

**INCH-POUND**

MIL-C-81511F(AS)  
 30 September 1992  
 SUPERSEDING  
 MIL-C-81511E(AS)  
 23 May 1977

**MILITARY SPECIFICATION  
 CONNECTORS, ELECTRICAL, CIRCULAR, HIGH DENSITY,  
 QUICK DISCONNECT, ENVIRONMENT RESISTING; AND ACCESSORIES  
 GENERAL SPECIFICATION FOR**

This specification is approved for use by Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

The MIL-C-81511 connectors have been declared **INACTIVE FOR NEW DESIGN** after 30 April 1975 by decision of the Department of Defense. This does not preclude their use for maintenance, repair, or resupply purposes, nor does it preclude use in design circumstances wherein the connectors must interface with the connectors being supplied with Government Furnished Equipment.

**1. SCOPE**

**1.1 Scope.** This specification covers four series of electrical connectors (plugs and receptacles) with removable crimp and nonremovable solder contacts and accessories (see 6.1). Electrical, mechanical and environmental features of these connectors include:

- a. Environment resisting at sea level and high altitude.
- b. Quick disconnect.
- c. RFI/EMI (Radio Frequency Interference/Electromagnetic Interference) protection (includes shell to shell grounding spring members)
- d. High density insert arrangements.
- e. Low level circuit capabilities
- f. Scoop-proof.
- g. Fluid resistant class provided
- h. High temperature class provided.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Warfare Center Aircraft Division Lakehurst, Systems Requirements Department, Code SR3, Lakehurst, NJ 08733-5100, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5935

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## MIL-C-81511F(AS)

- i. Several voltage service ratings available.
- j. Individual contact release from the rear of the connector (series 3 and 4 only).

1.1.1 Series description. The connectors are identified as series 1, 2, 3 or 4. All series are designed to prevent inadvertent electrical contact and to provide contact protection during mating. They can be mounted in the same size panel cutout. They are identified as follows:

Series 1: Long Shell (shell size 8 through 24). Scoop-proof when pins are installed in either the plug or the receptacle. Plugs contain the grounding spring members. Gang contact release system (GCR) (see figure 1).

Series 2: Lightweight, Short Shell (shell size 8 through 18). Scoop-proof when pins are installed in the receptacle, not scoop-proof when pins are installed in the plug. Receptacles contain the grounding spring members. Gang contact release system (GCR) (see figure 1).

Series 3: Long Shell (shell size 8 through 24). Scoop-proof when pins are installed in either the plug or the receptacle. Plugs contain the grounding spring members. Individual contact release system (ICR) (see figure 1).

Series 4: Lightweight, Short Shell (shell size 8 through 18). Scoop-proof when pins are installed in the receptacle; not scoop-proof when pins are installed in the plug. Receptacles contain the grounding spring members. Individual contact release system (ICR) (see figure 1).

1.1.1.1 Intermateability. Series 1 is intermateable with series 3, and series 2 is intermateable with series 4. Series 1 and 3 are not intermateable with series 2 and 4.

1.1.1.2 Contact retention. Contacts are inserted and removed from the connector rear. In series 1 and 2, the removal tool must be applied from the connector front. In series 3 and 4, the removal tool must be applied from the connector rear (see figure 1). Series 1 and 2 connectors have a "ganged" contact retention and release mechanism. Series 3 and 4 connectors have individual contact retention and release.

1.1.1.3 Weight and size. The individual contact release connectors (series 3 and 4) are shorter and lighter than the "gang release" connectors (series 1 and 2), respectively (see 3.1).

1.1.2 Temperature. These connectors are rated for operation within a temperature range specified for each class. The upper temperature limit is the maximum internal hot-spot temperature resulting from any combination of electrical load and ambient temperature. The low temperature limit is -65°C for all classes.

**MIL-C-81511F(AS)**

1.1.2.1 Variation of insulation resistance. Insulation resistance varies with temperature as indicated in table I and figure 2.

**TABLE I. Variation of insulation resistance.**

<b>Class</b>	<b>Hot-spot temperature</b>	<b>Insulation resistance megohms (min)</b>
<b>A11</b>	<b>25°C</b>	<b>5000</b>
<b>E</b>	<b>150°C</b>	<b>2000</b>
<b>H</b>	<b>150°C</b>	<b>500</b>
<b>F, W</b>	<b>175°C</b>	<b>2000</b>
<b>D</b>	<b>175°C</b>	<b>500</b>
<b>A</b>	<b>200°C</b>	<b>2000</b>

MIL-C-81511F(AS)

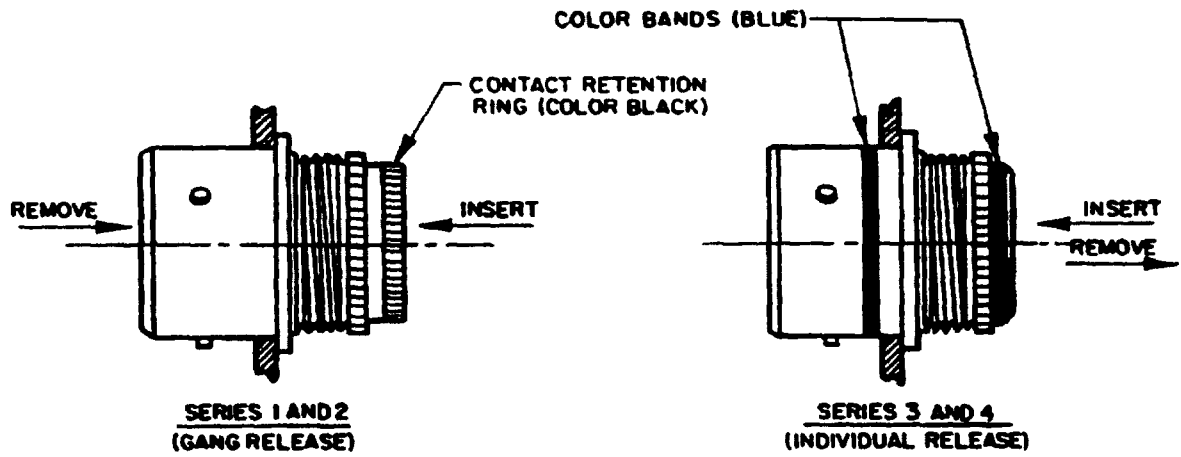


FIGURE 1. Contact insertion and removal methods.

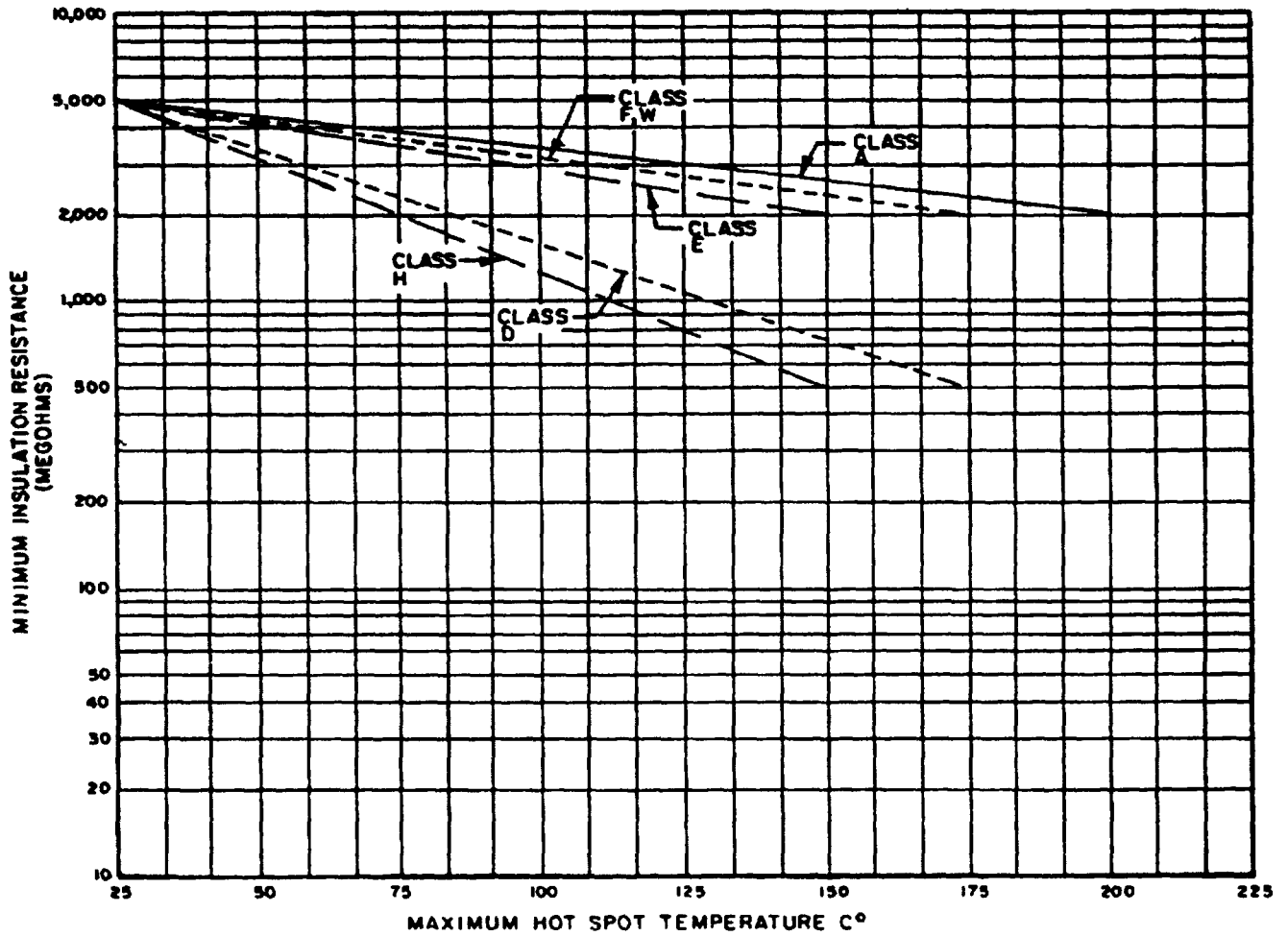


FIGURE 2. Minimum insulation resistance vs hot spot temperature.

## MIL-C-81511F(AS)

1.1.2.2 Variation of service life. Service life varies with temperature as indicated in figure 3 and table II.

TABLE II. Variation of service life.

Class	Hot-spot temperature	Service life
E, H	25°C 150°C Max	Continuous 1000 hours
F, W, D	25°C 175°C Max	Continuous 1000 hours
A	25°C 200°C Max	Continuous 1000 hours

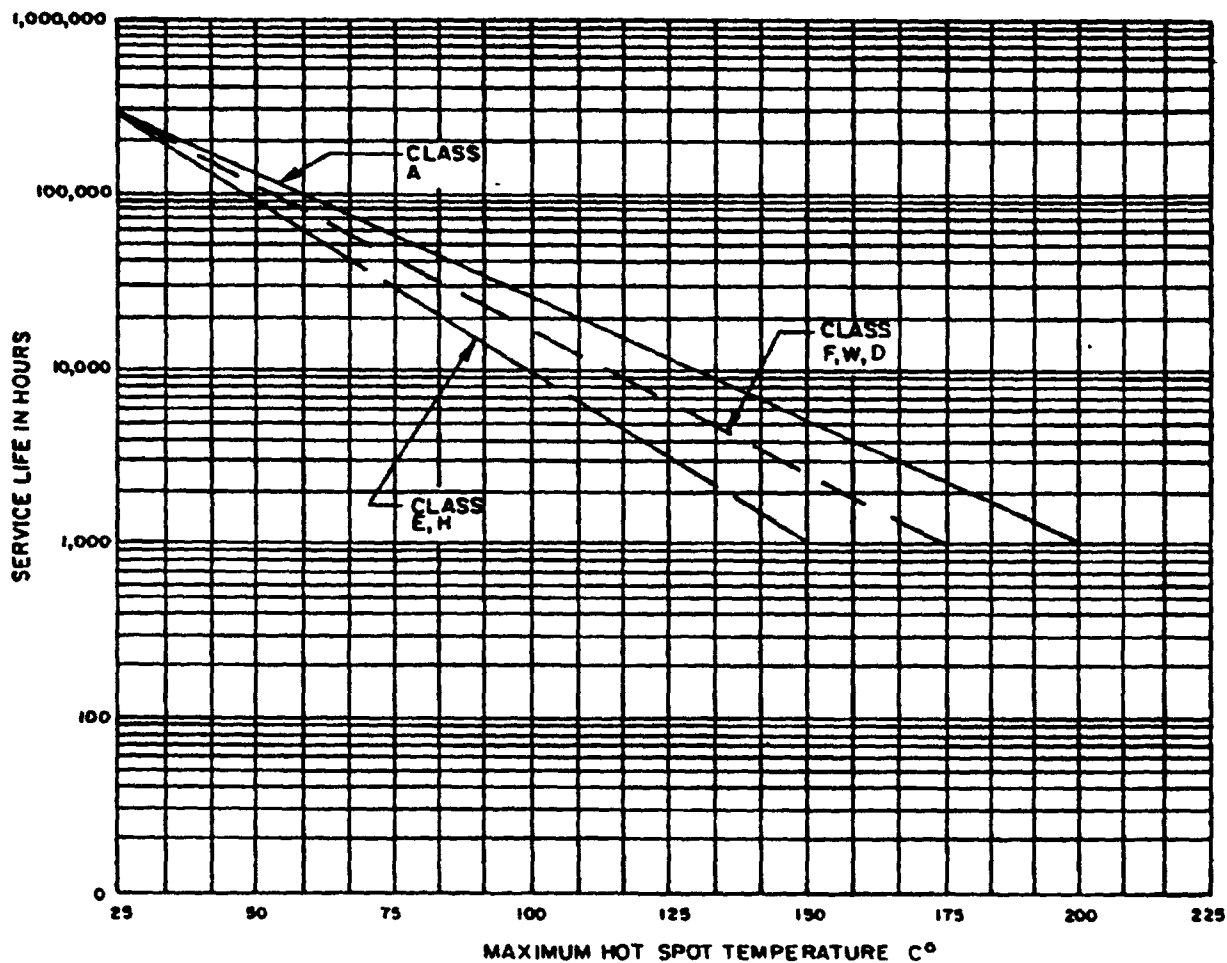
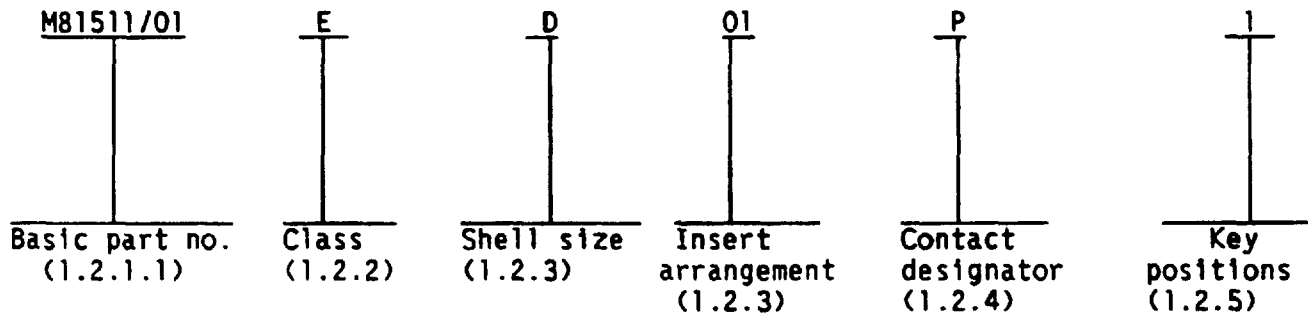


FIGURE 3. Service life vs hot spot temperature.

## MIL-C-81511F(AS)

1.2 Classification.1.2.1 Military part number.

1.2.1.1 Military part number for connectors. The connector part number will consist of the letter "M," the basic number of the applicable specification sheet and the applicable alpha-numeric characters (see 3.1), formulated as in the following example: M81511/01ED01P1.



1.2.1.2 Military part number for connector accessories. The part number for the accessories will consist of the letter "M," the basic number of the specification sheet and assigned dash numbers as indicated on the applicable specification sheet (see 3.1) (example: M81511/14-08-01).

1.2.2 Class. The class of the connector will be identified as shown in table III.

TABLE III. Connector class and series.

Class	Description	Applicable series	
		1 & 2	3 & 4
E	Grommet seal connectors (150°C operating temperature).	X	
F	Grommet seal connectors (175°C operating temperature), fluid resistant (not for Navy use).	X	X
A	Grommet seal connectors (200°C operating temperature), fluid resistant (not for Navy use).	X	X
H	Hermetic seal connectors (150°C operating temperature), solder terminated, ferrous alloy shell.	X	
D	Hermetic seal connectors (175°C operating temperature), solder terminated, ferrous alloy shell, fluid resistant.		X
W	Grommet seal connectors (175°C operating temperature), fluid resistant, 500 hour salt spray	X	X

## MIL-C-81511F(AS)

1.2.2.1 Fluid resistance. The fluid resistance capabilities for the various connector class are shown in table IV (see 3.5.8).

TABLE IV. Fluid resistance capabilities.

Class	Fluid resistance capabilities
E and H	MIL-H-5606 and MIL-L-23699.
A, D, F, and W	MIL-L-7808, MIL-L-23699, MIL-H-5606, MIL-T-5624 (Grade JP-5), Hydraulic Fluid, MIL-A-8243, MIL-C-87936, MIL-G-3056 (Type 1), Coolant Dielectric Fluid, Synthetic Silicate Ester Base, Solvents (a), (b) and (c) of MIL-STD-202, Method 215.

1.2.3 Shell size and insert arrangement. The shell size and insert arrangement will be identified by a two-part code. The first part will be the applicable shell size code letter per table V, the second part will be (2 numerical digits) as shown on top of the respective insert arrangement on figure 24.

TABLE V. Shell size code.

Shell size	Code letter
8	A
10	B
14	D
16	E
18	F
22	H
24	J

1.2.4 Contact designator.

1.2.4.1 Connector with contacts. The following designators are used to indicate a full complement of applicable power contacts (see 3.4.1):

- P - Pin contacts
- S - Socket contacts

## MIL-C-81511F(AS)

1.2.4.2 Connector without contacts. The following designations are used to indicate a connector less contact. They will be used only when other than a full complement of power contacts are to be installed in the connector. Examples of this are shielded, thermocouple and coaxial contacts (see 6.2)

- A - Less pin contacts
- B - Less socket contacts

1.2.5 Key position. Key or keyway position will be identified by a digit 1 through 6 (see 3.4.4.1).

1.2.6 Accessories.

## F adapter

- Type I - Straight cable clamp, for open wiring.
- Type II - 90° cable clamp, for open wiring.

## J adapter

- Type I - Straight adapter for jacketed cable.
- Type II - 45° adapter for jacketed cable.
- Type III - 90° adapter for jacketed cable.

Stowage receptacle - Dummy receptacle shell for stowing connector plugs.

Protective covers - Cover for protecting connector plugs or receptacles.

1.3 Wire range accommodations. The wire ranges given in table V-A and table V-B will be accommodated by the connectors and contact wire barrels as indicated.



## MIL-C-81511F(AS)

TABLE V-A. Wire range accommodations, series 1 and 2.

Wire barrel size	Wire size	OD of finished wire, (inch) 1/ (normal size)	Oversize wire 2/	Wire type (reference) 3/	
28	32	0.030 min	0.064 max	MIL-W-81044/12/13 MIL-W-5086/7 MIL-W-16878/28BCB	-28
	30	.042 nominal			-28
	28	0.054 max			
22	26	0.030 min	0.064 max	MIL-W-22759/18/19 MIL-W-22759/11/12 MIL-W-22759/16/17	-26
	24	.042 nominal			-24
	22	0.054 max			-22
20	24	0.041 min	0.085 max	MIL-W-22759/11/12 MIL-W-22759/9/10 MIL-W-81044/6/7	-24
	22	.062 nominal			-22
	20	0.081 max			-20
16	20	0.066 min	0.109 max	MIL-W-22759/9/10 MIL-W-81044/8/9 MIL-W-81044/5/6	-20
	18	.083 nominal			-18
	16	0.101 max			-16
12	14	0.097 min	0.139 max	MIL-W-22759/9/10 MIL-W-22759/44/45 MIL-W-81044/5/6	-14
	12	.106 nominal 0.135 max			-12 -12

1/ All contacts may be assembled with either minimum or maximum normal diameter wire as shown or in any combination thereof.

2/ 50 percent of the contacts in a given insert arrangement may be assembled with oversize wire up to and including the maximum diameter shown; however, the remaining 50 percent shall not exceed the nominal finished wire diameter. When using groupings of oversize wire, they shall be randomly distributed.

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

## MIL-C-81511F(AS)

TABLE V-B. Wire range accommodations, series 3 and 4.

Wire barrel	Wire size	O.D. of finished wire (inch) <u>1/</u>		Wire type (reference) <u>2/</u>	
28	32	0.030 minimum	0.042 nominal	MIL-W-81044/12/13	-28
	30			MIL-W-5086/6	-28
	28	0.054 maximum		MIL-W-16878/28BCB	
22	28	0.030 minimum	0.042 nominal	MIL-W-22759/18/19	-26
	26				
	24			MIL-W-22759/11/12	-24
	22	0.054 maximum		MIL-W-22759/16/17	-22
20	24	0.040 minimum	0.058 nominal	MIL-W-22759/14/15	-24
	22			MIL-W-22759/9/10	-22
	20	0.074 maximum		MIL-W-81044/9/10	-20
16	20	0.060 minimum	0.081 nominal	MIL-W-22759/9/10	-20
	18			MIL-W-81044/8/9	-18
	16	0.103 maximum		MIL-W-81044/5/6	-16
12	14	0.097 minimum	0.106 nominal	MIL-W-22759/9/10	-14
	12	0.135 maximum		MIL-W-22759/44/45	-12
				MIL-W-81044/5/6	-12

1/ All contacts may be assembled with either minimum or maximum normal diameter wire as shown or in any combination thereof.

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

## 2. APPLICABLE DOCUMENTS

### 2.1 Government documents.

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

## MIL-C-81511F(AS)

## SPECIFICATIONS

## FEDERAL

- QQ-A-225 Aluminum & Aluminum Alloy Bar, Rod Wire, or Special Shapes, Rolled, Drawn, or Cold Finished, General Specification for
- QQ-A-367 Aluminum Alloy Forging
- QQ-P-416 Plating, Cadmium (Electrodeposited)
- QQ-A-591 Aluminum Alloy Die Castings

## MILITARY

- MIL-G-3056 Gasoline, Automotive, Combat
- MIL-W-5086 Wire, Electric, Polyvinyl Chloride, Insulated Copper or Copper Alloy
- MIL-H-5606 Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance
- MIL-T-5624 Turbine Fuel, Aviation, Grades JP-4, JP-5, and JP-5/JP-8 ST
- MIL-S-7742 Screw Threads, Standard, Optimum Selected Series, General Specification for
- MIL-L-7808 Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number O-148
- MIL-A-8243 Anti-Icing and Deicing-Defrosting Fluid
- MIL-T-10727 Tin Plating: Electrodeposited or Hot-Dipped, for Ferrous and Nonferrous Metals
- MIL-W-16878 Wire, Electrical, Insulated, General Specification For
- MIL-C-22520 Crimping Tools, Terminal, Hand or Power Actuated, Wire Termination, and Tool Kits, General Specification For
- MIL-W-22759 Wire, Electric, Fluoropolymer-Insulated, Copper or Copper Alloy
- MIL-L-23699 Lubricating Oil, Aircraft Turbine Engines, Synthetic Base, NATO Code Number O-156

## MIL-C-81511F(AS)

## SPECIFICATIONS (Continued)

## MILITARY (Continued)

MIL-C-26074	Coating, Electroless Nickel, Requirements for
MIL-S-28786	Switches, Electrical and Fiber Optic, Packaging of
MIL-C-39029	Connector, Electrical Contacts, General Specification for
MIL-G-45204	Gold Plating, Electrode Deposited
MIL-C-55330	Connectors, Electrical and Fiber Optic, Packaging of
MIL-W-81044	Wire, Electric, Crosslinked Polyalkene, Crosslinked Alkane-imide Polymer, or Polyarylene Insulated, Copper or Copper Alloy
MIL-C-81511/15	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting; and Accessories: Plug, Sealing Contact (Series 1 or 2)
MIL-I-81969	Installing and Removal Tools, Connector Electrical Contact, General Specification for
MIL-C-87936	Cleaning Compounds, Aircraft Exterior Surfaces, Water Dilutable

(See Supplement 1 for list of associated specification sheets.)

## STANDARDS

## MILITARY

MIL-STD-104	Limits for Electrical Insulation Color
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-1285	Marking of Electrical and Electronic Parts
MIL-STD-1344	Test Methods for Electrical Connectors
MIL-STD-45662	Calibration Systems Requirements
MS3197	Gage Pin for Socket Contact Engagement Test

## MIL-C-81511F(AS)

## STANDARDS (Continued)

## MILITARY (Continued)

MS3322	Gasket, Conductive, Electrical Connector, Jam Nut Mount
MS3434	Test Gage, Contact Location and Retention Feature, MIL-C-0081511 Series 1 and 2 Connectors
MS3435	Test Gage, Contact Location and Retention Feature, MIL-C-0081511 Series 3 and 4 Connectors
MS3462	Test Gage, MIL-C-26482 Series 2 (Class N), MIL-C-81703 Series 3 (Class N) and MIL-C-0081511 Series 3 and 4 (Class L) Contact Retention Feature
MS9068	Packing, Preformed AMS 3304, 'O' Ring (Asg)
MS27488	Plug, End Seal, Electrical Connector
MS90484	Gasket, Flange Mount, Connector, Electric

(Application for copies of federal and military specifications, standards and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

MIL-C-81511F(AS)

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Y14.5                      Dimensioning and Tolerancing - (DOD adopted)

(Application for copies should be addressed to the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

ELECTRONIC INDUSTRIES ASSOCIATION

EIA-STD-RS359                      Standard Colors for Color Identification and Coding

(Application for copies should be addressed to the Electronic Industries Association (EIA), 2001 Eye Street, NW, Washington, DC 20006.)

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

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern. (If a specific requirement specified herein is not required for an item, it shall be so indicated on the specification sheet; for example, "Shock - N/A.").

## MIL-C-81511F(AS)

3.2 Qualification. Connector assemblies and accessories furnished under this specification and the applicable specification sheet shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.4 and 6.3).

3.2.1 Use of military part numbers. Military part numbers shall not be applied to a product, except for qualification test samples (see 6.3), until notification has been received from the activity responsible for qualification that the product has been approved for listing on the Qualified Products List.

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

3.3.1 Dissimilar metals. When dissimilar metals are employed in intimate contact with each other, suitable protection against electrolytic corrosion shall be provided as specified in Requirement 16 of MIL-STD-454.

3.3.2 Nonmagnetic materials (except class D and H). All parts shall be made from materials which are classed as nonmagnetic (see 3.5.18).

3.3.3 Fungus resistant. Materials used in the construction of these connectors shall be fungus inert in accordance with Requirement 4 of MIL-STD-454.

3.3.4 Contact materials. Contacts shall be made of suitably conductive copper alloys except that class D and H contacts may be ferrous alloy. All contacts shall be protected against electrolytic corrosion.

3.3.4.1 Contact plating (solder type). The external plated surface diameters of the contact body shall be gold-plated in accordance with MIL-G-45204, type II, grade C, class 1 (0.000050 minimum), over a suitable underplate except silver underplate shall not be used. Accessory members of the socket contacts need not be plated but shall comply with the requirements for dissimilar metals (see 3.3.1).

3.3.5 Dielectric materials.

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

3.3.5.1.1 Insert faces. The mating face of socket inserts shall be a hard nonresilient material. The mating face of pin inserts shall be a resilient material within a shore A durometer range of 40 to 50.

3.3.6 Connectors and accessories materials.

3.3.6.1 Connectors (class A, E, F, and W) and accessories. Shells for connectors (except class D and H) and metal accessories (see 1.2.6) shall be fabricated of high grade aluminum such as Alloy 6061. Temper T6 in accordance with QQ-A-367.

## MIL-C-81511F(AS)

3.3.6.2 Connectors (class D and H). Shells for classes D and H connectors shall be as specified (see 3.1).

3.3.6.3 Grounding spring members. Grounding springs shall be made from a spring temper copper alloy, protected to prevent corrosion.

3.3.6.4 Bayonet pins. Bayonet pins shall be made of corrosion resistant stainless steel.

3.3.6.5 Other component parts. Other metal component parts shall be fabricated from aluminum conforming to QQ-A-591 or QQ-A-225; however, the rear retention ring may be made from another material and shall comply with the requirements for dissimilar metals (see 3.3.1).

3.3.7 Connectors and accessories finish. The finish of all connector shells and accessories shall be electrically conductive.

3.3.7.1 Connectors (class E and W) and accessories. Aluminum parts shall be cadmium plated in accordance with QQ-P-416, type II, class 3. A preliminary plating of another metal is permissible. The resulting finish shall be olive drab (light to dark). Class W shall pass a 500 hour salt spray requirement (see 4.6.16).

3.3.7.2 Connectors (class A and F). Aluminum parts shall be nickel-plated in accordance with MIL-C-26074, class III, grade A.

3.3.7.3 Connectors (class D and H). Ferrous alloy shells shall be tin plated in accordance with MIL-T-10727, type 1 or 2. Preliminary plating of another metal is permissible. The resultant finish shall be suitable for soldering to a mounting surface.

3.3.7.4 Contact retention ring. The resultant finish of the contact retention ring shall be black (see figure 12).

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. Dimensioning and tolerancing shall be in accordance with ANSI Y14.5M-1982. Connector interface dimensions shall conform to figures 4 through 11. Connector back end configuration shall conform to figure 12A or 12B, as applicable.

3.4.1 Contact design. Contacts shall conform to MIL-C-39029, except as otherwise specified herein for solder contacts and through-bulkhead contacts.

3.4.1.1 Solder contacts. Solder contacts shall be as specified (see 3.1), and shall be nonremovable from the insert. Solder cups shall be so designed that during soldering no components will be damaged and no liquid solder shall escape.

3.4.1.2 Crimp contacts. Crimp contacts shall conform to the applicable military part number specified in table VI and shall be qualified to MIL-C-39029. The contact style shall be as designated in the connector part



## MIL-C-81511F(AS)

and the size and number of contacts shall be as shown in the applicable insert drawing. The contacts for use in each connector series are shown in table VI.

TABLE VI. Crimp contacts; insertion and removal tools.

Connector series	Crimp contact	Insertion tool	Removal tool
Series 1	Pin - M39029/47 Soc - M39029/33	M81969/2	M81969/3
Series 2	Pin - M39029/47 Soc - M39029/46		M81969/3
Series 3	Pin - M39029/18 Soc - M39029/17	<u>Insertion and removal tool</u> M81969/16	
Series 4	Pin - M39029/18 Soc - M39029/16		

3.4.1.3 Contacts (class D and H connectors). Nonremovable contacts for class D and H connectors shall be as specified (see 3.1).

3.4.2 Insert design and construction. Inserts shall be secured to prevent rotation or movement within the shell. The inserts shall be non-removable from the shell and shall be installed in the position specified on the applicable specification sheet. The insert shall contain no metallic components. The contact retention mechanism shall consist entirely of dielectric material. 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 for series 3 and 4 connectors shall be of voidless construction eliminating all air paths between contacts.

3.4.2.1 Contact retention and release.

3.4.2.1.1 Removable contacts (series 1 and 2). The inserts shall be designed so that positive locking of the contacts in the inserts is provided. The contact retaining system shall be free of foreign material, adhesive, or any obstruction that would prevent smooth contact insertion and positive retention. Contacts for class A, E, F and W removable contact connectors shall be retained by an internal insert construction and a ganged contact mechanism. To lock contacts, the retention system is operated by rotating the rear retention ring clockwise until the yellow color band is no longer exposed and metal to metal contact occurs between the shell and retention ring. Unlocking is accomplished by rotating the rear retention ring counterclockwise from the locked position until the yellow color band is fully exposed. The color shall be within the limits described in MIL-STD-104.

## MIL-C-81511F(AS)

3.4.2.1.2 Insertion and removal tools. The insertion and removal tools used to install and remove contacts from the connectors are shown in table VI.

3.4.2.1.3 Removable contacts (series 3 and 4). The inserts shall provide positive individual contact retention (ICR) and individual contact release from the wire side of the connector, using the applicable tools. The insert design shall permit individual insertion and extraction of contacts without use of a retention ring, or removal of the insert or sealing members. The individual contact retention members shall be surrounded by rigid dielectric material, configured so as to limit their flexure during contact insertion and removal as required to prevent overstressing. Insertion/extraction shall be possible with a full complement of maximum O.D. wire (see table V-B).

3.4.2.1.4 Nonremovable contacts. Nonremovable contact connectors shall have the contacts permanently retained in place. Contacts for class D and H receptacles shall be fused in vitreous material.

3.4.2.2 Grommet construction. The design of the grommet shall accommodate and seal insulated wire conductors having outside diameters within the ranges specified in table V-A and table V-B. Connectors with nonremovable contacts shall have a removable grommet if specified (see 3.1).

3.4.2.3 Interfacial seal. Plugs and receptacles with pin inserts shall have a resilient face seal permanently bonded in place to provide an interfacial seal with the hard face of the socket insert in the mated condition. The interfacial sealing member for class D and H connectors shall be permanently bonded to the insert. The interfacial sealing members of series 3 and 4 connectors shall provide raised seal barriers around each pin contact, as shown on figures 5B, 6B, 7B, 9B, 10B and 11B. There shall be .005 inch minimum displacement of resilient material when the connectors are fully mated, as tested in 4.6.29.

3.4.2.4 Insert arrangement. The arrangement of contacts in the insert shall be as specified on figure 24 and applicable military specification sheets.

3.4.2.5 Contact alignment and stability. With all contacts in place, the alignment of pin and socket contacts shall permit engagement irrespective of buildup of allowable tolerances on hole locations, distortion of contacts due to crimping and insert location in the shell.

3.4.3 Shell design The connector shall be of single-piece shell design, constructed to positively retain the insert interface in its specified position in the shell. The shell shall be designed to accept and retain a cable support or other accessory (see figures 4 through 12). The shells of series 3 and 4 connectors shall have a blue color band in accordance with EIA-STD-RS359 indicating individual contact release from the rear of the connector.

3.4.3.1 Grounding spring member. Series 1 and 3 plugs shall have a minimum of six fingers per inch. Series 2 and 4 receptacles shall have the following

## MIL-C-81511F(AS)

minimum fingers per shell size:

Shell size 8	6 fingers
Shell size 10	7 fingers
Shell size 14	9 fingers
Shell size 16	14 fingers
Shell size 18	17 fingers

Spring fingers shall be convex shaped in a manner which will ensure proper engagement of the mating shell. The grounding spring shall be permanently fixed to the shell periphery by riveting, welding, brazing, or soldering. Attachment of the grounding spring to the shell shall not impede spring flexing. The spring fingers shall engage the mating shell at a minimum distance of .090 inch prior to pin-socket engagement.

3.4.3.2 Jam nut mounting receptacle shell. The jam nut mounting receptacle shell shall be provided with a mounting nut with provisions for locking (see figures 6 and 10).

3.4.3.3 Screw threads. Screw threads shall be in accordance with MIL-S-7742. Out-of-roundness is not objectionable if the threads can be checked without forcing the thread gages.

3.4.3.4 Lubrication. Bayonet coupling slots, including inside diameter in the bayonet coupling slot area and threads shall be coated with a lubricant to aid in mating connectors. Features which are intended to provide potting compound anchorage shall be free of lubricant.

3.4.4 Connector engagement. The coupling type shall be a 3-pin bayonet (see figures 4 through 11). Keys and keyways shall be designed to prevent engagement of the contacts with the mating contacts or with the mating surface of the counterpart connector until the keyways are properly aligned for engagement (see figure 4 or 8). The coupling ring shall be nonremovable and of a fail-safe design. The coupling ring shall be knurled or fluted and designed to assist in engaging and disengaging contacts as the coupling ring is tightened or loosened. Counterpart connectors of any arrangement and size shall be capable of being fully engaged without the use of tools. 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 the connectors in the engaged position. Connectors shall be provided with spring fingers that are permanently attached to the shell.

3.4.4.1 Shell polarization. The polarization of the mating plugs and receptacles shall be accomplished by means of mating integral keys on the plug shell and keyways on the receptacle shell as specified (see 3.1). The key and keyway positions shall be in accordance with figure 4 (series 2 and 4) or figure 8 (series 1 and 3).

3.4.4.2 Bayonet pins. Bayonet pins on receptacle shells shall have end surfaces white in color. 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 fully engaged and the coupling ring is in the locked position (see figures 5, 6, 7, 9, 10 and 11).

## MIL-C-81511F(AS)

3.4.4.3 Engagement seal. Connectors shall contain sealing means so that the engaged connectors comply with the requirement specified herein (see 3.4.4). An O-ring seal shall be provided to achieve a peripheral seal around the mated shells.

3.4.4.4 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 XVI. Protective covers and stowage receptacles shall be provided with an electromagnetic shielding feature if required.

3.4.5 Panel seal. Jam nut mounting receptacles shall be provided with an MS9068 nonconductive O-ring panel seal. Flange mounted receptacles shall be provided with a qualified MS90484 flange gasket panel seal only if specified. Jam nut mounting receptacles shall be provided with a qualified MS3322 conductive O-ring panel seal only if specified (see 3.1).

3.4.6 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. Accessories shall be interchangeable between series and shall conform to figure 12C.

3.4.7 Intermateability. All series 1 and series 3 connectors having the same shell size, keying, contact arrangement and contact style shall be intermateable. All series 2 and series 4 connectors having the same shell size, keying, contact arrangement and contact style shall be intermateable (see 6.1 and figures 4 through 11).

3.5 Performance. Connectors and accessories shall meet the performance requirements stated herein when tested in accordance with the specified method of section 4.

3.5.1 Contact protection (scoop-proof).

3.5.1.1 Protection, receptacles or plugs designed for pin contacts (series 1 and 3). Connectors designed to provide protection in receptacles or plugs equipped with pin contacts shall not permit the edge of the shell of the mating plug or receptacle to touch the pin contacts (see figures 9, 10 and 11). The procedure described in 4.6.2 shall be used

3.5.1.2 Protection, receptacles designed for pin contacts (series 2 and 4). Connectors designed to provide protection only in receptacles equipped with pin contacts shall not permit the edge of the shell of the mating plug to touch the pin contacts (see figures 5, 6 and 7). The procedure described in 4.6.2 shall be used.

3.5.2 Contact forces.

3.5.2.1 Contact insertion and removal forces (crimp removable contact connectors only). When tested as specified in 4.6.3.1 or 4.6.3.2, contacts shall meet the insertion and removal forces specified in table VII-A or table VII-B, during maintenance aging.

3.5.2.2 Contact engaging and separating forces (non-removable contacts). When tested as specified in 4.6.3.3, the contact engaging and separating force

## MIL-C-81511F(AS)

shall not exceed the applicable values specified in table VII-C for non-removable contacts.

TABLE VII-A. Contact insertion and removal forces with locking mechanism disengaged (series 1 and 2 only).

Contact size	Insertion force pounds (max)	Removal force, pounds				
		During 1st cycle		During 10 cycle		Maximum
		Minimum average	Minimum	Minimum average	Minimum	
23-28	12	7	6	5	4	15
23-22	12	6	4	4	3	15
20-20	20	7	5	7	6	15
16-16	25	8	6	7	6	15
12-12	30	9	7	7	5	15

TABLE VII-B. Contact insertion and removal forces (series 3 and 4 only).

Contact size	Insertion or removal force, pounds (max.) (1st or 10th cycles)
23-28	3
23-22	3
20-20	5
16-16	7
12-12	10

TABLE VII-C. Contact engaging and separating forces (non-removable contacts only).

Mating end size	Minimum separating force (ounces) Minimum diameter MS3197 pin	Maximum average engaging force (ounces) Maximum diameter MS3197 pin	Maximum engaging force (ounces) Maximum diameter MS3197 pin
23	0.5	6.8	8
20	0.7	12	18
16	2	24	30
12	3	24	30

3.5.3 Operating force When tested as specified in 4.6.4, the coupling torque for mating and unmating of counterpart connectors shall meet the torque requirements in table VIII. The connectors used in this test shall have the complete complement of contacts. The dummy storage receptacles and protective covers, when mated with their applicable connectors, shall also comply with the torque requirements of table VIII.

## MIL-C-81511F(AS)

TABLE VIII. Coupling - torque.

Shell size	Torque (pounds-inches)	
	Maximum engagement and disengagement	Minimum disengagement
8	8	1
10	12	1
14	20	4
16	24	4
18	28	4
20	30	6
22	32	7
24	34	7

3.5.4 Contact retention (removable contacts). Contacts shall be retained in their inserts when the axial loads of table IX are applied. The axial displacement of the contact shall not exceed 0.012 inch while under the specified axial load on the mating end of the contact (see 4.6.5).

TABLE IX. Axial loads for contact retention.

Mating end size	Axial load (pounds - minimum)	
	Series 1 and 2	Series 3 and 4
23	10	12
20	15	15
16	25	25
12	25	25

3.5.5 Temperature cycling. When tested as specified in 4.6.6, there shall be no damage detrimental to the operation of the connector. The temperature extremes in table X shall be used.

TABLE X. Temperature extremes.

Low temperature All classes	Class E and H	High temperature Class D, F and W	Class A
-65 +0° -3°C	+150 +3° -0°C	+175 +3° -0°C	+200 +3° -0°C

3.5.6 Dielectric withstanding voltage. When tested as specified in 4.6.7, connectors shall show no evidence of breakdown or flashover when subjected to the test voltages and altitude in table XI, corona shall not be considered as breakdown. Maximum recommended working voltages are as shown in table XXII

## MIL-C-81511F(AS)

TABLE XI. Test voltage (ac, rms, not working voltage).

Simulated altitude condition	Service rating I	
	Mated	Unmated
Sea level	1800	1500
50,000 feet	1000	700
70,000 feet	1000	375
110,000 feet	1000	200

3.5.7 EMI/RFI shielding effectiveness.

3.5.7.1 Shielding effectiveness. When tested as specified in 4.6.8.1, the shells shall exhibit a radio frequency leakage attenuation equal to or greater than that specified in table XII.

TABLE XII. EMI/RFI shielding effectiveness.

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

3.5.7.2 Shell to shell continuity. When tested as specified in 4.6.8.2, the dc resistance shall not exceed 0.005 ohms.

3.5.7.3 Shell spring finger forces. When tested as specified in 4.6.8.3, the axial force necessary to overcome the shell spring finger interference shall be no less than .25 pounds nor more than 15 pounds.

3.5.8 Fluid immersion. After being immersed in the specified fluids, the connectors shall meet the requirements of operating force (see 3.5.3), dielectric withstanding voltage (see 3.5.6), and insulation resistance (see 3.5.13). The test method shall be as specified in 4.6.9.1 or 4.6.9.2.

3.5.8.1 Retention system fluid exposure (class A, E, F and W). When tested as specified in 4.6.9.3, the connectors shall meet the requirements of subsequent tests as specified herein. (Effects of fluids on resilient sealing members shall not be a consideration of this test.)

3.5.9 Durability. When tested as specified in 4.6.10, counterpart connectors shall show no damage detrimental to the operation of the connector.

## MIL-C-81511F(AS)

3.5.10 Vibration.

3.5.10.1 Vibration (conditioning). Mated connectors shall not be damaged, there shall be no loosening of parts due to vibration, and counter-part connectors shall be retained in full engagement (see 4.6.11.1).

3.5.10.2 Vibration (resistance change). Mated connectors shall not be damaged and there shall be no loosening of parts due to vibration. Counter-part connectors shall be retained in full engagement and the increase in contact resistance due to vibration shall not exceed 5 ohms in 1 microsecond (see 4.6.11.2).

3.5.11 Shock.

3.5.11.1 Shock (conditioning). Mated connectors shall not be damaged and there shall be no loosening of parts during the exposure to mechanical shock (see 4.6.12.1).

3.5.11.2 Shock (resistance change). Mated connectors shall not be damaged and there shall be no loosening of parts, nor shall the increase in contact resistance exceed 5 ohms in 1 microsecond during the exposure to mechanical shock (see 4.6.12.2).

3.5.12 Moisture resistance. When tested as specified in 4.6.13, mated connectors shall show no deterioration and the insulation resistance shall be 500 megohms or greater at 25°C.

3.5.13 Insulation resistance.

3.5.13.1 Insulation resistance at ambient temperature. When tested as specified in 4.6.14.1, the insulation resistance at ambient temperature (25°C) shall be greater than 5,000 megohms.

3.5.13.2 Insulation resistance at elevated temperature. After exposure for 1000 hours to the applicable high temperature specified in table I, and while still at that temperature insulation resistance shall be as specified in table I for each class (see 4.6.14.2).

3.5.14 External bending moment. When tested as specified in 4.6.15 using the applicable bending moment shown in table XIII, connectors shall show no evidence of damage nor shall there be any interruption of electrical continuity.



## MIL-C-81511F(AS)

TABLE XIII. External bending moment.

Plug shell size	Bending moment (inch-pounds)
8	75
10	230
14	350
16	419
18	433
20	460
22	500
24	525

3.5.15 Salt spray (corrosion). When tested as specified in 4.6.16, unmated connectors, stowage receptacles, protective covers, mating shells and accessories shall show no exposure of basic metal due to corrosion which will affect performance.

3.5.16 Temperature life. All connectors shall perform satisfactorily after exposure for 1000 hours to the applicable high temperature specified in table X when tested per 4.6.17.

3.5.16.1 Temperature life with contact retention. During exposure for 1000 hours to the applicable high temperature specified in table X, the contacts of removable contact connectors shall support an axial load equal to 50% of the values specified in table IX. The contacts shall maintain their specified locations (see figures 4 through 11). There shall be no electrical discontinuity in excess of one microsecond. The test shall be performed per 4.6.17.1.

3.5.17 Ozone exposure. When tested as specified in 4.6.18, 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.

3.5.18 Magnetic permeability. When tested as specified in 4.6.19, the relative permeability of connectors and accessories, except class D and H, shall be less than 2.

### 3.5.19 Insert retention.

3.5.19.1 Insert retention (class A, E, F, and W). When tested as specified in 4.6.20.1, inserts shall not be dislocated from their original positions when an axial load of 75 psig is applied.

3.5.19.2 Insert retention (class D and H). When tested as specified in 4.6.20.2, inserts shall not be dislocated from their original positions or damaged when an effective pressure differential of 2000 psig is applied.

## MIL-C-81511F(AS)

3.5.20 Air leakage.

3.5.20.1 Classes D and H connectors. When tested as specified in 4.6.21.1, the air leakage rate shall not be greater than  $10^{-8}$  ft<sup>3</sup>/hour (7.86 x  $10^{-8}$  cm<sup>3</sup>/sec). The specified leakage rate shall apply only through the connector and not through the flange and mounting surface area, unless solder mounted.

3.5.20.2 Stowage receptacle and protective covers. When tested as specified in 4.6.21.2, the air leakage rate shall not be greater than 1 cubic inch-per-hour ( $4.55 \times 10^{-3}$  cm<sup>3</sup>/sec).

3.5.21 Water immersion (J adapters). When tested as specified in 4.6.22, J adapters shall show no evidence of internal water entrance.

3.5.22 Altitude immersion. Connectors shall have an insulation resistance of at least 5,000 megohms after being subjected to altitude immersion as specified in 4.6.23, and shall maintain a dielectric withstanding voltage at sea level as specified in table XI.

3.5.23 Cover chains tensile strength. When tested in accordance with 4.6.24, protective covers with chains or wire rope as specified shall withstand a 50-pound tensile test without damage.

3.5.24 Insertion/removal tool abuse (series 3 and 4 only). When tested as specified in 4.6.25, there shall be no damage to the contacts, the connector insert, or the contact retaining mechanism. The connectors shall meet the requirements of subsequent testing.

3.5.25 Gage location and retention. When tested as specified in 4.6.26, the connectors shall meet the contact retention requirements of 3.5.4. Contact location shall be within the limits specified on figures 4 thru 11.

3.5.26 Pin contact stability (series 3 and 4 only). When tested as specified in 4.6.27, the total displacement of the tip of the pin contact probe shall not exceed the applicable value specified in table XX with the specified load applied.

3.5.27 Contact walk-out. When tested as specified in 4.6.28, contacts shall not become dislodged from their normal position.

3.5.28 Contact resistance. When tested as specified in 4.6.30, non-removable contacts in the mated condition shall meet the contact resistance requirements of table XXI, and the low-level contact resistance as described in MIL-C-39029.

3.6 Marking. Each connector and accessory shall be legibly and permanently marked on the shell or coupling ring in accordance with MIL-STD-1285 (see 3.1). The part number shall be as shown in 1.2, and shall be separate from other required markings. Series 3 and 4 connectors shall be marked with a blue color band denoting individual contact insertion and removal from the wire side of the connector (see 3.4.3).

## MIL-C-81511F(AS)

3.6.1 Insert marking. Inserts shall be marked as illustrated on figure 13. Raised or depressed characters shall not be used on mating faces. For series 3 and 4 connectors, a bracket [( )] shall be added to the rear grommet marking, identifying each 10th cavity. The pin front of series 3 and 4 connectors may be marked with an interrupted line, applied to the raised seal barriers.

3.6.1.1 Contact designations. Contact locations shall be designated by identifiable characters of contrasting color on the front and rear faces of the insert-grommet assembly. Positioning and arrangement of the characters shall be such that the appropriate contact cavities are identifiable and shall remain identifiable after completion of the tests specified in tables XIV through XVIII.

3.7 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 of 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. Emphasis shall be on the quality of the molded dielectric retention system parts.

#### 4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements; however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

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

## MIL-C-81511F(AS)

- a. Qualification inspection (see 4.4).
- b. Quality conformance inspection (see 4.5).
- c. Retention of qualification inspection (see 4.4.3).

4.3 Inspection conditions and preparation of sample.

4.3.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the following conditions:

- a. Temperature - 15° to 35°C.
- b. Relative humidity - 45 to 75 percent.
- c. Barometric pressure - 650 to 800 mm of mercury.

4.3.2 Preparation of sample. Connectors shall be wired with approximately 3 feet of wire except for those connectors being monitored for resistance change under shock and vibration, which shall have six inch lead lengths. Termination of wires to contacts shall be accomplished as follows: A crimping tool in accordance with MIL-C-22520 as indicated on the applicable crimp contact specification sheet, shall be used for removable contacts. Soldering shall be in accordance with Requirement 5 of MIL-STD-454 for nonremovable contacts.

4.4 Qualification inspection. Qualification inspection shall consist of the examinations and tests performed in the qualification and group B inspection table (table XIV), the intermateability test table (table XV), the qualification and group B inspection for connector accessories test table (table XVI), and the qualification of additional connectors table (table XVII) on the qualification test samples specified in 4.4.1. After receipt of the letter of authorization from the activity responsible for qualification (see 6.3), the applicant shall submit a copy of his test reports (certified by the Government inspector indicating the extent to which the tests were witnessed), together with required samples specified in 4.4.1, to the activity responsible for qualification.

4.4.1 Samples. All samples shall be taken from a production run and shall be produced with equipment and procedures normally used in production (see 6.3.2). The connector and accessories, accessories or shells, selected shall be submitted to the applicable qualification inspections specified in paragraphs 4.4.1.1 through 4.4.1.8. Where counterpart connectors are required for tests requiring mating assemblies, the counterpart connectors provided for this purpose shall be new, previously qualified connectors or new connectors submitted for qualification testing. Manufacturers not producing mating connectors shall submit substantiating certification data that tests were performed with approved counterpart connectors.

4.4.1.1 Connectors for group 1 (all classes except hermetics) For each class, one connector pair in each shell size, for each retention system being qualified, shall be subjected to group 1 tests sequence of table XIV. Each contact size shall be equally represented in the sample group. One half of the samples shall have the pin insert in the plug and the socket insert in the

## MIL-C-81511F(AS)

receptacle. The other samples shall have the inserts reversed. The samples shall be assembled with wire approaching the minimum diameter as specified in table V-A and table V-B.

4.4.1.2 Connectors for group 2 (all classes except hermetics) For each series, two connector pairs in each class with insert arrangements having the smallest and largest compliment of contacts for each contact size being qualified shall be subjected to the tests sequence in group 2 tests of table XIV. The samples shall have the socket insert in the plugs and the pin insert in the receptacles. The samples shall be assembled with wire approaching the maximum diameter specified in table V-A and table V-B.

4.4.1.3 Connectors for group 3 (all classes except hermetics). For each class, twelve connector pairs of medium shell sizes shall be subjected to the tests sequence in group 3 of table XIV. Each contact size shall be represented within the connector sample group. The samples shall be assembled with wire approaching the nominal diameter specified in table V-A and table V-B. For class E, only four connector pairs per class are required.

4.4.1.4 Connectors for group 4 (hermetics only). In each series, a minimum of two connectors with insert arrangements having the smallest and largest compliment of contacts for each contact size being qualified shall be subjected to the tests sequence in group 4 of table XIV. The connectors shall be assembled with wire approaching the nominal diameter specified in table V-A and table V-B.

4.4.1.5 Connectors for groups 5 and 6 (all classes having removable contacts). In each series being qualified, four medium shell size connectors for each contact size being qualified shall be selected. The connectors shall be assembled with wire approaching the nominal diameter (see table V-A and table V-B). One half the samples for each contact size shall be subjected to the tests sequence in group 5 in table XIV. The other half of the samples shall be subjected to the tests sequence in group 6.

4.4.1.6 Shells for EMI testing. Two small and two large pairs of mating shells for each shell and finish type being qualified shall be subjected to the sequence of tests in group 7 in table XIV. The samples shall be tested without the insert or contacts installed.

4.4.1.7 Connectors for intermateability tests (class A, E, F and W). A minimum of 4 connector halves in the series for which qualification is desired (see 4.4.5) shall be selected. Sample 1 shall be a plug with sockets. Sample 2 shall be a plug with pins. Sample 3 shall be a receptacle with sockets, and sample 4 shall be a receptacle with pins. An equal number of mating counterpart connectors shall be provided. Counterpart connectors of the intermating series (series 1 with series 3, and series 2 with series 4) need not be of the same class as the series being qualified. All samples shall be assembled with wire approaching the applicable maximum wire diameter shown in table V-A and table V-B. The connector samples shall be submitted to the qualification tests sequence specified in table XV.

## MIL-C-81511F(AS)

4.4.1.8 Accessories. Two each J adapters, protective covers, stowage receptacles, and cable clamps being qualified shall be subjected to the tests specified in table XVI. The accessory samples shall be tested with a qualified connector or an accessory device having identical mating features.

4.4.2 Qualification rejection. There shall be no failures during any examination or tests of the connectors or accessories 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 specification requirements.

4.4.3 Retention of qualification. In order to retain qualification, a group B report shall be furnished at three year intervals (see 4.5.1.4.2) and shall cover the results of group B tests performed during that period. The test report shall also include the number and type of any part failures and shall be forwarded via the Government inspector to the activity responsible for qualification. If the test report indicates nonconformance with specification requirements, 4.5.1.4.1 (noncompliance) shall apply. Failure to furnish the test report shall result in loss of qualification for that period.

4.4.4 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.

4.4.5 Qualification of additional connectors. For connectors of related series and similar construction which differ only in shell size and configuration from those which have been qualified, the supplier's test report need only provide test data necessary to validate the difference. The test sequence used for the validation should be agreed upon by the qualification activity. The connectors shall be subjected to the tests specified in table XVII, and the results forwarded to the qualifying activity (see 6.3.1). However, qualification of series 1 or 2 connectors shall not admit qualification of series 3 or 4 connectors under the provisions of this paragraph, nor shall qualification of series 3 or 4 connectors admit qualification of series 1 or 2 connectors. Each class for which qualification is requested shall be represented in each applicable test group, unless otherwise authorized by the qualifying activity.

## MIL-C-81511F(AS)

TABLE XIV. Qualification and group B inspection.

<u>Group 1</u>	Requirement Paragraph	Test Paragraph
Examination of product	3.1, 3.3 thru 3.4.6 3.6 and 3.7	4.6.1
Magnetic permeability	3.5.18	4.6.19
Interfacial seal	3.4.2.3	4.6.29
Contact insertion and removal forces (removable contacts)	3.5.2.1	4.6.3.1, 4.6.3.2
Shell to shell continuity	3.5.7.2	4.6.8.2
Contact protection (scoop-proof)	3.5.1	4.6.2
Contact retention	3.5.4	4.6.5
Temperature cycling	3.5.5	4.6.6
Altitude immersion	3.5.22	4.6.23
Insulation resistance (ambient temperature)	3.5.13.1	4.6.14.1
Dielectric withstanding voltage (sea level)	3.5.6	4.6.7.1
Vibration (conditioning)	3.5.10.1	4.6.11.1
Shock (conditioning)	3.5.11.1	4.6.12.1
Moisture resistance	3.5.12	4.6.13
Insulation resistance (ambient temperature)	3.5.13.1	4.6.14.1
Durability	3.5.9	4.6.10
Salt spray (corrosion)	3.5.15	4.6.16
Operating force	3.5.3	4.6.4
External bending moment	3.5.14	4.6.15
Contact retention	3.5.4	4.6.5
Dielectric withstanding voltage (unmated at sea level)	3.5.6	4.6.7.1
Dielectric withstanding voltage (unmated at altitude)	3.5.6	4.6.7.2
Shell to shell continuity	3.5.7.2	4.6.8.2
Examination of product	3.1, 3.3 thru 3.4.6 3.6 and 3.7	4.6.1
<u>Group 2</u>		
Examination of product	3.1, 3.3 thru 3.4.6 3.6 and 3.7	4.6.1
Interfacial seal	3.4.2.3	4.6.29
Insertion and removal forces (removable contacts)	3.5.2.1	4.6.3.1, 4.6.3.2
Shell to shell continuity	3.5.7.2	4.6.8.2
Contact protection, (scoop proof)	3.5.1	4.6.2
Contact retention	3.5.4	4.6.5
Temperature cycling	3.5.5	4.6.6
Dielectric withstanding voltage (unmated at sea level)	3.5.6	4.6.7.1

## MIL-C-81511F(AS)

TABLE XIV. Qualification and group B inspection.

<u>Group 2 (continued)</u>	Requirement Paragraph	Test Paragraph
Durability	3.5.9	4.6.10
Vibration (resistance change)	3.5.10.2	4.6.11.2
Shock (resistance change)	3.5.11.2	4.6.12.2
Insulation resistance (ambient temperature)	3.5.13.1	4.6.14.1
Shell to shell continuity	3.5.7.2	4.6.8.2
Temperature life	3.5.16	4.6.17
Insulation resistance (elevated temperature)	3.5.13.2	4.6.14.2
Operating force	3.5.3	4.6.4
Dielectric withstanding voltage (unmated sea level)	3.5.6	4.6.7.1
Water immersion (J adapters)	3.5.21	4.6.22
Insulation resistance (ambient temperature)	3.5.13.1	4.6.14.1
Dielectric withstanding voltage (mated at altitude)	3.5.6	4.6.7.2
Dielectric withstanding voltage (unmated at altitude)	3.5.6	4.6.7.2
Insert retention	3.5.19	4.6.20
Contact retention	3.5.4	4.6.5
Contact insertion and removal force (removable contacts)	3.5.2.1	4.6.3.1, 4.6.3.2
Examination of product	3.1, 3.3 thru 3.4.6, 3.6 and 3.7	4.6.1
<u>Group 3</u>		
Examination of product	3.1, 3.3 thru 3.4.6 3.6 and 3.7	4.6.1
Interfacial seal	3.4.2.3	4.6.29
Contact insertion and removal force (removable contacts)	3.5.2.1	4.6.3.1, 4.6.3.2
Contact protection (scoop proof)	3.5.1	4.6.2
Operating force	3.5.3	4.6.4
Contact retention	3.5.4	4.6.5
Ozone exposure (unmated)	3.5.17	4.6.18
Insulation resistance (ambient temperature)	3.5.13.1	4.6.14.1
Dielectric withstanding voltage (unmated at sea level)	3.5.6	4.6.7.1
Fluid immersion	3.5.8	4.6.9.1, 4.6.9.2
Operating force	3.5.3	4.6.4
Insulation resistance (ambient temperature)	3.5.13.1	4.6.14.1
Dielectric withstanding voltage (mated at altitude)	3.5.6	4.6.7.2
Examination of product	3.1, 3.3 thru 3.4.6 3.6 and 3.7	4.6.1



## MIL-C-81511F(AS)

TABLE XIV. Qualification and group B inspection.

<u>Group 4 (hermetics only)</u>	Requirement Paragraph	Test Paragraph
Examination of product	3.1, 3.3 thru 3.4.6 3.6 and 3.7	4.6.1
Contact engaging and separating force	3.5.2.2	4.6.3.3
Contact resistance	3.5.28	4.6.30
Temperature cycling	3.5.5	4.6.6
Dielectric withstanding voltage (unmated at sea level)	3.5.6	4.6.7.1
Durability	3.5.9	4.6.10
Vibration (resistance change)	3.5.10.2	4.6.11.2
Moisture resistance	3.5.12	4.6.13
Insulation resistance (ambient temperature)	3.5.13.1	4.6.14.1
Salt spray (corrosion)	3.5.15	4.6.16
Temperature life	3.5.16	4.6.17
Insulation resistance (elevated temperature)	3.5.13.2	4.6.16.2
Insert retention	3.5.19	4.6.20
Fluid immersion	3.5.8	4.6.9.1, 4.6.9.2
Operating force	3.5.3	4.6.4
Dielectric withstanding voltage (unmated at sea level)	3.5.6	4.6.7.1
Air leakage	3.5.20	4.6.21.1
Insulation resistance (ambient temperature)	3.5.13.1	4.6.14.1
Dielectric withstanding voltage (mated at altitude)	3.5.6	4.6.7.2
Dielectric withstanding voltage (unmated at altitude)	3.5.6	4.6.7.2
Examination of product	3.1, 3.3 thru 3.4.6 3.6 and 3.7	4.6.1
<u>Group 5 (dielectric retention system for removable contacts)</u>		
Examination of product	3.1, 3.3 thru 3.4.6 3.6 and 3.7	4.6.1
Retention System Fluid Immersion	3.5.8.1	4.6.9.3
Contact insertion and removal force	3.5.2.1	4.6.3.1, 4.6.3.2
Insertion and removal tool abuse	3.5.24	4.6.25
Contact retention	3.5.4	4.6.5
Examination of product	3.1, 3.3 thru 3.4.6 3.6 and 3.7	4.6.1
<u>Group 6 (dielectric retention system for removable contacts)</u>		
Examination of product	3.1, 3.3 thru 3.4.6 3.6 and 3.7	4.6.1

## MIL-C-81511F(AS)

TABLE XIV Qualification and group B inspection.

	Requirement Paragraph	Test Paragraph
<u>Group 6 (dielectric retention system for removable contacts)</u>		
Gage location and retention	3.5.25	4.6.26
Pin contact stability (series 3 and 4)	3.5.26	4.6.27
Temperature life with contact retention	3.5.16.1	4.6.17.1
Contact walkout	3.5.27	4.6.28
Examination of product	3.1, 3.3 thru 3.4.6, 3.6 and 3.7	4.6.1
<u>Group 7 (EMI/RFI shielding effectiveness)</u>		
Examination of product	3.1, 3.3 thru 3.4.6, 3.6 and 3.7	4.6.1
Shell spring finger force	3.5.7.3	4.6.8.3
Durability	3.5.9	4.6.10
Shell spring finger force	3.5.7.3	4.6.8.3
EMI/RFI shielding effectiveness	3.5.7.1	4.6.8.1
Examination of product	3.1, 3.3 thru 3.4.6, 3.6 and 3.7	4.6.1

## MIL-C-81511F(AS)

TABLE XV. Intermateability test, series 1 with series 3, and series 2 with series 4.

Title	Requirement paragraph	Test paragraph	Test sample number			
			1	2	3	4
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 3.7	4.6.1	X	X	X	X
Shell to shell continuity	3.5.7.2	4.6.8.2	X		X	
Operating force	3.5.3	4.6.4	X	X	X	X
Altitude immersion	3.5.22	4.6.23	X	X	X	X
Vibration (conditioning)	3.5.10.1	4.6.11.1	X		X	
Shock (conditioning)	3.5.11.1	4.6.12.1	X		X	
Dielectric withstanding voltage (mated at altitude)	3.5.6	4.6.7.2	X	X	X	X
Durability	3.5.9	4.6.10	X		X	
Operating force	3.5.3	4.6.4	X		X	
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 3.7	4.6.1	X	X	X	

## MIL-C-81511F(AS)

TABLE XVI. Qualification and group B inspection for connector accessories.

Examination or test	Requirement paragraph	Test paragraph	Test sample no.	
			1	2
<u>Protective covers, stowage receptacles and cable clamps</u>				
Examination of product	3.1, 3.3 thru 3.4.6, 3.6 and 3.7	4.6.1	X	X
Magnetic permeability	3.5.18	4.6.19	X	X
Operating force	3.5.3	4.6.4	X	X
Vibration (conditioning)	3.5.10.1	4.6.11.1	X	X
Moisture resistance	3.5.12	4.6.13	X	X
Cover chains, tensile strength	3.5.23	4.6.24	X	X
Air leakage	3.5.20.2	4.6.21.2	X	X
Shell to shell continuity (protective covers & stowing receptacles only)	3.5.7.2	4.6.8.2	X	X
Examination of product	3.1, 3.3 thru 3.4.6, 3.6 and 3.7	4.6.1		
<u>Connector assemblies, J adapter</u>				
Examination of product	3.1, 3.3 thru 3.4.6, 3.6 and 3.7	4.6.1	X	X
Magnetic permeability	3.5.18	4.6.19	X	X
External bending moment	3.5.14	4.6.15	X	X
Temperature cycling	3.5.5	4.6.6	X	X
Vibration (conditioning)	3.5.10.1	4.6.11.1	X	X
Moisture resistance	3.5.12	4.6.13	X	X
Salt spray (corrosion)	3.5.15	4.6.16	X	X
Water immersion	3.5.21	4.6.22	X	X
Shielding effectiveness	3.5.7.1	4.6.8.1	X	X
Fluid immersion	3.5.8	4.6.9	X	X

## MIL-C-81511F(AS)

TABLE XVII. Qualification of additional connectors.

Title	Requirement paragraph	Test paragraph
Examination of product	3.1, 3.3 thru 3.4.6, 3.6 and 3.7	4.6.1
Contact protection (scoop proof)		
Series 1 and 3	3.5.1.1	4.6.2
Series 2 and 4	3.5.1.2	4.6.2
Operating force	3.5.3	4.6.4
Contact insertion and removal	3.5.2.1	
Series 1 and 2		4.6.3.1
Series 3 and 4		4.6.3.2
Contact retention	3.5.4	
Series 1 and 2 removable contacts		4.6.5.1
Series 3 and 4 removable contacts		4.6.5.2
Dielectric withstanding voltage (unmated at sea level)	3.5.6	4.6.7.1
Durability	3.5.9	4.6.10
Air leakage (Hermetic connectors)	3.5.20	4.6.21
External bending moment	3.5.14	4.6.15
Examination of product	3.1, 3.3 thru 3.4.6, 3.6 and 3.7	4.6.1

4.5 Quality conformance inspection.

4.5.1 Inspection for delivery. Inspection of product for delivery shall consist of group A inspection.

4.5.1.1 Inspection lot. An inspection lot, 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 group B inspection shall not be delivered on the contract or order.

## MIL-C-81511F(AS)

4.5.1.3 Group A inspection. Group A inspection shall consist of the examinations and tests specified in table XVIII 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. Hermetically sealed receptacles (class H and D) shall undergo 100 percent inspection to assure compliance with the requirements of 3.5.20.1 (air leakage). 100 percent visual examination of each retention cavity for molding discrepancies and excessive glue shall be a required in-process control for all removable contact connectors.

TABLE XVIII. Group A inspection.

Examination or test	Connector type		Accessories	Requirement paragraph	Test paragraph
	Removable contacts	Nonremovable contacts			
Examination of product		X	X	3.1, 3.3 thru 3.4.6 and 3.7	4.6.1
Contact retention 1/ Series 1 and 2 Series 3 and 4	X X			3.5.4	4.6.5.1 4.6.5.2
Insulation resistance		X		3.5.13.1	4.6.14.1
Air leakage (Hermetic connectors)	-	X	-	3.5.20.1	4.6.21.1
Dielectric withstanding voltage (unmated)		X		3.5.6	4.6.7.3
Dielectric withstanding voltage (unmated)	X			3.5.6	4.6.7.4

1/ 100 percent of contact cavities shall be tested for retention. Displacement measurements not required.

4.5.1.3.1 Sampling plan. Statistical sampling and inspection shall be in accordance with MIL-STD-105 for general inspection level II. The acceptable quality level shall be 1 percent.

4.5.1.3.2 Rejected lots. If an inspection lot is rejected, the supplier may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection, and shall not thereafter be tendered for acceptance unless the former rejection or requirement of correction is disclosed. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.5.1.4 Group B inspection. Group B inspection shall consist of the applicable examinations and tests specified in table XIV, group 1, 2 and 4. Shipments shall not be held up pending the results of this inspection.

4.5.1.4.1 Noncompliance. If a sample fails to pass group B inspection, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the

## MIL-C-81511F(AS)

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 materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity has been taken. After the corrective action has been taken, group B inspection shall be repeated on additional sample units (all inspection, or the inspection which the original sample failed, at the option of the qualifying activity). Group A inspection may be reinstated; however, final acceptance and shipment shall be withheld until the group B inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

4.5.1.4.2 Sampling plan. For each test group, a minimum of two connector pairs from each contact size and of each series, having insert arrangements representing the smallest and largest complement of contacts, shall be selected from current production runs. Current production runs shall include all production runs made since the last retention of qualification inspection.

#### 4.6 Methods of examination and test.

4.6.1 Examination of product. The connectors, accessories and piece parts shall be examined to ensure conformance with the specification and the applicable specification sheets. In-process control of component parts, unrelated to lot sizes of furnished 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 (scoop-proof) (see 3.5.1). The front edge of the shell of the plug connector shall be scooped within the front aperture made by the shell of the mating receptacle. The front edges of both shells shall be in contact during this test.

#### 4.6.3 Contact forces (see 3.5.2).

4.6.3.1 Contact insertion and removal force (series 1 and 2, crimp removable contact connectors only). All contacts shall be inserted and removed once using the military tool (M81969/2 and M81969/3). When tested as specified in Method 2012 of MIL-STD-1344, insertion and removal forces shall be measured and recorded on a minimum of 20 percent but not less than three of the contacts. All contacts shall be reinserted. After the contacts are locked in place, counterpart connectors shall be mated and unmated once. The contact retention mechanism shall then be unlocked and the contacts for which measurements were recorded shall be removed and reinserted nine more times (with the other contacts in place) using the appropriate military tool. The contact insertion and removal forces shall again be measured during the fifth and tenth insertion cycles.

4.6.3.2 Contact insertion and removal forces (series 3 and 4, crimp removable contacts only). Twenty percent but not less than three of the contacts in each connector shall be removed and inserted 10 times using the insertion and removal tool (table VI). When tested as specified in Method 2012 of MIL-STD-1344, the forces required to remove and insert the contacts shall be measured on the first and tenth removal and insertion.

4.6.3.3 Contact engaging and separating forces (non-removable contacts only) (see 3.5.2.2). Socket contacts shall be tested in accordance with the contact engagement and separation test of MIL-C-39029

## MIL-C-81511F(AS)

4.6.4 Operating force (see 3.5.3). When tested as specified in Method 2013 of MIL-STD-1344, receptacles, plugs, dummy stowage receptacles and protective covers shall be engaged with and disengaged from counterpart connectors; the forces or torques which must be applied to the coupling rings in order to facilitate full coupling and uncoupling shall be measured and recorded. The force or torque application shall be applied at a uniform rate of approximately one inch-pound per second.

4.6.5 Contact retention (removable contacts) (see 3.5.4).

4.6.5.1 Contact retention (series 1 and 2). Series 1 and 2 connectors with removable contacts shall be tested with the contact lock ring on the connector tightened to the lock position.

4.6.5.2 Contact retention (series 3 and 4, class A, F and W). When tested as specified in Method 2007 of MIL-STD-1344, axial loads in accordance with table IX shall be applied to the mating end of each individual contact. Test probes per figure 14 shall be used to apply the load. The full load shall be applied after the slack in the contact position has been taken up by a pre-load of 3 lbs. The load shall be applied at a rate of approximately 0.02 inch per minute until the specified load is reached. The displacement of the contacts shall be measured under load after the load has been applied for 10 seconds minimum.

4.6.6 Temperature cycling (see 3.5.5). Unmated connectors shall be tested in accordance with Method 1003, condition A of MIL-STD-1344. The upper temperature used for step 3 shall be the rated temperature for the connector class. At the completion of the last cycle, the connectors shall be returned to room temperature for further inspection.

4.6.7 Dielectric withstanding voltage (see 3.5.6).

4.6.7.1 Dielectric withstanding voltage (sea level). Mated and unmated connectors shall be tested in accordance with Method 3001 of MIL-STD-1344. The applicable test voltages (table XI) shall be applied between all adjacent contacts and between the shell and each contact closest to the shell.

4.6.7.2 Dielectric withstanding voltage (altitude). The mated and unmated connectors shall be tested in accordance with Method 105 of MIL-STD-202 at the altitudes specified in table XI. After 30 minutes at the simulated altitude, the connectors shall be tested as specified in 4.6.7.1. Only the engaging faces of classes D and H connectors shall be subjected to the high altitude, and the rear faces shall be suitably protected.

4.6.7.3 Dielectric withstanding voltage (non-removable contacts) - group A inspection. Unmated connectors shall be tested in accordance with 4.6.7.1, except that the period of application of voltage shall be 1 second minimum.

4.6.7.4 Dielectric withstanding voltage (removable contacts) - group A inspection. Unmated connectors shall be tested in accordance with 4.6.7.1 except test voltages shall be as specified for mated connectors per table XI, simulated contacts may be used, and the period of voltage application shall be 1 second minimum. (When connectors with pin contact inserts are being tested, the simulated contacts shall not protrude from the insert.)



## MIL-C-81511F(AS)

**4.6.8 EMI/RFI shielding effectiveness (see 3.5.7).**

**4.6.8.1 Shielding effectiveness (see 3.5.7.1).** The electromagnetic susceptibility of mated pairs of shells shall be measured in a tri-axial radio frequency leakage tester. The RF leakage from the coaxial line through the shells of the connector pairs into the outer coaxial geometry shall be measured at the frequency shown in table XII (accuracy of frequency  $\pm 5$  percent). 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 arrangement shall be as shown on figures 15 and 16.

**4.6.8.2 Shell to shell conductivity (see 3.5.7.2).** The shell to shell conductivity of wired, mated, assembled connectors shall be measured using the procedure specified in Method 3007 of MIL-STD-1344. Probes shall be placed on the simulated panel and at the extreme edge of the plug as shown on figure 17 and shall not puncture or otherwise damage the connector.

**4.6.8.3 Shell spring finger forces (see 3.5.7.3).** An axial load shall be applied to engage the shell with spring fingers under test with a counterpart gage connector. The shells and gage shall not include coupling rings or inserts. The force necessary to engage and separate shall be within the values specified in 3.5.7.3. The rate of load application is approximately 0.5 inch per minute.

**4.6.8.3.1 Gage receptacle shell.** The gage receptacle shell mating dimensions shall be in accordance with figures 9A and 9B except that the "A" diameter shall be at the maximum limit.

**4.6.8.3.2 Gage plug shell.** The gage plug shell mating dimensions shall be in accordance with figures 7A and 7B except that the "A" diameter shall be at the minimum limit.

**4.6.9 Fluid immersion.**

**4.6.9.1 Fluid immersion (class A, D, F and W) (see 3.5.8).** Counterpart mated connectors shall be subjected to the test specified in Method 1016 of MIL-STD-1344 (one sample per fluid). Following the fluid immersion cycles, the connectors shall meet the subsequent tests requirements.

**4.6.9.2 Fluid immersion (class E and H) (see 3.5.8).** A minimum of one connector per fluid shall be fully immersed unmated into MIL-H-5606 and MIL-L-23699 for 20 hours at ambient temperature. After the fluid immersion, the connectors shall be removed and allowed to drain for one hour. Subsequent testing shall be performed on connectors utilizing the mating halves previously used.

## MIL-C-81511F(AS)

4.6.9.3 Retention system fluid exposure (class A, E, F and W) (see 3.5.8.1). Connectors shall be unmated and contacts shall be removed. Connectors shall be immersed in the following fluids (one sample per fluid) for 20 hours at room temperature.

<u>Sample no.</u>	<u>Test fluid</u>
1	MIL-T-5624 (grade JP-5)
2	Coolanol 25
3	MIL-H-5606
4	MIL-L-7808
5	MIL-L-23699
6	Methyl alcohol
7	Isopropyl alcohol

After removal, excess fluid shall be allowed to drain from the connectors for 4 hours and the contacts shall be reinstalled. The connectors shall then be subjected to subsequent tests specified in table XIV.

4.6.10 Durability (see 3.5.9).

4.6.10.1 Durability (class A, D, E, F and H). Wired, assembled counterpart connectors shall be mated and unmated 500 times at a maximum rate of 300 cycles per hour with the coupling rings operated in a manner to simulate actual service in that plugs and receptacles shall be completely separated during each cycle.

4.6.10.2 Durability (class W). Wired, assembled counterpart connectors shall be mated and unmated 500 times at a maximum rate of 300 cycles per hour with the coupling rings operated in a manner to simulate actual service in that plugs and receptacles shall be completely separated during each cycle. The assemblies shall be mated and unmated 50 cycles followed by the salt spray test. After the salt spray test, the remaining 450 mating and unmating cycles shall be performed.

4.6.11 Vibration. Each receptacle shall be mounted on a fixture, which in turn shall be attached to a vibration table. A 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 or cables shall be clamped to non-vibrating points at least 8 inches from the rear of the connector.

4.6.11.1 Vibration (conditioning) (see 3.5.10.1). The connector assembly shall be mounted as specified herein and vibrated in accordance with Method 2005, test condition IV, MIL-STD-1344. In addition, the vibration shall be conducted at the low temperature extreme and the high temperature extreme as shown in table X. The duration of vibration at extreme temperatures shall be 25 percent of the duration specified for the standard temperature condition.

4.6.11.2 Vibration (resistance change) (see 3.5.10.2). The connectors shall be subjected to the vibration specified in 4.6.11.1. In addition, all contacts shall be wired in series with at least 100 milliamperes of current allowed to flow, and there shall be a minimum of 10 percent but not less than 3 contact pairs in the circuit (see figure 19). A suitable instrument shall be employed to monitor the increase in contact resistance (see figure 18).

## MIL-C-81511F(AS)

4.6.12 Shock (see 3.5.11).

4.6.12.1 Shock (conditioning) (see 3.5.11.1). Mated connectors shall be mounted as specified (see 4.6.11.1) and subjected to the shock test of Method 2004, test condition A, of MIL-STD-1344 except that only one shock shall be applied in each direction of the three major axes of the connector.

4.6.12.2 Shock (resistance change) (see 3.5.11.2). Mated connector shall be mounted as specified in 4.6.11.1, and wired and monitored for resistance change as specified in 4.6.11.2. Shock shall be applied as specified in 4.6.12.1.

4.6.13 Moisture resistance (see 3.5.12). The mated and wired connectors shall be subjected to a moisture resistance test in accordance with Method 1002.2, type II of MIL-STD-1344, with the following details and exceptions:

- a. Step 7b, vibration not required.
- b. There shall be no drip loops in the wires.
- c. Wires shall be brought out of the chamber through vaportight seals.
- d. There shall be no open wire splices in the chamber.
- e. After a minimum of 3 hours at step 7 of the final cycle, while connectors are still subjected to high humidity, the insulation resistance shall be measured.
- f. Class D and H connectors shall have their rear portion suitably protected from the humidity exposure.

4.6.14 Insulation resistance.

4.6.14.1 Insulation resistance at ambient temperature (see 3.5.13.1). Unmated connectors shall be tested in accordance with Method 3003 of MIL-STD-1344. The contacts selected shall be those having the closest spacing between measurement points.

4.6.14.2 Insulated resistance at elevated temperature. The insulation resistance shall be measured in accordance with 4.6.14.1, except that the connectors shall have been exposed for 1000 hours to the elevated temperature specified in table X. The measurement shall be made at the end of the temperature life (see 4.6.17) 1000 hours, while the connectors are at the elevated temperature (see 3.5.13.2).

4.6.15 External bending moment (see 3.5.14). The receptacle connector shall be mounted as in normal service to a rigid panel. Before mating the plug connector to the receptacle, the "K" adapter or torque arm adapter shall be attached as shown on figure 20. After mating the plug and receptacle connectors, the distance "L" from the point of load application "P," to the mounting panel shall be determined. The load to be applied at point "P" shall then be determined as the bending moment listed in table XIII divided by the lever arm "L." This load shall be applied at a rate of approximately 10 pounds per second until the required load is achieved. The load so applied

## MIL-C-81511F(AS)

shall be held for a period of 1 minute after which the load shall be released. Continuity of the contacts shall be monitored during the test. The connector shall be removed, unmated and inspected to 3X power magnification for damage or breakage.

4.6.16 Salt spray (corrosion) (see 3.5.15). Unmated connectors, shells and accessories shall be subjected to a salt spray test in accordance with Method 1001, test condition B of MIL-STD-1344. The following details and exceptions shall apply: Class W connectors shall be exposed to 452 hours mated, followed by 48 hours unmated. Wire ends must be protected to prevent salt migration. The salt concentration shall be 5 percent. The specimens shall then be washed off with tap water and then dried in a circulating air oven at a temperature of  $38^{\circ} \pm 3^{\circ}\text{C}$  for a period of not more than 12 hours, after which they shall be removed and inspected. Prior to all subsequent tests, corrosion tested connectors shall be engaged and disengaged for one cycle to remove free salt deposits. The rear portions of class D and H receptacles shall be protected from the salt spray exposure.

4.6.17 Temperature life (see 3.5.16). The mated connectors shall be subjected to the applicable high temperature specified in table X for a period of 1000 continuous hours. The internal temperature shall be monitored at a contact closest to the center of the connector.

4.6.17.1 Temperature life with contact retention. Connectors with removable contacts shall have one mating pair of contacts removed and replaced with contacts crimped to steel core copper wire (copperweld or equivalent) of the appropriate size. The axial location of these contacts shall be measured for conformance with the applicable dimensions shown on figures 4 through 11, with a load of 2 pounds applied to seat the contact back against the retention device. The connector shall then be mounted in a fixture as shown on figure 21. A weight equal to 50 percent of the axial load specified in table IX for the applicable contact size shall be suspended freely from each steel core wire. A current of  $100 \pm 10$  milliamperes supplied from a 10.0 Vdc maximum power source shall be applied to the test contacts and a suitable instrument shall be used to monitor the circuit for discontinuity in excess of one microsecond. The connector, mounted as shown on figure 21, shall then be subjected to the temperature life test of 4.6.17. After the connectors return to ambient temperature they shall be unmated and the contact locations remeasured (figures 4 through 11 as applicable) with 2 pounds axial load applied to seat the contact back against the retention device. The tested contacts shall then be replaced with unwired contacts and sealing plugs, and those cavities shall be exempted from subsequent testing

4.6.18 Ozone exposure (see 3.5.17). The unmated connectors shall be subjected to the ozone test as specified in Method 1007 of MIL-STD-1344. At the end of the specified period, the samples shall be examined for signs of ozone deterioration.

4.6.19 Magnetic permeability (class A, E, F and W) (see 3.5.18). Connectors shall be tested as specified in Method 3006 of MIL-STD-1344.

## MIL-C-81511F(AS)

4.6.20 Insert retention.

4.6.20.1 Insert retention (class A, F, E and W) (see 3.5.19.1). Inserts in connectors less removable grommets or any accessory shall be subjected to axial loads in each direction separately. Loading shall be accomplished by applying air pressure or equivalent load. The pressure shall be increased gradually at a rate of approximately 10 psi/second until the specified pressure is reached. The insert shall retain its normal position in the connector shell for at least 10 seconds at maximum specified pressure.

4.6.20.2 Insert retention (class D and H) (see 3.5.19.2). Inserts in connectors less any accessories shall be subjected to axial in each direction separately. Loading shall be accomplished by applying hydraulic pressure or equivalent load. The pressure shall be increased gradually at a rate of 50 psi/second until the specified pressure is reached. The insert shall retain its normal position in the connector shell for at least 10 seconds at maximum specified pressure.

4.6.21 Air leakage.

4.6.21.1 Class D and H connectors (see 3.5.20.1). Class D and H connectors shall be mounted in a manner suitable for application of 15 psi pressure across the connectors and tested in accordance with Method 1008 of MIL-STD-1344. The leakage rate shall be determined while pressurized air or gas, containing not less than 10 percent helium by volume, is applied to the connector.

4.6.21.2 Stowage receptacle and protective covers (see 3.5.20.2). Stowage receptacles and protective covers shall be mated to connectors having either contacts or inserts removed so that a pressure of 30 psi can be applied against the insides of the protective covers or stowage receptacles. The leakage rate shall be measured when tested in accordance with Method 1008 of MIL-STD-1344.

4.6.22 Water immersion (J adapters) (see 3.5.21). The J adapter shall be assembled to a counterpart connector. A test plug having dimensions specified in table XIX shall be installed to simulate a jacketed cable. The face of the connector shall be protected from the test environment. The assembly shall be immersed in tap water to a depth of 6 feet for a period of 48 hours. After the exposure, the assembly shall be examined for leakage of water at the interface of the test plug and J adapter.

- a. Test plugs with J adapters shall be assembled to test cylinders (see table XIX).
- b. Class A, F and E receptacles shall be mounted by their normal mounting means with mounting flange gaskets to that water pressure is applied to only one side. One-half the sample shall be front-mounted and the remainder back-mounted (except the single-hole mounted receptacles).

## MIL-C-81511F(AS)

- c. Fifty percent of the connectors tested shall be mated and shall be such that mated receptacles will be subjected to water pressure from the mating side or mating plug and receptacle shall be completely immersed in water as applicable to meet conditions of this test. Insulation resistance of the mated connectors shall be measured at the end of the 48 hour period while still immersed.
- d. Class A, F and E receptacles, mated or unmated, shall be inspected for leakage through or around the insert and for leakage of the panel seals.
- e. Fifty percent of the connector test samples shall be tested unmated and shall be such that receptacles are subjected to water pressure from both the unmated front and the rear of the connector. Upon completion of the test, the connectors shall be removed from the connectors by shaking them at room temperature. Insulation resistance shall be measured within one-half hour after the connector is removed from the water.
- f. All mated connectors shall be inspected for internal leakage of water at the interface and cable housing.

TABLE XIX. Test plug O.D. size.

Shell size	$\varnothing$ $\pm 0.016$ inch
8	0.214
10	0.250
14	0.462
16	0.596
18	0.646
20	0.812
22	0.947
24	1.062

4.6.23 Altitude immersion (see 3.5.22). Connector shall be mated and unmated 50 times. The mated connectors shall be tested in accordance with Method 1004 of MIL-STD-1344. All wire ends shall be located within the chamber and exposed to the chamber atmosphere but not submerged or sealed. The insulation resistance shall be measured as specified in 4.6.14.1 at the completion of each cycle and while still submerged in the solution. At the end of the third cycle and while the connectors are still submerged, the insulation resistance shall be measured followed by the dielectric withstanding voltage as specified in 4.6.7.1. Class D and H connectors shall have their rear portion excluded from the water immersion.

## MIL-C-81511F(AS)

4.6.24 Cover chain tensile strength (see 3.5.23). The protective cover shall be securely held and a tensile static load of 50 pounds shall be applied to the end of the chain for 5 minutes in each direction as specified:

- a. With the axis of the chain at right angles to the axis of the holding fastener.
- b. With the axis of the chain in the same axis as that of the fastener.

4.6.25 Insertion/removal tool abuse (see 3.5.24). (Series 3 and 4 only). Steps a, b, c and d shall be performed. Separate groups of 5 contact cavities each shall be used for each step.

- a. Removal tool - The tool shall be inserted as if to remove a contact and a total of 3 pounds axial load shall be applied. With the force applied, the tool shall be rotated 180° and then removed also removing the contact. The contact shall be reinserted. These steps shall be repeated three times on each of the five contacts selected.
- b. Insertion tool - The contact shall first be removed. With the insertion end of the tool, insert the contact and continue to press until an axial load of 3 pounds is applied. With the force applied, the tool shall be rotated 180° and then removed. These steps shall be repeated three times on each of the five contacts selected.
- c. Insertion tool - The contact shall first be removed. With the insertion end of the tool, the contact shall be inserted and an axial load of 10 pounds applied to the tool. These steps shall be performed only once on each of the five contacts selected. A new tool shall be used for each contact.
- d. Removal tool - The tool shall be inserted as if to remove contact and a total of 10 pounds axial load shall be applied. The tool shall then be removed also removing the contact. These steps shall be performed only once on each of the five contacts selected. A new tool shall be used for each contact.

NOTE: Should a tool become damaged during any of the testing, it shall be replaced. Failure of a tool shall not constitute a test failure.

4.6.26 Gage location and retention (see 3.5.25). Applicable test gages in accordance with MS3462, MS3434 or MS3435 shall be installed in 3 randomly selected cavities of each connector. Remaining cavities shall have contacts in place. An axial load of 2 pounds shall be applied to the engaging end of the gage and the location of the gage shall be measured in accordance with figures 4 through 11 as applicable. The axial load specified in table IX shall then be applied to the test gage in the direction tending to displace it toward the rear of the connector. The load shall be applied at a rate of approximately 1 pound per second until the specified load has been reached

## MIL-C-81511F(AS)

The displacement of the gage relative to the shell shall be measured under load after the load has been applied for 10 seconds minimum.

4.6.27 Pin contact stability (see 3.5.26) (series 3 and 4 only). Three pin contact cavities in each connector shall be tested. The applicable test probe (MS3435) shall be inserted into the cavity until it is locked into place by the contact retaining mechanism. The load specified in table XX shall be applied perpendicular to the probe at the point of load application shown on figure 22. With the load applied, the position of the test probe tip shall be located. The applicable load shall then be applied in the opposite direction (180°) and the total displacement (splay) of the test probe tip shall be measured (see figure 22).

TABLE XX. Pin contact stability.

Contact size	Total displacement (inch maximum)	Load (ounces minimum)
23	.025	4
20	.030	8
16	.048	16
12	.062	16

4.6.28 Contact walk-out (see 3.5.27). Two contacts in each plug and receptacle shall be tested. The contacts shall be crimped to stranded steel cable of an appropriate size and installed in the connector. The unmated connector shall be mounted in a test fixture as shown on figure 23. A 3 pound load shall be applied to the cable. One 360° rotation of the fixture with the connector mounted shall constitute one cycle. The connector shall be subjected to 100 cycles at a rate of 10 to 20 cycles per minute.



## MIL-C-81511F(AS)

4.6.29 Interfacial seal compression (see 3.4.2.3). Each measurement of compression displacement of the interfacial seal shall be obtained in the following manner.

- a. Pin contacts shall be installed and socket contacts shall not be installed in mating connectors under test.
- b. Series 1 and 2 mating connectors shall be engaged without the aid of the coupling ring until the face of the pin insert touches the face of the socket insert (determined by feel). Series 3 and 4 mating connectors shall be engaged without the aid of the coupling ring until the raised seal barriers around the pin contacts touch the socket insert entry cones (determined by feel).
- c. The overall length from the rear of the plug shell to the rear of the receptacle shell shall be measured at 2 or more locations equally spaced about the connector diameter.
- d. The connectors shall be fully engaged by means of the coupling ring and the measurements repeated at the same locations as in step (c).
- e. Measurements obtained in step (d) shall be subtracted from those obtained at corresponding locations in step (c). The resultant difference in measurements is the compression discontinuity placement of the interfacial seal.

4.6.30 Contact resistance (non-removable contacts) (see 3.5.28). The contact resistance shall be measured in accordance with the contact resistance test of method 3004.1, MIL-STD-1344. See table XXI for applicable test currents.

## MIL-C-81511F(AS)

TABLE XXI. Contact resistance limits (non-removable contacts).

Connector class	Mating end size	Wire size	Test current (amps)	Millivolt drop (Max)			
				Initial		After corrosion	
A, F, E, and W	23	28	1.5	60		70	
		32	1.0	55		65	
	23	22	5.0	70		80	
		26	2.0	60		70	
		20	20	7.5	55		65
	22		5.0	45		55	
	24		3.0	45		55	
	16	16	13.0	50		60	
		18	10.0	45		55	
		20	7.5	45		55	
12	12	23.0	50		60		
		17.0	45		55		
D and H	23	22	4.0	Avg	Indiv	Avg	Indiv
				90	115	105	180
				70	105	90	165
				65	95	80	165
				65	95	80	165

4.7 Inspection of packaging. The sampling and inspection of the preservation, packing, and container marking shall be in accordance with the requirements of MIL-S-28786

## 5. PACKAGING

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

5.1.1 Level A. The following additional requirements shall apply to level A packaging.

5.1.1.1 Removable contacts. The unit package shall contain the normal complement, plus one spare contact, for connectors arrangements having 26 contacts or less, and two spare contacts for arrangements over 26 contacts. These shall be contained in the connector unit package.

5.1.1.2 Grommet sealing plugs. A quantity of grommet sealing plugs in accordance with MIL-C-81511/15 (for series 1 and 2) or MS27488 (for series 3 and 4) (15 percent of the number of contacts, but not less than one) shall be included in the container with the contacts for both removable and nonremovable contact type connectors having grommets

## MIL-C-81511F(AS)

5.1.1.3 Accessory parts. When accessory parts such as backshells and rear accessory hardware are included with each connector, these parts shall be separately cushioned and included in the unit package.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The classes and types of connectors are intended for military application as follows (see 1.1.2.2):

- a. Class E connector is intended for use in environmental applications where the operating temperature range of  $-65$  to  $150^{\circ}\text{C}$  is experienced. Class F and W are intended for use in environmental applications where the operating temperature range of  $-65$  to  $175^{\circ}\text{C}$  is experienced and additional fluid resistance is needed. Class A is intended for use in environmental applications where the operating temperature range of  $-65$  to  $200^{\circ}\text{C}$  is experienced and additional fluid resistance is needed. Classes A and F are not for shipboard, jacketed cable and Naval aircraft applications, but for use in outer space.
- b. All connectors are environment resisting with provisions to ensure electrical continuity from plug to receptacle shell.
- c. Classes D and H receptacles are intended for use in applications wherein fluid pressures must be contained by the connectors with a very low leakage rate across the walls or panels on which they are mounted.
- d. Class W connectors are intended for use in environmental applications where corrosion protection is a concern.
- e. To provide adequate moisture seal, wire diameters larger than minimum specified in table V-A and table V-B for the applicable contact size must be used.
- f. Where two or more wires are used in a wire barrel, moisture sealing is not obtainable.
- g. Crimp contact connectors shall have contacts installed in all positions when the connector is wired. Sealing plugs shall be installed in the grommet holes when no wire is attached to the contact in grommet-sealed connectors.

## MIL-C-81511F(AS)

6.2 Acquisition requirements. Acquisition documents must specify the following.

- a. Title, number and date of this specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).
- c. Title, number and date of the applicable specification sheet and the complete part number (see 1.2 and 3.1).
- d. Levels of preservation and packaging and packing, and applicable marking (see section 5).
- e. Flange gaskets as specified (see 3.4.5).
- f. For indirect shipment, these connectors may be furnished without contacts.

6.2.1 Accessory hardware. Accessory hardware, such as covers, dummy stowage receptacles, or mounting hardware especially designed for these connectors, is defined in the applicable specification sheet. Flange gaskets will not be supplied with receptacles unless they are specified.

6.2.2 Crimp contacts. When specified in the contract or purchase order, connectors may be supplied less crimp contacts and/or grommet sealing plugs to permit procurement of these items in bulk. Crimp contacts may be ordered in bulk in accordance with MIL-C-39029.

6.2.3 Solder contacts. Solder contacts are not to be ordered or qualified separately from the connectors.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in the Qualified Products List QPL No. 81511 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Warfare Center Aircraft Division Lakehurst, Code SR3, Lakehurst, NJ 08733-5100, however, information pertaining to qualification may be obtained from the Commanding Officer, Naval Air Warfare Center, Aircraft Division, Indianapolis, Code 444, M/S 60, 6000 East 21st Street, Indianapolis, IN 46219-2189.

6.3.1 Qualification procedures. Upon application for qualification testing, the qualifying activity shall verify that the manufacturer has established written procedures to assure actual connector performance to the requirements of this specification. Emphasis will be on the molded plastic

## MIL-C-81511F(AS)

retention system piece parts prior to assembly into the connector. These procedures shall contain:

- (1) Analysis of minimum/maximum dimensions of contacts and molded plastic retention discs.
- (2) Acceptable levels for:
  - a. Plastic mixtures and chemical tests.
  - b. Purity of materials.
  - c. Method for flash removal.
- (3)
  - a. Contact retention tests on molded plastic retention disc based on analysis of number (1).
  - b. Insertion and removal forces for pin and socket contacts in plastic disc.

When approved by the qualifying activity, these shall become the minimum requirements for molded plastic contact retention systems prior to assembly into the connectors for that manufacturer.

6.4 Maximum recommended working voltage. The maximum recommended working voltage is shown in table XXII.

TABLE XXII. Maximum recommended working voltage, ac, rms.

Condition	Service rating I	Service rating II
Sea level	600	1000
50,000 feet	300	450
70,000 feet	300	450
110,000 feet	300	450

#### 6.5 Definitions.

6.5.1 Permanent. For purposes of this specification, when the word "permanent" or "permanently" is used in connection with the attachment or retention or material, it shall be construed to mean that destruction or rupture of material is required before removal can be accomplished.

6.5.2 Scoop-proof. Scoop-proof refers to the impossibility of a mating plug connector inadvertently being cocked into a mating receptacle and damaging pins or electrically shorting the contacts.

## MIL-C-81511F(AS)

6.6 Patent notice. The Government has a royalty-free license under the following listed patents and applications for patent, for the benefit of manufacturers of the item either for the Government or for use in equipment to be delivered to the Government:

U.S. Patent Number	U.S. Patent application serial number
3,003,135	558,958
3,101,229	
3,727,172	
3,784,966	

6.7 Connector weights. Approximate weights for all classes of connectors are as shown in the applicable specification sheet.

6.8 Subject term (keyword) listing.

Release, individual contact

RFI/EMI

Scoop-proof

Temperature, high

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

6.10 Insert arrangement summary. Figure 24 provides a summary of insert arrangements and shell sizes.

MIL-C-81511F(AS)

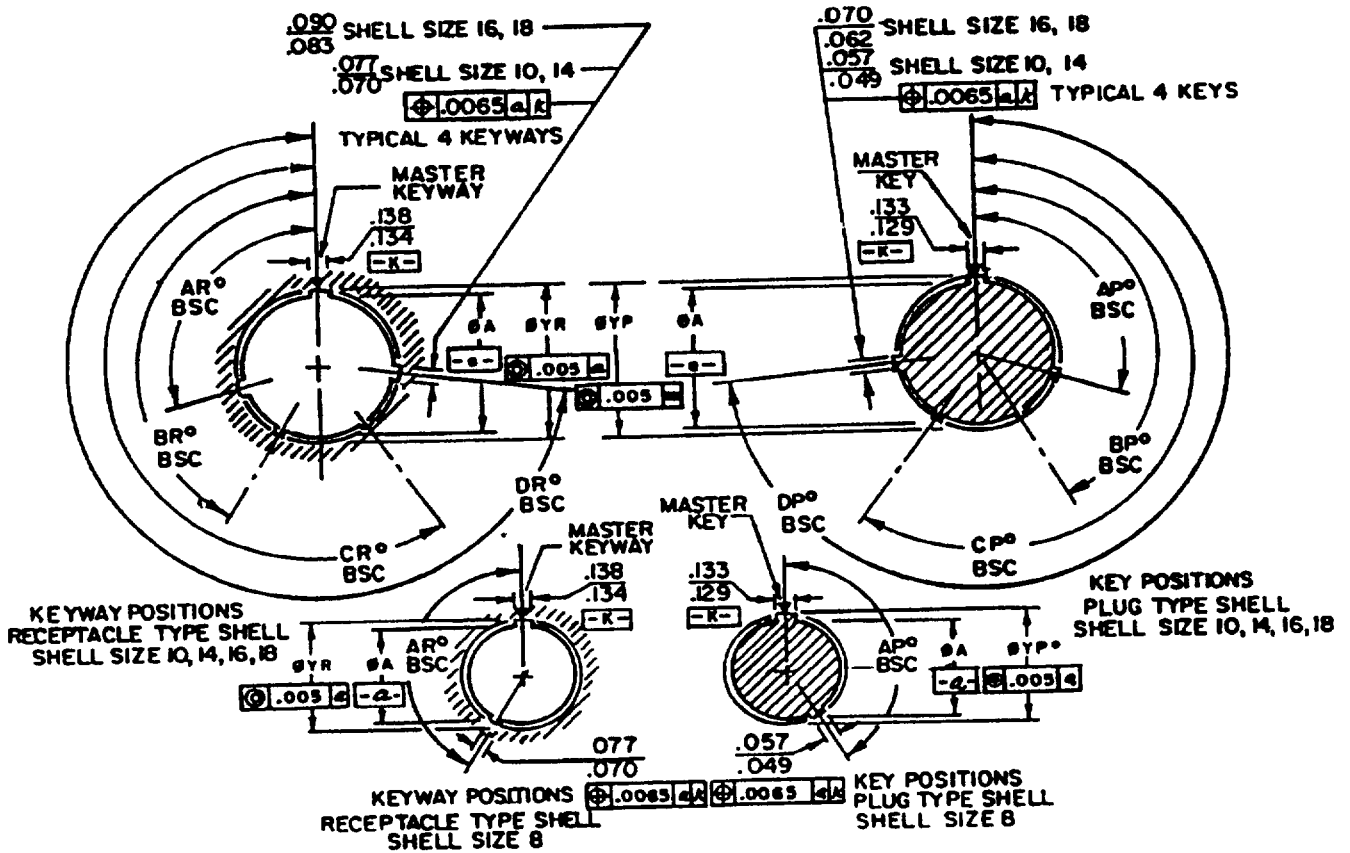


FIGURE 4. Connector, electrical, position key and keyways, mating (series 2 and 4).

## MIL-C-81511F(AS)

Shell size	Key & keyway arrangement	AR° or AP° BSC	BR° or BP° BSC	CR° or CP° BSC	DR° or DP° BSC	Ø YR	Ø YP
8	1	128	---	---	---	.462 (11.73) .450 (11.43)	.440 (11.18) .432 (10.97)
	2	190	---	---	---		
	3	205	---	---	---		
	4	220					
	5	235					
	6	250					
10 and 14	1	105	140	215	265	.587 (14.91) .575 (14.61) .837 (21.26) .825 (20.96)	.565 (14.35) .557 (14.15) .815 (20.70) .807 (20.50)
	2	102	132	248	320		
	3	80	118	230	312		
	4	35	140	205	275		
	5	64	155	235	304		
	6	35	115	220	270		
16 and 18	1	105	140	215	265	.963 (24.46) .951 (24.16) 1.087 (27.61) 1.075 (27.31)	.941 (23.90) .933 (23.70) 1.065 (27.05) 1.057 (26.85)
	2	18	149	192	259		
	3	92	152	222	342		
	4	84	152	204	334		
	5	24	135	199	240		
	6	98	152	268	338		

## NOTES:

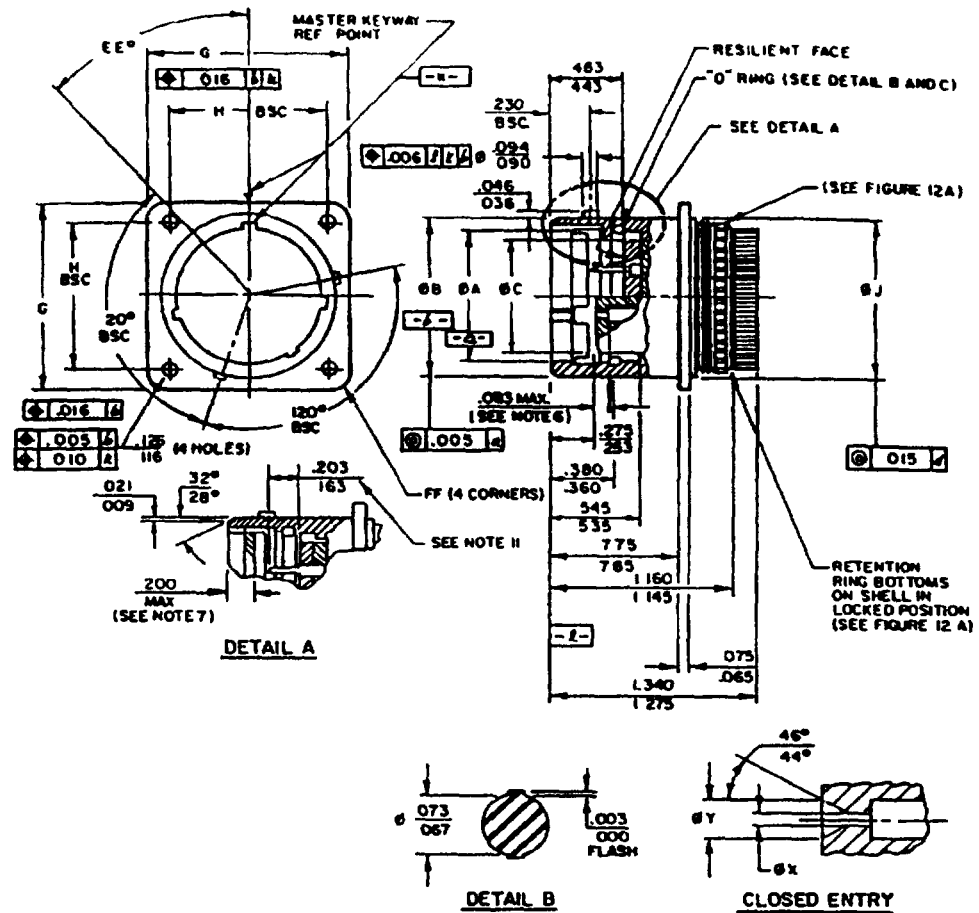
1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. For datum "a" refer to figures 5, 6 and 7.

INCHES	mm	INCHES	mm	INCHES	mm
.005	.13	.070	1.78	.129	3.28
.008	.20	.077	1.96	.133	3.38
.049	1.24	.083	2.11	.134	3.40
.057	1.45	.090	2.29	.138	3.51
.062	1.57				

FIGURE 4. Connector, electrical, position key and keyways, mating (series 2 and 4) (continued).



MIL-C-81511F(AS)

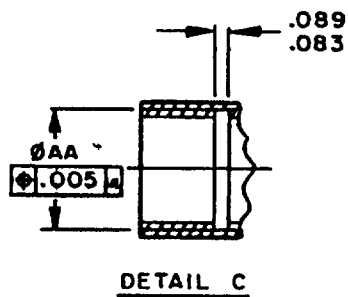


Contact size	$\emptyset X$	$\emptyset Y$
23 - 22	.035 (.89)	.073 (1.91)
	.032 (.81)	.065 (1.65)
20 - 20	.053 (1.35)	.085 (2.16)
	.050 (1.27)	.080 (2.03)
16 - 16	.077 (1.96)	.108 (2.74)
	.074 (1.88)	.103 (2.62)
12 - 12	.130 (3.30)	.170 (4.32)
	.126 (3.20)	.166 (4.22)

INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
.003	.08	.040	1.02	.094	2.39	.230	5.84	.535	13.59
.005	.13	.046	1.17	.116	2.95	.253	6.43	.545	13.84
.006	.15	.065	1.65	.126	3.20	.275	6.99	.765	19.43
.009	.23	.067	1.70	.157	3.99	.290	7.37	.775	19.69
.010	.25	.073	1.85	.163	4.14	.360	9.14	1.145	29.08
.015	.38	.075	1.91	.169	4.29	.380	9.65	1.160	29.46
.016	.41	.083	2.11	.200	5.08	.443	11.25	1.275	32.39
.021	.53	.090	2.29	.203	5.16	.463	11.76	1.340	34.04

FIGURE 5A. Connector, receptacle, electrical, flange mount (series 2).

## MIL-C-81511F(AS)



Size	Ø AA
8	.493 (12.52)
	.488 (12.40)
10	.618 (15.70)
	.613 (15.57)
14	.868 (22.05)
	.863 (21.92)
16	.994 (25.25)
	.989 (25.12)
18	1.118 (28.40)
	1.113 (28.27)

FIGURE 5A. Connector, receptacle, electrical, flange mount (series 2) (continued).

## MIL-C-81511F(AS)

Shell size	ØA	ØB	ØC	G	H Basic	ØJ	FF	EE° BSC					
								Position					
								1	2	3	4	5	6
8	.3895 (9.89)	.553 (14.05)	.290 (7.37)	.820 (20.83)	.594 (15.09)	.549 (13.94)	.120 (3.05)	40	40	40	40	40	40
	.3845 (9.77)	.547 (13.89)	.280 (7.11)	.804 (20.42)		.539 (13.69)	.100 (2.54)						
10	.5145 (13.07)	.678 (17.22)	.415 (10.54)	.945 (24.00)	.719 (18.26)	.674 (17.12)	.120 (3.05)	60	46	46	60	89	60
	.5095 (12.94)	.672 (17.07)	.405 (10.29)	.929 (23.60)		.664 (16.87)	.100 (2.54)						
14	.7645 (19.42)	.928 (23.57)	.665 (16.89)	1.133 (28.78)	.906 (23.01)	.924 (23.47)	.120 (3.05)	60	46	46	60	89	60
	.7595 (19.29)	.922 (23.42)	.655 (16.64)	1.117 (28.37)		.914 (23.22)	.100 (2.54)						
16	.8905 (22.62)	1.054 (26.79)	.791 (20.09)	1.258 (31.95)	.969 (24.61)	1.050 (26.67)	.150 (3.81)	50	50	50	50	50	50
	.8855 (22.49)	1.048 (26.62)	.781 (19.84)	1.242 (31.55)		1.040 (26.42)	.130 (3.30)						
18	1.0145 (25.77)	1.178 (29.92)	.916 (23.27)	1.351 (34.32)	1.062 (26.97)	1.173 (29.79)	.150 (3.81)	50	50	50	50	50	50
	1.0095 (25.64)	1.172 (29.77)	.906 (23.01)	1.335 (33.91)		1.163 (29.54)	.130 (3.30)						

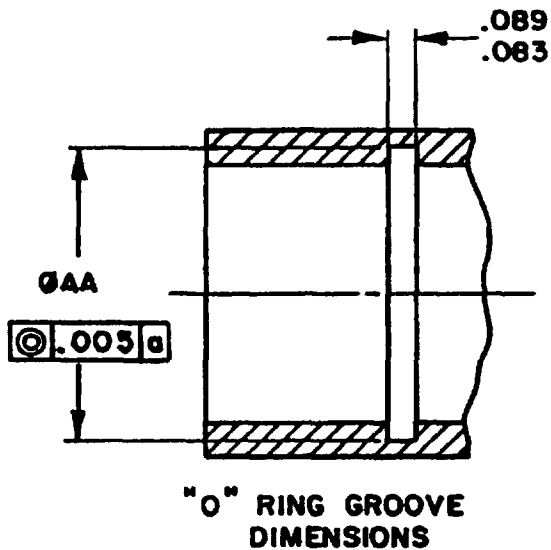
## NOTES:

- Dimensions are in inches.
- Millimeters are in parentheses.
- Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
- Dimensions apply after plating.
- Mating keyway positions and dimensions are shown in figure 4.
- Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
- Distance from front of shell to the point at which a gage pin, having the same basic diameter as plug shell, engages the spring member.
- This design information establishes connector intermating criteria and interchangeability of accessory hardware.
- All dimensions are for connector with contact retention system in locked position.
- Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12A.
- Dimension includes contact slack.

FIGURE 5A. Connector, receptacle, electrical, flange mount (series 2) (continued).



## MIL-C-81511F(AS)



Size	$\varnothing AA$
8	.493 (12.52)
	.488 (12.40)
10	.618 (15.70)
	.613 (15.57)
14	.868 (22.05)
	.863 (21.92)
16	.994 (25.25)
	.989 (25.12)
18	1.118 (28.40)
	1.113 (28.27)

FIGURE 5B. Connector, receptacle, electrical, flange mount (series 4) (continued).

## MIL-C-81511F(AS)

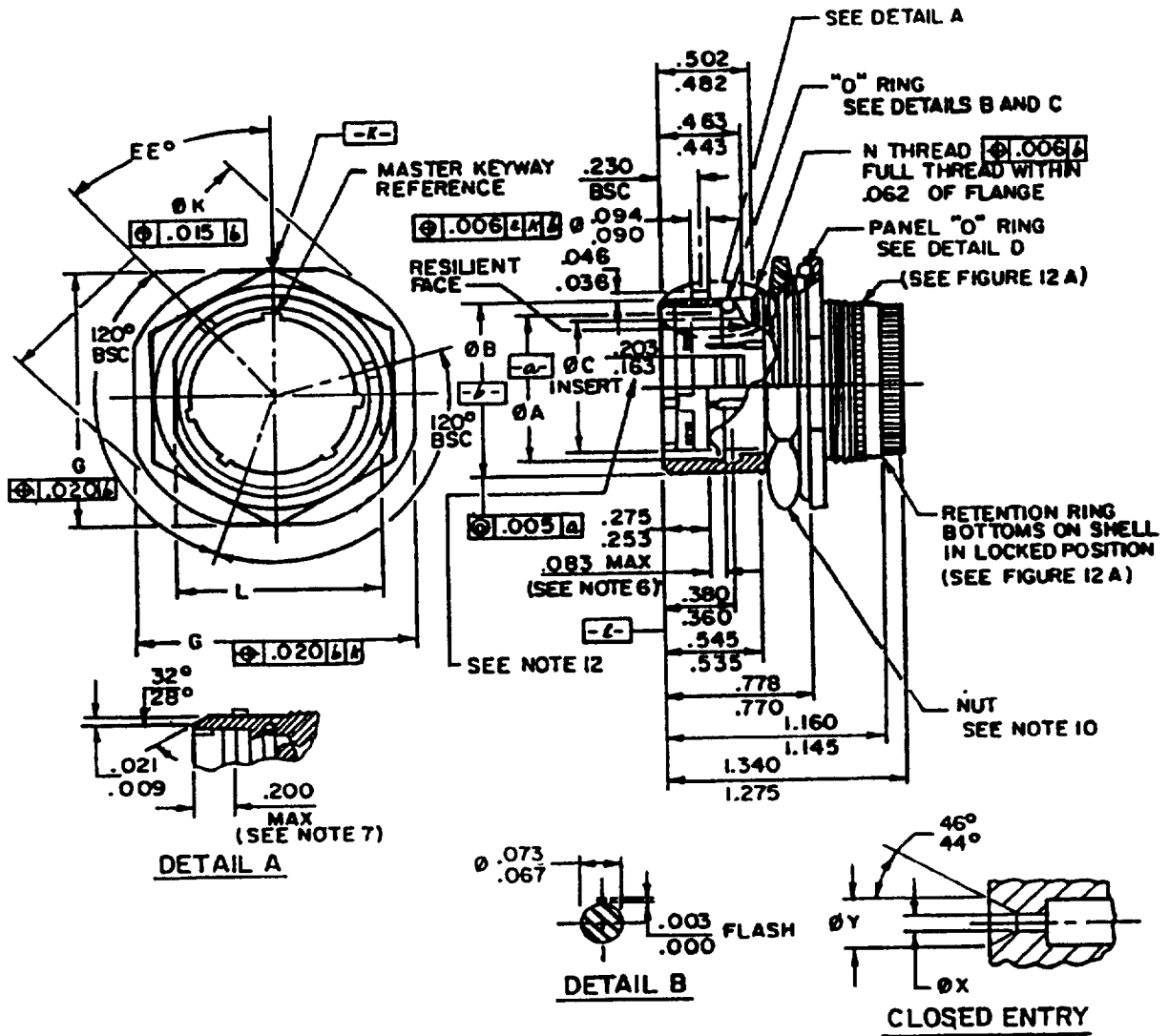
Shell size	ØA	ØB	ØC	G	H Basic	ØJ	FF	EE° BSC					
								Position					
								1	2	3	4	5	6
8	.3895	.553	.290	.820		.549	.120	40	40	40	40	40	40
	(9.89)	(14.05)	(7.37)	(20.83)	.594	(13.94)	(3.05)						
	.3845	.547	.280	.804	(15.09)	.539	.100						
	(9.77)	(13.89)	(7.11)	(20.42)		(13.69)	(2.54)						
10	.5145	.678	.415	.945		.674	.120	60	46	46	60	89	60
	(13.07)	(17.22)	(10.54)	(24.00)	.719	(17.12)	(3.05)						
	.5095	.672	.405	.929	(18.26)	.664	.100						
	(12.94)	(17.07)	(10.29)	(23.60)		(16.87)	(2.54)						
14	.7645	.928	.665	1.133		.924	.120	60	46	46	60	89	60
	(19.42)	(23.57)	(16.89)	(28.78)	.906	(23.47)	(3.05)						
	.7595	.922	.655	1.117	(23.01)	.914	.100						
	(19.29)	(23.42)	(16.64)	(28.37)		(23.22)	(2.54)						
16	.8905	1.054	.791	1.258		1.050	.150	50	50	50	50	50	50
	(22.62)	(26.77)	(20.09)	(31.95)	.969	(26.67)	(3.81)						
	.8855	1.048	.781	1.242	(24.61)	1.040	.130						
	(22.49)	(26.62)	(19.84)	(31.55)		(26.42)	(3.30)						
18	1.0145	1.178	.916	1.351		1.173	.150	50	50	50	50	50	50
	(25.77)	(29.92)	(23.27)	(34.32)	1.062	(29.79)	(3.81)						
	1.0095	1.172	.906	1.335	(26.97)	1.163	.130						
	(25.64)	(29.77)	(23.01)	(33.91)		(29.54)	(3.30)						

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. Mating keyway positions and dimensions are shown in figure 4.
6. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. Distance from front of shell to the point at which a gage pin, having the same basic diameter as plug shell, engages the spring member.
8. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12B.
9. Dimension includes contact slack.
10. Arrangements containing size 12 contacts, insert protrusion. .020/.070

FIGURE 5B. Connector, receptacle, electrical, flange mount (series 4) (continued).

MIL-C-81511F(AS)



Contact size	$\phi X$	$\phi Y$
23 - 22	$.035$ (.89)	$.075$ (1.91)
	$.032$ (.81)	$.065$ (1.65)
20 - 20	$.053$ (1.35)	$.085$ (2.16)
	$.050$ (1.27)	$.080$ (2.03)
16 - 16	$.077$ (1.96)	$.108$ (2.74)
	$.074$ (1.88)	$.103$ (2.62)
12 - 12	$.130$ (3.30)	$.170$ (4.32)
	$.126$ (3.20)	$.166$ (4.22)

FIGURE 6A. Connector, receptacle, electrical, jam nut mount (series 2).

## MIL-C-81511F(AS)

Shell size	Ø A	Ø B	Ø C	G across flats	Ø K	L across flat	N thread	Panel "O" ring	EE*BSL					
									1	2	Position		5	6
8	.3895 (9.89) .3845 (9.77)	.553 (14.05) .547 (13.89)	.290 (7.37) .280 (7.11)	.989 (25.12) .969 (24.61)	1.072 (27.23) 1.052 (26.72)	.598 (15.19) .590 (14.99)	5/8-20UN-2A	MS-9068-018	40	40	40	40	40	40
10	.5145 (13.07) .5095 (12.94)	.678 (17.22) .672 (17.07)	.415 (10.54) .405 (10.29)	1.114 (28.30) 1.094 (27.79)	1.197 (30.40) 1.177 (29.90)	.723 (18.36) .715 (18.16)	3/4-20UNEF-2A	MS-9068-020	60	46	46	60	89	60
14	.7645 (19.42) .7595 (19.29)	.928 (23.57) .922 (23.42)	.665 (16.89) .655 (16.64)	1.401 (35.59) 1.381 (35.08)	1.510 (38.35) 1.490 (37.85)	.973 (24.71) .965 (24.51)	1-20UNEF-2A	MS-9068-024	60	46	46	60	89	60
16	.8905 (22.62) .8855 (22.49)	1.054 (26.77) 1.048 (26.62)	.791 (20.09) .781 (19.84)	1.526 (38.76) 1.506 (38.25)	1.635 (41.53) 1.615 (41.02)	1.098 (27.89) 1.090 (27.69)	1-1/8-20UN-2A	MS-9068-026	50	50	50	50	50	50
18	1.0145 (25.77) 1.0095 (25.64)	1.178 (29.92) 1.172 (29.77)	.916 (23.27) .906 (23.01)	1.651 (41.94) 1.631 (41.43)	1.745 (44.32) 1.725 (43.82)	1.222 (31.04) 1.214 (30.84)	1-1/4-20UN-2A	MS-9068-028	50	50	50	50	50	50

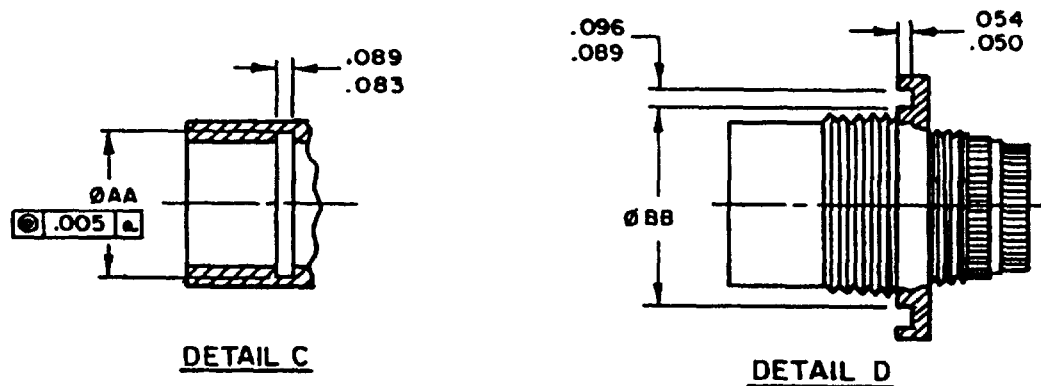
## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. Mating keyway positions and dimensions are shown in figure 4.
6. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. Distance from front of shell to the point at which a gage pin, having the same basic diameter as plug shell, engages the spring member.
8. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
9. All dimensions are for connector with contact retention system in locked position.
10. Slotted nut shall conform to MIL-C-81511/20.
11. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12A.
12. Dimension includes contact slack.

FIGURE 6A. Connector, receptacle, electrical, jam nut  
mount (series 2) (continued).



## MIL-C-81511F(AS)



Size	Ø AA
8	.493 (12.52)
	.488 (12.40)
10	.618 (15.70)
	.613 (15.57)
14	.868 (22.05)
	.863 (21.92)
16	.994 (25.25)
	.989 (25.12)
18	1.118 (28.40)
	1.113 (28.27)

Size	Ø BB
8	.724 (18.39)
	.713 (18.11)
10	.849 (21.56)
	.838 (21.29)
14	1.099 (27.91)
	1.088 (27.64)
16	1.221 (31.01)
	1.210 (30.73)
18	1.356 (34.44)
	1.345 (34.16)

INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
.003	.08	.040	1.02	.157	3.99	.290	7.37	.545	13.84
.005	.13	.046	1.17	.163	4.14	.360	9.14	.770	19.56
.006	.15	.062	1.57	.169	4.29	.380	9.65	.778	19.76
.009	.23	.067	1.70	.200	5.08	.443	11.25	1.145	29.08
.010	.25	.073	1.85	.203	5.16	.463	11.76	1.160	29.46
.015	.38	.083	2.11	.230	5.84	.482	12.24	1.275	32.39
.020	.51	.090	2.29	.253	6.43	.502	12.75	1.340	34.04
.021	.53	.094	2.39	.275	6.99	.535	13.59		

FIGURE 6A. Connector, receptacle, electrical, jam nut mount (series 2) (continued).

MIL-C-81511F(AS)

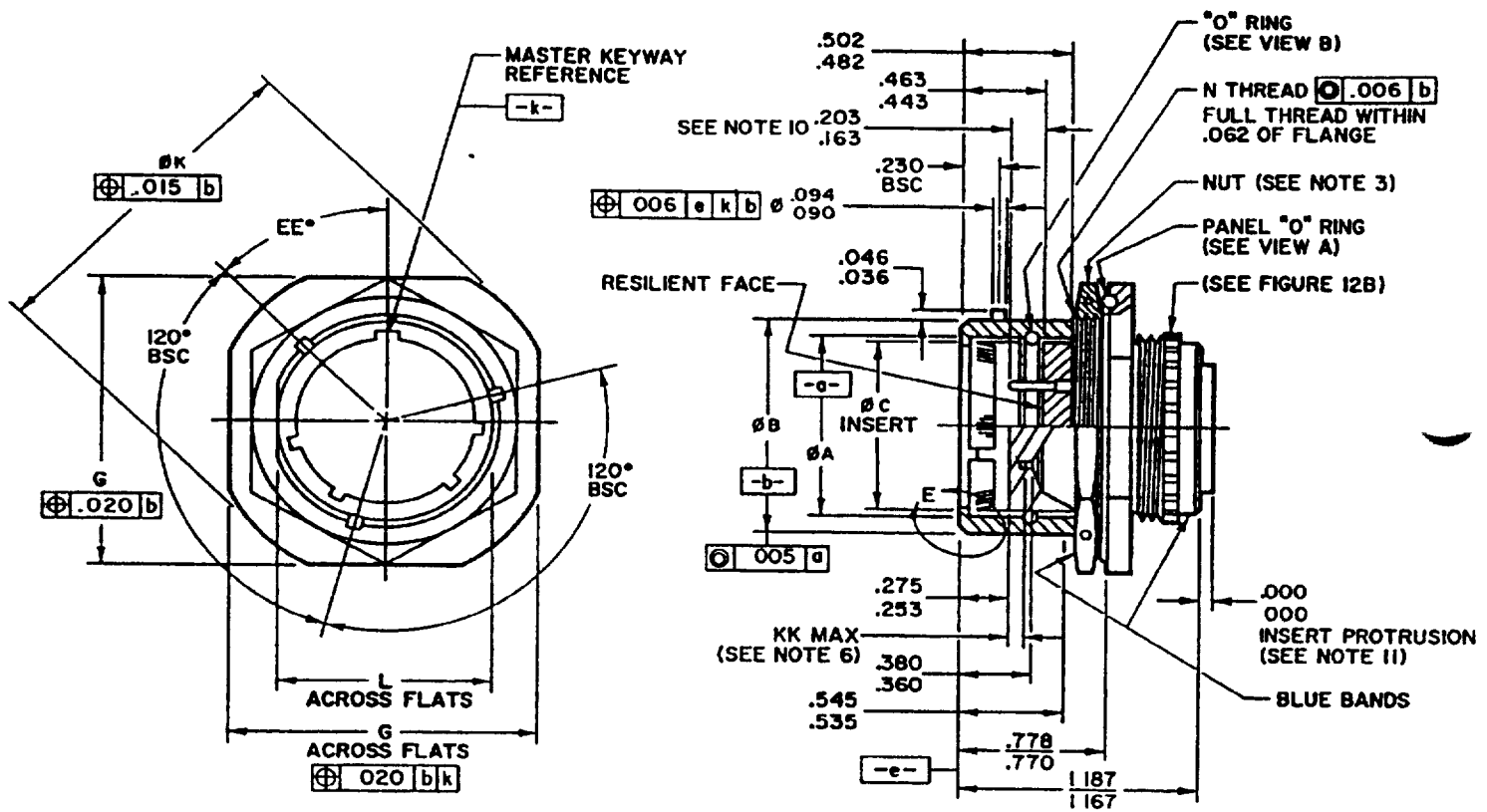
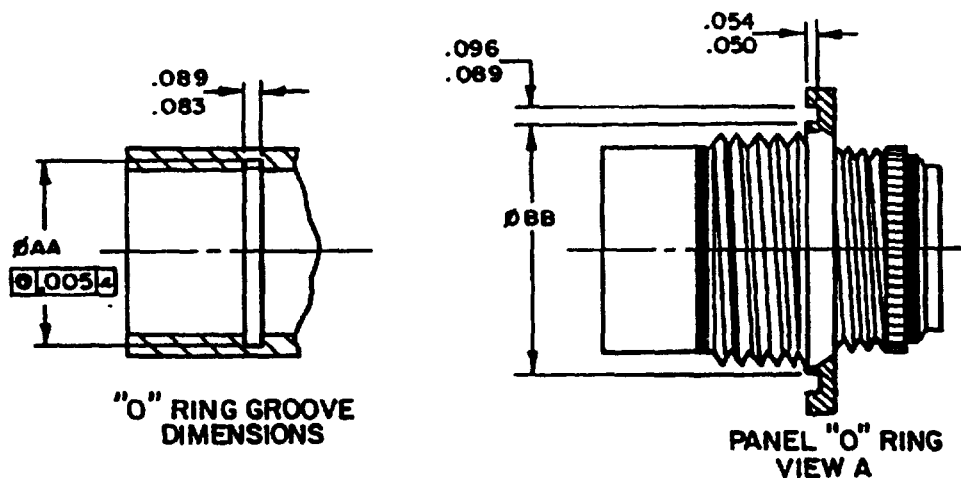


FIGURE 6B. Connector, receptacle, electrical, jam nut mount (series 4).

MIL-C-81511F(AS)



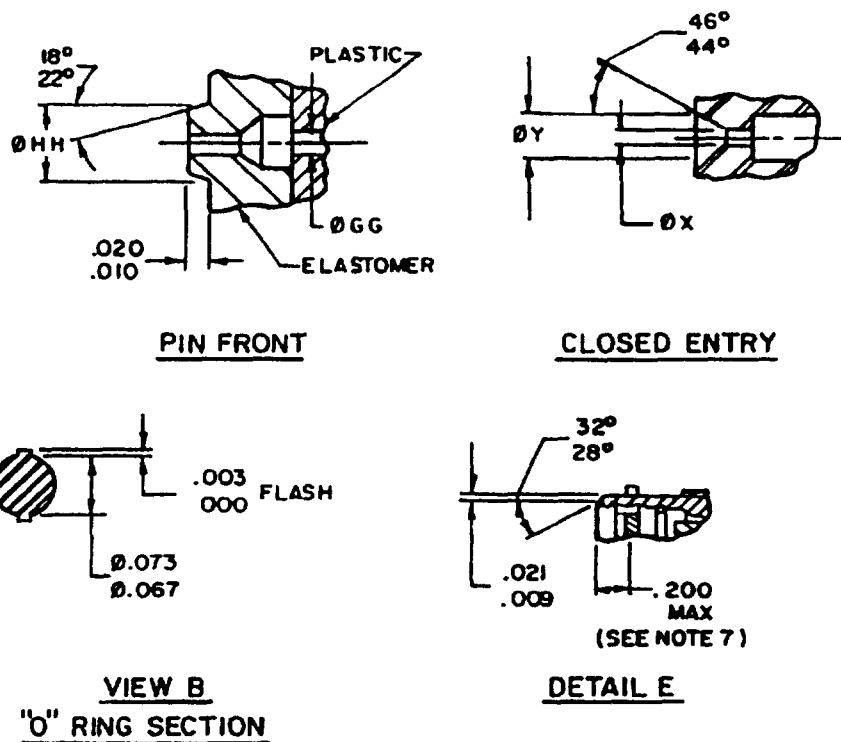
Size	ØAA
8	.493 (12.52)
	.488 (12.40)
10	.618 (15.70)
	.613 (15.57)
14	.868 (22.05)
	.863 (21.92)
16	.994 (25.25)
	.989 (25.12)
18	1.118 (28.40)
	1.113 (28.27)

Size	ØBB
8	.724 (18.39)
	.713 (18.11)
10	.849 (21.56)
	.838 (21.29)
14	1.099 (27.91)
	1.088 (27.64)
16	1.221 (31.01)
	1.210 (30.73)
18	1.356 (34.44)
	1.345 (34.16)

INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
.003	.08	.035	.89	.094	2.39	.275	6.99	.502	12.75
.005	.13	.040	1.02	.157	3.99	.290	7.37	.535	13.59
.006	.15	.046	1.17	.163	4.14	.360	9.14	.545	13.84
.009	.23	.062	1.57	.169	4.29	.380	9.65	.770	19.56
.010	.25	.067	1.70	.200	5.08	.443	11.25	.778	19.76
.015	.38	.073	1.85	.203	5.16	.463	11.76	1.167	29.64
.020	.51	.083	2.11	.230	5.84	.482	12.24	1.187	30.15
.021	.53	.090	2.29	.253	6.43				

FIGURE 6B. Connector, receptacle, electrical, jam nut mount (series 4) (continued).

## MIL-C-81511F(AS)



Contact size	$\varnothing X$	$\varnothing Y$	$\varnothing GG$	$\varnothing HH$	KK (max)
23 - 22	.035 (.89)	.075 (1.91)	.0280 (.71)	.068 (1.73)	.083 (2.11)
	.032 (.81)	.065 (1.65)	.0300 (.76)	.062 (1.57)	
20 - 20	.053 (1.35)	.085 (2.16)	.0415 (1.05)	.083 (2.11)	.090 (2.29)
	.050 (1.27)	.080 (2.03)	.0445 (1.13)	.077 (1.96)	
16 - 16	.077 (1.96)	.108 (2.74)	.0950 (2.41)	.106 (2.69)	.105 (2.67)
	.074 (1.88)	.103 (2.62)	.0990 (2.52)	.100 (2.54)	
12 - 12	.130 (3.30)	.170 (4.32)	.1540 (3.91)	.169 (4.29)	.105 (2.67)
	.126 (3.20)	.166 (4.22)	.1580 (4.01)	.163 (4.14)	

FIGURE 6B. Connector, receptacle, electrical, jam nut mount (series 4) (continued).

## MIL-C-81511F(AS)

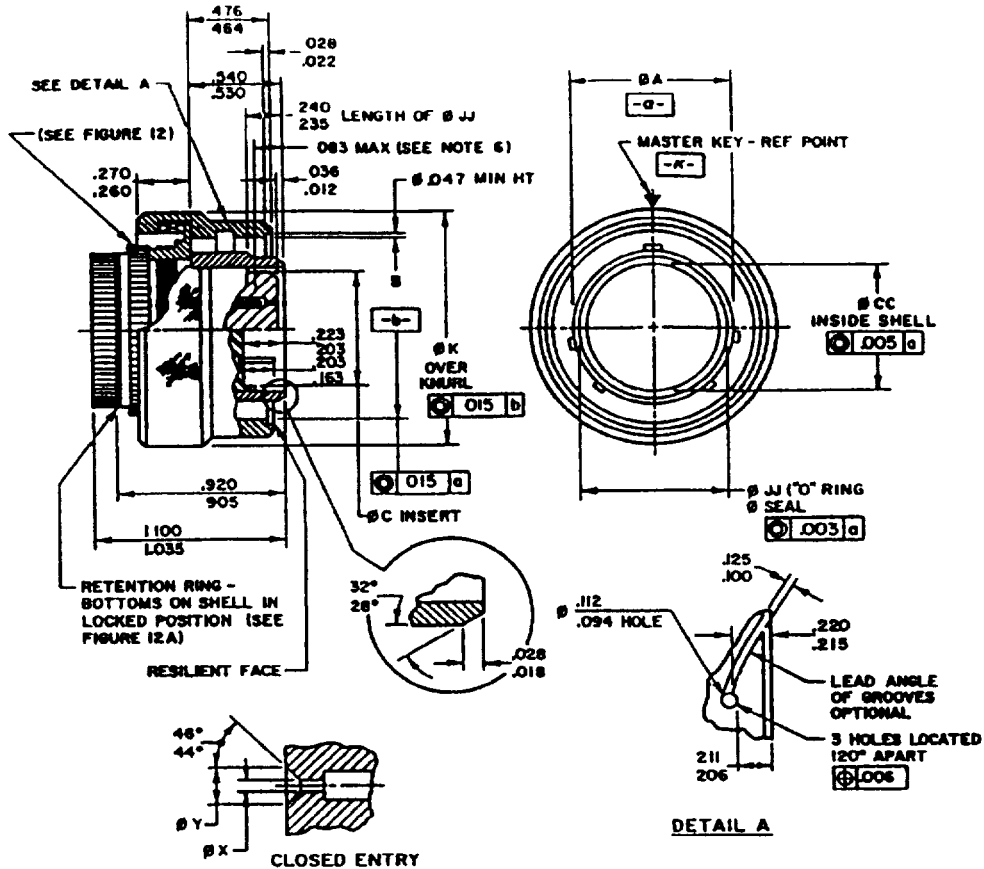
Shell size	ØA	ØB	ØC	G across flats	ØK	L across flat	N thread	Panel "O" ring	EE*BSC					
									Position					
									1	2	3	4	5	6
8	.3895	.553	.290	.989	1.072	.598	5/8-20UN-2A	MS-9068-018	40	40	40	40	40	40
	(9.89)	(14.05)	(7.37)	(25.12)	(27.23)	(15.19)								
	.3845	.547	.280	.969	1.052	.590								
10	.5145	.678	.415	1.114	1.197	.723	3/4-20UN-2A	MS-9068-020	60	46	46	60	89	60
	(13.07)	(17.22)	(10.54)	(28.30)	(30.40)	(18.36)								
	.5095	.672	.405	1.094	1.177	.715								
14	.7645	.928	.665	1.401	1.510	.973	1-20UNEF-2A	MS-9068-024	60	46	46	60	89	60
	(19.42)	(23.57)	(16.89)	(35.59)	(38.35)	(24.71)								
	.7595	.922	.655	1.381	1.490	.965								
16	.8905	1.054	.791	1.526	1.635	1.098	1-1/8-20UN-2A	MS-9068-026	50	50	50	50	50	50
	(22.62)	(26.77)	(20.09)	(38.76)	(41.53)	(27.89)								
	.8855	1.048	.781	1.506	1.615	1.090								
18	1.0145	1.178	.916	1.651	1.745	1.222	1-1/4-20UN-2A	MS-9068-028	50	50	50	50	50	50
	(25.77)	(29.92)	(23.27)	(41.94)	(44.32)	(31.04)								
	1.0095	1.172	.906	1.631	1.725	1.214								

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. Mating keyway positions and dimensions are shown in figure 4.
6. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. Distance from front of shell to the point at which a gage pin, having the same basic diameter as plug shell, engages the spring member.
8. Slotted nut shall conform to MIL-C-81511/20.
9. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12B.
10. Dimension includes contact slack.
11. Arrangements containing size 12 contacts, insert protrusion. .020/.070

FIGURE 6B. Connector, receptacle, electrical, jam nut mount (Series 4) (continued).

## MIL-C-81511F(AS)



Contact size	$\emptyset$ X	$\emptyset$ Y
23 - 22	.035 (.89)	.075 (1.91)
	.032 (.81)	.065 (1.65)
20 - 20	.053 (1.35)	.085 (2.16)
	.050 (1.27)	.080 (2.03)
16 - 16	.077 (1.96)	.108 (2.74)
	.074 (1.88)	.103 (2.62)
12 - 12	.130 (3.30)	.170 (4.32)
	.126 (3.20)	.166 (4.22)

INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM
.005	.13	.036	.91	.163	4.14	.235	5.97	.474	12.04
.006	.15	.047	1.19	.169	4.29	.240	6.10	.530	13.46
.008	.20	.083	2.11	.203	5.16	.260	6.60	.540	13.72
.012	.30	.094	2.39	.206	5.23	.270	6.86	.905	22.99
.015	.38	.100	2.54	.211	5.36	.275	6.99	.920	23.37
.018	.46	.112	2.84	.215	5.46	.290	7.37	1.035	26.29
.022	.56	.125	3.18	.220	5.59	.464	11.79	1.100	27.94
.028	.71	.157	3.99						

FIGURE 7A. Connector, plug, electrical (series 2).

## MIL-C-81511F(AS)

Shell size	Ø A	Ø B	Ø C	Ø K	Ø CC	Ø JJ
8	.3815 (9.69)	.566 (14.38)	.290 (7.37)	.850 (21.59)	.301 (7.65)	.3815 (9.69)
	.3755 (9.54)	.558 (14.17)	.280 (7.11)	.830 (21.08)	.293 (7.45)	.373 (9.47)
10	.5065 (12.87)	.691 (17.55)	.415 (10.54)	.975 (24.77)	.426 (10.82)	.5065 (12.87)
	.5005 (12.71)	.683 (17.35)	.405 (10.29)	.955 (24.26)	.418 (10.62)	.498 (12.65)
14	.7565 (19.22)	.941 (23.90)	.665 (16.89)	1.225 (31.12)	.676 (17.17)	.7565 (19.22)
	.7505 (19.06)	.933 (23.70)	.655 (16.64)	1.205 (30.61)	.668 (16.97)	.746 (18.95)
16	.8825 (22.42)	1.068 (27.13)	.791 (20.09)	1.350 (34.29)	.802 (20.37)	.8825 (22.42)
	.8765 (22.26)	1.060 (26.92)	.781 (19.84)	1.330 (33.78)	.794 (20.17)	.872 (22.15)
18	1.0065 (25.57)	1.191 (30.25)	.916 (23.27)	1.475 (37.41)	.927 (23.55)	1.0065 (25.57)
	1.0005 (25.41)	1.183 (30.05)	.906 (23.01)	1.455 (36.96)	.919 (23.35)	.996 (25.30)

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions are after plating.
5. Mating key positions and dimensions are shown in figure 4.
6. Distance from front of insert and the point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
8. All dimensions are for connector with contact retention system in locked position.
9. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12.

FIGURE 7A. Connector, plug, electrical (series 2) (continued).

MIL-C-81511F(AS)

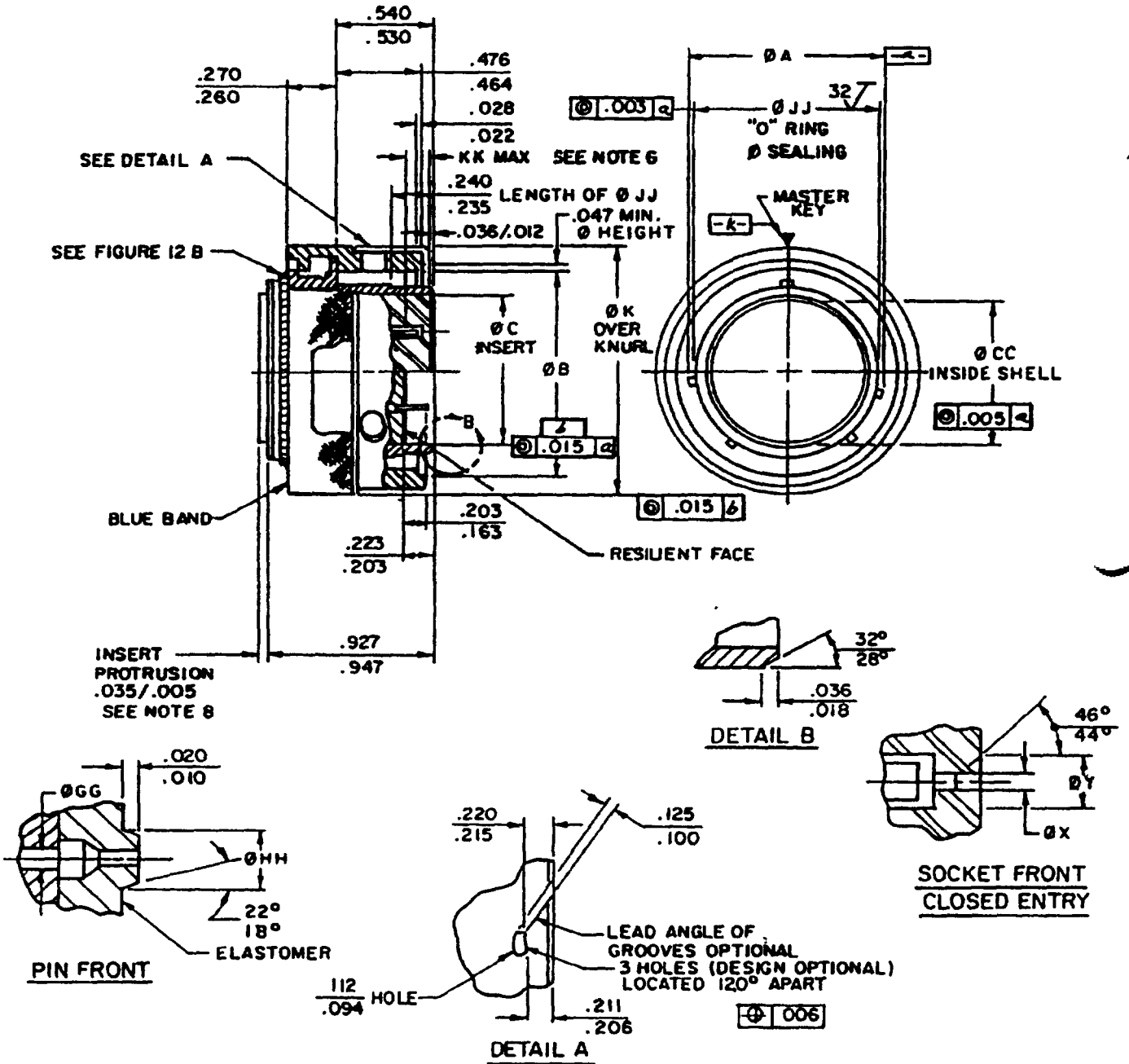


FIGURE 7B. Connector, plug, electrical (series 4).



## MIL-C-81511F(AS)

Shell size	Ø A	Ø B	Ø C	Ø K	Ø CC	Ø JJ
8	.3815 (9.69)	.566 (14.38)	.290 (7.37)	.850 (21.59)	.301 (7.65)	.3815 (9.69)
	.3755 (9.54)	.558 (14.17)	.280 (7.11)	.830 (21.08)	.293 (7.45)	.373 (9.47)
10	.5065 (12.87)	.691 (17.55)	.415 (10.54)	.975 (24.77)	.426 (10.82)	.5065 (12.87)
	.5005 (12.71)	.683 (17.35)	.405 (10.29)	.955 (24.26)	.418 (10.62)	.498 (12.65)
14	.7565 (19.22)	.941 (23.90)	.665 (16.89)	1.225 (31.12)	.676 (17.17)	.7565 (19.22)
	.7505 (19.06)	.933 (23.70)	.655 (16.64)	1.205 (30.61)	.668 (16.97)	.746 (18.95)
16	.8825 (22.42)	1.068 (27.13)	.791 (20.09)	1.350 (34.29)	.802 (20.37)	.8825 (22.42)
	.8765 (22.26)	1.060 (26.92)	.781 (19.84)	1.330 (33.78)	.794 (20.17)	.872 (22.15)
18	1.0065 (25.57)	1.191 (30.25)	.916 (23.27)	1.475 (37.41)	.927 (23.55)	1.0065 (25.57)
	1.0005 (25.41)	1.183 (30.05)	.906 (23.01)	1.455 (36.96)	.919 (23.35)	.996 (25.30)

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions are after plating.
5. Mating key positions and dimensions are shown in figure 4.
6. Distance from front of insert and the point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12B.
8. Arrangements containing size 12 contacts, insert protrusion .070/.020.

FIGURE 7B. Connector, plug, electrical (series 4) (continued).

## MIL-C-81511F(AS)

Contact size	ØX	ØY	ØGG	ØHH	ØKK (max)
23 - 22	.035 (.89)	.075 (1.91)	.0280 (.71)	.068 (1.73)	.083 (2.11)
	.032 (.81)	.065 (1.65)	.0300 (.76)	.062 (1.57)	
20 - 20	.053 (1.35)	.085 (2.16)	.0415 (1.05)	.083 (2.11)	.090 (2.29)
	.050 (1.27)	.080 (2.03)	.0445 (1.13)	.077 (1.96)	
16 - 16	.077 (1.96)	.108 (2.74)	.0950 (2.41)	.106 (2.69)	.105 (2.67)
	.074 (1.88)	.103 (2.62)	.0990 (2.52)	.100 (2.54)	
12 - 12	.130 (3.30)	.170 (4.32)	.1540 (3.91)	.169 (4.29)	.105 (2.67)
	.126 (3.20)	.166 (4.22)	.1580 (4.01)	.163 (4.14)	

INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM
.005	.13	.035	.89	.125	3.18	.215	5.46	.290	7.37
.006	.15	.036	.91	.157	3.99	.220	5.59	.464	11.79
.008	.20	.047	1.19	.163	4.14	.235	5.97	.474	12.04
.012	.30	.083	2.11	.169	4.29	.240	6.10	.530	13.46
.015	.38	.094	2.39	.203	5.16	.260	6.60	.540	13.72
.018	.46	.100	2.54	.206	5.23	.270	6.86	.927	23.55
.022	.56	.112	2.84	.211	5.36	.275	6.99	.947	34.05
.028	.71								

FIGURE 7B. Connector, plug, electrical (series 4) (continued).



## MIL-C-81511F(AS)

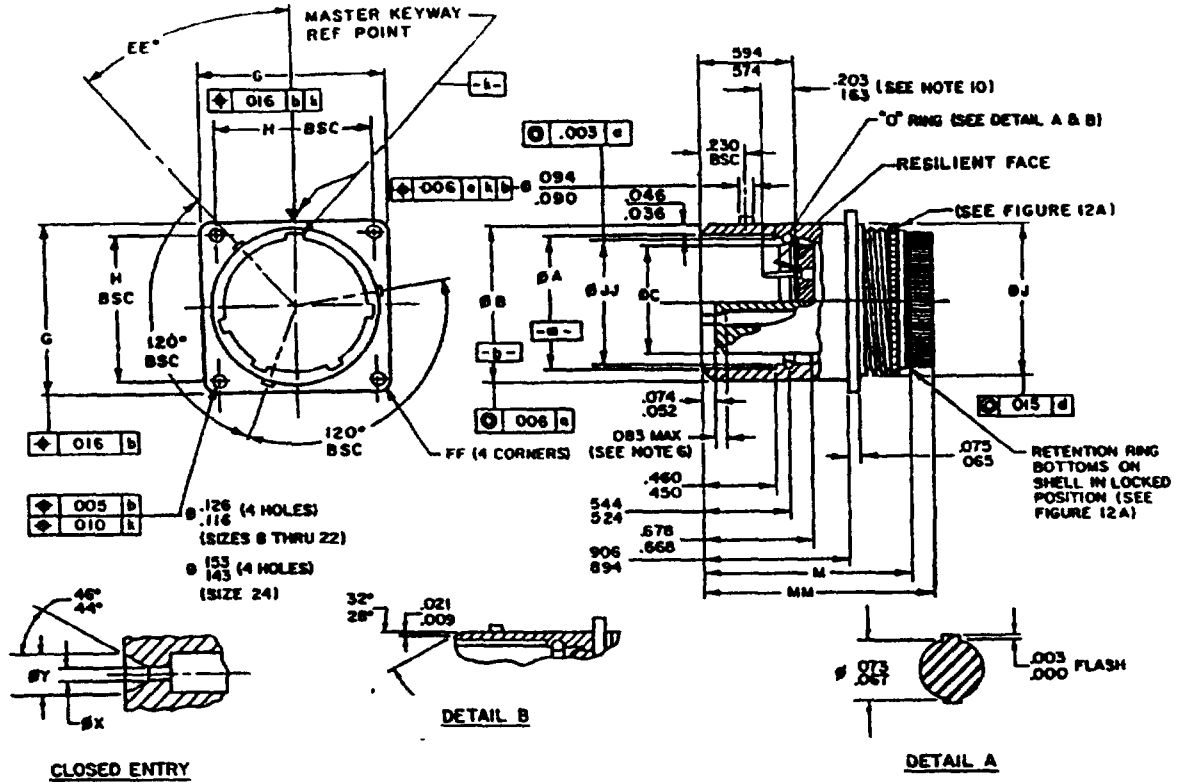
Shell size	Key & keyway arrangement	AR° or AP° BSC	BR° or BP° BSC	CR° or CP° BSC	DR° or DP° BSC	ØYR	ØYP
8	1	105	140	215	265	.482 (12.24) .470 (11.94)	.460 (11.68) .452 (11.48)
	2	102	132	248	320		
	3	80	118	230	312		
	4	35	140	205	275		
	5	64	155	234	304		
	6	91	131	197	240		
10 and 14	1	95	141	208	236	.607 (15.42) .595 (15.11) .857 (21.77) .845 (21.46)	.585 (14.86) .577 (14.66) .835 (21.21) .827 (21.01)
	2	113	156	182	292		
	3	90	145	195	252		
	4	53	156	220	255		
	5	119	146	176	298		
	6	51	141	184	242		
16 and 18	1	80	142	196	293	.983 (24.97) .971 (24.66) 1.107 (28.12) 1.095 (27.81)	.961 (24.41) .953 (24.21) 1.085 (27.56) 1.077 (27.36)
	2	135	170	200	310		
	3	49	169	200	244		
	4	66	140	200	257		
	5	62	145	180	280		
	6	79	153	197	272		
20, 22 and 24	1	80	142	196	293	1.232 (31.29) 1.220 (30.99) 1.357 (34.47) 1.345 (34.16) 1.482 (37.64) 1.470 (37.34)	1.210 (30.73) 1.202 (30.53) 1.335 (33.91) 1.327 (33.71) 1.460 (37.08) 1.452 (36.88)
	2	135	170	200	310		
	3	49	169	200	244		
	4	66	140	200	257		
	5	62	145	180	280		
	6	79	153	197	272		

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. For datum "a" refer to figures 9, 10 and 11.

FIGURE 8. Connector, electrical, positions key and keyway, mating (series 1 & 3) (continued).

MIL-C-81511F(AS)

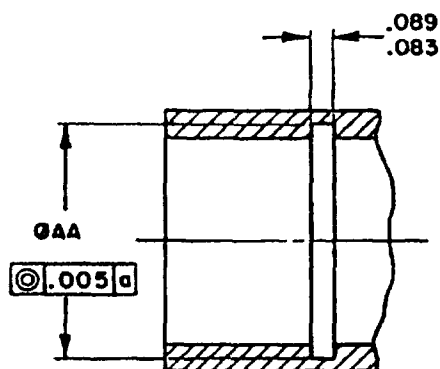


Contact size	$\phi X$	$\phi Y$
23 - 22	.035 (.89)	.075 (1.91)
	.032 (.81)	.065 (1.65)
20 - 20	.053 (1.35)	.085 (2.16)
	.050 (1.27)	.080 (2.03)
16 - 16	.077 (1.96)	.108 (2.74)
	.074 (1.88)	.103 (2.62)
12 - 12	.130 (3.30)	.170 (4.32)
	.126 (3.20)	.166 (4.22)

INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
.003	.08	.040	1.02	.090	2.29	.275	6.99	.668	16.97
.004	.10	.046	1.17	.094	2.39	.290	7.37	.678	17.22
.005	.13	.052	1.32	.116	2.95	.450	11.43	.894	22.71
.006	.15	.065	1.65	.126	3.20	.460	11.68	.906	23.01
.009	.23	.067	1.70	.157	3.99	.524	13.31	1.276	32.41
.010	.25	.073	1.85	.153	4.14	.544	13.82	1.291	32.79
.015	.38	.074	1.88	.169	4.29	.574	14.58	1.406	35.71
.016	.41	.075	1.91	.203	5.16	.594	15.09	1.471	37.36
.021	.53	.083	2.11	.230	5.84				

FIGURE 9A. Connector, receptacle, electrical, flange mount (series 1).

## MIL-C-81511F(AS)



DETAIL B

Size	$\varnothing AA$
8	.493 (12.52)
	.488 (12.40)
10	.618 (15.70)
	.613 (15.57)
14	.868 (22.05)
	.863 (21.92)
16	.994 (25.25)
	.989 (25.12)
18	1.118 (28.40)
	1.113 (28.27)
20	1.243 (31.57)
	1.238 (31.45)
22	1.368 (34.75)
	1.363 (34.62)
24	1.493 (37.92)
	1.488 (37.80)

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. Mating keyway positions and dimensions are shown in figure 8.
6. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
8. All dimensions are for connector with contact retention system in locked position.
9. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12A.
10. Dimension includes contact slack.

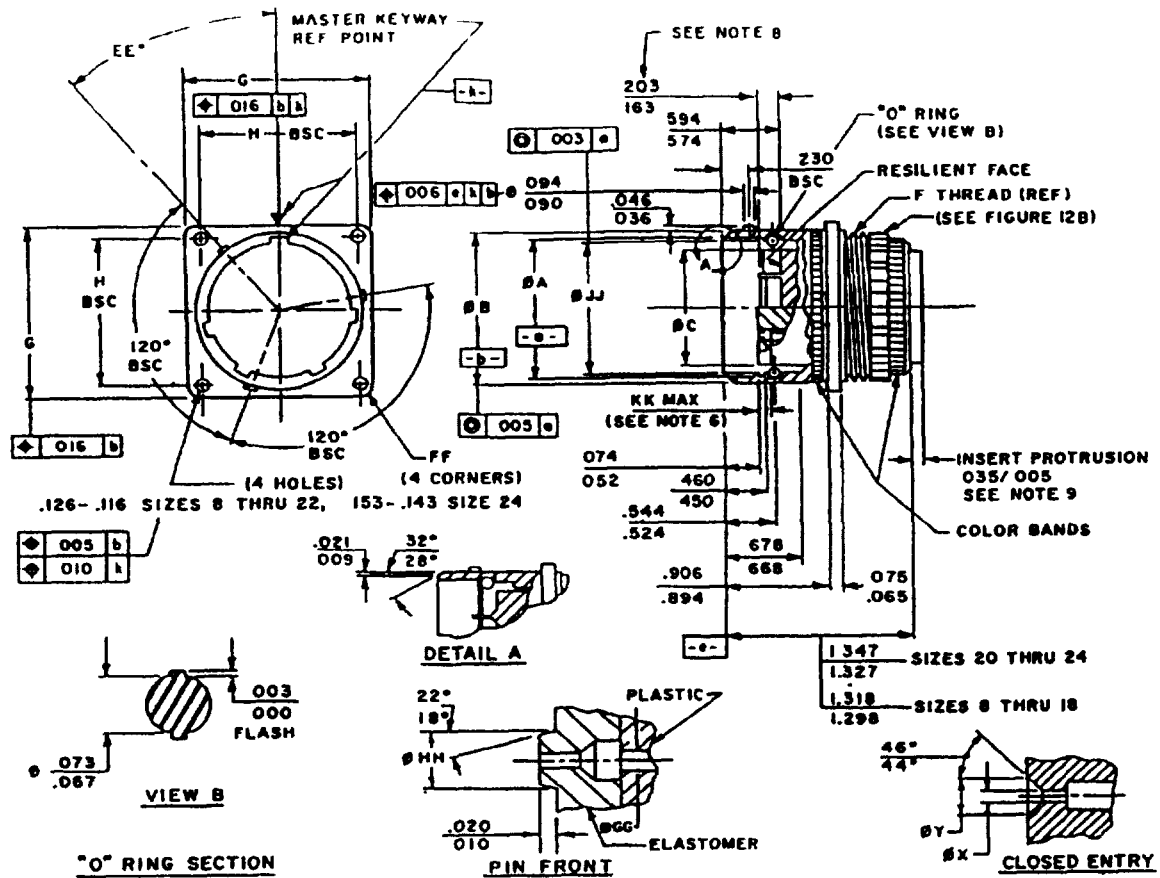
FIGURE 9A. Connector, receptacle, electrical, flange mount  
(series I) (continued).

## MIL-C-81511F(AS)

Shell size	ØA	ØB	ØC	G	H basic	ØJ	FF rad	ØJJ	M	MM	EE* BSC Position					
											1	2	3	4	5	6
8	.4095 (10.40)	.553 (14.05)	.290 (7.37)	.820 (20.83)	.594 (15.09)	.549 (13.94)	.120 (3.05)	.3895 (9.89)	1.291 (32.79)	1.471 (37.36)	60	46	43	60	89	43
	.4045 (10.27)	.547 (13.89)	.280 (7.11)	.804 (20.42)		.539 (13.69)	.100 (2.54)	.3845 (9.77)	1.276 (32.41)	1.406 (35.71)						
10	.5345 (13.58)	.678 (17.22)	.415 (10.54)	.945 (24.00)	.719 (18.26)	.674 (17.12)	.120 (3.05)	.5145 (13.07)	1.291 (32.79)	1.471 (37.36)	53	87	51	77	87	87
	.5295 (13.45)	.672 (17.07)	.405 (10.29)	.929 (23.60)		.664 (16.87)	.100 (2.54)	.5095 (12.94)	1.276 (32.41)	1.406 (35.71)						
14	.7845 (19.93)	.928 (23.57)	.665 (16.89)	1.133 (28.78)	.906 (23.01)	.924 (23.47)	.120 (3.05)	.7645 (19.42)	1.291 (32.79)	1.471 (37.36)	53	87	51	77	87	87
	.7795 (19.80)	.922 (23.42)	.655 (16.64)	1.117 (28.37)		.914 (23.22)	.100 (2.54)	.7595 (19.29)	1.276 (32.41)	1.406 (35.71)						
16	.9105 (23.13)	1.054 (26.77)	.791 (20.09)	1.258 (31.95)	.969 (24.61)	1.050 (26.67)	.150 (3.81)	.8905 (22.62)	1.291 (32.79)	1.471 (37.36)	98	98	98	98	98	98
	.9055 (23.00)	1.048 (26.62)	.781 (19.84)	1.242 (31.55)		1.040 (26.42)	.130 (3.30)	.8855 (22.49)	1.276 (32.41)	1.406 (35.71)						
18	1.0345 (26.28)	1.178 (29.92)	.916 (23.27)	1.351 (34.22)	1.062 (26.97)	1.173 (29.79)	.150 (3.81)	1.0145 (25.77)	1.291 (32.79)	1.471 (37.36)	98	98	98	98	98	98
	1.0295 (26.15)	1.172 (29.77)	.906 (23.01)	1.335 (33.91)		1.163 (29.54)	.130 (3.30)	1.0095 (25.64)	1.276 (32.41)	1.406 (35.71)						
20	1.1595 (29.45)	1.303 (33.10)	1.041 (26.44)	1.475 (37.47)	1.156 (29.36)	1.298 (32.97)	.150 (3.81)	1.1395 (28.94)	1.371 (34.82)	1.551 (39.40)	98	98	98	98	98	98
	1.1545 (29.32)	1.297 (32.94)	1.031 (26.19)	1.459 (37.06)		1.288 (32.72)	.130 (3.30)	1.1345 (28.82)	1.356 (34.44)	1.486 (37.74)						
22	1.2835 (32.60)	1.428 (36.27)	1.166 (29.62)	1.570 (39.88)	1.250 (31.75)	1.423 (36.14)	.150 (3.81)	1.2645 (32.12)	1.371 (34.82)	1.551 (39.40)	98	98	98	98	98	98
	1.2795 (32.50)	1.422 (36.12)	1.156 (29.36)	1.554 (39.47)		1.413 (35.89)	.130 (3.30)	1.2595 (31.99)	1.356 (34.44)	1.486 (37.74)						
24	1.4095 (35.80)	1.553 (39.45)	1.291 (32.79)	1.711 (43.46)	1.375 (34.92)	1.548 (39.32)	.150 (3.81)	1.3895 (35.29)	1.371 (34.82)	1.551 (39.40)	98	98	98	98	98	98
	1.4045 (35.67)	1.547 (39.29)	1.281 (32.54)	1.695 (43.05)		1.538 (39.07)	.130 (3.30)	1.3845 (35.17)	1.356 (34.44)	1.486 (37.74)						

FIGURE 9A. Connector, receptacle, electrical, flange mount (series 1) (continued).

MIL-C-81511F(AS)



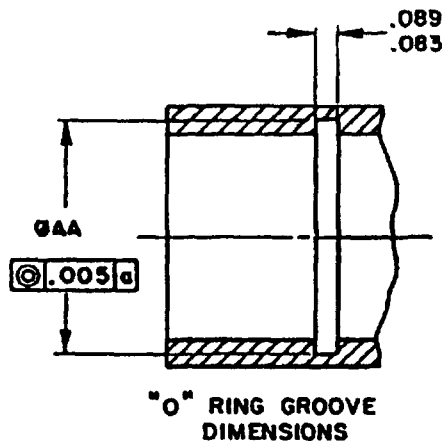
Contact size	ØX	ØY	ØGG	ØHH	KK (max)
23 - 22	.035 (.89) .032 (.81)	.075 (1.91) .065 (1.65)	.0280 (.71) .0300 (.76)	.068 (1.73) .062 (1.57)	.083 (2.11)
20 - 20	.053 (1.35) .050 (1.27)	.085 (2.16) .080 (2.03)	.0415 (1.05) .0445 (1.13)	.083 (2.11) .077 (1.96)	.090 (2.29)
16 - 16	.077 (1.96) .074 (1.88)	.108 (2.74) .103 (2.62)	.0950 (2.41) .0990 (2.52)	.106 (2.69) .100 (2.54)	.105 (2.67)
12 - 12	.130 (3.30) .126 (3.20)	.170 (4.32) .166 (4.22)	.1540 (3.91) .1580 (4.01)	.169 (4.29) .163 (4.14)	.105 (2.67)

INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
.003	.08	.040	1.02	.035	.89	.203	5.16	.594	15.09
.004	.10	.046	1.17	.090	2.29	.230	5.84	.668	16.97
.005	.13	.052	1.32	.094	2.39	.275	6.99	.678	17.22
.006	.15	.065	1.65	.100	2.54	.290	7.37	.894	22.71
.009	.23	.067	1.70	.116	2.95	.450	11.43	.906	23.01
.010	.25	.073	1.85	.126	3.20	.460	11.68	1.298	32.97
.015	.38	.074	1.88	.143	3.63	.524	13.31	1.318	33.48
.016	.41	.075	1.91	.153	3.89	.544	13.82	1.327	33.71
.020	.51	.083	2.11	.163	4.14	.574	14.58	1.347	34.21
.021	.53								

FIGURE 9B. Connector, receptacle, electrical, flange mount (series 3).



## MIL-C-81511F(AS)



Size	Ø AA
8	.493 (12.52)
	.488 (12.40)
10	.618 (15.70)
	.613 (15.57)
14	.868 (22.05)
	.863 (21.92)
16	.994 (25.25)
	.989 (25.12)
18	1.118 (28.40)
	1.113 (28.27)
20	1.243 (31.57)
	1.238 (31.45)
22	1.368 (34.75)
	1.363 (34.62)
24	1.493 (37.92)
	1.488 (37.80)

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. Mating keyway positions and dimensions are shown in figure 8.
6. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12B.
8. Dimension includes contact slack.
9. Arrangements containing size 12 contacts, insert protrusion. .020/.070

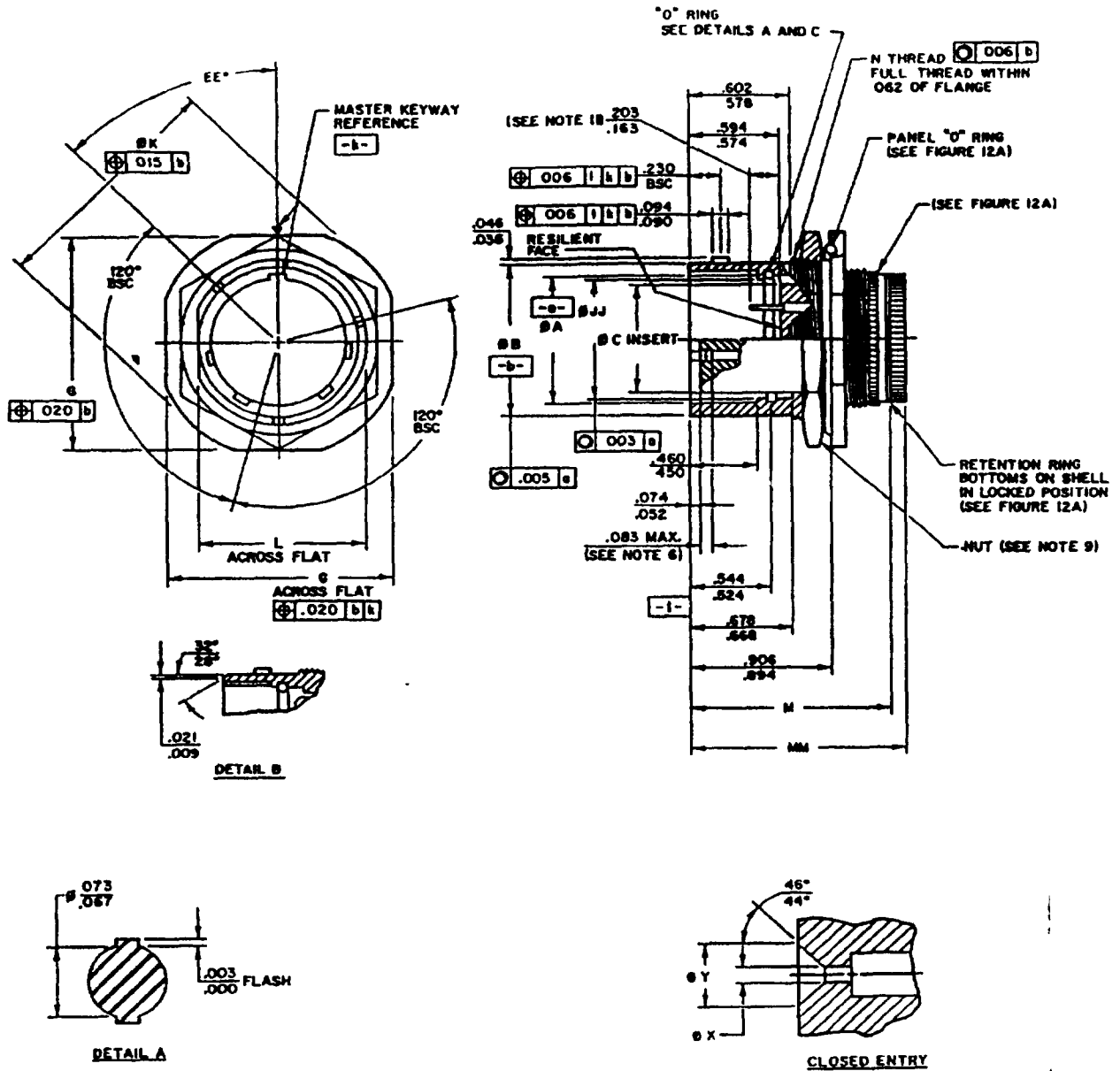
FIGURE 9B. Connector, receptacle, electrical, flange mount (series 3) (continued).

## MIL-C-81511F(AS)

Shell size	ØA	ØB	ØC	G	H basic	ØJ	FF rad	ØJJ	EE* BSC Position					
									1	2	3	4	5	6
8	.4095 (10.40)	.553 (14.05)	.290 (7.37)	.820 (20.83)	.594 (15.09)	.549 (13.94)	.120 (3.05)	.3895 (9.89)	60	46	43	60	89	43
	.4045 (10.27)	.547 (13.89)	.280 (7.11)	.804 (20.42)		.539 (13.69)	.100 (2.54)	.3845 (9.77)						
10	.5345 (13.58)	.678 (17.22)	.415 (10.54)	.945 (24.00)	.719 (18.26)	.674 (17.12)	.120 (3.05)	.5145 (13.07)	53	87	51	77	87	87
	.5295 (13.45)	.672 (17.07)	.405 (10.29)	.929 (23.60)		.664 (16.87)	.100 (2.54)	.5095 (12.94)						
14	.7845 (19.93)	.928 (23.57)	.665 (16.89)	1.133 (28.78)	.906 (23.01)	.924 (23.47)	.120 (3.05)	.7645 (19.42)	53	87	51	77	87	87
	.7795 (19.80)	.922 (23.42)	.655 (16.64)	1.117 (28.37)		.914 (23.22)	.100 (2.54)	.7595 (19.29)						
16	.9105 (23.13)	1.054 (26.77)	.791 (20.09)	1.258 (31.95)	.969 (24.61)	1.050 (26.67)	.150 (3.81)	.8905 (22.62)	98	98	98	98	98	98
	.9055 (23.00)	1.048 (26.62)	.781 (19.84)	1.242 (31.55)		1.040 (26.42)	.130 (3.30)	.8855 (22.49)						
18	1.0345 (26.28)	1.178 (29.92)	.916 (23.27)	1.351 (34.32)	1.062 (26.97)	1.173 (29.79)	.150 (3.81)	1.0145 (25.77)	98	98	98	98	98	98
	1.0295 (26.15)	1.172 (29.77)	.906 (23.01)	1.335 (33.91)		1.163 (29.54)	.130 (3.30)	1.0095 (25.64)						
20	1.1595 (29.45)	1.303 (33.10)	1.041 (26.44)	1.475 (37.47)	1.156 (29.36)	1.298 (32.97)	.160 (4.06)	1.1395 (28.94)	98	98	98	98	98	98
	1.1545 (29.32)	1.297 (32.94)	1.031 (26.19)	1.459 (37.06)		1.288 (32.72)	.130 (3.30)	1.1345 (28.82)						
22	1.2835 (32.60)	1.428 (36.27)	1.166 (29.62)	1.570 (39.88)	1.250 (31.75)	1.423 (36.14)	.160 (4.06)	1.2645 (32.12)	98	98	98	98	98	98
	1.2795 (32.50)	1.422 (36.12)	1.156 (29.36)	1.554 (39.47)		1.413 (35.89)	.130 (3.30)	1.2595 (31.99)						
24	1.4095 (35.80)	1.553 (39.45)	1.291 (32.79)	1.711 (43.46)	1.375 (34.92)	1.548 (39.32)	.160 (4.06)	1.3895 (35.29)	98	98	98	98	98	98
	1.4045 (35.67)	1.547 (39.29)	1.281 (32.54)	1.695 (43.05)		1.538 (39.07)	.130 (3.30)	1.3845 (35.17)						

FIGURE 9B. Connector, receptacle, electrical, flange mount (series 3) (continued).

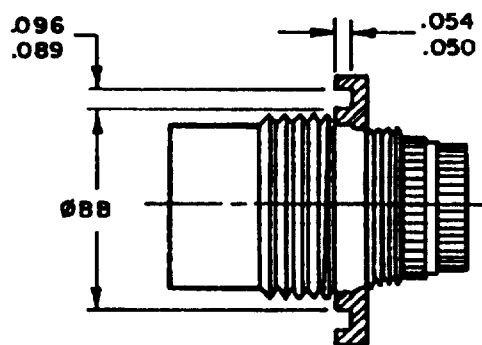
## MIL-C-81511F(AS)



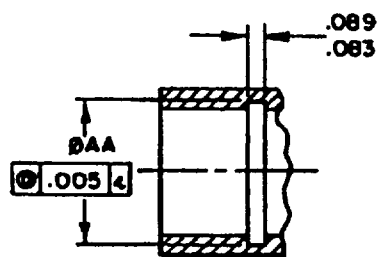
Contact size	$\phi$ X	$\phi$ Y
23 - 22	.035 (.89)	.075 (1.91)
	.032 (.81)	.065 (1.65)
20 - 20	.053 (1.35)	.085 (2.16)
	.050 (1.27)	.080 (2.03)
16 - 16	.077 (1.96)	.108 (2.74)
	.074 (1.88)	.103 (2.62)
12 - 12	.130 (3.30)	.170 (4.32)
	.126 (3.20)	.166 (4.22)

FIGURE 10A. Connector, receptacle, electrical, jam nut mount (series 1).

MIL-C-81511F(AS)



DETAIL B



DETAIL C

Size	Ø BB
8	.724 (18.39)
	.713 (18.11)
10	.849 (21.56)
	.838 (21.29)
14	1.099 (27.91)
	1.088 (27.64)
16	1.221 (31.01)
	1.210 (30.73)
18	1.356 (34.44)
	1.345 (34.16)
20	1.481 (37.62)
	1.470 (37.34)
22	1.606 (40.79)
	1.595 (40.51)
24	1.731 (43.97)
	1.720 (43.69)

Size	Ø AA
8	.493 (12.52)
	.488 (12.40)
10	.618 (15.70)
	.613 (15.57)
14	.868 (22.05)
	.863 (21.92)
16	.989 (25.12)
	.994 (25.25)
18	1.118 (28.40)
	1.113 (28.27)
20	1.243 (31.57)
	1.238 (31.45)
22	1.368 (34.75)
	1.363 (34.62)
24	1.493 (37.92)
	1.488 (37.80)

INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
.003	.08	.021	.53	.083	2.11	.450	11.43	.668	16.97
.004	.10	.040	1.02	.090	2.29	.460	11.68	.678	17.22
.005	.13	.046	1.17	.094	2.39	.524	13.31	.894	22.71
.006	.15	.052	1.32	.157	3.99	.544	13.82	.906	23.01
.009	.23	.062	1.57	.163	4.14	.574	14.58	1.276	32.41
.010	.25	.067	1.70	.169	4.29	.578	14.68	1.291	32.79
.015	.38	.073	1.85	.203	5.16	.594	15.09	1.406	35.71
.020	.51	.074	1.88	.230	5.84	.602	15.29	1.471	37.36

FIGURE 10A. Connector, receptacle, electrical, jam nut mount (series 1) (continued).

## MIL-C-81511F(AS)

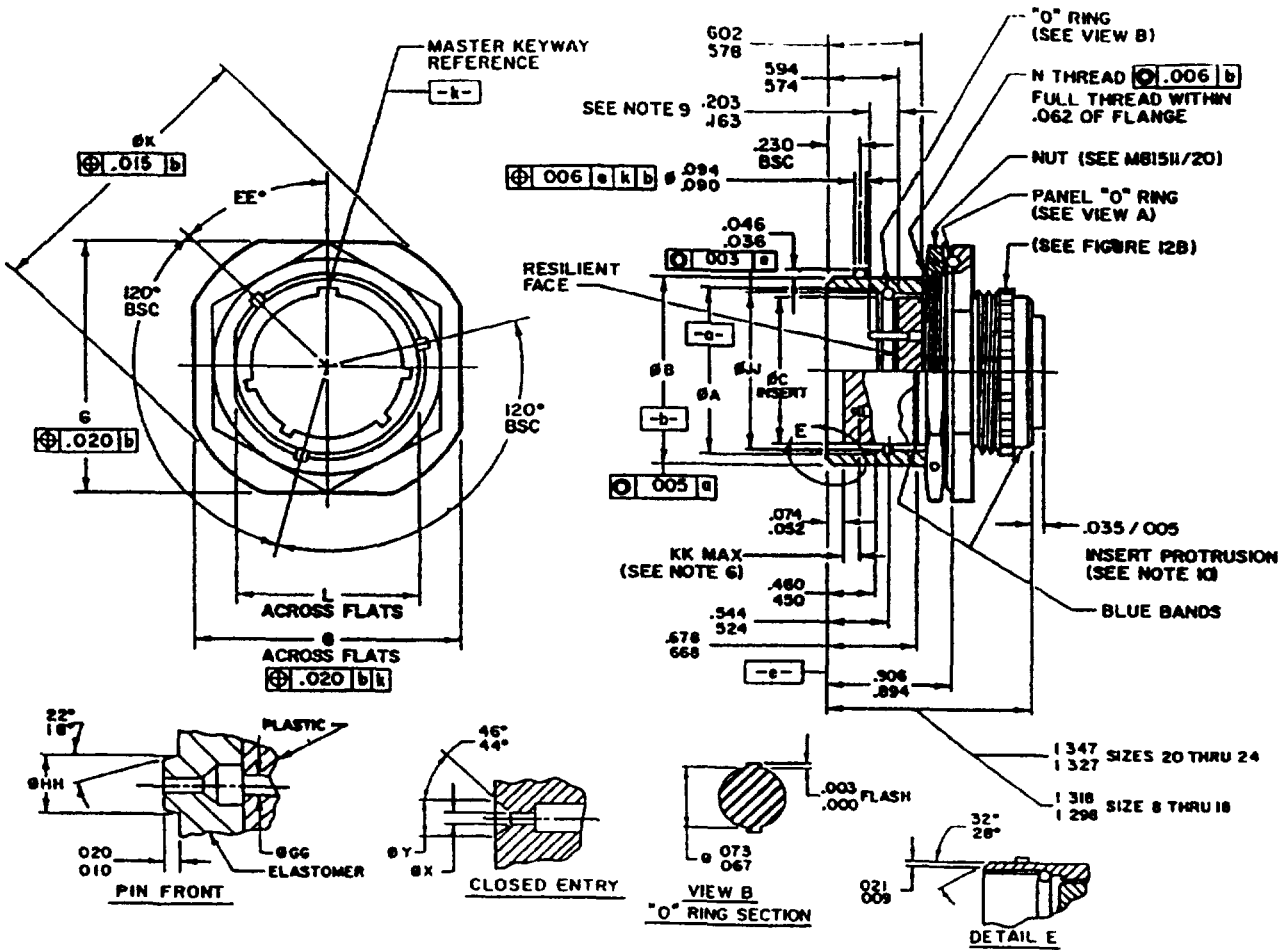
Shell size	Ø A	Ø B	Ø C	G across flats	Ø K	L across flat	H thread	Ø JJ	M	Ø CC	Panel "O" ring	EE*USC						MM
												1	2	3	4	5	6	
8	.4095	.553	.290	.989	1.072	.598	5/8-20UN-2A	.3895	1.291	.301	MS9068-018	60	46	43	60	89	43	1.471 (37.36) 1.406 (35.71)
	(10.40)	(14.05)	(7.37)	(25.12)	(27.23)	(15.19)	(9.89)	(32.79)	(7.65)									
	.4045	.547	.280	.969	1.052	.590	(9.77)	(32.41)	(7.45)									
10	.5345	.678	.415	1.114	1.197	.723	3/4-20UNEF-2A	.5145	1.291	.426	MS9068-020	53	87	51	77	87	87	1.471 (37.36) 1.406 (35.71)
	(13.58)	(17.22)	(10.54)	(28.30)	(30.40)	(18.36)	(13.07)	(32.79)	(10.82)									
	.5295	.672	.405	1.094	1.177	.715	(12.94)	(32.41)	(10.62)									
14	.7845	.928	.665	1.401	1.510	.973	1-20UNEF-2A	.7645	1.291	.676	MS9068-024	53	87	51	77	87	87	1.471 (37.36) 1.406 (35.71)
	(19.93)	(23.57)	(16.89)	(35.59)	(38.35)	(24.71)	(19.42)	(19.42)	(17.17)									
	.7795	.922	.655	1.381	1.490	.965	(19.29)	(32.41)	(16.97)									
16	.9105	1.054	.791	1.526	1.635	1.098	1-1/8-20UN-2A	.8905	1.291	.802	MS9068-026	98	98	98	98	98	98	1.471 (37.36) 1.406 (35.71)
	(23.13)	(26.77)	(20.09)	(38.76)	(41.53)	(27.89)	(22.62)	(32.79)	(20.37)									
	.9055	1.048	.781	1.506	1.615	1.090	(22.49)	(32.41)	(20.17)									
18	1.0345	1.178	.916	1.651	1.745	1.222	1-1/4-20UN-2A	1.0145	1.291	.927	MS9068-028	98	98	98	98	98	98	1.471 (37.36) 1.406 (35.71)
	(26.28)	(29.92)	(23.27)	(41.94)	(44.32)	(31.04)	(25.77)	(32.79)	(23.55)									
	1.0295	1.172	.906	1.631	1.725	1.214	(25.64)	(32.41)	(23.35)									
20	1.1595	1.303	1.041	1.776	1.870	1.347	1-3/8-20UN-2A	1.1395	1.371	1.052	MS9068-029	98	98	98	98	98	98	1.551 (39.40) 1.486 (37.74)
	(29.45)	(33.10)	(26.44)	(45.11)	(47.50)	(28.94)	(28.94)	(34.82)	(26.72)									
	1.1545	1.297	1.031	1.756	1.850	1.339	(28.82)	(34.44)	(26.52)									
22	1.2845	1.428	1.166	1.901	1.995	1.472	1-1/2-20UN-2A	1.2645	1.371	1.177	MS9068-030	98	98	98	98	98	98	1.551 (39.40) 1.486 (37.74)
	(32.63)	(36.27)	(29.62)	(48.29)	(50.67)	(37.39)	(32.12)	(34.82)	(29.90)									
	1.2795	1.422	1.156	1.881	1.975	1.464	(31.99)	(34.44)	(29.70)									
24	1.4095	1.553	1.291	2.026	2.120	1.597	1-5/8-20UN-2A	1.3895	1.371	1.302	MS9068-031	98	98	98	98	98	98	1.551 (39.40) 1.486 (37.74)
	(35.80)	(39.45)	(32.79)	(51.46)	(53.85)	(40.56)	(35.29)	(34.82)	(33.07)									
	1.4045	1.547	1.281	2.006	2.100	1.589	(35.17)	(34.44)	(32.90)									

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. Mating keyway positions and dimensions are shown in figure 8.
6. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
8. All dimensions are for connector with contact retention system in locked position.
9. Slotted nut shall conform to MIL-C-81511/20.
10. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12A.
11. Dimension includes contact slack.

FIGURE 10A. Connector, receptacle, electrical, jam nut mount (series I) (continued).

MIL-C-81511F(AS)



Contact size	Ø X	Ø Y	Ø GG	Ø HH	KK (max)
23 - 22	.035 (.89)	.075 (1.91)	.0280 (.71)	.068 (1.73)	.083 (2.11)
	.032 (.81)	.065 (1.65)	.0300 (.76)	.062 (1.57)	
20 - 20	.053 (1.35)	.085 (2.16)	.0415 (1.05)	.083 (2.11)	.090 (2.29)
	.050 (1.27)	.080 (2.03)	.0445 (1.13)	.077 (1.96)	
16 - 16	.077 (1.96)	.108 (2.74)	.0950 (2.41)	.106 (2.69)	.105 (2.67)
	.074 (1.88)	.103 (2.62)	.0990 (2.52)	.100 (2.54)	
12 - 12	.130 (3.30)	.170 (4.32)	.1540 (3.91)	.169 (4.29)	.105 (2.67)
	.126 (3.20)	.166 (4.22)	.1580 (4.01)	.163 (4.14)	

FIGURE 10B. Connector, receptacle, electrical, jam nut mount (series 3).

## MIL-C-81511F(AS)

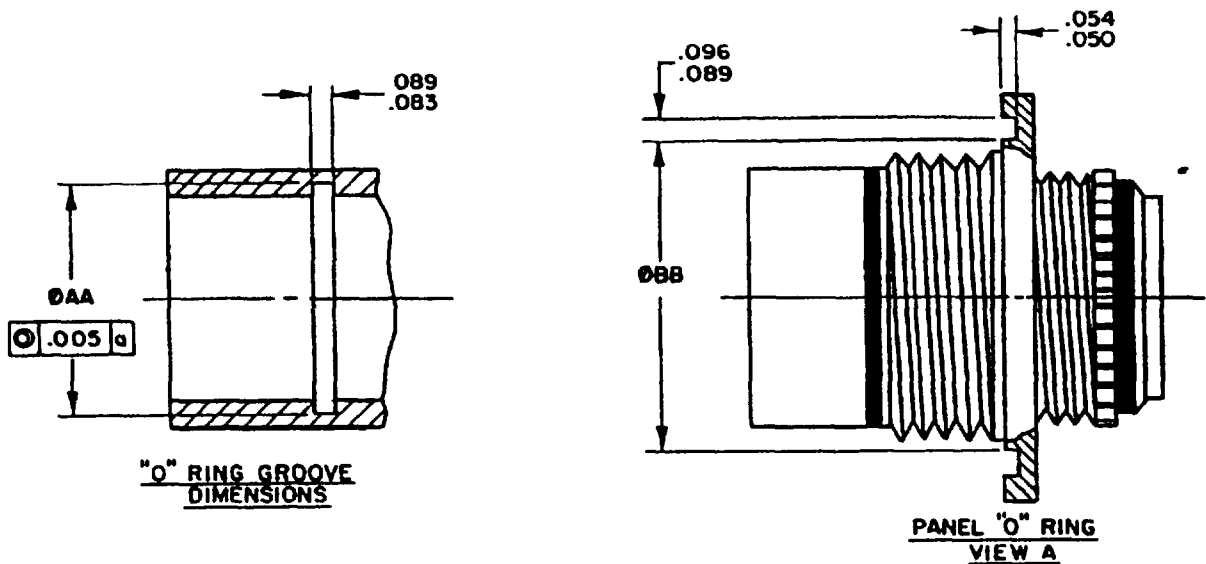
Shell size	Ø A	Ø B	Ø C	G across flats	Ø K	L across flat	N thread	Ø JJ	Panel "U" ring	LL <sup>®</sup> BSC					
										Position					
										1	2	3	4	5	6
8	.4095	.553	.290	.989	1.072	.598	5/8-20UN-2A	.3895	MS9068-018	60	46	43	60	89	43
	(10.40)	(14.05)	(7.37)	(25.12)	(27.23)	(15.19)									
	.4045	.547	.280	.969	1.052	.590		.3845							
10	.5345	.678	.415	1.114	1.197	.723	3/4-20UNEF-2A	.5145	MS9068-020	53	37	51	77	87	87
	(13.58)	(17.22)	(10.54)	(28.30)	(30.40)	(18.36)									
	.5295	.672	.406	1.094	1.177	.715		.5095							
14	.7845	.928	.665	1.401	1.510	.973	1-20UNEF-2A	.7645	MS9068-024	53	87	51	77	87	87
	(19.93)	(23.57)	(16.89)	(35.59)	(38.35)	(24.71)									
	.7795	.922	.655	1.381	1.490	.965		.7595							
16	.9105	1.054	.791	1.526	1.635	1.098	1-1/8-20UN-2A	.8905	MS9068-026	98	98	98	98	98	98
	(23.13)	(26.77)	(20.09)	(38.76)	(41.53)	(27.89)									
	.9055	1.048	.781	1.506	1.615	1.090		.8855							
18	1.0345	1.178	.916	1.651	1.745	1.222	1-1/4-20UN-2A	1.0145	MS9068-028	98	98	98	98	98	98
	(26.28)	(29.92)	(23.27)	(41.94)	(44.32)	(31.04)									
	1.0295	1.172	.906	1.631	1.725	1.214		1.0095							
20	1.1595	1.303	1.041	1.776	1.870	1.347	1-3/8-20UN-2A	1.1395	MS9068-029	98	98	98	98	98	98
	(29.45)	(33.10)	(26.44)	(45.11)	(47.50)	(34.21)									
	1.1545	1.297	1.031	1.756	1.850	1.339		1.1345							
22	1.2845	1.428	1.166	1.901	1.995	1.472	1-1/2-20UN-2A	1.2645	MS9068-030	98	98	98	98	98	98
	(32.63)	(36.27)	(29.62)	(48.29)	(50.67)	(37.39)									
	1.2795	1.422	1.156	1.881	1.975	1.464		1.2595							
24	1.4095	1.553	1.291	2.026	2.120	1.597	1-5/8-20UN-2A	1.3895	MS9068-031	98	98	98	98	98	98
	(35.80)	(39.45)	(32.79)	(51.46)	(53.85)	(40.56)									
	1.4045	1.547	1.281	2.006	2.100	1.589		1.3845							

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. Mating keyway positions and dimensions are shown in figure 8.
6. Distance from face of insert to the point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12B.
8. Dimension includes contact slack.
9. Arrangements containing size 12 contacts, insert protrusion. .020/.070

FIGURE 10B. Connector, receptacle, electrical, jam nut mount (series 3) (continued).

MIL-C-81511F(AS)



Size	$\varnothing AA$
8	.493 (12.52)
	.488 (12.40)
10	.618 (15.70)
	.613 (15.57)
14	.868 (22.05)
	.863 (21.92)
16	.994 (25.25)
	.989 (25.12)
18	1.118 (28.40)
	1.113 (28.27)
20	1.243 (31.57)
	1.238 (31.45)
22	1.368 (34.75)
	1.363 (34.62)
24	1.493 (37.92)
	1.488 (37.80)

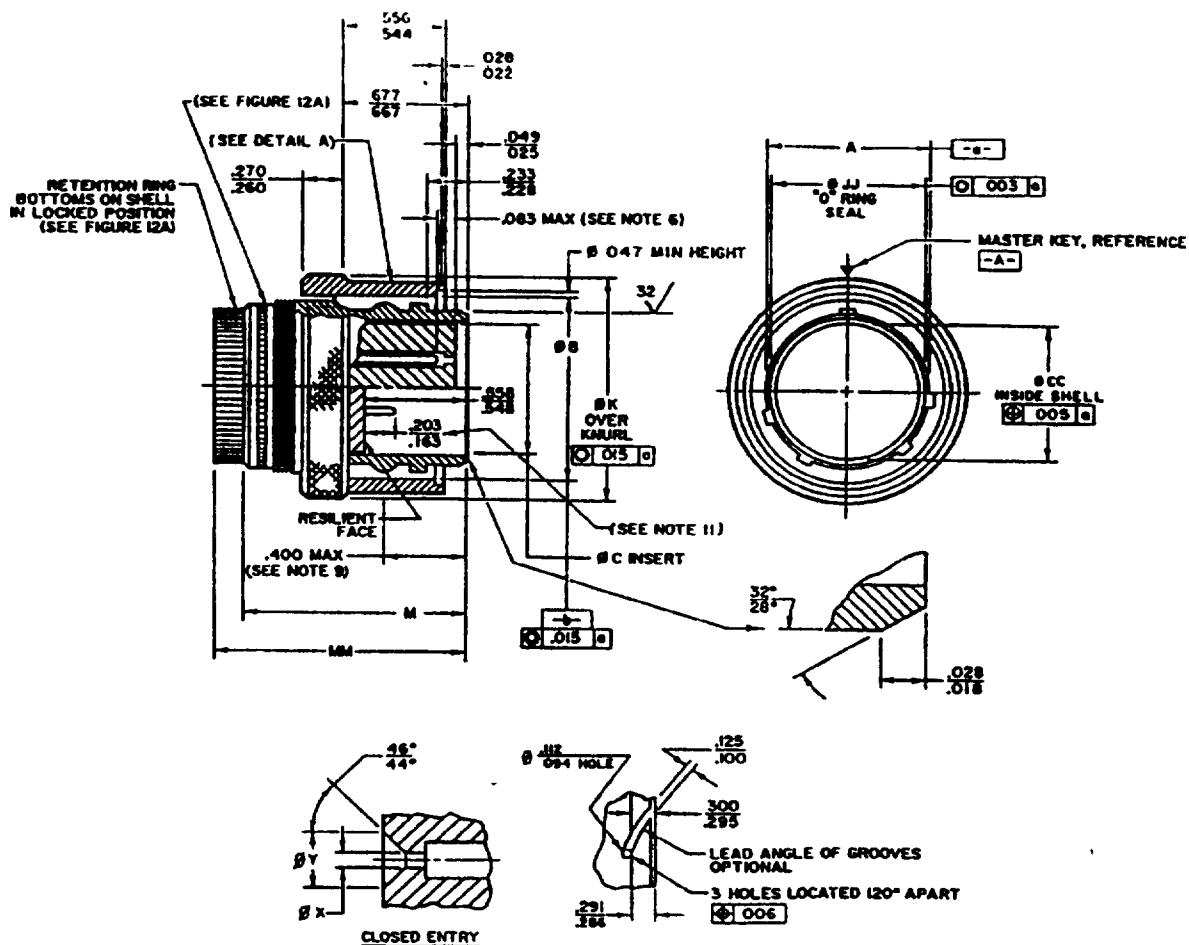
Size	$\varnothing BB$
8	.724 (18.39)
	.713 (18.11)
10	.849 (21.56)
	.838 (21.29)
14	1.099 (27.91)
	1.088 (27.64)
16	1.221 (31.01)
	1.210 (30.73)
18	1.356 (34.44)
	1.345 (34.16)
20	1.481 (37.62)
	1.470 (37.34)
22	1.606 (40.79)
	1.595 (40.51)
24	1.731 (43.97)
	1.720 (43.69)

INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
.003	.08	.035	.89	.083	2.11	.450	11.43	.668	16.97
.004	.10	.040	1.02	.090	2.29	.460	11.68	.678	17.22
.005	.13	.046	1.17	.094	2.39	.524	13.31	.894	22.71
.006	.15	.052	1.32	.157	3.99	.544	13.82	.906	23.01
.009	.23	.062	1.57	.163	4.14	.574	14.58	1.298	32.97
.010	.25	.067	1.70	.169	4.29	.578	14.68	1.318	33.48
.015	.38	.073	1.85	.203	5.16	.594	15.09	1.327	33.71
.020	.51	.074	1.88	.230	5.84	.602	15.29	1.347	34.21
.021	.53								

FIGURE 10B. Connector, receptacle, electrical, jam nut mount (series 3) (continued).



MIL-C-81511F(AS)



Contact size	Ø X	Ø Y
23 - 22	.035 (.89)	.075 (1.91)
	.032 (.81)	.065 (1.65)
20 - 20	.053 (1.35)	.085 (2.16)
	.050 (1.27)	.080 (2.03)
16 - 16	.077 (1.96)	.108 (2.74)
	.074 (1.88)	.103 (2.62)
12 - 12	.130 (3.30)	.170 (4.32)
	.126 (3.20)	.166 (4.22)

INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
.005	.13	.047	1.19	.163	4.14	.286	7.26	.548	13.92
.006	.15	.049	1.24	.169	4.29	.290	7.37	.556	14.12
.008	.20	.083	2.11	.203	5.16	.291	7.39	.568	14.43
.015	.38	.094	2.39	.228	5.79	.295	7.49	.667	16.94
.018	.46	.100	2.54	.233	5.92	.300	7.62	.677	17.20
.022	.56	.112	2.84	.260	6.60	.400	10.16	1.250	31.75
.025	.64	.125	3.18	.270	6.88	.544	13.82	1.265	32.13
.028	.71	.157	3.99	.275	6.99				

FIGURE 11A. Connector, plug, electrical (series 1).

## MIL-C-81511F(AS)

Shell size	Ø A	Ø B	Ø C	Ø K	M	Ø CC	Ø JJ	MM
8	.4015 (10.20)	.566 (14.38)	.290 (7.37)	.850 (21.59)	1.265 (32.13)	.301 (7.65)	.3815 (9.69)	1.445 (36.70)
	.3955 (10.05)	.558 (14.17)	.280 (7.11)	.830 (21.08)	1.250 (31.75)	.293 (7.45)	.373 (9.47)	1.380 (35.05)
10	.5265 (13.37)	.691 (17.55)	.415 (10.54)	.975 (24.77)	1.265 (32.13)	.426 (10.82)	.5065 (12.87)	1.445 (36.70)
	.5205 (13.22)	.683 (17.35)	.405 (10.29)	.955 (24.26)	1.250 (31.75)	.418 (10.62)	.498 (12.65)	1.380 (35.05)
14	.7765 (19.72)	.941 (23.90)	.665 (16.89)	1.225 (31.12)	1.265 (32.13)	.676 (17.17)	.7565 (19.22)	1.445 (36.70)
	.7705 (19.57)	.933 (23.70)	.655 (16.64)	1.205 (30.61)	1.250 (31.75)	.668 (16.97)	.746 (18.95)	1.380 (35.05)
16	.9025 (22.92)	1.068 (27.13)	.791 (20.09)	1.350 (34.29)	1.265 (32.13)	.802 (20.37)	.8825 (22.42)	1.445 (36.70)
	.8965 (22.77)	1.060 (26.92)	.781 (19.84)	1.330 (33.78)	1.250 (31.75)	.794 (20.17)	.872 (22.15)	1.380 (35.05)
18	1.0265 (26.07)	1.191 (30.25)	.916 (23.27)	1.475 (37.47)	1.265 (32.13)	.927 (23.55)	1.0065 (25.57)	1.445 (36.70)
	1.0205 (25.92)	1.183 (30.05)	.906 (23.01)	1.455 (36.96)	1.250 (31.75)	.919 (23.35)	.996 (25.30)	1.380 (35.05)
20	1.1515 (29.25)	1.316 (33.43)	1.041 (26.44)	1.624 (41.25)	1.345 (34.16)	1.052 (26.72)	1.1315 (28.74)	1.525 (38.74)
	1.1455 (29.10)	1.308 (33.22)	1.031 (26.19)	1.604 (40.74)	1.330 (33.78)	1.044 (26.52)	1.121 (28.47)	1.460 (37.08)
22	1.2765 (32.42)	1.441 (36.60)	1.166 (29.62)	1.749 (44.42)	1.345 (34.16)	1.177 (29.90)	1.2565 (31.92)	1.525 (38.74)
	1.2705 (32.27)	1.433 (36.40)	1.156 (29.36)	1.729 (43.92)	1.330 (33.78)	1.169 (29.70)	1.246 (31.65)	1.460 (37.08)
24	1.4015 (35.60)	1.566 (39.78)	1.291 (32.79)	1.874 (47.60)	1.345 (34.16)	1.302 (33.07)	1.3815 (35.09)	1.525 (38.74)
	1.3955 (35.45)	1.558 (39.57)	1.281 (32.54)	1.854 (47.09)	1.330 (33.78)	1.295 (32.90)	1.371 (34.82)	1.460 (37.08)

FIGURE 11A. Connector, plug, electrical (series 1) (continued).

## MIL-C-81511F(AS)

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. Mating key positions and dimensions are shown in figure 8.
6. Distance from front of insert and to point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
8. All dimensions are for connector with contact retention system in locked position.
9. Distance from front of shell to the point at which a gage ring, having the same basic diameter as the receptacle shell engages the spring member.
10. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12A.
11. Dimension includes contact slack.

FIGURE 11A. Connector, plug, electrical (series 1) (continued).

MIL-C-81511F(AS)

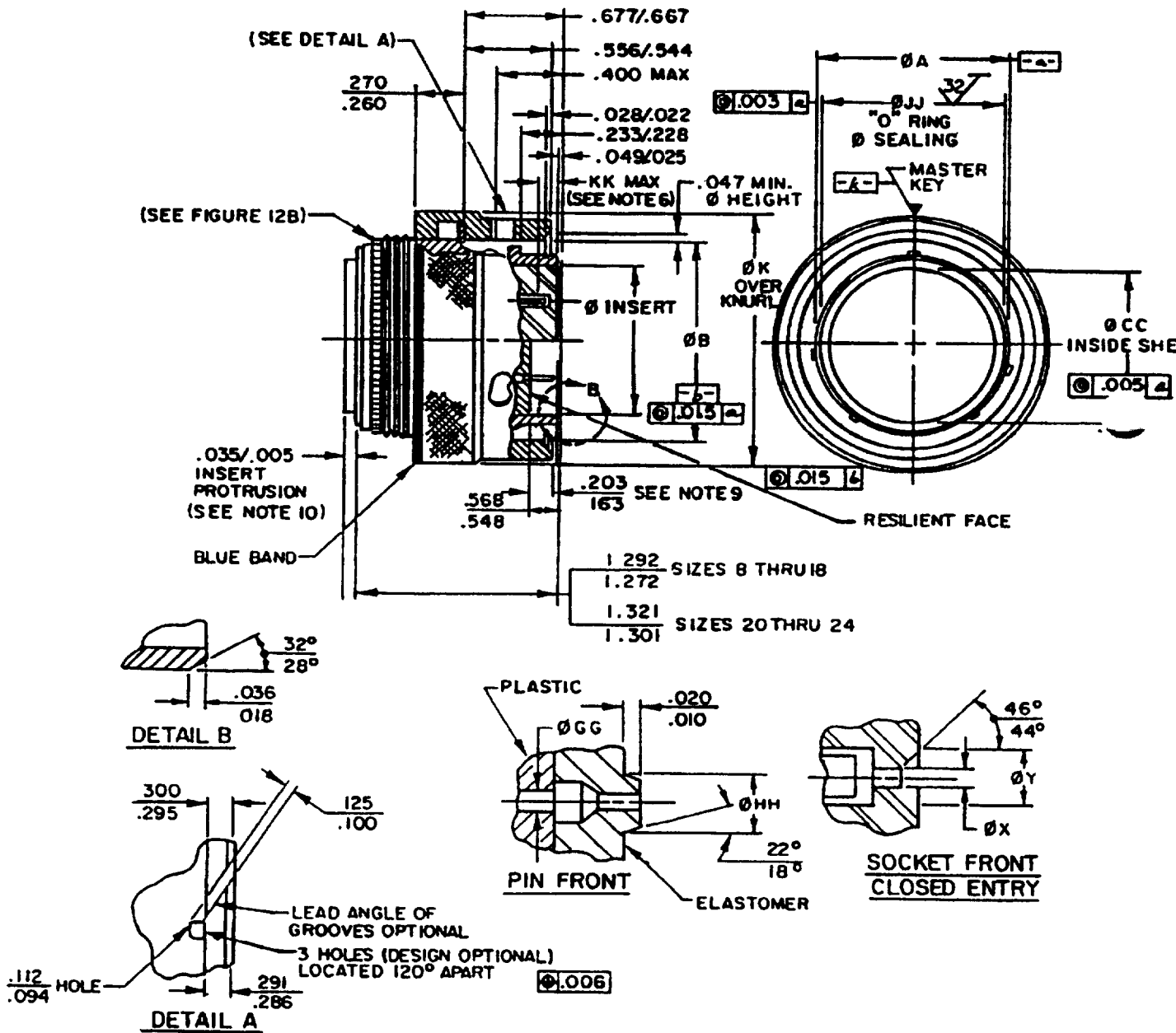


FIGURE 11B. Connector, plug, electrical (series 3).

## MIL-C-81511F(AS)

Shell size	Ø A	Ø B	Ø C	Ø K	Ø CC	Ø JJ
8	.4015	.566	.290	.850	.301	.3815
	(10.20)	(14.38)	(7.37)	(21.59)	(7.65)	(9.69)
	.3955	.558	.280	.830	.293	.373
	(10.05)	(14.17)	(7.11)	(21.08)	(7.45)	(9.47)
10	.5265	.691	.415	.975	.426	.5065
	(13.37)	(17.55)	(10.54)	(24.77)	(10.82)	(12.87)
	.5205	.683	.405	.955	.418	.498
	(13.22)	(17.35)	(10.29)	(24.26)	(10.62)	(12.65)
14	.7765	.941	.665	1.225	.676	.7565
	(19.72)	(23.90)	(16.89)	(31.12)	(17.17)	(19.22)
	.7705	.933	.655	1.205	.668	.746
	(19.57)	(23.70)	(16.64)	(30.61)	(16.97)	(18.95)
16	.9025	1.068	.791	1.350	.802	.8825
	(22.92)	(27.13)	(20.09)	(34.29)	(20.37)	(22.42)
	.8965	1.060	.781	1.330	.794	.872
	(22.77)	(26.92)	(19.84)	(33.78)	(20.17)	(22.15)
18	1.0265	1.191	.916	1.475	.927	1.0065
	(26.07)	(30.25)	(23.27)	(37.47)	(23.55)	(25.57)
	1.0205	1.183	.906	1.455	.919	.996
	(25.92)	(30.05)	(23.01)	(36.96)	(23.35)	(25.30)
20	1.1515	1.316	1.041	1.624	1.052	1.1315
	(29.25)	(33.43)	(26.44)	(41.25)	(26.72)	(28.74)
	1.1455	1.308	1.031	1.604	1.044	1.121
	(29.10)	(33.22)	(26.19)	(40.74)	(26.52)	(28.47)
22	1.2765	1.441	1.166	1.749	1.177	1.2565
	(32.42)	(36.60)	(29.62)	(44.42)	(29.90)	(31.92)
	1.2705	1.433	1.156	1.729	1.169	1.246
	(32.27)	(36.40)	(29.36)	(43.92)	(29.70)	(31.65)
24	1.4015	1.566	1.291	1.874	1.302	1.3815
	(35.60)	(39.78)	(32.79)	(47.60)	(33.07)	(35.09)
	1.3955	1.558	1.281	1.854	1.295	1.371
	(35.45)	(39.57)	(32.54)	(47.09)	(32.90)	(34.82)

## NOTES:

1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
4. Dimensions apply after plating.
5. Mating key positions and dimensions are shown in figure 8.
6. Distance from front of insert and to point at which a gage pin, having the same basic diameter as the mating contact and a square face, engages the socket contact spring.
7. Distance from front of shell to the point at which a gage ring, having the same basic diameter as the receptacle shell engages the spring member.
8. Rear end connector design for attachment of non-rotatable accessory hardware is shown on figure 12B.
9. Dimension includes contact slack.
10. Arrangements containing size 12 contacts, insert protrusion. .020/.070

FIGURE 11B. Connector, plug, electrical (series 3) (continued).

## MIL-C-81511F(AS)

Contact size	Ø X	Ø Y	Ø GG	Ø HH	KK (max)
23 - 22	.035 (.89)	.075 (1.91)	.0280 (.71)	.068 (1.73)	.083 (2.11)
	.032 (.81)	.065 (1.85)	.0300 (.76)	.062 (1.57)	
20 - 20	.053 (1.35)	.085 (2.16)	.0415 (1.05)	.083 (2.11)	.090 (2.29)
	.050 (1.27)	.080 (2.03)	.0445 (1.13)	.077 (1.96)	
16 - 16	.077 (1.96)	.108 (2.74)	.0950 (2.41)	.106 (2.69)	.105 (2.67)
	.074 (1.88)	.103 (2.62)	.0990 (2.52)	.100 (2.54)	
12 - 12	.130 (3.30)	.170 (4.32)	.1540 (3.91)	.169 (4.29)	.105 (2.67)
	.126 (3.20)	.166 (4.22)	.1580 (4.01)	.163 (4.14)	

INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm	INCHES	mm
.005	.13	.047	1.19	.163	4.14	.286	7.26	.556	14.12
.006	.15	.049	1.24	.169	4.29	.290	7.37	.568	14.43
.008	.20	.083	2.11	.203	5.16	.291	7.39	.667	16.94
.015	.38	.094	2.39	.228	5.79	.295	7.49	.677	17.20
.018	.46	.100	2.54	.233	5.92	.300	7.62	1.272	32.31
.022	.56	.112	2.84	.260	6.60	.400	10.16	1.292	32.82
.025	.64	.125	3.18	.270	6.86	.544	13.82	1.301	33.05
.028	.71	.157	3.99	.275	6.99	.548	13.92	1.321	33.55
.035	.89								

FIGURE 11B. Connector, plug, electrical (series 3) (continued).

MIL-C-81511F(AS)

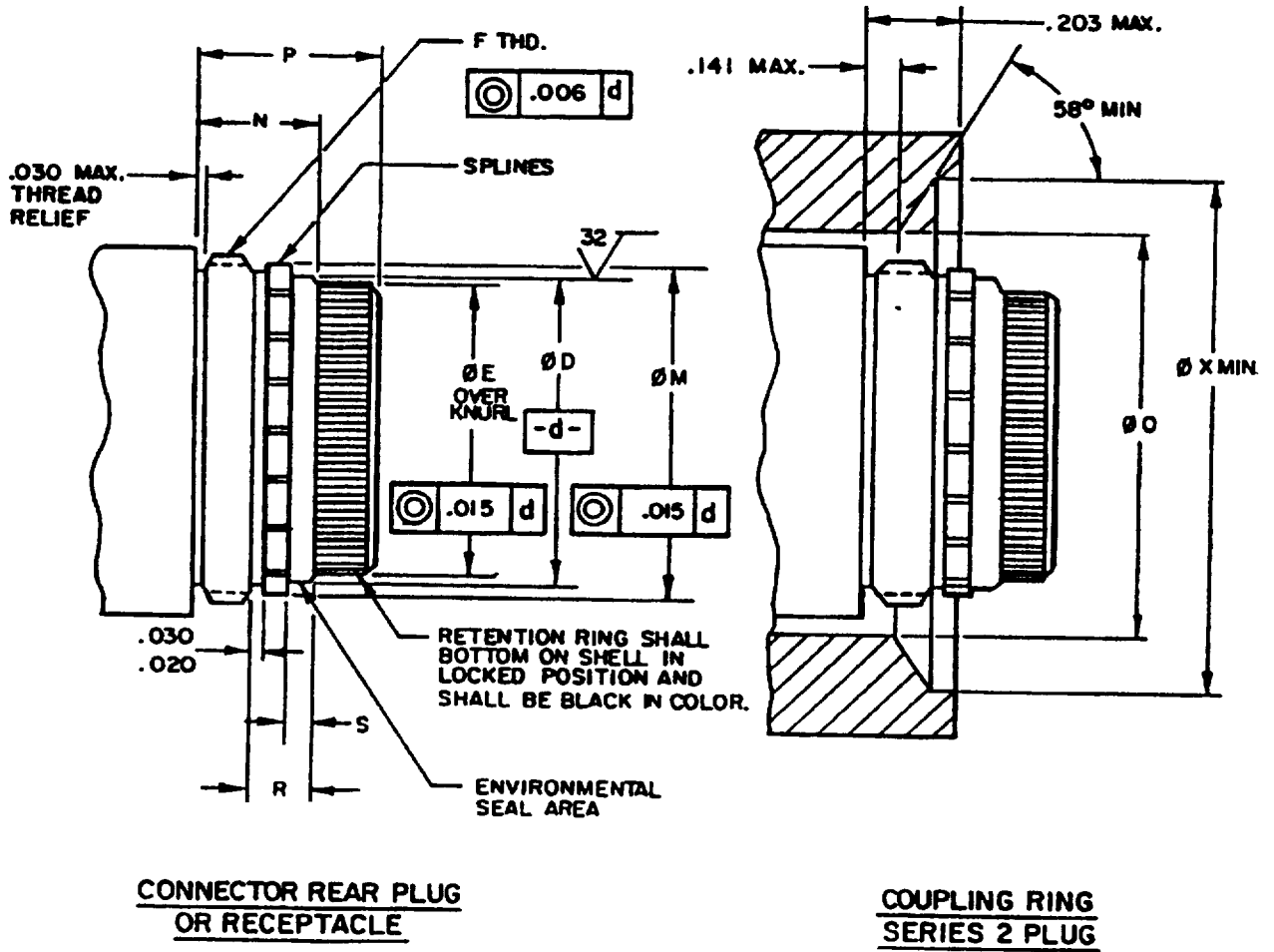
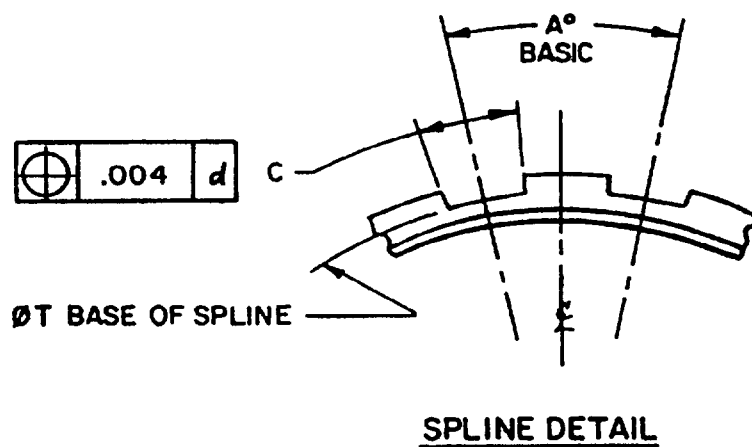


FIGURE 12A. Series 1 & 2 connector back end configuration.

## MIL-C-81511F(AS)



INCHES	mm
.020	.51
.030	.76
.141	3.58
.203	5.16

## NOTES:

1. Dimensions are in inches.
2. Dimensions apply after plating, and with contact retention system in locked position.
3. Metric equivalents (to the nearest .01 mm) are given for general information only.

FIGURE 12A. Series 1 & 2 connector back end configuration (continued).



## MIL-C-81511F(AS)

Shell Size	A (Degrees)	C	Ø D	Ø E	F Thread	Ø M	N
8	20	.051 (1.30)	.430 (10.92)	.422 (10.72)	1/2-28UNEF-2A	.463 (11.76)	.290 (7.37)
		.046 (1.17)	.424 (10.77)	.407 (10.34)		.457 (11.61)	.280 (7.11)
10	15	.049 (1.24)	.555 (14.10)	.548 (13.92)	5/8-28UN-2A	.588 (14.94)	.290 (7.37)
		.044 (1.12)	.549 (13.94)	.533 (13.54)		.582 (14.78)	.280 (7.11)
14	12	.054 (1.37)	.805 (20.45)	.798 (20.27)	7/8-28UN-2A	.838 (21.29)	.290 (7.37)
		.049 (1.24)	.799 (20.29)	.783 (19.89)		.832 (21.13)	.280 (7.11)
16	10	.053 (1.35)	.930 (23.62)	.924 (23.47)	1-28UN-2A	.963 (24.46)	.290 (7.37)
		.048 (1.22)	.924 (23.47)	.909 (23.09)		.957 (24.31)	.280 (7.11)
18	9	.053 (1.35)	1.055 (26.80)	1.048 (26.62)	1-1/8-28UN-2A	1.088 (27.64)	.290 (7.37)
		.048 (1.22)	1.049 (26.64)	1.033 (26.24)		1.082 (27.48)	.280 (7.11)
20	9	.059 (1.50)	1.180 (29.97)	1.173 (29.79)	1-1/4-28UN-2A	1.213 (30.81)	.364 (9.25)
		.054 (1.37)	1.174 (29.82)	1.158 (29.41)		1.207 (30.66)	.349 (8.86)
22	9	.062 (1.57)	1.305 (33.15)	1.298 (32.97)	1-3/8-28UN-2A	1.338 (33.99)	.364 (9.25)
		.057 (1.45)	1.299 (32.99)	1.283 (32.59)		1.332 (33.83)	.349 (8.86)
24	9	.069 (1.75)	1.430 (36.32)	1.423 (36.14)	1-1/2-28UN-2A	1.463 (37.16)	.364 (9.25)
		.064 (1.63)	1.424 (36.17)	1.408 (35.76)		1.457 (37.01)	.349 (8.86)

Shell Size	P Max.	R	S	Ø T	Ø O	Ø X Min.
8	.454 (11.53)	.169 (4.29)	.076 (1.93)	.439 (11.15)	.579 (14.71)	.645 (16.38)
		.157 (3.99)	.063 (1.60)	.433 (11.00)	.559 (14.20)	
10	.454 (11.53)	.169 (4.29)	.076 (1.93)	.564 (14.33)	.704 (17.88)	.770 (19.56)
		.157 (3.99)	.063 (1.60)	.558 (14.17)	.684 (17.37)	
14	.454 (11.53)	.169 (4.29)	.076 (1.93)	.814 (20.68)	.954 (24.23)	1.020 (25.91)
		.157 (3.99)	.063 (1.60)	.808 (20.52)	.934 (23.72)	
16	.454 (11.53)	.169 (4.29)	.076 (1.93)	.939 (23.85)	1.082 (27.48)	1.145 (29.08)
		.157 (3.99)	.063 (1.60)	.933 (23.70)	1.060 (26.92)	
18	.454 (11.53)	.169 (4.29)	.076 (1.93)	1.064 (27.03)	1.204 (30.58)	1.279 (32.49)
		.157 (3.99)	.063 (1.60)	1.058 (26.87)	1.184 (30.07)	
20	.530 (13.46)	.217 (5.51)	.092 (2.34)	1.189 (30.20)	1.315 (33.40)	1.305 (33.15)
		.205 (5.21)	.079 (2.01)	1.183 (30.05)	1.305 (33.15)	
22	.530 (13.46)	.217 (5.51)	.092 (2.34)	1.314 (33.38)	1.440 (36.58)	1.430 (36.32)
		.205 (5.21)	.079 (2.01)	1.308 (33.22)	1.430 (36.32)	
24	.530 (13.46)	.217 (5.51)	.092 (2.34)	1.439 (36.55)	1.565 (39.75)	1.555 (39.50)
		.205 (5.21)	.079 (2.01)	1.433 (36.40)	1.555 (39.50)	

FIGURE 12A. Series 1 &amp; 2 connector back end configuration (continued).

MIL-C-81511F(AS)

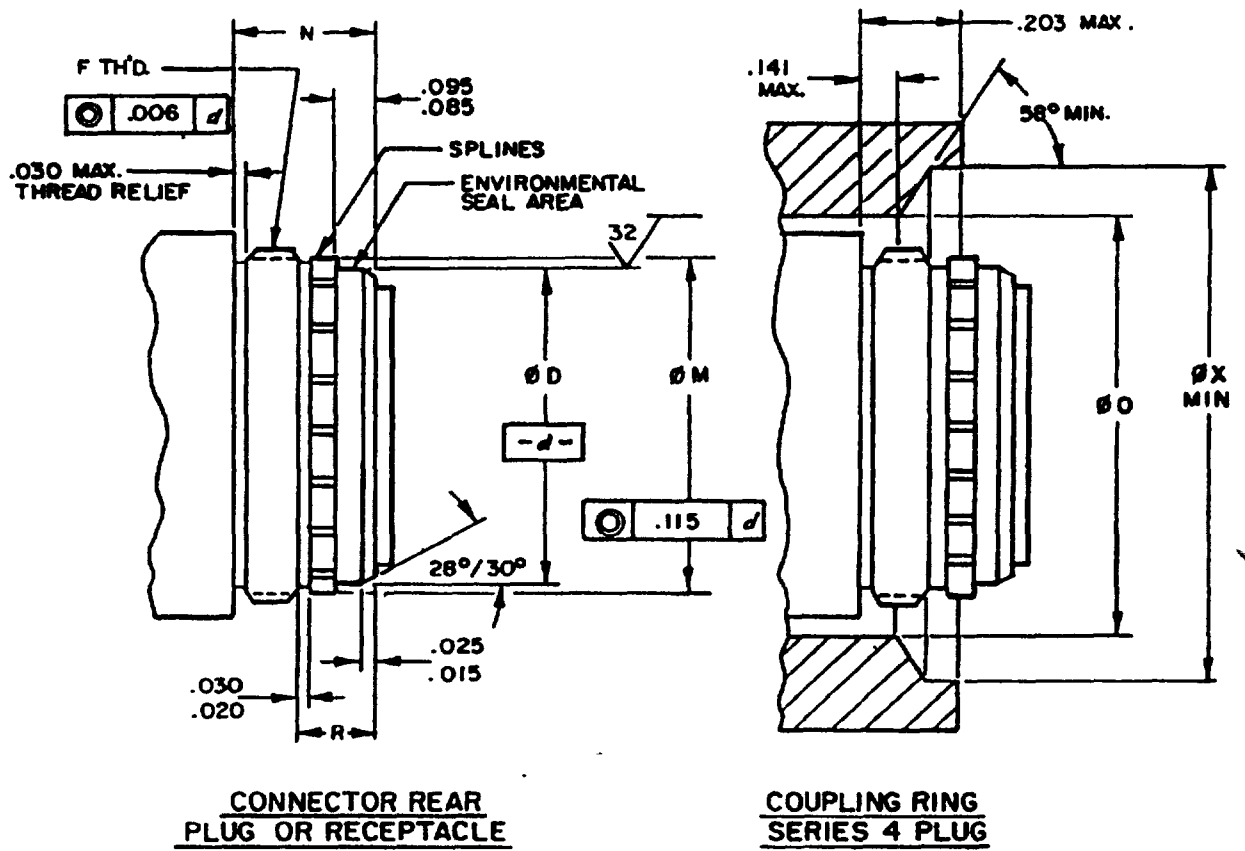


FIGURE 12B. Series 3 & 4 connector back end configuration.

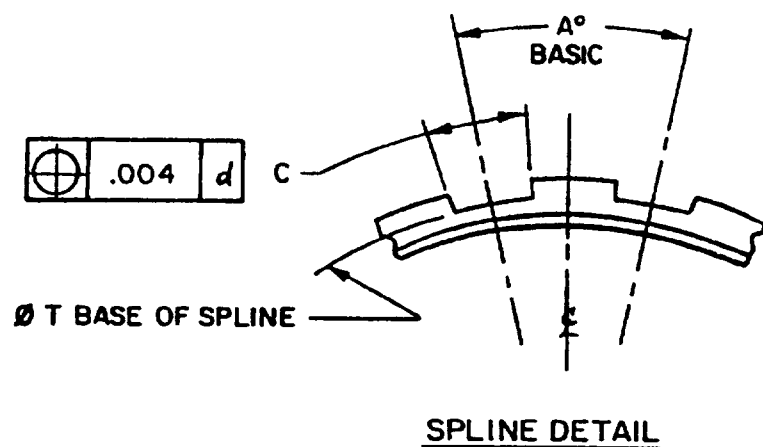
## MIL-C-81511F(AS)

Shell Size	A (Degrees)	C	Ø D	F Thread	Ø M	Ø O
8	20	.051 (1.30)	.430 (10.92)	1/2-28UNEF-2A	.463 (11.76)	.579 (14.71)
		.046 (1.17)	.424 (10.77)		.457 (11.61)	.559 (14.20)
10	15	.049 (1.24)	.555 (14.10)	5/8-28UN-2A	.588 (14.94)	.704 (17.88)
		.044 (1.12)	.549 (13.94)		.582 (14.78)	.684 (17.37)
14	12	.054 (1.37)	.805 (20.45)	7/8-28UN-2A	.838 (21.29)	.954 (24.23)
		.049 (1.24)	.799 (20.29)		.832 (21.13)	.934 (23.72)
16	10	.053 (1.35)	.930 (23.62)	1-28UN-2A	.963 (24.46)	1.082 (27.48)
		.048 (1.22)	.924 (23.47)		.957 (24.31)	1.060 (26.92)
18	9	.053 (1.35)	1.055 (26.80)	1-1/8-28UN-2A	1.088 (27.64)	1.204 (30.58)
		.048 (1.22)	1.049 (26.64)		1.082 (27.48)	1.184 (30.07)
20	9	.059 (1.50)	1.180 (29.97)	1-1/4-28UN-2A	1.213 (30.81)	
		.054 (1.37)	1.174 (29.82)		1.207 (30.66)	
22	9	.062 (1.57)	1.305 (33.15)	1-3/8-28UN-2A	1.338 (33.99)	
		.057 (1.45)	1.299 (32.99)		1.332 (33.83)	
24	9	.069 (1.75)	1.430 (36.32)	1-1/2-28UN-2A	1.463 (37.16)	
		.064 (1.63)	1.424 (36.17)		1.457 (37.01)	

Shell Size	N	Ø T	R	Ø X
8	.320 (8.13)	.439 (11.15)	.190 (4.83)	.645 (16.38)
	.300 (7.62)	.433 (11.00)	.160 (4.06)	
10	.320 (8.13)	.564 (14.33)	.190 (4.83)	.770 (19.56)
	.300 (7.62)	.558 (14.17)	.160 (4.06)	
14	.320 (8.13)	.814 (20.68)	.190 (4.83)	1.020 (25.91)
	.300 (7.62)	.808 (20.52)	.160 (4.06)	
16	.320 (8.13)	.939 (23.85)	.190 (4.83)	1.145 (29.08)
	.300 (7.62)	.933 (23.70)	.160 (4.06)	
18	.320 (8.13)	1.064 (27.03)	.190 (4.83)	1.279 (32.49)
	.300 (7.62)	1.058 (26.87)	.160 (4.06)	
20	.358 (9.09)	1.189 (31.20)	.220 (5.59)	
	.338 (8.59)	1.183 (30.05)	.190 (4.83)	
22	.358 (9.09)	1.314 (33.38)	.220 (5.59)	
	.338 (8.59)	1.308 (33.22)	.190 (4.83)	
24	.358 (9.09)	1.439 (36.55)	.220 (5.59)	
	.338 (8.59)	1.433 (36.40)	.190 (4.83)	

FIGURE 12B. Series 3 &amp; 4 connector back end configuration (continued).

MIL-C-81511F(AS)



SPLINE DETAIL

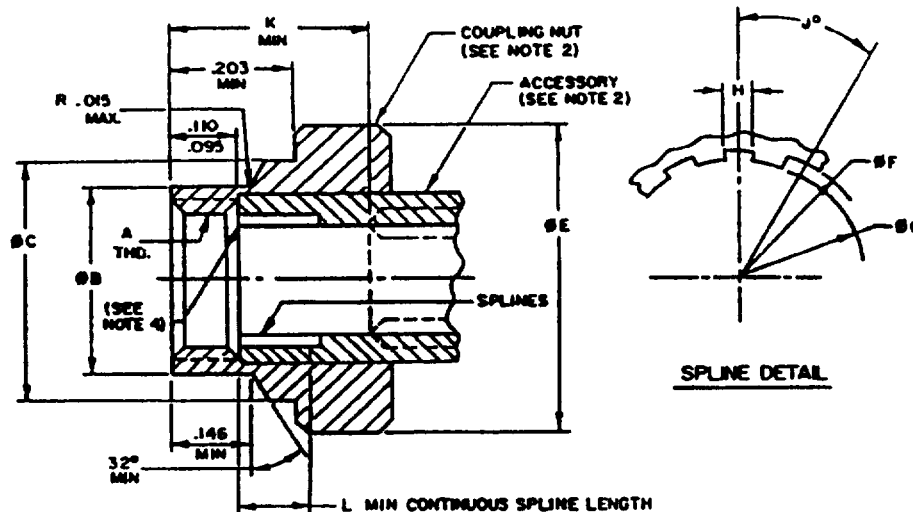
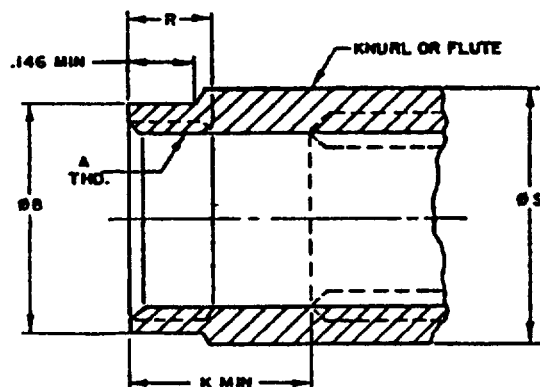
INCHES	mm
.015	.38
.020	.51
.025	.64
.030	.76
.085	2.16
.095	2.41
.141	3.58
.203	5.16

NOTES:

1. Dimensions are in inches.
2. Dimensions apply after plating.
3. Metric equivalents (to the nearest .01 mm) are given for general information only.

FIGURE 12B. Series 3 & 4 connector back end configuration (continued).

## MIL-C-81511F (AS)

DESIGN STANDARD FOR NON-ROTATABLE ACCESSORY HARDWAREDESIGN STANDARD FOR ROTATABLE ACCESSORY HARDWARE

INCHES	mm
.015	.38
.095	2.41
.110	2.79
.146	3.71
.203	5.16

## NOTES:

1. Dimensions in inches.
2. Coupling nut shall be captivated to and free to rotate on accessory.
3. Dimensions apply after plating.
4. Non-rotatable hardware shall bottom on lead thread (F THD.) of connectors (figures 12A and 12B).
5. Metric equivalents (to the nearest .01 mm) are given for general information only.

FIGURE 12C. Design standard for rotatable and non-rotatable connector accessories (for use on series 1, 2, 3 & 4).

## MIL-C-81511F(AS)

Shell Size	A Thread	Mod. Minor Dia.	ØB	ØC	ØE Max	ØF	ØG
8	1/2-28UNEF-2B	.470 (11.94)	.558 (14.17)	.640 (16.26)	.850 (21.59)	.473 (12.01)	.446 (11.34)
		.464 (11.79)	.546 (13.87)	.635 (16.13)		.469 (11.91)	.443 (11.25)
10	5/8-28UN-2B	.595 (15.11)	.683 (17.35)	.765 (19.43)	.975 (24.77)	.598 (15.19)	.571 (14.50)
		.589 (14.96)	.671 (17.04)	.760 (19.30)		.594 (15.09)	.568 (14.43)
14	7/8-28UN-2B	.845 (21.46)	.933 (23.70)	1.015 (25.78)	1.225 (31.12)	.848 (21.54)	.821 (20.85)
		.839 (21.31)	.921 (23.39)	1.010 (25.65)		.844 (21.44)	.818 (20.78)
16	1-28UN-2B	.970 (24.64)	1.059 (26.90)	1.140 (28.96)	1.350 (34.29)	.973 (24.71)	.946 (24.03)
		.964 (24.49)	1.047 (26.59)	1.135 (28.83)		.969 (24.61)	.943 (23.95)
18	1-1/8-28UN-2B	1.095 (27.81)	1.183 (30.05)	1.274 (32.36)	1.475 (37.47)	1.098 (27.89)	1.071 (27.20)
		1.089 (27.66)	1.171 (29.74)	1.269 (32.23)		1.094 (27.79)	1.068 (27.13)
20	1-1/4-28UN-2B	1.220 (30.99)	1.308 (33.22)	1.410 (35.81)	1.624 (41.25)	1.223 (31.06)	1.196 (30.38)
		1.214 (30.84)	1.296 (32.92)	1.405 (35.69)		1.219 (30.96)	1.193 (30.30)
22	1-3/8-28UN-2B	1.345 (34.16)	1.433 (36.40)	1.535 (38.99)	1.749 (44.42)	1.348 (34.24)	1.321 (33.55)
		1.339 (34.01)	1.421 (36.09)	1.530 (38.86)		1.344 (34.14)	1.318 (33.48)
24	1-1/2-28UN-2B	1.470 (37.34)	1.558 (39.57)	1.649 (41.88)	1.874 (47.60)	1.473 (37.41)	1.446 (36.7)
		1.464 (37.19)	1.546 (39.27)	1.644 (41.76)		1.469 (37.31)	1.443 (36.65)

Shell Size	H	J	K Min.	L Min.	R	ØS
8	.050 (1.27)	20°	.500 (12.7)	.078 (1.98)	.300 (7.62)	.640 (16.26)
	.048 (1.22)					.590 (14.99)
10	.048 (1.22)	15°	.500 (12.7)	.078 (1.98)	.300 (7.62)	.765 (19.43)
	.046 (1.17)					.715 (18.16)
14	.053 (1.35)	12°	.500 (12.7)	.078 (1.98)	.300 (7.62)	1.015 (25.78)
	.051 (1.30)					.967 (24.56)
16	.052 (1.32)	10°	.500 (12.7)	.078 (1.98)	.300 (7.62)	1.140 (28.96)
	.050 (1.27)					1.090 (27.69)
18	.052 (1.32)	9°	.500 (12.7)	.078 (1.98)	.300 (7.62)	1.274 (32.36)
	.050 (1.27)					1.220 (30.99)
20	.059 (1.50)	9°	.576 (14.63)	.109 (2.77)	.328 (8.33)	1.410 (35.81)
	.056 (1.42)					1.340 (34.04)
22	.062 (1.57)	9°	.576 (14.63)	.109 (2.77)	.328 (8.33)	1.535 (38.99)
	.059 (1.50)					1.465 (37.21)
24	.069 (1.75)	9°	.576 (14.63)	.109 (2.77)	.328 (8.33)	1.649 (41.88)
	.066 (1.68)					1.590 (40.39)

FIGURE 12C. Design standard for rotatable and non-rotatable connector accessories (for use on series 1, 2, 3 & 4) (continued).

## MIL-C-81511F(AS)

Markings are shown for the pin insert front and socket grommet. The socket face and pin grommet are the opposite. All characters on the insert grommets shall be white in color.

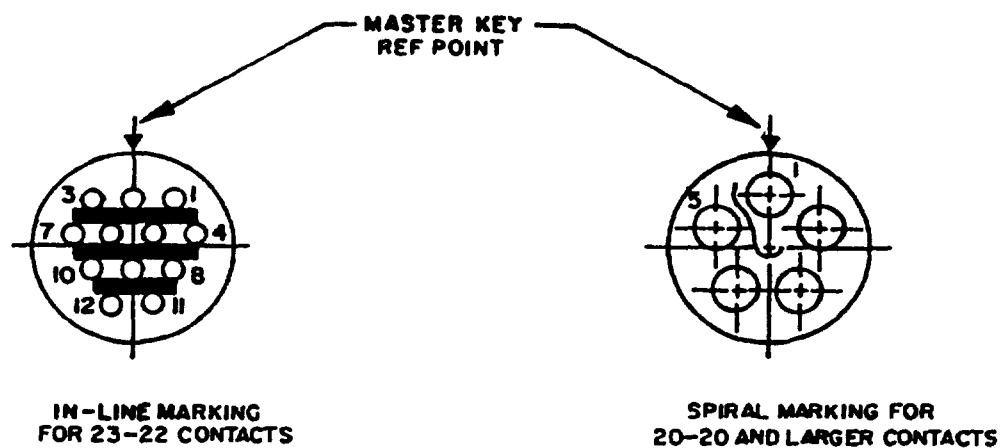
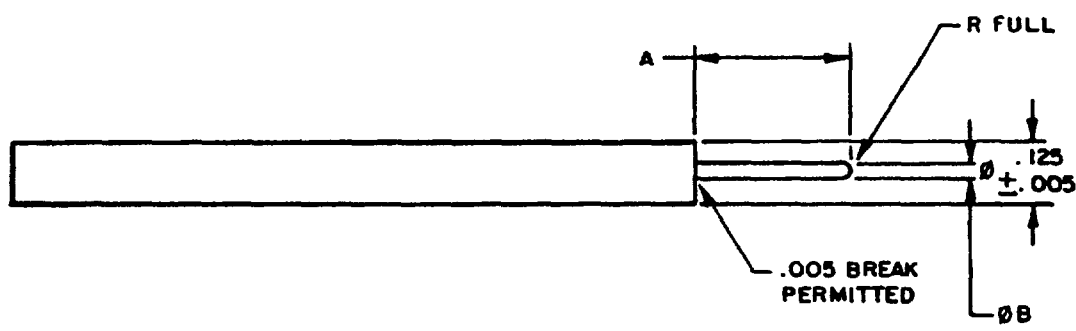
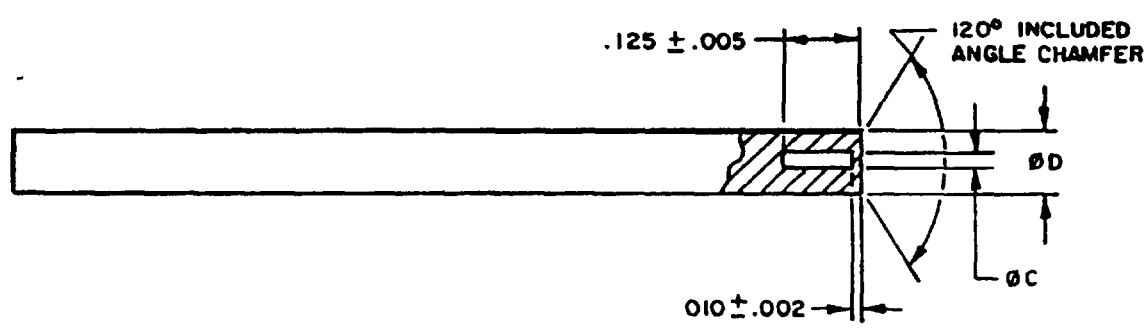


FIGURE 13. Insert arrangement marking (typical).

MIL-C-81511F(AS)



SOCKET CONTACT RETENTION PROBE



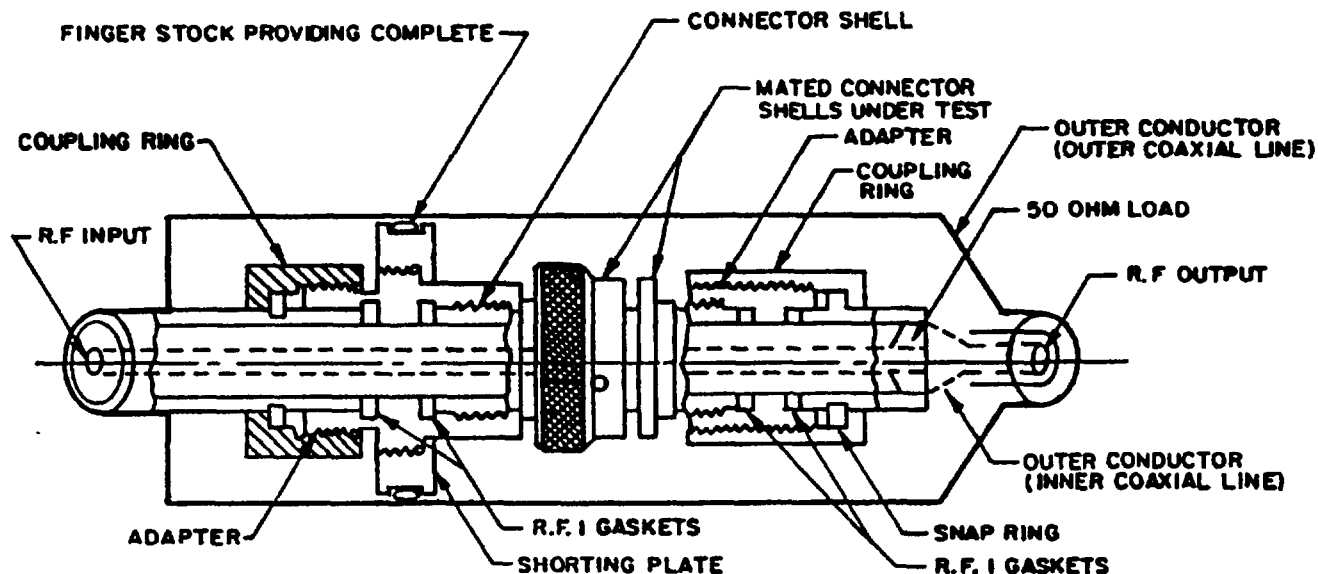
PIN CONTACT RETENTION PROBE

Contact Size	A +.010	Ø B +.001	Ø C +.001	Ø D +.005
23	.300	.026	.029	.125
20	.410	.039	.043	.125
16	.410	.061	.065	.125
12	.410	.093	.097	.156

FIGURE 14. Contact retention probes.



## MIL-C-81511F(AS)



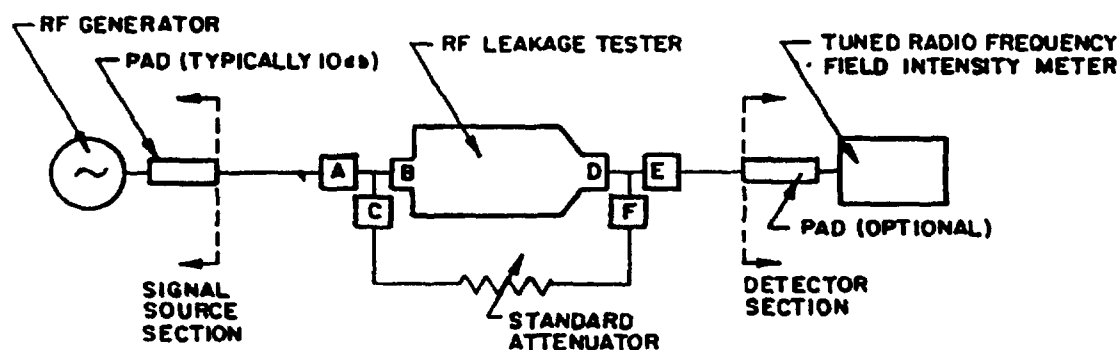
The mated pairs of connector shells shall be connected to the center coaxial line as shown in figure 14 and tested as shown in figure 15. Attachment of the connector shells to the outer conductor of the inner coaxial line shall be accomplished using R.F. gaskets to prevent leakage through the adapters.

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 ( $Z_0 = 50$  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. The outer coaxial line must not support higher order modes, especially the transverse electric II (TEM) mode, at frequencies below 1400 MHz.
- d. The input and output VSWR of the standard attenuator (see figure 15) 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 figure 15) shall be a nominal 50 ohms having a maximum allowable VSWR of 1.5.
- f. Connectors A, B, C, D, E and F (see figure 15) should be of a low leakage type which exhibit R.F. leakage attenuation of  $>100$  db.

FIGURE 15. Tri-axial RF leakage tester.

## MIL-C-81511F(AS)



A standard attenuator capable of providing at least 100 db (accuracy  $\pm 3$  db) of attenuation in one db step 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 16. Test procedure for tri-axial RF leakage tester.

MIL-C-81511F(AS)

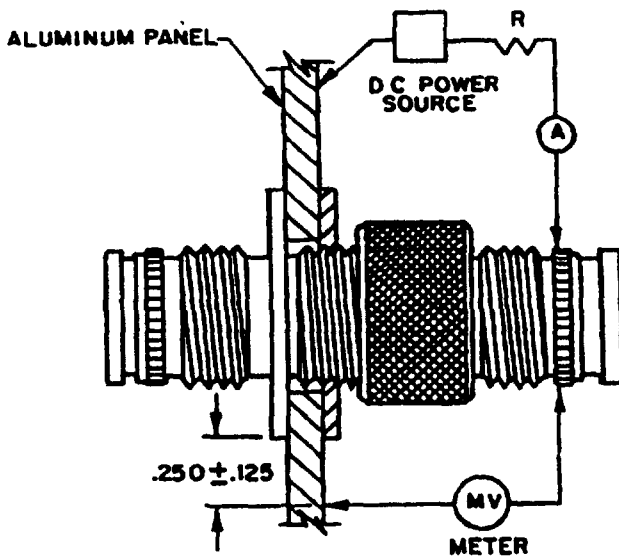


FIGURE 17. Shell to shell continuity test diagram.

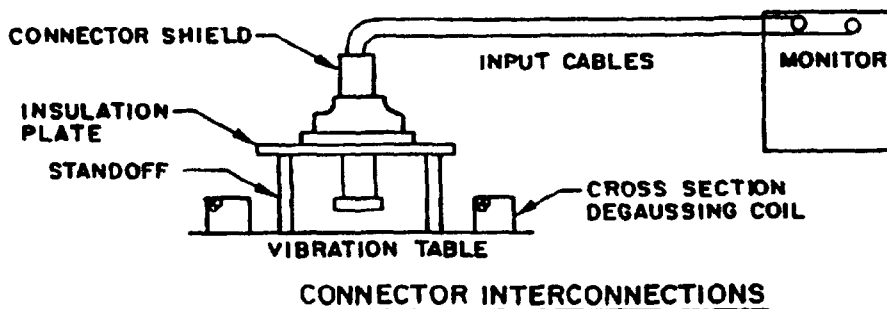
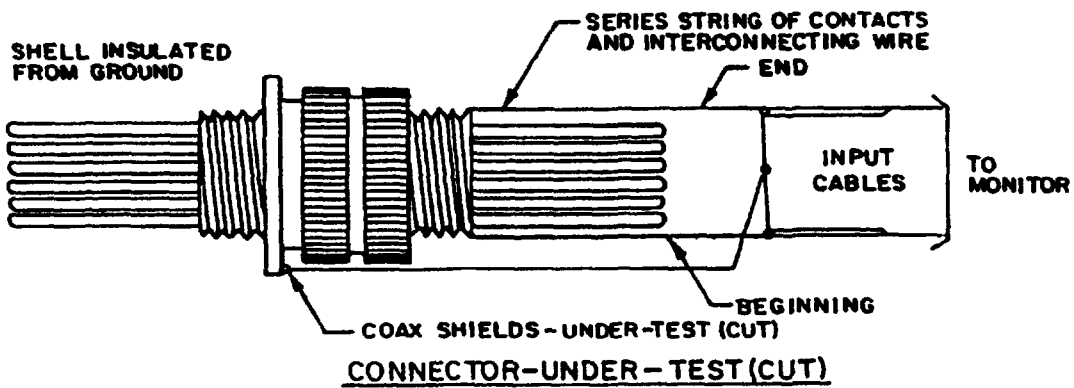
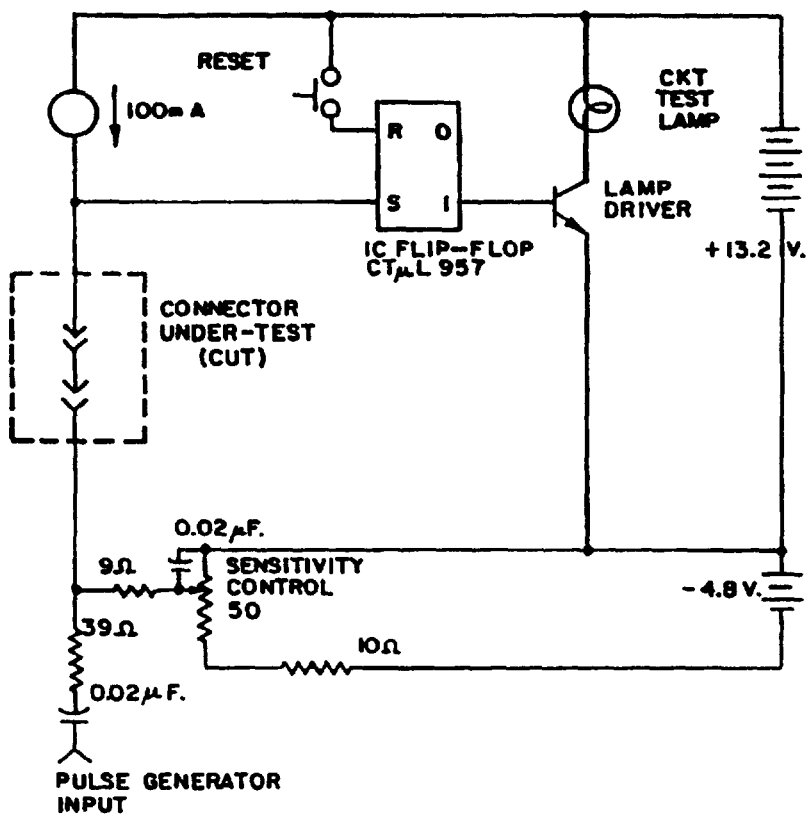


FIGURE 18. Application of resistance change monitor.

## MIL-C-81511F(AS)

FIGURE 19. Contact resistance change monitor circuit.

MIL-C-81511F(AS)

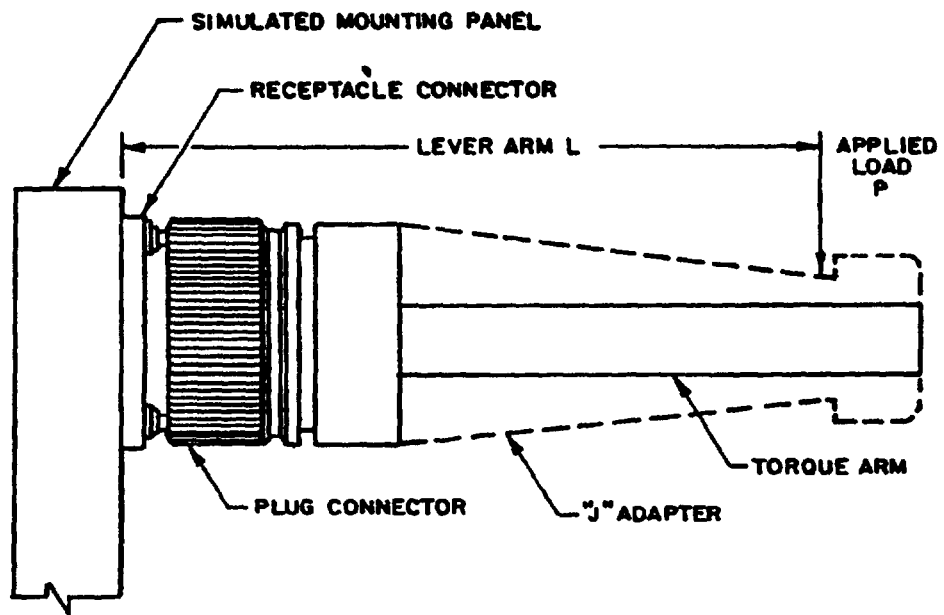


FIGURE 20. External bending moment test set-up.

MIL-C-81511F(AS)

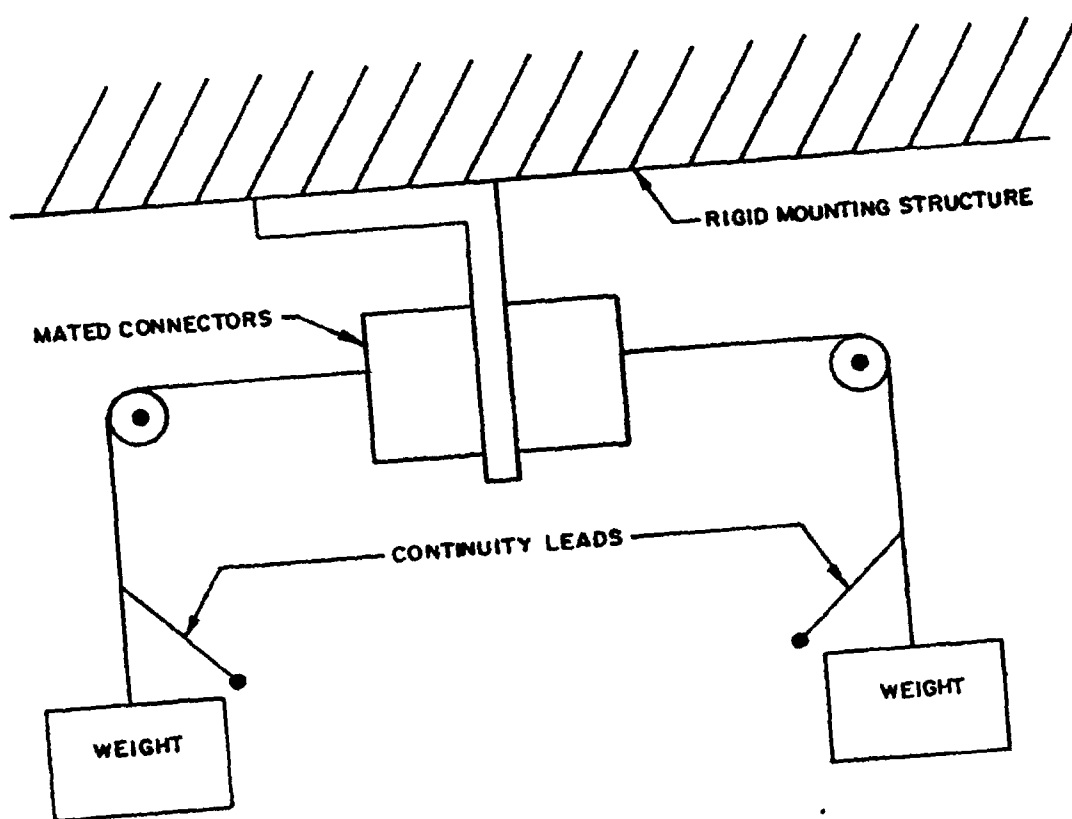
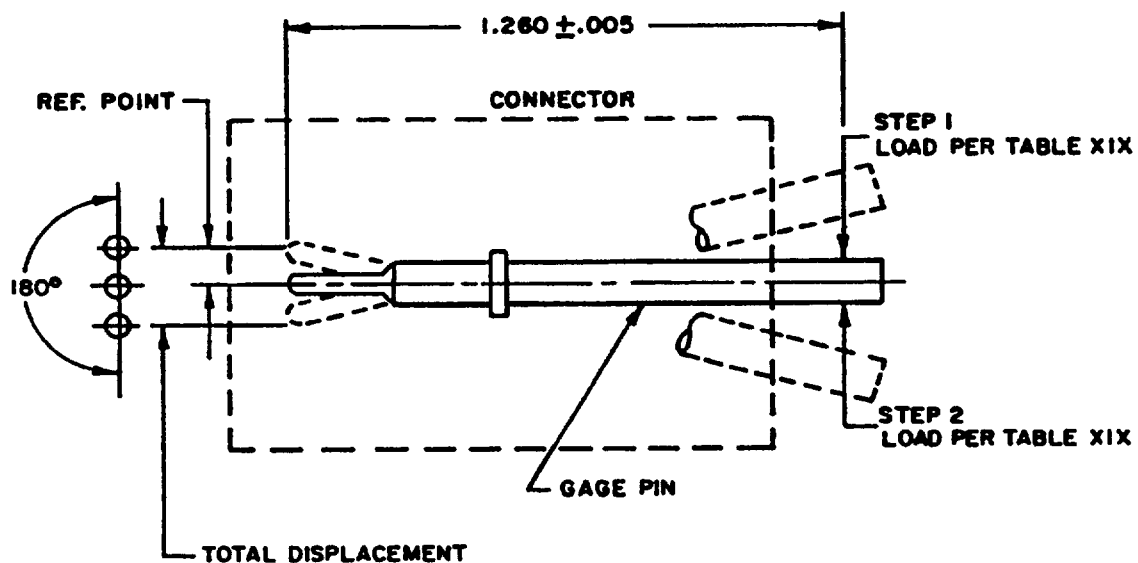


FIGURE 21. Temperature life with contact retention.

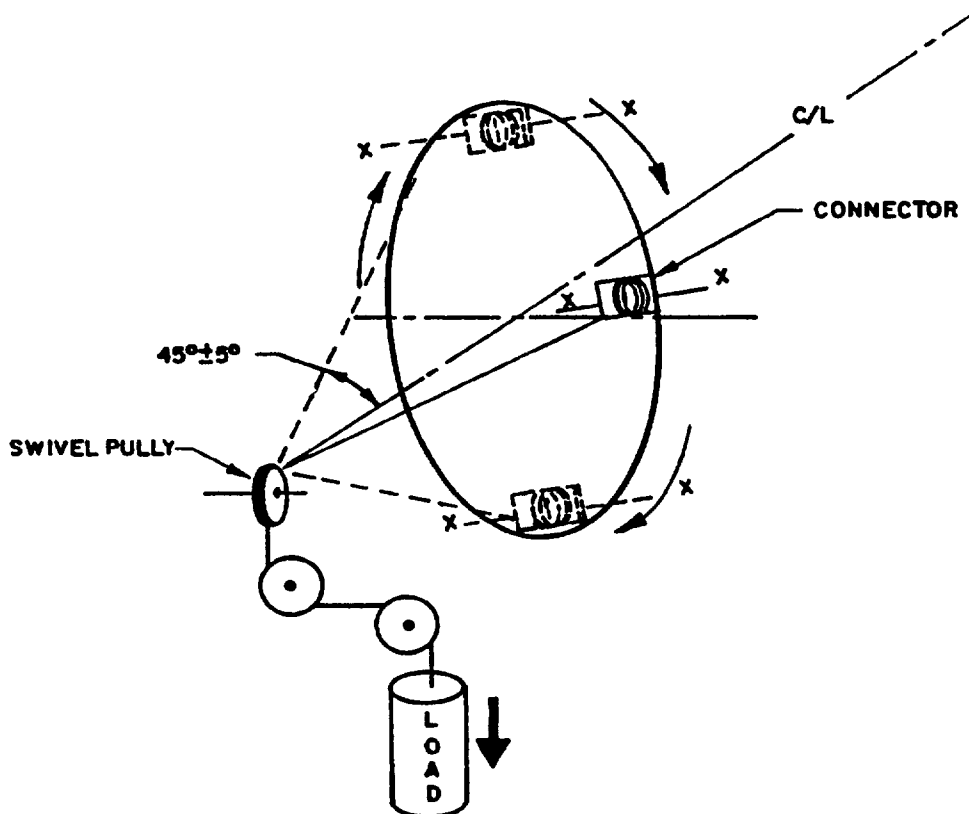
## MIL-C-81511F(AS)



- STEP 1 Apply load to determine reference point.  
STEP 2 Apply load in opposite direction ( $180^\circ$ ) and measure total deflection.

FIGURE 22. Pin contact stability.

MIL-C-81511F(AS)



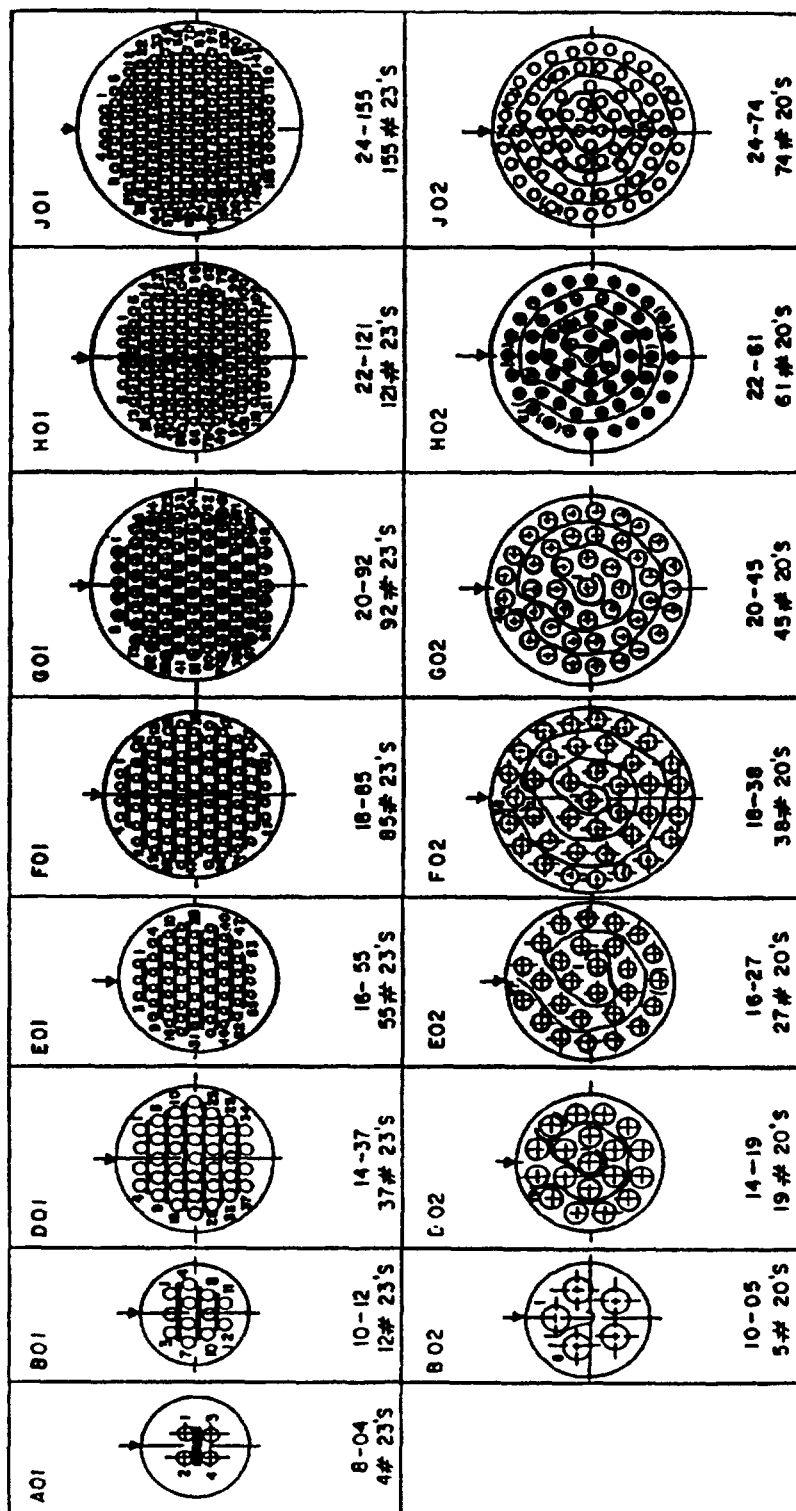
NOTE: CONNECTOR AXIS (REF X-X) TO REMAIN CONSTANT DURING ROTATION.

NOTE: Connector axis (ref X-X) to remain constant during rotation.

FIGURE 23. Contact walk-out.



## MIL-C-81511F(AS)

FIGURE 24. Insert arrangement summary.

MIL-C-81511F(AS)

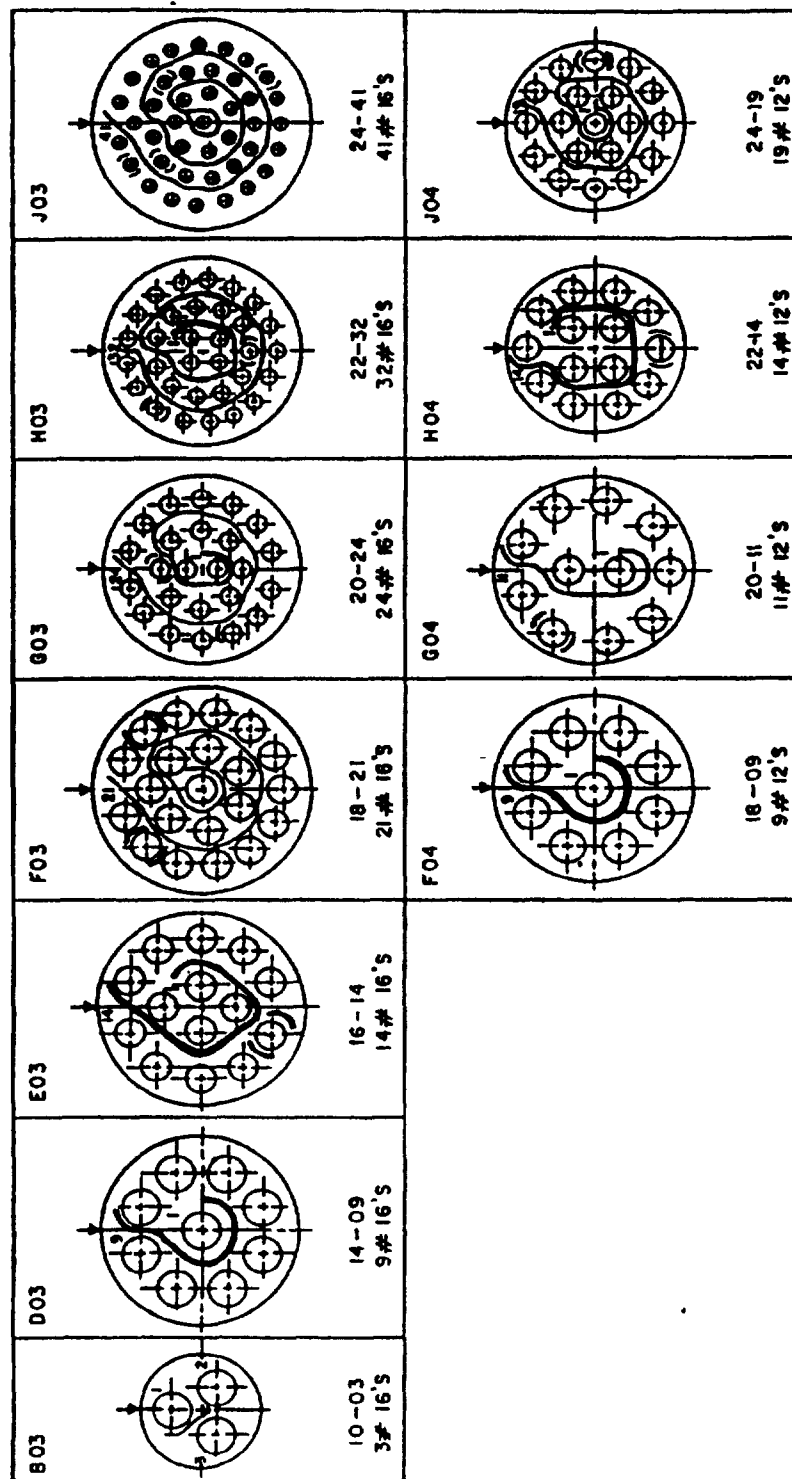


FIGURE 24. Insert arrangement summary (continued).

## MIL-C-81511F(AS)

Cross Reference Data

Shell Size of Insert Arrangement Code	Shell Size (and) No. of Inserts			No. of Contacts	Contact Size
A01	8	-	04	4	#23
B01	10	-	12	12	#23
D01	14	-	37	37	#23
E01	16	-	55	55	#23
F01	18	-	85	85	#23
G01	20	-	92	92	#23
H01	22	-	121	121	#23
J01	24	-	155	155	#23
B02	10	-	05	5	#20
D02	14	-	19	19	#20
E02	16	-	27	27	#20
F02	18	-	38	38	#20
G02	20	-	45	45	#20
H02	22	-	61	61	#20
J02	24	-	74	74	#20
B03	10	-	03	3	#16
D03	14	-	09	9	#16
E03	16	-	14	14	#16
F03	18	-	21	21	#16
G03	20	-	24	24	#16
H03	22	-	32	32	#16
J03	24	-	41	41	#16
F04	18	-	09	9	#12
G04	20	-	11	11	#12
H04	22	-	14	14	#12
J04	24	-	19	19	#12

FIGURE 24. Insert arrangement summary (continued).

MIL-C-81511F(AS)

**Custodians:**  
Navy - AS

**Review activities:**  
Navy - EC, OS  
DLA - ES

**User activities:**  
Navy - MC

**Preparing activity:**  
Navy - AS

(Project 5935-N318)

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3. DOCUMENT TITLE CONNECTORS, ELECTRICAL, CIRCULAR, HIGH DENSITY, QUICK DISCONNECT, ENVIRONMENT RESISTING AND			
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed)			
ACCESSORIES GENERAL SPEC I			
5. REASON FOR RECOMMENDATION			
6. SUBMITTER			
a. NAME (Last, First, Middle Initial)		b. ORGANIZATION	
c. ADDRESS (Include Zip Code)		d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (if applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY AMECOMMANDING OFFICER, NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION LAKEHURST SYSTEMS REQUIREMENTS DEPARTMENT		b. TELEPHONE (Include Area Code) (1) Commercial (908) 323-7488	(2) AUTOVON 624-7488
c. ADDRESS (Include Zip Code) CODE SR3 LAKEHURST, NJ 08733-5100		IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	