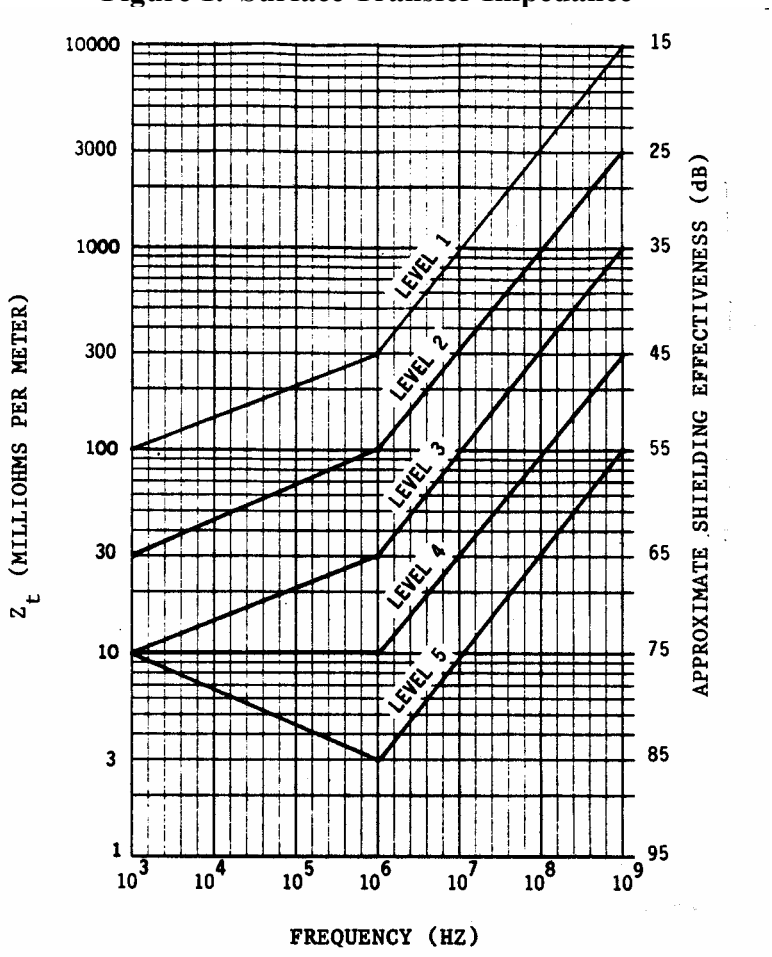
3.6.31 Removable Insert Retention System Abuse. After conditioning as specified in 4.5.33, unmated connectors shall meet the insert retention requirements of 3.6.9 and shall show no evidence of damage detrimental to performance or handling.

3.6.32 Contact Retention System Abuse.

3.6.33 Retention System Fluid Resistance. When unmated connectors are tested as specified in 4.5.35, they shall meet the contact retention requirements of 3.6.10 and the insert retention requirements of 3.6.9.

3.6.34 EME Shielding (EME-Shielded Class Only). When terminated mated connector assemblies are tested in accordance with 4.5.36, the surface transfer impedance (Z_t) of the connector assembly at each frequency shall not exceed the applicable limit as shown in Figure 1. The applicable limit for connector/cable assemblies shall be level 5 or higher, depending on the harness construction specified on the applicable drawing.

Figure 1. Surface Transfer Impedance



3.6.35 Air Leakage (Pressure Maintaining Connectors Only). When tested in accordance with 4.5.37 connectors shall have a leakage rate of 0.5 atm cm^3/s maximum.

3.6.36 Pin Contact Stability. When inserts are tested in accordance with 4.5.38, the total displacement of a reference point on the tip of the test pin shall not exceed the value specified in Table X.

Table X. Pin Contact Stability

Contact Size	Test Force		Total Displacement, max.	
	Lbf	Newtons	Inches	mm
22-20	0.28	1.2	0.030	0.76
16	1.10	4.9	0.075	1.91
12	1.10	4.9	0.075	1.91

3.6.37 Post Test Examination. Connector assemblies shall be inspected as specified in 4.5.39. Any evidence of the effects described therein shall constitute failure

3.7 Product Identification Requirements. All marking shall be in accordance with the applicable specification control drawing. The marking shall remain legible after completion of the test sequences in Groups 1, 2, 3, and 4 of Table XII.

3.7.1 Shell Identification. Connector shells shall be marked on an external surface with the shell part number, date code, and the brand name "Raychem". The top and bottom surfaces of every shell designed for removable inserts shall be permanently marked at the wire termination end to identify proper insert orientation.

3.7.2 Removable Insert Identification. Removable inserts shall be marked with the part number, date code, the brand name "Raychem", and an orientation indicator as specified in the applicable specification sheet.

3.7.3 Contact Identification. The contact positions shall be permanently identified on the mating and wire seal faces.

3.8 Workmanship Requirements. Connectors and accessories shall be processed in such a manner as to be uniform in quality; they shall be free from burrs, cracks, voids, chips, blisters, sharp cutting edges, and other defects that would adversely affect life or serviceability.

4.0 Quality Assurance Provisions

4.1 Responsibility for Inspection. The supplier is responsible for the performance of all inspection tests specified herein. The supplier may utilize his own or any other suitable testing facility. Inspection records of the tests shall be kept complete and available to the buyer as specified in the contract or order.

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 supplier. A calibration system to control the accuracy of the measuring and test equipment shall be maintained in accordance with ANSI NSCL Z540-1.

4.2 Classification of Inspections. The examination and testing of connectors covered by this specification shall be classified as follows:

a. Qualification inspection (See 4.3)
b. Acceptance inspection (See 4.4)

4.3 Qualification Inspection. Qualification inspection shall consist of the tests in Table XII. Qualification shall be granted upon successful completion of the inspections and tests of Table XII, conducted upon the samples of Table XI, in accordance with Specification C-6100. Separate samples shall be used for each test in Table XII where tests are not sequential.

4.3.1 Test Samples for Qualification Inspection. Test samples submitted for qualification inspection shall be produced using equipment and procedures normally used in production. Test samples shall be of the types listed in Table XI. Individual test samples shall be selected in compliance with the qualification requirements of Specification C-6100.

4.3.2 Failures. One or more failures of the tests listed in Table XII shall be cause for failure of qualification of the parts under test. The exception to this is visual examination, where occurrence of one major defect or two minor defects shall be cause for failure of qualification. Major and minor defects shall be as defined in ANSI ASQC Z1.4.

4.3.3 Qualification Report. Qualification shall be documented in a report which shall be available to the buyer.

Table XI. Qualification Test Samples

Test Group	Type of Test Sample
1	Terminated mated connectors
2	Terminated mated connectors
3	Terminated mated connectors
4	Terminated mated connectors
5	Terminated mated connectors (Connectors with size 22-20 contacts only)
6	Terminated mated connectors (EME-shielded class only)
7	Terminated mated connectors (Cadmium shell plating only)
8	Insert material specimens
9	Removable inserts
10	Terminated mated connectors

Table XII. Qualification Tests, Test Group 1 through Test Group 10

Test Group 1

Test Sequence	Requirement Paragraph	Procedure Paragraph
Visual examination	3.1, 3.4, 3.5, 3.7, 3.8	4.5.2
Maintenance aging	3.6.13	4.5.15
Contact engagement and separation forces*	3.6.6	4.5.8
Thermal shock	3.6.16	4.5.18
Air leakage**	3.6.35	4.5.37
Coupling torque	3.6.11	4.5.13
Durability	3.6.7	4.5.9
Altitude immersion Insulation resistance measurement Dielectric withstanding voltage test	3.6.19	4.5.21
Insert retention	3.6.9	4.5.11
Salt spray (corrosion)	3.6.21	4.5.23.1
Coupling torque	3.6.11	4.5.13
Low signal level contact resistance*	3.6.3.2	4.5.5.3
Contact resistance at specified current* (Room temperature)	3.6.3.1	4.5.5.1
Electrical engagement	3.6.5	4.5.7
Contact engagement and separation forces*	3.6.6	4.5.8
Coupling over-torque	3.6.12	4.5.14
Post test examination	3.6.37	4.5.39

*Connectors with size 22-20 contacts only.
*Pressure-maintaining connectors only.

Test Group 2

Test Sequence	Requirement Paragraph	Procedure Paragraph
Visual examination	3.1, 3.4, 3.5, 3.7, 3.8	4.5.2
Maintenance aging	3.6.13	4.5.15
Contact engagement and separation forces*	3.6.6	4.5.8
Contact retention	3.6.10	4.5.12
Altitude – Low temperature	3.6.20	4.5.22
Insulation resistance at room temperature	3.6.1	4.5.3
Dielectric withstanding voltage at sea level	3.6.2	4.5.4.1
Thermal shock	3.6.6	4.5.18
Air leakage**	3.6.35	4.5.37
Coupling torque	3.6.11	4.5.13
Insulation resistance at maximum rated temperature	3.6.1	4.5.3
Dielectric withstanding voltage at sea level	3.6.2	4.5.4.1
Dielectric withstanding voltage at altitude	3.6.2	4.5.4.2
Durability	3.6.7	4.5.9
Random vibration	3.6.14	4.5.16
Mechanical shock	3.6.15	4.5.17
Shell to shell conductivity	3.6.4	4.5.6
Humidity Insulation resistance measurement in high humidity Dielectric withstanding voltage test in high humidity Insulation resistance measurement after 24 hours Dielectric withstanding voltage test after 24 hours	3.6.18	4.5.20
Low signal level contact resistance*	3.6.3.2	4.5.5.3
Contact resistance at specified current* (Maximum rated temperature)	3.6.3.1	4.5.5.2
Contact engagement and separation forces*	3.6.6	4.5.8
Contact retention	3.6.10	4.5.12
Coupling over-torque	3.6.12	4.5.14
Post test examination	3.6.37	4.5.39

*Connectors with size 22-20 contacts only.
**Pressure-maintaining connectors only.

Test Group 3

Test Sequence	Requirement Paragraph	Procedure Paragraph
Visual examination	3.1, 3.4, 3.5 3.7, 3.8	4.5.2
Magnetic permeability	3.6.24	4.5.26
Ozone exposure	3.6.22	4.5.24
Insulation resistance at room temperature	3.6.1	4.5.3
Dielectric withstanding voltage at sea level	3.6.2	4.5.4.1
Fluid immersion	3.6.23	4.5.25
Dielectric withstanding voltage at sea level	3.6.2	4.5.4.1
Coupling torque	3.6.11	4.5.13
Insert retention	3.6.9	4.5.11
Post test examination	3.6.37	4.5.39

Test Group 4

Test Sequence	Requirement Paragraph	Procedure Paragraph
Visual examination	3.1, 3.4, 3.5, 3.7, 3.8	4.5.2
Contact engagement and separation forces*	3.6.6	4.5.8
Temperature life Insulation resistance measurement at a maximum rated temperature	3.6.17	4.5.19
Humidity Insulation resistance measurement in high humidity Dielectric withstanding voltage test in high humidity Insulation resistance measurement after 24 hours	3.6.18	4.5.20
Low signal level contact resistance	3.6.3.2	4.5.5.3
Contact resistance at specified current* (Room temperature)	3.6.3.1	4.5.5.1
Contact resistance at specified current* (Maximum rated temperature)	3.6.3.1	4.5.5.2
Insert retention	3.6.9	4.5.11
Contact engagement and separation forces*	3.6.6	4.5.8
Contact retention	3.6.10	4.5.12
Post test examination	3.6.37	4.5.39
Termination tensile strength*	3.6.8	4.5.10

*Connectors with size 22-20 contacts only.
**Pressure-maintaining connectors only.

Test Group 5 (Connectors with size 22-20 contacts only)

Test Sequence	Requirement Paragraph	Procedure Paragraph
Visual examination	3.1, 3.4, 3.5, 3.7, 3.8	4.5.2
Low signal level contact resistance	3.6.3.2	4.5.5.3
Contact resistance at specified current (Room temperature)	3.6.3.1	4.5.5.1
Industrial gas	3.6.25	4.5.27
Low signal level contact resistance	3.6.3.2	4.5.5.3
Contact resistance at specified current (Room temperature)	3.6.3.1	4.5.5.1
Post test examination	3.6.37	4.5.39

Test Group 6 (EME shielded class only)

Test Sequence	Requirement Paragraph	Procedure Paragraph
Visual examination	3.1, 3.4, 3.5, 3.7, 3.8	4.5.2
Durability	3.6.7	4.5.9
Shell-to-shell conductivity	3.6.4	4.5.6
EME shielding	3.6.34	4.5.36

Test Group 7 (Cadmium shell plating only)

Test	Requirement Paragraph	Procedure Paragraph
Salt Spray (dynamic test)	3.6.21	4.5.23.2

Test Group 8

Test Sequence	Requirement Paragraph	Procedure Paragraph
Insert Material Certification		
Tensile strength	3.6.26.1	4.5.28.1
Deflection temperature	3.6.26.2	4.5.28.2
Water absorption	3.6.26.3	4.5.28.3
Flammability	3.6.26.4	4.5.28.4
Smoke generation	3.6.26.5	4.5.28.5

Test Group 9

Test	Requirement Paragraph	Procedure Paragraph
Removable insert retention system abuse	3.6.31	4.5.33

Test Group 10

Test Sequence	Requirement Paragraph	Procedure Paragraph
Pin contact stability	3.6.26	4.5.28
Contact walkout	3.6.30	4.5.32
Contact retention system abuse	3.6.32	4.5.34
Retention system fluid resistance	3.6.33	4.5.35

4.4 Acceptance Inspection. Lot acceptance inspection shall consist of the tests listed in Table XIII. Acceptance inspection shall be performed on every lot of connectors manufactured under this specification. The sample units shall be tested un-terminated and shipped against orders. In-process examination may be used for acceptance inspection. Military specification contacts shall meet the applicable acceptance tests of MIL-C-39029.

Table XIII. Acceptance Inspection

Test	Requirement Paragraph	Procedure Paragraph	Inspection Level	AQL*
Visual examination	3.1, 3.4, 3.5, 3.7, and 3.8	4.5.2	I	1.0
Insulation resistance at room temperature Size 16 and Size 12 inserts only	3.6.1	4.5.3	S-3	1.0
Dielectric withstanding voltage Inserts Only – 10 second test (tested with an external clip to simulate grounded shell)	3.6.2	4.5.4.1	100%	1.0
Contact engagement and separation forces, largest and smallest values Size 22-20 contacts only	3.6.6	4.5.8	S-3	1.0

*AQL shall apply to individual defects in accordance with ANSI ASQC Z1.4, Section 4.5

4.4.1 Sampling for Acceptance Inspection. ANSI ASQC Z1.4 shall apply for definitions of inspection terms used herein. For purposes of this specification, the following shall apply:

4.4.1.1 Inspection Lot. The inspection lot shall consist of all connectors or components of one part number, manufactured under essentially the same conditions, and offered for inspection at one time.

4.4.1.2 Inspection Level and Acceptable Quality Levels (AQL). The inspection levels and acceptable quality levels shall be in accordance with ANSI ASQC Z1.4 and shall be as specified in Table XIII.

4.4.2 Rejected Lots. If an inspection lot is rejected, the lot shall be replaced, or the defective units shall be reworked to correct the defect or screened out. If the lot is reworked or the defective units are screened out, the lot shall be resubmitted for inspection. Resubmitted lots shall be inspected using tightened inspection in accordance with ANSI ASQC Z1.4.

4.4.3 Examination of Preparation for Delivery. Preparation for delivery of material ready for shipment shall be examined to determine compliance with the requirements of Section 5.

4.5 Test Procedures.

4.5.1 Test Conditions. Unless otherwise specified, all tests shall be performed at ambient pressure, and relative humidity as specified in the general requirements of MIL-STD-1344 with an ambient temperature of 25 ± 5°C Where conditioning at the maximum rated temperature-is specified, the temperature tolerances shall be -0°C and +5°C.

4.5.1.1 Connector Assembly Preparation. When terminated connectors are specified for testing, appropriate contacts shall be installed and terminated in accordance with the applicable specification control drawing. Wire or cable lengths shall be approximately 3 feet (1 meter). Connectors shall be assembled in accordance with the applicable engineering standard (ES). Cable clamps shall be installed, if provided for.

4.5.2 Visual Examination (see 3.1, 3.4, 3.5, 3.7, 3,8). Connector components and assemblies shall be visually examined at 4X magnification.

4.5.3 Insulation Resistance (see 3.6.1). Connector assemblies shall be tested in accordance with MIL-STD-1344, Method 3003. Insulation resistance shall be measured between all adjacent contacts in the insert and between all contacts and the shell (ground). When insulation resistance at maximum rated temperature is specified, the connector assemblies shall be conditioned in an oven at the maximum rated temperature for 30 minutes and the measurements shall be made while the connector assemblies are at the maximum rated temperature.

4.5.4 Dielectric Withstanding Voltage.

4.5.4.1 Dielectric Withstanding Voltage at Sea Level (see 3.6.2). Connector assemblies shall be tested in accordance with MIL-STD-1344, Method 3001. Test voltage shall be 60 Hz ac applied between all adjacent contacts in the same insert and between all contacts and the shell (ground). The shell and all contacts not connected to the test voltage shall be grounded. The test voltage shall be 1500 V rms.

4.5.4.2 Dielectric Withstanding Voltage at Altitude (see 3.6.2). Mated and unmated connector assemblies shall be tested as specified in 4.5.4.1, except that the test voltages and altitude pressure equivalents shall be as specified in Table XIV.

4.5.5 Contact Resistance (see 3.6.3).

4.5.5.1 Contact Resistance at Specified Current (Room Temperature). Mated connector assemblies shall be tested in accordance with MIL-STD-1344, Method 3004. At least 20 percent of the contacts in each connector assembly shall be tested.

4.5.5.2 Contact Resistance at Specified Current (Maximum Rated Temperature). Mated connector assemblies shall be conditioned in an oven at the maximum rated temperature for 30 minutes. Measurements shall be made as detailed in 4.5.5.1, while the connector assemblies are at the maximum rated temperature.

4.5.5.3 Low Signal Level Contact Resistance. Mated connector assemblies shall be tested in accordance with MIL-STD-1344, Method 3002. At least 20 percent of the contacts in each connector assembly shall be tested.

Table XIV. Dielectric Withstanding Voltage Test Voltages and Altitudes

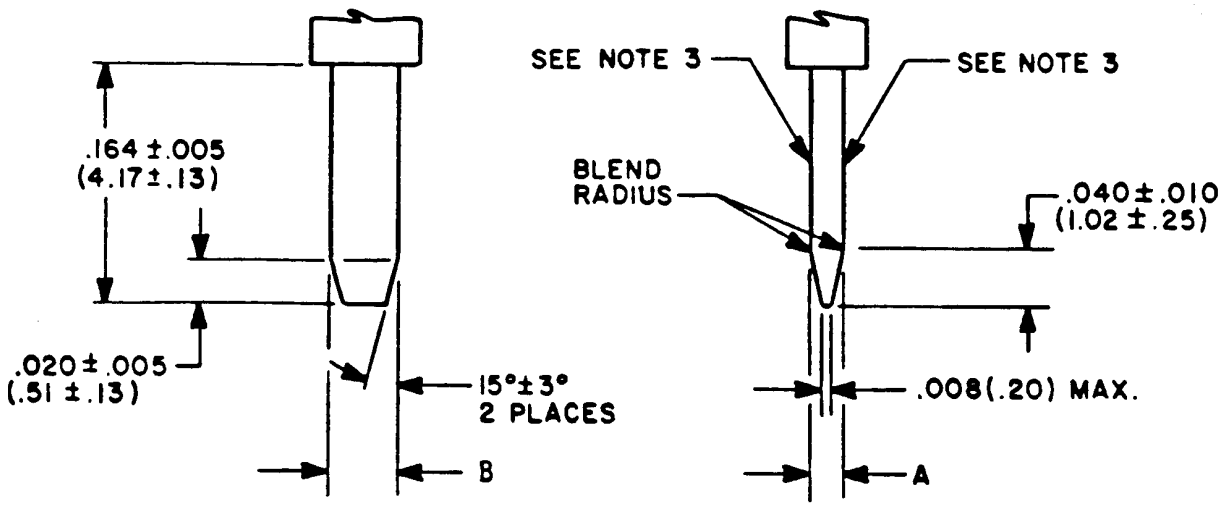
Altitude	Pressure Equivalent	Test Voltage, V rms	
		Unmated	Mated
50,000 ft (15.2 km)	87.5 torr (11.7 kPa)	550	1000
70,000 ft (21.3 km)	33.5 torr (4.47 kPa)	375	1000
110,000 ft (33.5 km)	5.74 torr (0.765 kPa)	200	800

4.5.6 Shell to Shell Conductivity (see 3.6.4). Mated connector assemblies with conductive shell finish shall be tested by applying a direct current of 1.0 ± 0.1 A from the rear corner of one shell to the opposite rear corner of the other shell. Measure the voltage drop between the mated surfaces of the shells by applying the voltmeter probes on the flat surfaces at the middle of the rear edge of the shells. Probes used to make voltage measurements shall have spherical ends with 0.050 inch (1.3 mm) minimum radius and shall not puncture or damage the shell finish.

4.5.7 Electrical Engagement (see 3.6.5). Mated connector assemblies shall be wired to provide a series circuit through all contacts of the mated connector. A suitable power source and indicator shall be provided such that the point at which the series circuit is completed, during normal connector mating, can be established. Connector halves shall be held flat against a smooth, flat surface and mated by alternately turning each jackscrew one-half turn. The mating operation shall be stopped at the first indication of a completed circuit, and the plug-to-receptacle shell spacing shall be measured along the centerline of the connectors. The mating operation shall then be continued until the connector halves are completely mated at a jackscrew torque 9 lbf-in. (1.0 N-m), and the shell spacing shall again be measured. Electrical engagement shall be the difference between the two measurements.

4.5.8 Contact Engagement and Separation Forces (see 3.6.6). Size 22-20 contacts shall be tested in accordance with MIL-STD-1344, Method 2014, Procedure I. Test blades shall be as shown in Figure 2. Contacts shall be conditioned by inserting and withdrawing the maximum-thickness test blade. For qualification inspection., at least 20 percent of the contacts in each connector assembly shall be tested.

Figure 2. Test Blades for Size 22-20 Contact Engagement and Separation Forces.



Test Blade Type	Dimension A				Dimension B	
	Inches		(Millimeters)		Inches	(Millimeters)
	Thickness	Tolerance	Thickness	Tolerance		
Maximum Thickness	0.0210	+0.0000 -0.0002	(0.533)	(+0.000) (-0.005)	0.050	(1.27)
Minimum Thickness	0.0190	+0.0002 -0.0000	(0.483)	(+0.000) (-0.005)	0.050	(1.27)

Notes: 1. Material: Hardened Tool Steel
2. Hardness: Rockwell "C" 50-55
3. Surface finish: 6 to 10 microinch (0.15 to 0.25 micrometer) on working surfaces

4.5.9 Durability (see 3.6.7). Terminated connector assemblies shall be mated and unmated 500 times at a rate not to exceed 300 cycles per hour and in a manner simulating actual service. The test may be performed by hand or by mechanical means.

4.5.10 Termination Tensile Strength (see 3.6.8). Terminated contacts shall be placed in a tensile testing device and sufficient force applied to individual wires to separate the wires from the contacts or break the wires. Wires shall be gripped 2.0 ± 0.5 inches (50 ± 13 mm) from the mating end of the contact. The speed of head travel of the tensile tester shall be 1.0 ± 0.25 inch (25 ± 6 mm) per minute. Conductor breakage outside the termination area at less than the tensile loads shown in Table IX shall not constitute failure. At least 20 percent of the contacts of each insert shall be tested.

4.5.11 Insert Retention (see 3.6.9). Terminated-Connector assemblies shall be tested in accordance with MIL-STD-1344, Method 2010, except that the load shall be applied only against the insert mating surface. The load shall be 200 psi (1.4 MPa), applied evenly over the entire mating surface. If a tensile tester is used to apply the load, the speed of head travel shall be 0.02 inch (0.5.mm) per minute.

4.5.12 Contact Retention (see 3.6.10). Inserts with contacts (removed from connector shells if removable) shall be tested in accordance with MIL-STD-1344, Method 2007. Axial load shall be 10 lbf (44 N) for size 22-20 contacts, 25 lbf (111 N) for size 16 contacts, and 35 lbf (156 N) for size 12 contacts, applied to mating ends of contacts.

4.5.13 Coupling Torque (see 3.6.11). Terminated plug and receptacle assemblies shall be mated by alternately turning jackscrews one-half turn at each side of the connector to a torque of 9 lbf-in. (1.0 N-m). The mated assembly shall then be visually inspected.

4.5.14 Coupling Overtorque (see 3.6.12). Terminated connector assemblies shall be mated to a torque of 9 lbf-in. (1.0 N-m). The jack-screws shall then be torqued to 15 lbf-in. (1.7 N-m), and the shells and mating hardware visually examined.

4.5.15 Maintenance Aging (see 3.6.13). Terminated connector assemblies shall be fully mated and unmated three times. Using the tool specified in the applicable specification sheet, removable inserts shall then be removed from the shells and installed in the shells ten times. A minimum of 20 percent of size 22-20 contacts and all size 16 and size 12 contacts shall be removed and reinstalled in the inserts 10 times. Connector assemblies shall then be fully mated and unmated three additional times.

4.5.16 Random Vibration (see 3.6.14). Terminated, mated connector assemblies shall be tested in accordance with MIL-STD-1344, Method 2005, Test Condition VI, Letter J. Connectors shall be panel mounted by normal means, with at least 8 inches (200 mm) of wire unsupported behind each connector. Specimens shall be subjected to vibration for 8 hours in each major axis for a total of 24 hours. The discontinuity detector shall be capable of detecting discontinuities of 50 nanoseconds and greater.

4.5.17 Mechanical Shock (see 3.6.15). Terminated, mated connectors shall be tested in accordance with MIL-STD-1344, Method 2004, Test Condition D. The connectors shall be panel mounted by normal means, with at least 8 inches (200 mm) of wire unsupported behind each connector. The discontinuity detector shall be capable of detecting discontinuities of 50 nanoseconds and greater.

4.5.18 Thermal Shock (see 3.6.16). Mated connector assemblies shall be tested in accordance with MIL-STD-202 Method 107, Test Condition F except that the high temperature extreme shall be the maximum rated temperature.

4.5.19 Temperature Life (see 3.6.17). Terminated, mated connector assemblies shall be tested in accordance with MIL-STD-1344, Method 1005, for 1000 hours at the maximum rated temperature, using an air-circulating oven. Contacts shall not be wired in series or connected to an electrical load. Leads shall be brought out through a suitable port so that electrical measurements can be taken. After 1000 hours and while connectors are still at the maximum rated temperature and mated, the insulation resistance shall, be measured in accordance with 4.5.3.

4.5.20 Humidity (see 3.6.18). Terminated, mated connector assemblies shall be tested in accordance with MIL-STD-1344, Method 1002, Type II. Polarization voltage is not required. Final measurements at high humidity shall be insulation resistance in accordance with 4.5.3 and dielectric withstanding voltage in accordance with 4.5.4.1. Final measurements after high humidity shall be performed after the mated connectors have remained outside the chamber in ambient conditions for 24 hours.

4.5.21 Altitude Immersion (see 3.6.19). Terminated, mated connectors shall be tested in accordance with Method 1004 of MIL-STD-1344.

4.5.22 Altitude-Low Temperature (see 3.6.20). Terminated, mated connector assemblies shall be tested in accordance with MIL-STD-1344, Method 1011. After stabilizing at ambient conditions, the insulation resistance measurement shall be made in accordance with 4.5.3, with the connectors mated, and the dielectric withstanding voltage test shall be performed as specified in 4.5.4.1, with the connectors mated.

4.5.23 Salt Spray (see 3.6.21).

4.5.23.1 Salt Spray (Corrosion). Terminated unmated connector assemblies shall be tested in accordance with MIL-STD-1344, Method 1001, Test Condition B. Suitable measures shall be taken to preclude migration of condensation along the conductors.

4.5.23.2 Salt Spray (Dynamic Test). Terminated plugs and receptacles shall be mated and unmated 50 cycles at a rate not to exceed 300 cycles per hour. The plug and receptacle shall be completely separated during the un-mate portion of the cycle. The connectors shall then be mated and exposed to salt fog for 452 hours in accordance with MIL-STD-1344, Method 1001. The connectors shall then be unmated and exposed to the salt fog for 48 hours. Suitable measures shall be taken to preclude migration of condensation along with conductors. Following the salt fog exposure, 450 mate and un-mate cycles shall be performed.

4.5.24 Ozone Exposure (see 3.6.221. Terminated, unmated connector assemblies shall be tested in accordance with MIL-STD-1344, Method 1007.

4.5.25 Fluid Immersion (see 3.6.23). Terminated connector assemblies shall be tested in accordance with MIL-STD-1344, Method 1016, except that measurement of initial

mating and un-mating forces is not required. The following exceptions and additional fluids shall be incorporated into the procedure:

a. One sample shall be tested in hydraulic fluid per MIL-PRF-83282, using the same procedure as for hydraulic fluid (Ref: MIL-H-5606).
b. One sample shall be tested in MIL-DTL-5624, Grade JP-4, using the same procedure as for Grade JP-5 (Ref: MIL-T-5624).
c. Conditioning in coolant-dielectric fluid (Coolanol) shall be at the maximum rated temperature.
d. Deleted.
e. One sample shall be tested in mineral-based lubricating oil per SAE J1966, using the same procedure as for lubricating oil (Ref: MIL-L-7808).
f. Samples shall be tested in each of the following fluids, using the same procedure as for hydraulic fluid (Ref: MIL-H-5606), except that the connectors shall be immersed mated: Monsanto Skydrol 500 B-4, Monsanto Skydrol LD4, Chevron Hyjet IV
g. One sample shall be tested in Odex Super Ready, Racasan, Odex Lt Water based with dilution rate in water of 1.6 g/l, using the same procedure as for hydraulic fluid (Ref: MIL-H-5606), except that the connectors shall be immersed mated.
h. One sample shall be tested in Borough Welcome World Health Organization multi-shot insecticide spray, using the same procedure as for hydraulic fluid (Ref: MIL-H-5606), except that the fluid exposure (immersion) shall be done at room temperature by spraying from 12 to 18 inch (300 to 450 mm) distance until connector is thoroughly wetted.
i. One sample shall be tested in uncracked, unleaded gasoline ("white gas"), using the same procedure as for gasoline (Ref: MIL-G-3056).

4.5.26 Magnetic Permeability (see 3.6.24). Terminated, unmated connector assemblies shall be tested in accordance with MIL-STD-1344, Method 3006.

4.5.27 Industrial Gas (see 3.6.25). Terminated, unmated connector assemblies shall be place on a non-corrosive rack in a closed plastic or glass chamber with a maximum volume of 2 cubic feet (56 dm) containing a 10-percent solution of sulfurated potash NF in distilled water. Samples shall not be immersed in the solution, but shall be exposed to the sulfide vapor for 100 hours.

4.5.28 Insert Material. Supplier certification is acceptable using the test methods defined below or suitable alternatives.

4.5.28.1 Tensile Strength (see 3.6.26.1). Tensile strength shall be determined in accordance with ASTM D638 on Type IV molded tensile bars, utilizing a crosshead speed of 2.0 inches per minute (0.85 mm/s).

4.5.28.2 Deflection Temperature (see 3.6.26.2). The deflection temperature at 66 psi (455 kPa) maximum fiber stress shall be determined in accordance with ASTM D648. Specimen width shall be 0.125 inch (3 mm). (The required load is 0.34 lbf (1.54 N).

4.5.28.3 Water Absorption (3.6.26.3). Water absorption shall be measured in accordance with ASTM D570 using 2.0 x 0.5 x 0.125 inch (51 x 13 x 3 mm) molded specimens. The test specimens shall be preconditioned for 24 hours at 100°C before immersion. Immersion time shall be 24 hours.

4.5.28.4 Flammability (see 3.6.26.4). Flammability shall be tested in accordance with UL 94V, Section 3, using 5.0 x 0.5 x 0.125 inch (127 x 13 x 3 mm) molded specimens.

4.5.28.5 Smoke Generation (see 3.6.26.5). Smoke generation shall be determined in accordance with ASTM E662. Specimens shall be 3.0 x 3.0 x. 0.125 inch (76 x 76 x 3 mm) molded insert material. Three specimens shall be tested, under flaming exposure and three under non-flaming exposure.

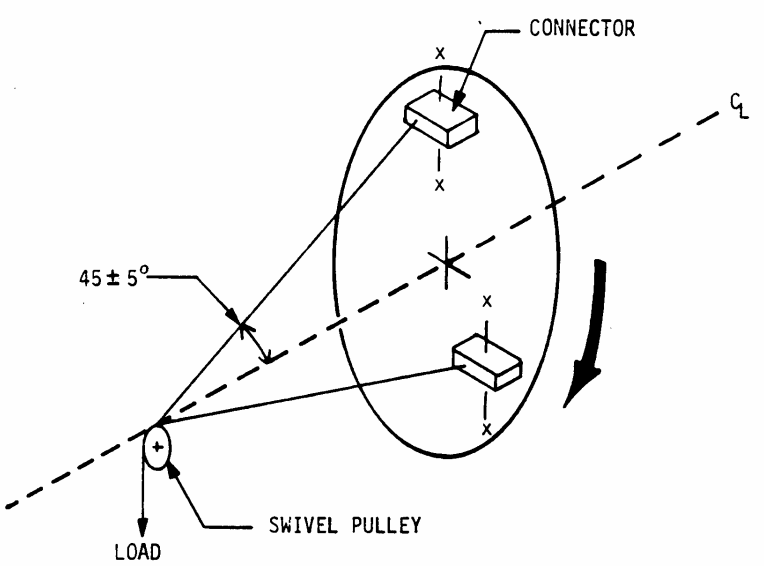
4.5.29 Deleted

4.5.30 Deleted

4.5.31 Deleted

4.5.32 Contact Walkout (see 3.6.30). Two pin contacts in an insert and two socket contacts in an insert shall be tested. The contacts shall be soldered or crimped, as applicable, to stranded steel or steel-cored wire of an appropriate size and the inserts installed in a shell without a cable clamp. The unmated connector shall be mounted in a test fixture as shown in Figure 3. A 3.0 lb (1.36 kg) weight shall be attached to the wire. One 360-degree rotation of the fixture with connector mounted shall constitute one cycle. The connector shall be subjected to 100 cycles at a rate of 10 to 20 cycles per minute.

Figure 3: Contact Walkout Test Fixture



4.5.33 Removable Insert Retention System Abuse (see 3.6.31). Removable inserts shall be subjected to the following tests, using a different specimen for each test. Should a tool become damaged during testing, it shall be replaced. Failure of a tool shall not constitute a test failure.

4.5.33.1 Removable Insert Removal Tool Rotation. Removable inserts of each polarization and contact type shall be tested. Inserts shall be removed while torque is applied to the removal tool. The insert shall then be reinserted. These steps shall be repeated ten times on each insert.

4.5.33.2 Removable Insert Removal Tool Thrust. Removable inserts of each polarization and contact type shall be tested. The applicable insert removal tool shall be inserted as if to remove the insert, and an axial load of 10. 0 lbf (44 N) shall be applied to the tool. The tool shall then be removed along with the insert.

4.5.34 Contact Retention System Abuse (see 3.6.32). Contacts shall be subjected to the following tests. Any contact cavity used for testing shall not be subjected to further tests. Should a tool become damaged during testing, it shall be replaced. Failure of a tool shall not constitute a test failure.

4.5.34.1 Contact Removal Tool Rotation. The applicable contact removal tool shall be installed as if to remove a contact, and an axial load of 3.0 lbf (13 N) shall be applied. With the force applied, the tool shall be rotated 180 degrees and then removed along with the contact. The contact shall be reinstalled. These steps shall be repeated three times on each of five contacts in each connector tested.

4.5.34.2 Contact Installing Tool Rotation. The contact shall first be removed. With the applicable contact installing tool, the contact shall be reinstalled and an axial load of 3.0 lbf (13 N) applied to the tool. With the force applied, the tool shall be rotated 180 degrees and then removed. These steps shall be repeated-three times on each of five contacts in each connector tested.

4.5.34.3 Contact-Installing Tool Thrust. The contact shall first be removed. With the applicable contact installing tool, the contact shall be reinstalled and an axial load of 7.0 lbf (31 N) applied to the tool. These steps shall be performed once on each of five contacts in each connector tested. A new tool shall be used for each contact.

4.5.34.4 Contact Removal Tool Thrust. The applicable contact removal tool shall be installed as if to remove the contact, and an axial load of 7. 0 lbf (31 N) shall be applied to the tool. The tool shall then be removed along with the contact. These steps shall be performed once on each of five contacts in each connector tested. A new tool shall be used for each contact.

4.5.35 Retention System Fluid Resistance (see 3.6.33). Unmated connectors shall be immersed for 20 hours at room temperature in the fluids specified below, using a different connector for each fluid. Connectors shall be removed from fluids and allowed to drain for 4 hours. Contact retention and insert retention shall then be tested as specified in 4.5.12 and 4.5.11.

Test fluids:

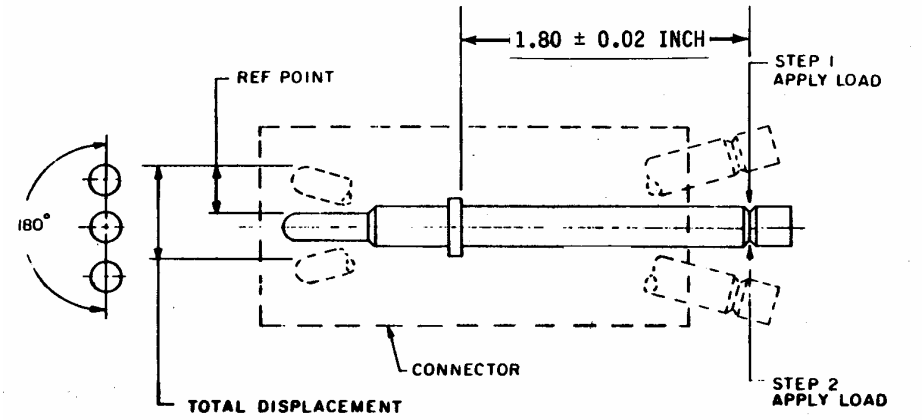
a. Monsanto low density aviation hydraulic test fluid.
b. MIL-PRF-5606 hydraulic fluid.
c. MIL-PRF-23699 lubricating oil.
d. Methyl ethyl ketone per ASTM D740.
e. Alkaline detergent, pH 10.0-10.5.
f. Aviation turbine fuel, type Jet A.
g. MIL-DTL-5624 fuel, type JP-4.
h. One part by volume of isopropyl alcohol per ASTM D770 mixed with three parts mineral spirits per MIL-PRF-680, Type 1.
i. Anti-icing fluid, composition by weight: 66.0 % ethylene glycol per ASTM E1119; 22.0 % 1,2 propanediol (propylene glycol) per MIL-P-83800, industrial grade; 10.0 % water; 0.90 % dibasic potassium phosphate; 0.65 % sodium di-(2-ethylhexyl) sulfosuccinate (100 % active); 0.45 % benzotriazole.

4.5.36 EME Shielding (see 3.6.34). EME shielded connectors shall be tested for EME shielding performance by determining the surface transfer impedance (Z_t) of connector assemblies as follows. EME shielded connectors shall be terminated to suitable lengths of compatible shielded wire or cable and a test specimen prepared in accordance with MIL-C-85485. The Z_t of the connector assembly shall then be measured.

4.5.37 Air Leakage (see 3.6.35). Terminated, pressure maintaining connector assemblies shall be tested in accordance with the environmental seal test method of MIL-STD-1344, Method 1008. The wired pin receptacle shall be mounted on the divider and mated to the wired plug. The wires from the plug shall remain within the test chamber. The test shall be conducted at room temperature with a pressure differential of 1 atmosphere (101 kPa) maintained for 30 minutes.

4.5.38 Pin Contact Stability (see 3.6.36). Ten percent of the contact cavities, but not less than one cavity, of removable and fixed inserts shall be tested using test pins conforming dimensionally to the applicable contacts and to Figure 4. The insert or connector shall be fixtured and the applicable force specified in Table X shall be applied as shown in Figure 4. The rate of load application shall not exceed 1.0 inch (25.4 mm) per minute. The total displacement of the tip of the test pin shall be measured as shown in Figure 4.

Figure 4. Pin Contact Stability Testing



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

4.5.39 Post Test Examination (see 3.6.37). The tested connectors shall be examined for evidence of cracking, loosening of parts, carbon tracking, excess wear, or missing parts.

5.0 Preparation For Delivery

5.1 Packaging and Packing. Unless otherwise specified in the procurement document packaging and packing shall be in accordance with commercial practice.

5.2 Marking. Unless otherwise specified in the procurement document, marking shall be in accordance with commercial practice.