



AEROSPACE STANDARD

AS81511

Issued

2014-10

Connectors, Electrical, Circular, High Density, Quick Disconnect,
Environment Resisting and Accessories,
General Specification For

FSC 5935

RATIONALE

The document is written to permit the cancellation and supersession of MIL-C-81511 with this document. It includes the qualifying activity requirements. Technical changes previously approved by the military Preparing Activity were added. Government documentation references have been removed.

1. SCOPE

1.1 Scope

This specification covers four series of electrical connectors (plugs and receptacles) with removable crimp contacts and accessories (see 6.1). AS81511 connectors are not recommended for new design. All AS81511 detail sheets that specified class D and/or H have been cancelled without replacement, therefore all class D and H requirements have been deleted from this specification. 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.
- i. Several voltage service ratings available.
- j. Individual contact release from the rear of the connector (series 3 and 4 only).

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on this Technical Report, please visit
<http://www.sae.org/technical/standards/AS81511>

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) (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.

1.1.2.1 Variation of Insulation Resistance

Insulation resistance varies with temperature as indicated in Table 1 and Figure 2.

TABLE 1 - VARIATION OF INSULATION RESISTANCE

Class	Hot-spot Temperature	Insulation Resistance (megohms-minimum)
All	25 °C	5000
E	150 °C	2000
F, W	175 °C	2000
A	200 °C	2000

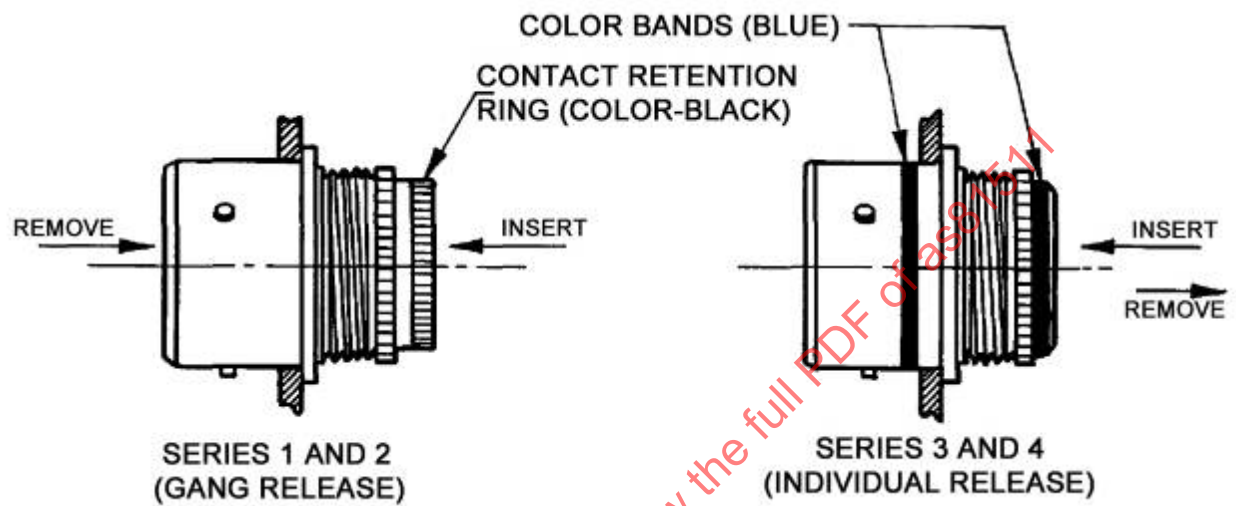


FIGURE 1 - CONTACT INSERTION AND REMOVAL METHODS

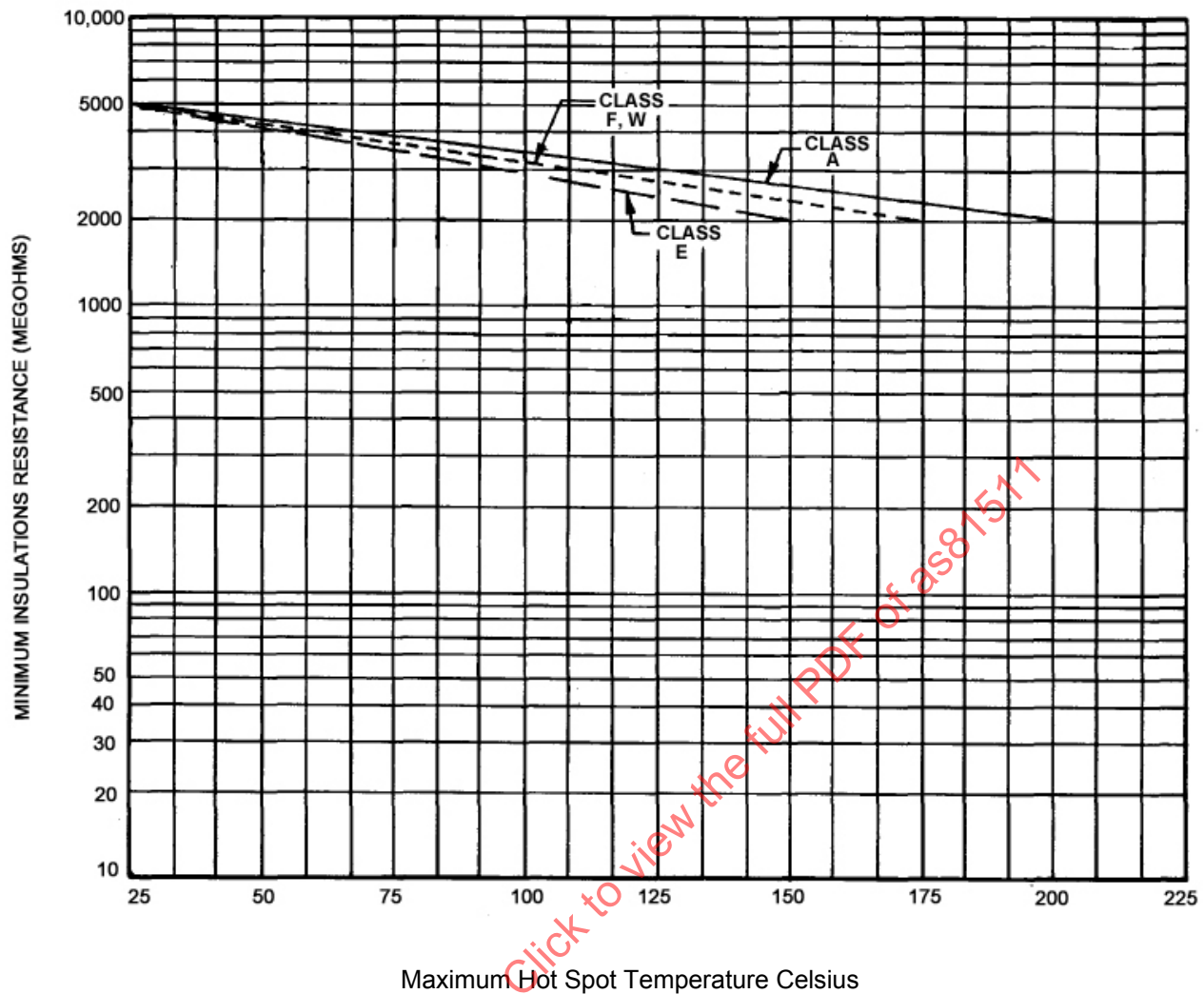


FIGURE 2 - MINIMUM INSULATION RESISTANCE VERSUS HOT SPOT TEMPERATURE

1.1.2.2 Variation of Service Life

Service life varies with temperature as indicated in Figure 3 and Table 2.

TABLE 2 - VARIATION OF SERVICE LIFE

Class	Hot-spot Temperature	Insulation Resistance (megohms-minimum)
E	25 °C/150 °C Maximum	Continuous/1000 hours
F, W	25 °C/175 °C Maximum	Continuous/1000 hours
A	25 °C/200 °C Maximum	Continuous/1000 hours

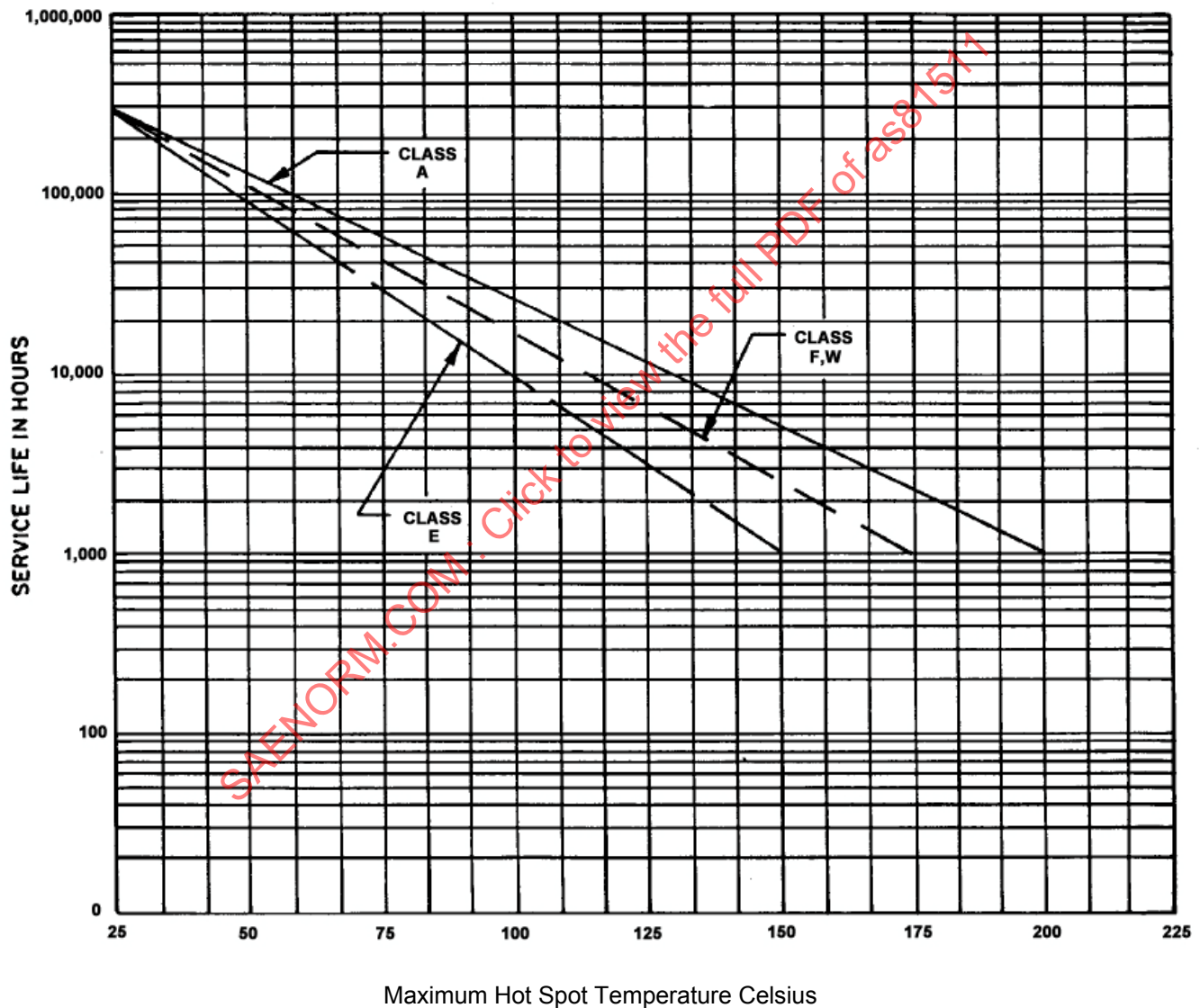


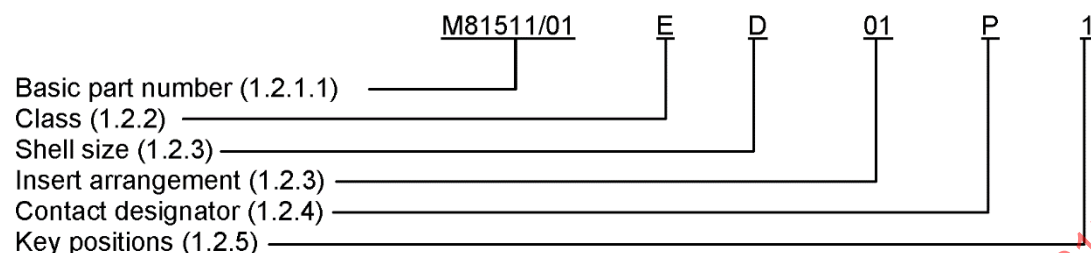
FIGURE 3 - SERVICE LIFE VERSUS HOT SPOT TEMPERATURE

1.2 Classification

1.2.1 Basic Part Number

1.2.1.1 Basic Part Number for Connectors

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



1.2.1.2 Basic Part Number for Connector Accessories

The part number for the accessories will consist of the letter M, the basic specification number/applicable specification sheet, and the assigned dash numbers as indicated on the 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 3.

TABLE 3 - CONNECTOR CLASS AND SERIES

Class	Description	Applicable Series	
		1 & 2	3 & 4
E	Grommet Seal Connectors (150 degree Operating Temperature) (Not for Navy Use)	X	
F	Grommet Seal Connectors (175 degree Operating Temperature), Fluid Resistant, (Not For Navy Use)	X	X
A	Grommet Seal Connectors (200 degree Operating Temperature), Fluid Resistant, (Not For Navy Use)	X	X
W	Grommet Seal Connectors (175 degree Operating Temperature), Fluid Resistant, 500 hour Salt Spray	X	X

1.2.2.1 Fluid Resistance

The fluid resistance capabilities for the various connector classes are shown in Table 4 (see 3.5.8).

TABLE 4 - FLUID RESISTANCE CAPABILITIES

Class	Fluid Resistance Capabilities
E	MIL-PRF-5606, MIL-PRF-23699
A, F, W	MIL-PRF-5606, MIL-PRF-23699, MIL-PRF-7808, MIL-DTL-5624 (JP-5), AMS1424, MIL-C-87937, ASTM D4814, EIA 364-10 TEST CONDITIONS I AND K

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 5, the second part will be (2 numerical digits) as shown on top of the respective insert arrangement in Figure 4.

TABLE 5 - SHELL SIZE AND INSERT ARRANGEMENT

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

1.2.4.2 Connector without Contacts

The following designations are used to indicate a connector less contacts. 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. The digit designations shall be 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 degree cable clamp, for open wiring

J adapter:

- Type I - Straight adapter for jacketed cable
- Type II - 45 degree adapter for jacketed cable
- Type III - 90 degree 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 Tables 5A and 5B will be accommodated by the connectors and contact wire barrels as indicated.

TABLE 5A - WIRE RANGE ACCOMMODATIONS, SERIES 1 AND 2

Wire Barrel Size	Wire Size	OD of Finished Wire (Inch/Normal Size) <u>1/</u>	Oversized Wire <u>2/</u>	Wire Type (Reference) <u>3/</u>	
28	32	0.030 Minimum	0.064 Maximum	AS81044/12, /13	-28
	30	0.042 Nominal		AS50861/7	-28
	28	0.054 Maximum		NEMA-HP3	
22	26	0.030 Minimum	0.064 Maximum	AS22759/18, /19	-26
	24	0.042 Nominal		AS22759/11, /12	-24
	22	0.054 Maximum		AS22759/16, /17	-22
20	24	0.041 Minimum	0.085 Maximum	AS22759/11, /12	-24
	22	0.062 Nominal		AS22759/9, /10	-22
	20	0.081 Maximum		AS81044/6, /7	-20
16	20	0.066 Minimum	0.109 Maximum	AS22759/9, /10	-20
	18	0.083 Nominal		AS81044/8, /9	-18
	16	0.101 Maximum		AS81044/5, /6	-16
12	14	0.097 Minimum	0.139 Maximum	AS22759/9, /10	-14
	12	0.106 Nominal		AS22759/44, /45	-12
		0.135 Maximum		AS81044/5, /6	-12

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

2/ Fifty 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% shall not exceed the nominal finished wire diameter. When using groupings of oversized wire, they shall be randomly distributed.

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

TABLE 5B - WIRE RANGE ACCOMMODATIONS, SERIES 3 AND 4

Wire Barrel Size	Wire Size	OD of Finished Wire (inch) <u>1/</u>	Wire Type (Reference) <u>2/</u>	
28	32	0.030 Minimum	AS81044/12, /13	-28
	30	0.042 Nominal	AS50861/6	-28
	28	0.054 Maximum	NEMA-HP3	
22	28	0.030 Minimum	AS22759/18, /19	-26
	26			
	24	0.042 Nominal	AS22759/11, /12	-24
	22	0.054 Maximum	AS22759/16, /17	-22
20	24	0.040 Minimum	AS22759/14, /15	-24
	22	0.058 Nominal	AS22759/9, /10	-22
	20	0.074 Maximum	AS81044/9, /10	-20
16	20	0.060 Minimum	AS22759/9, /10	-20
	18	0.081 Nominal	AS81044/8, /9	-18
	16	0.103 Maximum	AS81044/5, /6	-16
12	14	0.097 Minimum	AS22759/9, /10	-14
		0.106 Nominal	AS22759/44, /45	-12
	12	0.135 Maximum	AS81044/5, /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 specification numbers are for reference only and are not intended to restrict the use of the acceptable wire types with these connectors.

2. APPLICABLE DOCUMENTS

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

2.1 SAE Publications

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

AMS1424	Deicing/Anti-Icing Fluid, Aircraft SAE Type I
AMS2404	Plating, Electroless Nickel
AMS-C-26074	Electroless Nickel Coatings
AMS-QQ-A-225	Aluminum and Aluminum Alloy, Bar, Rod, Wire, or Special Shapes; Rolled, Drawn, or Cold Finished; General Specification For
AMS-QQ-A-367	Aluminum Alloy Forging
AMS-QQ-A-591	Aluminum Alloy Die Castings
AMS-QQ-P-416	Plating, Cadmium (Electrodeposited)

AIR4789	Aerospace Information Report on Evaluating Corrosion Testing of Electrical Connectors and Accessories for the Purpose of Qualification
AS3582	Packing, Preformed – O-Ring Seal, AMS3304
AS22520	Crimping Tools, Wire Termination, General Specification For
AS22759	Wire, Electrical, Fluoropolymer-Insulated, Copper or Copper Alloy
AS31971	Gage Pin for Socket Contact Engagement Test
AS33221	Gasket, Conductive, MIL-C-81511 Electrical Connectors, Jam Nut Mount
AS39029	Contacts, Electrical Connector, General Specification For
AS50861	Wire, Electric, Polyvinyl Chloride Insulated, Copper or Copper Alloy
AS81044	Wire, Electrical, Crosslinked Polyalkene, Crosslinked Alkane-Imide Polymer, or Polyarylene Insulated, Copper or Copper Alloy
AS81511/1	Connectors, Receptacle, Flange Mount, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Crimp Type Contacts; And Accessories, Class A, F, E and W (Series 2)
AS81511/3	Connectors, Receptacle, Jam Nut Mount, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Crimp Type Contacts; And Accessories, Class A, F, E and W (Series 2)
AS81511/5	Connectors, Receptacle, Cable Connecting, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Crimp Type Contacts; And Accessories, Class A, F, E and W (Series 2)
AS81511/6	Connectors, Plug, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Crimp Type Contacts; And Accessories, Class A, F, E and W (Series 2)
AS81511/13	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Accessory, F Adapter, Rotatable, Type 1 (Series 1 or 2)
AS81511/14	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Accessory, Adapter, Straight
AS81511/15	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Accessory, Plug, Sealing Contact
AS81511/16	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Accessory, Cap, Protective Locking
AS81511/17	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Accessory, Cover, Protective, Plug (Series 2)
AS81511/18	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Accessory, Cover, Protective, Receptacle (Series 1 or 2)
AS81511/19	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Accessory, Dummy Stowage, Receptacle (For Series 2 Connectors)
AS81511/20	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Accessory, Nut, Slotted Hexagon, Connector Mounting (For Series 1 and 2 Connectors)

AS81511/21	Connectors, Receptacle, Flange Mount, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Crimp Type Contacts; And Accessories, Class A, F, E and W (Series 1)
AS81511/23	Connectors, Receptacle, Jam Nut Mount, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Crimp Type Contacts; And Accessories, Class A, F, E and W (Series 1)
AS81511/25	Connectors, Receptacle, Cable Connecting, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Crimp Type Contacts; And Accessories, Class A, F, E and W (Series 1)
AS81511/26	Connectors, Plug, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Crimp Type Contacts; And Accessories, Class A, F, E and W (Series 1)
AS81511/41	Connectors, Receptacle, Flange Mount, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Individual Release, Crimp Type Contacts, Class A, F, and W (Series 3)
AS81511/45	Connectors, Receptacle, Cable Connecting, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Individual Release, Crimp Type Contacts, Class A, F, and W (Series 3)
AS81511/46	Connectors, Plug, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Individual Release Crimp Type Contacts, Class A, F and W (Series 3)
AS81511/49	Connectors, Receptacle, Jam Nut Mount, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Individual Release, Crimp Type Contacts; And Accessories, Class A, F, and W (Series 3)
AS81511/51	Connectors, Receptacle, Flange Mount, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Individual Release, Crimp Type Contacts, Class A, F, and W (Series 4)
AS81511/53	Connectors, Receptacle, Jam Nut Mount, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Individual Release, Crimp Type Contacts, Class A, F, and W (Series 4)
AS81511/55	Connectors, Receptacle, Cable Connecting, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Individual Release, Crimp Type Contacts, Class A, F, and W (Series 4)
AS81511/56	Connectors, Plug, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Individual Release, Crimp Type Contacts, Class A, F, and W (Series 4)
AS81969	Installing and Removal Tools, Connector Electrical Contact, General Specification For
AS90484	Gasket, Flange Mount, Connector, Electric

2.2 U.S. Government Publications

Available from DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6396, <http://quicksearch.dla.mil/>.

MS3434	Test Gage, Contact Location and Retention Feature, AS81511 Series 1 and 2 Connectors
MS3435	Test Gage, Contact Location and Retention Feature, AS81511 Series 3 and 4 Connectors
MS3462	Test Gage, MIL-DTL-26482 Series 2 (Class N), AS81703 Series 3 (Class N) and AS81511 Series 3 and 4 (Class L) Contact Retention Feature
MS27488	Plug, End Seal, Electrical Connector

MIL-DTL-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-DTL-16878	Wire, Electrical, Insulated, General Specification for
MIL-DTL-28786	Switches, Electrical and Fiber Optic, Packaging of
MIL-DTL-45204	Gold Plating, Electrodeposited
MIL-DTL-55330	Connectors, Electrical and Fiber Optic, Packaging of
MIL-PRF-5606	Hydraulic Fluid, Petroleum Base; Aircraft, Missile and Ordnance
MIL-PRF-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-PRF-23699	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number 0-156
MIL-PRF-87937	Cleaning Compound, Aerospace Equipment
MIL-S-7742	Screw Threads, Standard, Optimum Selected Series, General Specification for
MIL-STD-104	Limit for Electrical Insulation Color
MIL-STD-202	Electronic and Electrical Component Parts
MIL-STD-889	Dissimilar Metals
MIL-STD-1285	Marking of Electrical and Electronic Parts
MIL-STD-1916	DoD Preferred Methods for Acceptance of Product

2.2.1 The following detail sheet specifications have been cancelled without replacement:

MIL-C-81511/2	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting: and Accessories, Receptacle, Solder Mount, Solder Type Contacts, Pins Only, Class B, G, and H (Series 2)
MIL-C-81511/4	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting: and Accessories, Receptacle, Jam Nut Mount, Solder Type Contacts, Pins only, Class B, G and H (Series 2)
MIL-C-81511/7	Connector, Receptacle, Flange Mount, Through Bulkhead, Nonremovable Contacts, Pin Only, Class H
MIL-C-81511/8	Connector Insert Arrangement, Electric Connector, Shell Size 8
MIL-C-81511/9	Connector Insert Arrangement, Electric Connector, Shell Size 10
MIL-C-81511/10	Connector Insert Arrangement, Electric Connector, Shell Size 14
MIL-C-81511/11	Connector Insert Arrangement, Electric Connector, Shell Size 16
MIL-C-81511/12	Connector Insert Arrangement, Electric Connector, Shell Size 18
MIL-C-81511/22	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories: Receptacle, Solder Mount, Solder-Type Contacts, Pins Only, Class B, G and H (Series 1)

MIL-C-81511/24	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories: Receptacle, Jam Nut Mount, Solder-Type Contacts, Pin Only, Class B, G, and H (Series 1)
MIL-C-81511/27	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories: Receptacle, Jam Nut Mount, Through Bulkhead, Nonremovable Contacts, Class B, G and H (Series 1)
MIL-C-81511/28	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories, Receptacle, Jam Nut Mount, Through Bulkhead, Nonremovable Contacts, Class B, G and H (Series 2)
MIL-C-81511/29	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories, Cover, Protective, Plug (Series 1)
MIL-C-81511/30	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories: Receptacle, Dummy Storage, for Series 1 Connectors
MIL-C-81511/31	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories: Receptacle, Flange Mount, Crimp-Type Contacts Class C, T, and P (Series 2)
MIL-C-81511/32	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories: Receptacle, Jam Nut Mount, Crimp-Type Contacts, Class C, T, and P (Series 2)
MIL-C-81511/33	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories, Receptacle, Cable Connecting, Crimp Type Contacts, Class C, T, and P (Series 2)
MIL-C-81511/34	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories: Plug, Crimp-Type Contacts, Class C, T and P (Series 2)
MIL-C-81511/35	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories, Receptacle, Flange Mount, Crimp Type Contacts, Class C, T, and P (Series 1)
MIL-C-81511/36	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories, Receptacle, Jam Nut Mount, Crimp Type Contacts, Class C, T and P (Series 1)
MIL-C-81511/37	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories, Receptacle, Cable Connecting, Crimp Type Contacts, Class C, T and P (Series 1)
MIL-C-81511/38	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories: Plug, Crimp Type Contacts, Class C, T, and P (Series 1)
MIL-C-0081511/39	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Plug, Sealing Contact (Series 3 or 4)
MIL-C-0081511/40	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories, Ring Spacer, Rear Accessory, (Series 3 and 4)
MIL-C-0081511/42	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Receptacle, Solder Mount, Solder-Type Contact, Pins Only, Class D (Series 3)
MIL-C-81511/43	Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, and Accessories, J Adapter, Non-Rotatable Type I II III (Series 1/2) F/Attaching R-FI and Non-RFI Cable to Connectors
MIL-C-81511/44	Connector, Insert Arrangements, Electric Connector, Shell Size 20 Connector, Insert Arrangements, Electric Connector, Shell Size 20

- MIL-C-0081511/44 Connector, Electrical, Circular, High Density Quick Disconnect, Environment Resisting, Receptacle, Jam Nut Mount, Solder Type Contacts, Pin Only, Class D (Series 3)
- MIL-C-0081511/47 Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Receptacle, Solder Flange Mount, Crimp Type Contacts, Pin Only, Class L (Series 3)
- MIL-C-0081511/48 Connector, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Receptacle, Jam, Nut Mount, Crimp Type Contacts, Pins Only, Class L (Series 3)
- MIL-C-81511/54 Connectors, Receptacle, Jam Nut Mount, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting, Solder Type Contacts, Pins Only, Class D (Series 4)

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org or National Conference of Standards Laboratories, 2995 Wilderness Place, Suite 107, Boulder, CO 80301, Tel: 303-440-3339, www.ncsli.org.

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

ANSI/ASME Y14.5M Dimensioning and Tolerancing

ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes

2.4 ASTM Publications

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

ASTM B85/85M Aluminum Alloy Die Castings

ASTM B211 Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire

ASTM B339 Standard Specification for Pig Tin

ASTM B545 Standard Specification for Electrodeposited Coatings of Tin

ASTM D4814 Standard Specification for Automotive Spark-Ignition Engine Fuel

ASTM G21 Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

2.5 EIA Publications

Available from Electronic Component Association (ECA), 2500 Wilson Boulevard, Arlington, VA 22201-3834, Tel: 703-907-7500, www.eia.org.

EIA 364 Electrical Connector/Socket Test Procedures Including Environmental Classifications

EIA 364-02 Air Leakage Test Procedure for Electrical Connectors

EIA 364-03 Altitude Immersion

EIA 364-05 Contact Insertion, Release and Removal Force Test Procedure for Electrical Connectors

EIA 364-10 Fluid Immersion Test Procedure for Electrical Connectors

EIA 364-13 Mating and Unmating Force Test Procedure for Electrical Connectors and Sockets

EIA 364-14	Ozone Exposure Test Procedure for Electrical Connectors
EIA 364-20	Withstanding Voltage Test Procedure for Electrical Connectors, Sockets, and Coaxial Contacts
EIA 364-21	Insulation Resistance Test Procedure for Electrical Connectors, Sockets, and Coaxial Contacts
EIA 364-26	Salt Spray Test Procedure for Electrical Connectors, Contacts, and Sockets
EIA 364-27	Mechanical Shock (Special Pulse) Test procedure for Electrical Connectors
EIA 364-28	Vibration Test Procedure for Electrical Connectors and Sockets
EIA 364-29	Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors And Sockets
EIA 364-31	Humidity Test Procedure for Electrical Connectors and Sockets
EIA 364-32	Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors and Sockets
EIA 364-38	Cable Pull-out Test Procedure for Electrical Connectors
EIA 364-54	Magnetic Permeability Test Procedure for Electrical Connectors, Contacts, and Sockets
EIA-359	Colors for Color Identification and Coding

2.6 Order of Precedence

In the event of a conflict between the text of this document and the reference 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.

2.7 Definitions

2.7.1 PERMANENT

For purposes of this specification, when the word "permanent" or "permanently" is used in connection with the attachment or retention of material, in such a way that destruction or rupture of material is required before removal can be accomplished.

2.7.2 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.

3. REQUIREMENTS

3.1 Specification Sheets

The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification

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 database at the time of award of the contract (see 4.4 and 6.3).

3.2.1 Use of SAE Part Numbers

SAE part numbers (AS or M prefix designators) shall not be applied to a product, except for qualification samples, until notification has been received from the activity responsible for qualification that the product has been approved for listing on the Qualified Products Database.

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 MIL-STD-889.

3.3.2 Nonmagnetic Materials

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 ASTM G21.

3.3.4 Contact Materials

Contact materials shall be as required by AS39029 and the individual contact detail specification sheets.

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 non-resilient 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 and metal accessories (see 1.2.6) shall be fabricated of high grade aluminum such as alloy 6061. Temper T6 in accordance with AMS-QQ-A-367.

3.3.6.2 Grounding Spring Members

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

3.3.6.3 Bayonet Pins

Bayonet pins shall be made of corrosion resistant stainless steel.

3.3.6.4 Other Component Parts

Other metal component parts shall be fabricated from aluminum conforming to AMS-QQ-A-591 or AMS-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 AMS-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 AMS-C-26074.

3.3.7.3 Contact Retention Ring

The resultant finish of the contact retention ring shall be black (see Figure 2).

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/ASME Y14.5M. Dimensioning and tolerancing shall conform to Figures 4 through 17. Connector back end configurations shall conform to Figure 18 or 19, as applicable.

3.4.1 Contact Design

Contacts shall conform to AS39029, except as otherwise specified herein.

3.4.1.1 Crimp Contacts

Crimp contacts shall conform to the applicable part number specified in Table 6 and shall be qualified to AS39029. The contact style shall be as designed in the connector part 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 6.

TABLE 6 - CRIMP CONTACTS AND INSERTION/REMOVAL TOOLS

Connector Series	Crimp Contact	Insertion Tool	Removal Tool
Series 1	Pin – AS39029/47 Socket – AS39029/33	AS81969/2	AS81969/3
Series 2	Pin – AS39029/47 Socket – AS39029/46		AS81969/3
Series 3	Pin – AS39029/18 Socket – AS39029/17	Insertion and removal tool – AS81969/16	
Series 4	Pin – AS39029/18 Socket – AS39029/16		

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 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.

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 6.

3.4.2.1.3 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 5B).

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 Tables 5A and 5B.

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 members of series 3 and 4 connectors shall provide raised seal barriers around each pin contact, as shown on Figures 6, 8, 10, 13, 15, and 17. There shall be 0.005 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 in Appendix A and applicable detail 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 17). The shells of series 3 and 4 connectors shall have a blue color band in accordance with EIA 359 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 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 0.090 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 7, 8, 14, and 15).

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 17). 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 non-removable 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 cable 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 11 (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 through 10 and 12 through 17).

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 16. 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 AS3582 nonconductive O-ring panel seal. Flange mounted receptacles shall be provided with a qualified AS90484 flange gasket panel seal only if specified. Jam nut mounting receptacles shall be provided with a qualified AS33221 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 20.

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 17).

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 12 through 17). 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 through 10). 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 Tables 7A or 7B, during maintenance aging.

TABLE 7A - CONTACT INSERTION AND REMOVAL FORCES WITH LOCKING MECHANISM DISENGAGED (SERIES 1 AND 2 ONLY)

Contact Size	Insertion Force pounds (Maximum)	Removal Force, pounds				
		During First Cycle		During Tenth 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 7B - CONTACT INSERTION AND REMOVAL FORCES (SERIES 3 AND 4 ONLY)

Contact Size	Insertion Force pounds (Maximum) First or Tenth Cycle
23-28	3
23-22	3
20-20	5
16-16	7
12-12	10

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 8. 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 8.

TABLE 8 - COUPLING TORQUE

		Shell Size	Torque (pound-inch)	
			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

Contacts shall be retained in their inserts when the axial loads of Table 9 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 9 - AXIAL LOADS FOR CONTACT RETENTION

Mating End Size	Axial Loads (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 10 shall be used.

TABLE 10 - TEMPERATURE EXTREMES

Low Temperature All Classes	Class E	High Temperature Class F and W	Class A
-65 +0 °C/-3 °C	+150 +3 °C/-0 °C	+175 +3 °C/-0 °C	+200 +3 °C/-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 11, corona shall not be considered as breakdown. Maximum recommended working voltages are as shown in Table 22.

TABLE 11 - TEST VOLTAGE (AC, RMS, NOT WORKING VOLTAGE)

Simulated Altitude Condition	Service Rating 1	
	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 12.

TABLE 12 - 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 Ω .

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 0.25 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.

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 counterpart 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. Counterpart connectors shall be retained in full engagement and the increase in contact resistance due to vibration shall not exceed 5 Ω in 1 μs (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 Ω in 1 μs 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 M Ω 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 5000 MΩ.

3.5.13.2 Insulation Resistance at Elevated Temperature

After exposure for 1000 hours to the applicable high temperature specified in Table 1, and while still at that temperature, insulation resistance shall be as specified in Table 1 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 13, connectors shall show no evidence of damage nor shall there be any interruption of electrical continuity.

TABLE 13 - EXTERNAL BENDING MOMENT

Plug Shell Size	Bending Moment (inch-pound)
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 when evaluated in accordance with AIR4789.

3.5.16 Temperature Life

All connectors shall perform satisfactorily after exposure for 1000 hours to the applicable high temperature specified in Table 10 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 10, the contacts of removable contact connectors shall support an axial load equal to 50% of the values specified in Table 9. The contacts shall maintain their specified locations (see Figures 4 through 11). There shall be no electrical discontinuity in excess of 1 μs. 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 shall be less than 2 μu.

3.5.19 Insert Retention

3.5.19.1 Insert Retention

When tested as specified in 4.6.20.1, inserts shall not be dislocated from their original positions when an axial load of 75 pounds per square inch gauge is applied.

3.5.20 Air Leakage

3.5.20.1 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 ($4.55 \times 10^{-3} \text{cm}^3/\text{second}$).

3.5.21 Altitude Immersion

Connectors shall have an insulation resistance of at least 5000 M Ω 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 11.

3.5.22 Cover Chains Tensile Strength

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

3.5.23 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.

3.5.24 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 through 17.

3.5.25 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 20 with the specified load applied.

3.5.26 Contact Walk-Out

When tested as specified in 4.6.28, contacts shall not become dislodged from their normal position.

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).

3.6.1 Insert Marking

Inserts shall be marked as illustrated on Figure 21. 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 14 through 18.

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 supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements. Qualification by similarity may be granted. The acceptance and extent of qualification by similarity shall be determined by the Qualifying Activity. Similarity is established through a rationale that certain designs, materials, and/or processes are identical to those already approved through qualification of the components. Verification testing for the new product is not required for designs, materials, and/or processes already approved. When a Qualified Products List is being established the qualification by similarity rationale shall be approved by the qualifying activity prior to initiation of the remaining portions of the qualification inspection process.

4.1.1 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 ANSI/NCSL-Z540.3.

4.2 Classification of Inspections

The inspection requirements specified herein are classified as follows:

- 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 made in accordance with the general requirements of EIA 364. Performance of the inspection shall be the responsibility of the qualification applicant under authorization of the qualifying activity (NAVAIR). The qualifying activity shall authorize the applicant to begin qualification testing by written notice that describes the requirements of submission in accordance with this specification. The qualification applicant shall furnish test results, certifications, and tested product to the qualifying activity. The samples shall be taken from the same lot as tested by the supplier and plainly identified by attached durable tags marked with the information listed below. The tags must be stamped by the supplier and qualifying activities designated quality Assurance Representative (QAR) inspector as representative samples of the manufacturer's normal production capability. Samples submitted without the stamp will not be accepted. All inspections shall be performed in accordance with the following conditions:

- a. Temperature - 15 to 35 °C
- b. Relative humidity - 45 to 75%
- 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 6 inch lead lengths. Termination of wires to contacts shall be accomplished as follows: A crimping tool in accordance with AS22520 as indicated on the applicable crimp contact specification sheet shall be used for the AS39029 contacts.

4.4 Qualification Inspection

Qualification inspection shall consist of the examinations and tests performed in the qualification inspection table (Table 14), the intermateability test table (Table 15), the qualification inspection for connector accessories test table (Table 16), and the qualification of additional connectors table (Table 17) on the qualification test samples specified in 4.4.1. The supplier shall perform all testing with the exception of test group 3 for Table 14. 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 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. All test samples required for the Qualifying Activity testing shall comply with 4.3.2 and shall be forwarded to the Qualifying Activity prior to the start of the supplier's testing.

4.4.1.1 Connectors for Group 1 (All Classes)

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 14. 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 receptacle. The other samples shall have the inserts reversed. The samples shall be assembled with wire approaching the minimum diameter as specified in Tables 5A and 5B.

4.4.1.2 Connectors for Group 2 (All Classes)

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 14. 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 Tables 5A and 5B.

4.4.1.3 Connectors for Group 3 (All Classes)

For each class, twelve connector pairs of medium shell sizes shall be subjected to the test sequence in group 3 of Table 14. Each contact size shall be represented within the connector sample group. The samples shall be assembled with wire approaching the nominal diameter specified in Tables 5A and 5B. For class E, only four connector pairs per class are required. The test samples shall be forwarded to the Qualifying Activity for the performance of the Group 3 testing.

4.4.1.4 Connectors for Groups 4 and 5 (All Classes)

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 Tables 5A and 5B). One half the samples for each contact size shall be subjected to the tests sequence in group 4 in Table 14. The other half of the samples shall be subjected to the tests sequence in group 5.

4.4.1.5 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 6 in Table 14. The samples shall be tested without the insert or contacts installed.

4.4.1.6 Connectors for Intermateability Tests

A minimum of four 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 Tables 5A and 5B. The connector samples shall be submitted to the qualification tests sequence specified in Table 15.

4.4.1.7 Accessories

Two each protective covers, stowage receptacles, and cable clamps being qualified shall be subjected to the tests specified in Table 16. 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

Retention of qualification inspection (Tables 17A and 17B) shall be performed by the Qualifying Activity on sample units produced with equipment and procedures normally used in production. To retain qualification, the supplier shall forward their periodic qualification submittal every 36 months to the Qualifying Activity. The Qualifying Activity shall establish the initial reporting date. Failure to submit test samples/data within 30 days after the end of the sampling interval may result in loss of qualification for the products. Except where the results of these inspections show non-compliance with the applicable requirements, delivery of products which have passed group A inspection shall not be delayed pending the results of retention of qualification inspections.

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 17, 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.

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TABLE 14 - QUALIFICATION INSPECTION

Inspection	Requirement Paragraph	Test Paragraph
Group 1		
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 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	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, 3.7	4.6.1
Group 2		
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 3.7	4.6.1
Interfacial seal	3.4.2.3	4.6.29
Contact insertion and removal forces	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

TABLE 14 - QUALIFICATION INSPECTION (CONTINUED)

Inspection	Requirement Paragraph	Test Paragraph
Group 2 (continued)		
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
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 at sea level)	3.5.6	4.6.7.1
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
Insert retention	3.5.19	4.6.20
Contact retention	3.5.4	4.6.5
Contact insertion and removal force	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, 3.7	4.6.1
Group 3 (Performed by the QA)		
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 3.7	4.6.1
Interfacial seal	3.4.2.3	4.6.29
Contact insertion and removal forces	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, 3.7	4.6.1

TABLE 14 - QUALIFICATION INSPECTION (CONTINUED)

Inspection	Requirement Paragraph	Test Paragraph
Group 4 (Dielectric retention system)		
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 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, 3.7	4.6.1
Group 5 (Dielectric retention system)		
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 3.7	4.6.1
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, 3.7	4.6.1
Group 6 (EMI/RFI shielding effectiveness)		
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 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, 3.7	4.6.1

TABLE 15 - INTERMEDIATEABILITY TEST
(SERIES 1 WITH SERIES 3, SERIES 2 WITH SERIES 4)

Title	Requirement Paragraph	Test Method 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	

TABLE 16 - QUALIFICATION INSPECTION FOR CONNECTOR ACCESSORIES

Inspection	Requirement Paragraph	Test Paragraph	Test Sample Number	
			1	2
Protective covers, stowage receptacles and cable clamps				
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 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 and 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, 3.7	4.6.1	X	X

TABLE 17 - QUALIFICATION OF ADDITIONAL CONNECTORS

Inspection	Requirement Paragraph	Test Paragraph
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 3.7	4.6.1
Contact protection (scoop proof)		4.6.26
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		
Series 1 and 2	3.5.2.1	4.6.3.1
Series 3 and 4	3.5.2.1	4.6.3.2
Contact retention		
Series 1 and 2	3.5.4	4.6.5.1
Series 3 and 4	3.5.4	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
External bending moment	3.5.14	4.6.15
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 3.7	4.6.1

TABLE 17A - PERIODIC QUALIFICATION (TO BE PERFORMED BY THE QUALIFYING ACTIVITY)

Title	Requirement Paragraph	Test Method Paragraph
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 3.7	4.6.1
Interfacial seal	3.4.2.3	4.6.29
Contact insertion and removal forces	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, 3.7	4.6.1

TABLE 17B - PERIODIC QUALIFICATION FOR CONNECTOR ACCESSORIES
(TO BE PERFORMED BY THE QUALIFYING ACTIVITY)

Inspection	Requirement Paragraph	Test Method Paragraph
Protective covers, stowage receptacles and cable clamps		
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 3.7	4.6.1
Magnetic permeability	3.5.18	4.6.19
Operating force	3.5.3	4.6.4
Cover chains, tensile strength	3.5.23	4.6.24
Shell to shell continuity (protective covers and stowing receptacles only)	3.5.7.2	4.6.8.2
Examination of product	3.1, 3.3 thru 3.4.6, 3.6, 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.

4.5.1.3 Group A Inspection

Group A inspection shall consist of the examinations and tests specified in Table 18 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. 100% visual examination of each retention cavity for molding discrepancies and excessive glue shall be a required in-process control for all connectors.

TABLE 18 - GROUP A INSPECTION

Inspection	Connector Type	Accessories	Requirement Paragraph	Test Paragraph
Examination of product				
Contact retention ^{1/}		X	3.1, 3.3 thru 3.4.6, 3.6, 3.7	4.6.1
Series 1 and 2	X			4.6.5.1
Series 3 and 4	X		3.5.4	4.6.5.2
Dielectric withstanding voltage (unmated)	X		3.5.4	
			3.5.6	4.6.7.4

^{1/} 100% 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 ANSI/ASQ Z1.4 for general inspection level II. The acceptable quality level shall be 1%.

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 re-inspection. 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 re-inspected lots.

4.5.1.4 Group B Inspection

Group B inspection shall consist of the applicable examinations and tests specified in Tables 17A and 17B. Except where the results of these inspections show noncompliance with the applicable requirements, delivery of products which have passed group A shall not be delayed pending the results of these periodic inspections.

4.5.1.4.1 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 compliment 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. In the event that no production occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. The form of the report shall be in accordance with the Qualifying Activity requirements. If limited production has occurred for the reporting period, the manufacturer may request the Qualifying Activity to consider a similar certification to fulfill the periodic requirement. Qualification by Certification shall not be permitted for more than one 36 month interval.

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)

All contacts shall be inserted and removed once using the military tool (M81969/2 and M81969/3). When tested as specified in ECA/EIA 364-05, insertion and removal forces shall be measured and recorded on a minimum of 20% 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)

Twenty percent but not less than three of the contacts in each connector shall be removed and inserted ten times using the insertion and removal tool (Table 7). When tested as specified in ECA/EIA 364-05, the forces required to remove and insert the contacts shall be measured on the first and tenth removal and insertion.

4.6.4 Operating Force (see 3.5.3)

When tested as specified in ECA/EIA 364-13, 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 1 inch-pound per second.

4.6.5 Contact Retention (see 3.5.4)

4.6.5.1 Contact Retention (Series 1 and 2)

Series 1 and 2 connectors 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 ECA/EIA 364-29, axial loads in accordance with Table 9 shall be applied to the mating end of each individual contact. Test probes per Figure 22/Table 50 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 pounds. 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 ECA/EIA 364-32. 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 ECA/EIA 364-20. The applicable test voltages (Table 11) 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 11. After 30 minutes at the simulated altitude, the connectors shall be tested as specified in 4.6.7.

4.6.7.3 Dielectric Withstanding Voltage - 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 11, 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.)

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 12 (accuracy of frequency $\pm 5\%$). The level of detected signal power indicated by a tuned radio frequency field intensity meter is a result of RF leakage from the mated pair of shells. The test arrangement shall be as shown on Figures 23 and 24.

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 test procedure method EIA 364-83. Probes shall be placed on the simulated panel and at the extreme edge of the plug as shown on Figure 25 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, F, and W) (see 3.5.8)

Counterpart mated connectors shall be subjected to the test specified in ECA/EIA 364-10 (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) (see 3.5.8)

A minimum of one connector per fluid shall be fully immersed unmated into MIL-PRF-5606 and MIL-PRF-23699 for 20 hours at ambient temperature. After the fluid immersion, the connectors shall be removed and allowed to drain for 1 hour. Subsequent testing shall be performed on connectors utilizing the mating halves previously used.

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 fluids listed in Table 19 (one sample per fluid) for 20 hours at room temperature

TABLE 19 - FLUID TESTING SAMPLES AND FLUIDS

Sample Number	Test Fluid
1	MIL-DTL-5624 (JP-5)
2	Coolanol 25
3	MIL-PRF-5606
4	MIL-PRF-7808
5	MIL-PRF-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 14.

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 ECA/EIA 364-28, test condition IV. In addition, the vibration shall be conducted at the low temperature extreme and the high temperature extreme as shown in Table 10. The duration of vibration at extreme temperatures shall be 25% 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 mA of current allowed to flow, and there shall be a minimum of 10% but not less than three contact pairs in the circuit (see Figure 19). A suitable instrument shall be employed to monitor the increase in contact resistance (see Figure 18).

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) and subjected to the shock test of ECA/EIA 364-27, test condition A, 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, 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 ECA/EIA 364-31, method IV, 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 vapor tight 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.

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 ECA/EIA 364-21. 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 10. 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 28. 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 13 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 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 ECA/EIA 364-26, test condition B. 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%. The specimens shall then be washed off with tap water and then dried in a circulating air oven at a temperature of $38^{\circ}\text{C} \pm 3^{\circ}\text{C}$ 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.

4.6.17 Temperature Life (see 3.5.16)

The mated connectors shall be subjected to the applicable high temperature specified in Table 10 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 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 17, 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 29. A weight equal to 50% of the axial load specified in Table 9 for the applicable contact size shall be suspended freely from each steel core wire. A current of $100\text{ mA} \pm 10\text{ mA}$ supplied from a 10.0 V DC 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 $1\text{ }\mu\text{s}$. The connector, mounted as shown on Figure 29, 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 re-measured (Figures 4 through 17 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 ECA/EIA 364-14. 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 ECA/EIA 364-54.

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.

4.6.21 Air Leakage

4.6.21.1 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 ECA/EIA 364-02.

4.6.22 Altitude Immersion (see 3.5.22)

Connector shall be mated and unmated 50 times. The mated connectors shall be tested in accordance with ECA/EIA 364-03. 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.

4.6.23 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.

4.6.24 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 five 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 degrees 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 degrees 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.

4.6.25 Gage Location and Retention (see 3.5.25)

Applicable test gages in accordance with MS3462, MS3434, or MS3435 shall be installed in three 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 17 as applicable. The axial load specified in Table 9 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. The displacement of the gage relative to the shell shall be measured under load after the load has been applied for 10 seconds minimum.

4.6.26 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 20 shall be applied perpendicular to the probe at the point of load application shown on Figure 31. 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 degrees) and the total displacement (splay) of the test probe tip shall be measured (see Figure 31).

TABLE 20 - PIN CONTACT STABILITY

Contact Size	Total Displacement	Load (ounces minimum)
23	0.025	4
20	0.030	8
16	0.048	16
12	0.062	16

4.6.27 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 30. A 3 pound load shall be applied to the cable. One 360 degree 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.

4.6.28 Interfacial Seal Compression (see 3.4.2.3)

Each measurement of compression displacement of the interfacial seal shall be obtained in the following manner.

- Pin contacts shall be installed and socket contacts shall not be installed in mating connectors under test.
- 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).
- The overall length from the rear of the plug shell to the rear of the receptacle shell shall be measured at two or more locations equally spaced about the connector diameter.
- The connectors shall be fully engaged by means of the coupling ring and the measurements repeated at the same locations as in step (c).
- 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.

4.7 Inspection of Packaging

The sampling and inspection of the preservation, packing, and container marking shall be in accordance with the requirements of MIL-DTL-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 Contacts

The unit package shall contain the normal complement, plus one spare contact, for connector 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 AS81511/15 (for series 1 and 2) or MS27488 (for series 3 and 4) (15% of the number of contacts, but not less than one) shall be included in the container with the contacts for connectors having grommets.

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.)

NOTICE

This document references a part which contains cadmium as a plating material. Consult local officials if you have questions concerning cadmium's use.

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 °C is experienced. Class F and W are intended for use in environmental applications where the operating temperature range of -65 to 175 °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 °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. Class W connectors are intended for use in environmental applications where corrosion protection is a concern.
- d. To provide adequate moisture seal, wire diameters larger than minimum specified in Tables 5A and 5B for the applicable contact size must be used.
- e. Where two or more wires are used in a wire barrel, moisture sealing is not obtainable.
- f. 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.

6.2 Acquisition Requirements

Acquisition documents must specify the following.

- a. Title, number, and date of this specification.
- b. 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 AS39029.

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 (Also see Qualified Products Database and QPL-SIS) 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 Naval Air Systems Command, AIR-4.4.5.3, 48298 Shaw Road, Bldg 1461, Patuxent River, MD 20670-1900.

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 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.

6.3.2 The qualifying activity is required to provide a summarized list of all qualified sources on a public accessible electronic site. The summary shall include but is not limited to the supplier approved part number and related specification part number, a dedicated approval reference number, a supplier location where purchases may be requested and the manufacturing location of the component. The suppliers and products qualified to this specification are available on the qualifying activity website (<http://www.navair.navy.mil/qpl/>).

Provisions Governing Qualification

Copies of "Provisions Governing Qualification" (SD-6) are available online at <http://quicksearch.dla.mil/>.

6.4 Maximum Recommended Working Voltage

The maximum recommended working voltage is shown in Table 22.

TABLE 22 - 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 Connector Weights

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

6.6 Insert Arrangements

Appendix A provides details of the insert arrangements and shell sizes.

- 6.7 A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

PREPARED BY SAE SUBCOMMITTEE AE-8C1, CONNECTORS OF
COMMITTEE AE-8, AEROSPACE ELECTRICAL/ELECTRONIC DISTRIBUTION SYSTEMS

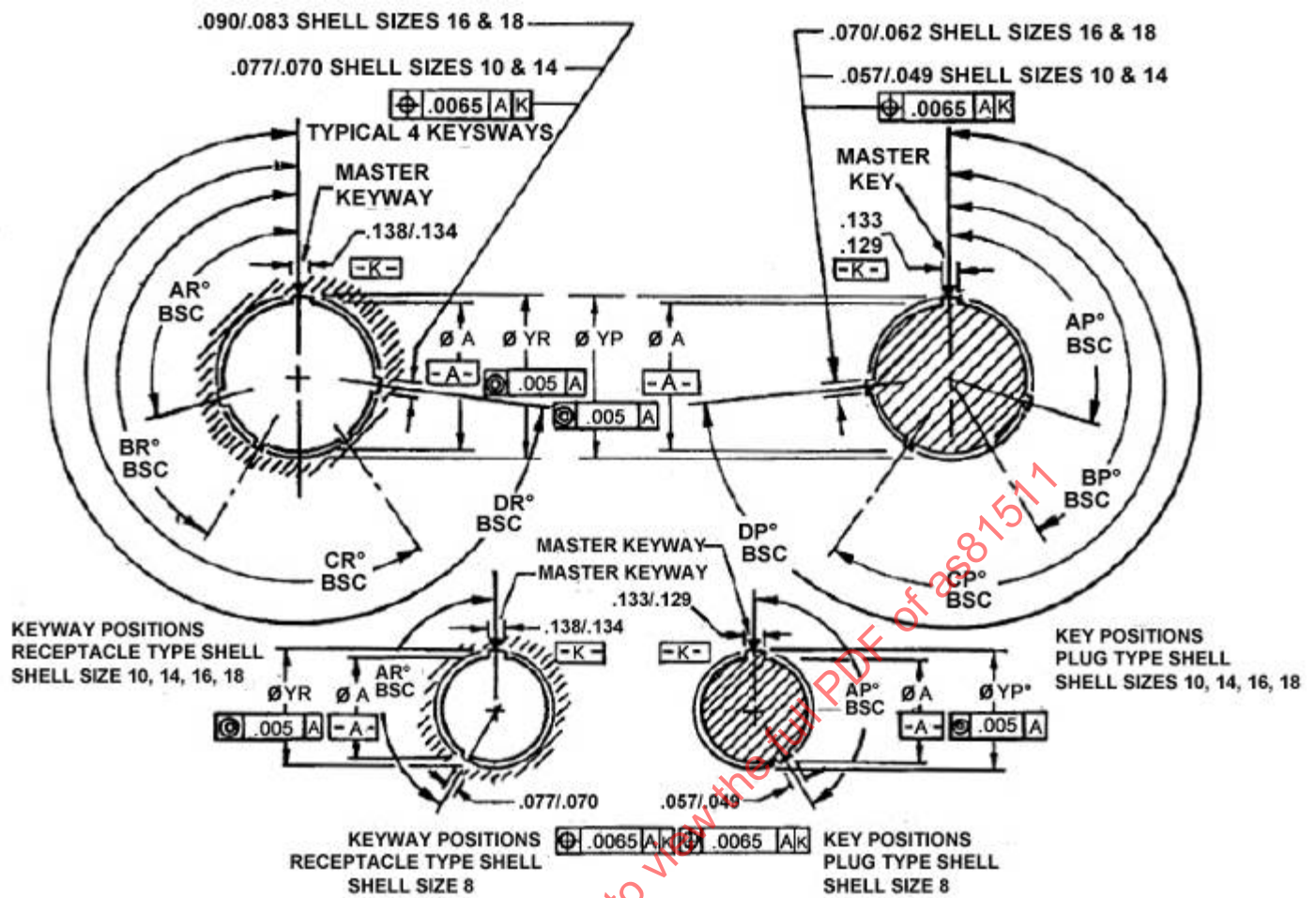


FIGURE 4 - CONNECTOR, ELECTRICAL, MATING POSITION KEY AND KEYWAYS (SERIES 2 AND 4)

TABLE 23 - FIGURE 4 DIMENSIONS

Shell Size	Key & Keyway Arrangement	AR° or AP° BSC	BR° or BP° BSC	CR° or CP° BSC	DR° or DP° BSC	YR Diameter	YP Diameter
8	1	128	N/A	N/A	N/A	0.462 (11.73) 0.450 (11.43)	0.440 (11.18) 0.432 (10.97)
	2	190	N/A	N/A	N/A		
	3	205	N/A	N/A	N/A		
	4	220	N/A	N/A	N/A		
	5	235	N/A	N/A	N/A		
	6	250	N/A	N/A	N/A		
10 AND 14	1	105	140	215	265	0.587 (14.91) 0.575 (14.61)	0.565 (14.35) 0.557 (14.15)
	2	102	132	248	320		
	3	80	118	230	312		
	4	35	140	205	275	0.837 (21.26) 0.825 (20.96)	0.815 (20.70) 0.807 (20.50)
	5	64	155	235	304		
	6	35	115	220	270		
16 AND 18	1	105	140	215	265	0.963 (24.46) 0.951 (24.16)	0.941 (23.90) 0.933 (23.70)
	2	18	149	192	259		
	3	92	152	222	342		
	4	84	152	204	334	1.087 (27.61) 1.075 (27.31)	1.065 (27.05) 1.057 (26.85)
	5	24	135	199	240		
	6	98	152	268	338		

TABLE 23A - FIGURE 4 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.005	0.13	0.057	1.45	0.077	1.96	0.129	3.28	0.138	3.51
0.008	0.20	0.062	1.57	0.083	2.11	0.133	3.38		
0.049	1.24	0.070	1.78	0.090	2.29	0.134	3.40		

Figure 4 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. For datum "A", refer to Figures 5 through 10.

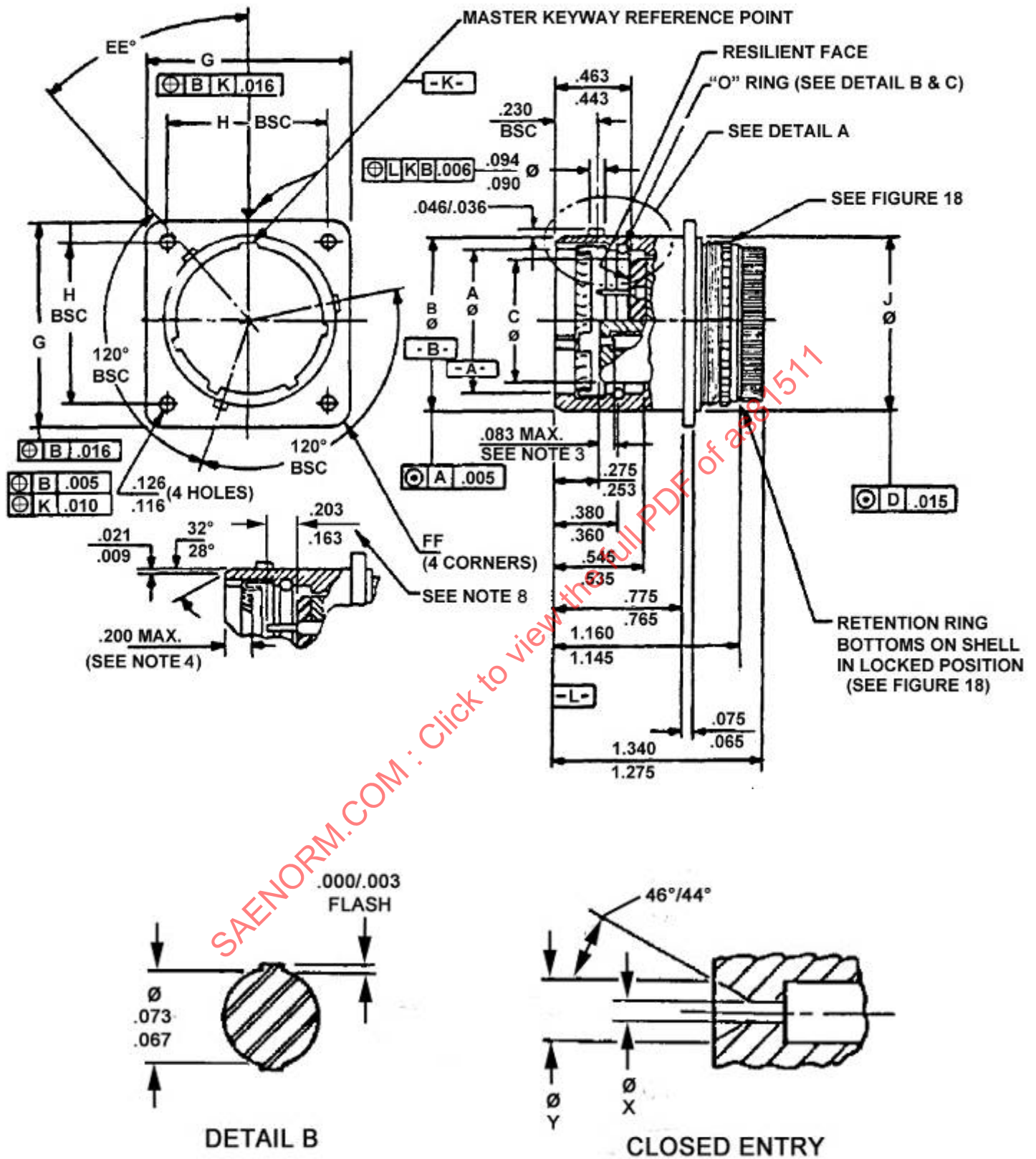


FIGURE 5 - CONNECTOR, RECEPTACLE, ELECTRICAL, FLANGE MOUNT (SERIES 2)

TABLE 24 - FIGURE 5 DIMENSIONS

Shell Size	A ø	B ø	C ø	G	H Basic	J ø	FF	EE° BSC					
								Position					
								1	2	3	4	5	6
8	0.3895 (9.89)	0.553 (14.05)	0.290 (7.37)	0.820 (20.83)	0.594 (15.09)	0.549 (13.94)	0.120 (3.05)	40	40	40	40	40	40
	0.3845 (9.77)	0.547 (13.89)	0.280 (7.11)	0.804 (20.42)		0.539 (13.69)	0.100 (2.54)						
10	0.5145 (13.07)	0.678 (17.22)	0.415 (10.54)	0.945 (24.00)	0.719 (18.26)	0.674 (17.12)	0.120 (3.05)	60	46	46	60	89	60
	0.5095 (12.94)	0.672 (17.07)	0.405 (10.29)	0.929 (23.60)		0.664 (16.87)	0.100 (2.54)						
14	0.7645 (19.42)	0.928 (23.57)	0.665 (16.89)	1.133 (28.78)	0.906 (23.01)	0.924 (23.47)	0.120 (3.05)	60	46	46	60	89	60
	0.7595 (19.29)	0.922 (23.42)	0.655 (16.64)	1.117 (28.37)		0.914 (23.22)	0.100 (2.54)						
16	0.8905 (22.62)	1.054 (26.77)	0.791 (20.09)	1.258 (31.95)	0.969 (24.61)	1.050 (26.67)	0.150 (3.81)	50	50	50	50	50	50
	0.8855 (22.49)	1.048 (26.62)	0.781 (19.84)	1.242 (31.55)		1.040 (26.42)	0.130 (3.30)						
18	1.0145 (25.77)	1.178 (29.92)	0.916 (23.27)	1.351 (34.32)	1.062 (26.97)	1.173 (29.79)	0.150 (3.81)	50	50	50	50	50	50
	1.0095 (25.64)	1.172 (29.77)	0.906 (23.01)	1.335 (33.91)		1.163 (29.54)	0.130 (3.30)						

TABLE 24A - FIGURE 5 DIMENSIONS (CLOSED ENTRY)

Contact Size	X Diameter	Y Diameter
23-22	0.035 (0.89)	0.075 (1.91)
	0.032 (0.81)	0.065 (1.65)
20-20	0.053 (1.35)	0.085 (2.16)
	0.050 (1.27)	0.080 (2.03)
16-16	0.077 (1.96)	0.108 (2.74)
	0.074 (1.88)	0.103 (2.62)
12-12	0.130 (3.30)	0.170 (4.32)
	0.126 (3.20)	0.166 (4.22)

TABLE 24B - FIGURE 5 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.003	0.08	0.021	0.53	0.083	2.11	0.163	4.14	0.290	7.37	0.765	19.43
0.005	0.13	0.040	1.02	0.089	2.26	0.169	4.29	0.360	9.14	0.775	19.69
0.006	0.15	0.046	1.17	0.090	2.29	0.200	5.08	0.380	9.65	1.145	29.08
0.009	0.23	0.065	1.65	0.094	2.39	0.203	5.16	0.443	11.25	1.160	29.46
0.010	0.25	0.067	1.70	0.116	2.95	0.230	5.84	0.463	11.76	1.275	32.39
0.015	0.38	0.073	1.85	0.126	3.20	0.253	6.43	0.535	13.59	1.340	34.04
0.016	0.41	0.075	1.91	0.157	3.99	0.275	6.99	0.545	13.84		

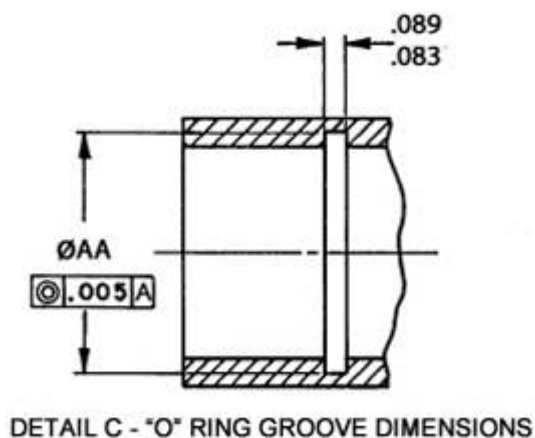


FIGURE 5A - CONNECTOR, RECEPTACLE, ELECTRICAL, FLANGE MOUNT (SERIES 2-DETAIL C)

TABLE 25 - FIGURE 5A DIMENSIONS

Size	AA Diameter
8	0.493 (12.52)
	0.488 (12.40)
10	0.618 (15.70)
	0.613 (15.57)
14	0.868 (22.05)
	0.863 (21.92)
16	0.994 (25.25)
	0.989 (25.12)
18	1.118 (28.40)
	1.113 (28.27)

Figure 5 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 4.
3. Distance from the face of the 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.
4. Distance from the front of the shell to the point at which a gage pin having the same basic diameter as the plug shell, engages the spring member.
5. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
6. All dimensions are for a connector with the contact retention system in the locked position.
7. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 18.
8. The dimension includes the contact slack.



TABLE 26 - FIGURE 6 DIMENSIONS

Shell Size	A ø	B ø	C ø	G	H Basic	J ø	FF	EE° BSC					
								Position					
								1	2	3	4	5	6
8	0.3895 (9.89)	0.553 (14.05)	0.290 (7.37)	0.820 (20.83)	0.594 (15.09)	0.549 (13.94)	0.120 (3.05)	40	40	40	40	40	40
	0.3845 (9.77)	0.547 (13.89)	0.280 (7.11)	0.804 (20.42)		0.539 (13.69)	0.100 (2.54)						
10	0.5145 (13.07)	0.678 (17.22)	0.415 (10.54)	0.945 (24.00)	0.719 (18.26)	0.674 (17.12)	0.120 (3.05)	60	46	46	60	89	60
	0.5095 (12.94)	0.672 (17.07)	0.405 (10.29)	0.929 (23.60)		0.664 (16.87)	0.100 (2.54)						
14	0.7645 (19.42)	0.928 (23.57)	0.665 (16.89)	1.133 (28.78)	0.906 (23.01)	0.924 (23.47)	0.120 (3.05)	60	46	46	60	89	60
	0.7595 (19.29)	0.922 (23.42)	0.655 (16.64)	1.117 (28.37)		0.914 (23.22)	0.100 (2.54)						
16	0.8905 (22.62)	1.054 (26.77)	0.791 (20.09)	1.258 (31.95)	0.969 (24.61)	1.050 (26.67)	0.150 (3.81)	50	50	50	50	50	50
	0.8855 (22.49)	1.048 (26.62)	0.781 (19.84)	1.242 (31.55)		1.040 (26.42)	0.130 (3.30)						
18	1.0145 (25.77)	1.178 (29.92)	0.916 (23.27)	1.351 (34.32)	1.062 (26.97)	1.173 (29.79)	0.150 (3.81)	50	50	50	50	50	50
	1.0095 (25.64)	1.172 (29.77)	0.906 (23.01)	1.335 (33.91)		1.163 (29.54)	0.130 (3.30)						

TABLE 26A - FIGURE 6 DIMENSIONS (CLOSED ENTRY/PIN FRONT)

Contact Size	X Diameter	Y Diameter	GG Diameter	HH Diameter	KK (max)
23-22	0.035 (0.89)	0.075 (1.91)	0.0280 (0.71)	0.068 (1.73)	0.083 (2.11)
	0.032 (0.81)	0.065 (1.65)	0.0300 (0.76)	0.062 (1.57)	
20-20	0.053 (1.35)	0.085 (2.16)	0.0415 (1.05)	0.083 (2.11)	0.090 (2.29)
	0.050 (1.27)	0.080 (2.03)	0.0445 (1.13)	0.077 (1.96)	
16-16	0.077 (1.96)	0.108 (2.74)	0.0950 (2.41)	0.106 (2.69)	0.105 (2.67)
	0.074 (1.88)	0.103 (2.62)	0.0990 (2.52)	0.100 (2.54)	
12-12	0.130 (3.30)	0.170 (4.32)	0.1540 (3.91)	0.169 (4.29)	0.105 (2.67)
	0.126 (3.20)	0.166 (4.22)	0.1580 (4.01)	0.163 (4.14)	

TABLE 26B - FIGURE 6 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.003	0.08	0.035	0.89	0.094	2.39	0.230	5.84	0.535	13.59
0.005	0.13	0.040	1.02	0.116	2.95	0.253	6.43	0.545	13.84
0.006	0.15	0.046	1.17	0.126	3.20	0.275	6.99	0.765	19.43
0.009	0.23	0.065	1.65	0.157	3.99	0.290	7.37	0.775	19.69
0.010	0.25	0.067	1.70	0.163	4.14	0.360	9.14	1.167	29.64
0.015	0.38	0.073	1.85	0.169	4.29	0.380	9.65	1.187	30.15
0.016	0.41	0.075	1.91	0.200	5.08	0.443	11.25		
0.020	0.51	0.083	2.11	0.203	5.16	0.463	11.76		
0.021	0.53	0.090	2.29						

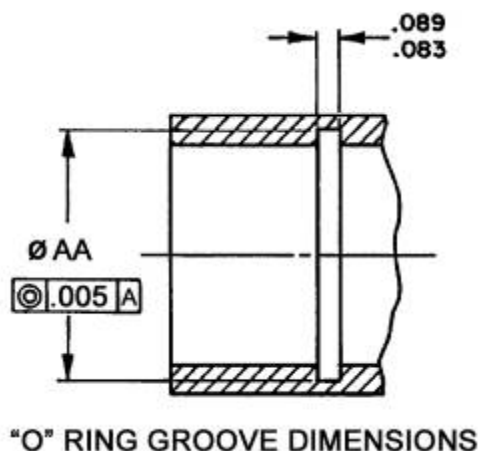


FIGURE 6A - CONNECTOR, RECEPTACLE, ELECTRICAL, FLANGE MOUNT
(SERIES 4 - O-RING GROOVE DIMENSIONS)

TABLE 27 - FIGURE 6A DIMENSIONS

Size	AA Diameter
8	0.493 (12.52)
	0.488 (12.40)
10	0.618 (15.70)
	0.613 (15.57)
14	0.868 (22.05)
	0.863 (21.92)
16	0.994 (25.25)
	0.989 (25.12)
18	1.118 (28.40)
	1.113 (28.27)

Figure 6 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 4.
3. Distance from the face of the 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.
4. Distance from the front of the shell to the point at which a gage pin having the same basic diameter as the plug shell, engages the spring member.
5. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 19.
6. The dimension includes the contact slack.
7. For insert arrangements containing size 12 contacts, the insert protrusion shall be 0.020/0.070.



FIGURE 7 - CONNECTOR, RECEPTACLE, JAM NUT MOUNT (SERIES 2)

TABLE 28 - FIGURE 7 DIMENSIONS

Shell Size	A ø	B ø	C ø	G Across Flats	K ø	L Across Flats	N Thread	Panel "O" Ring	EE° BSC					
									Position					
									1	2	3	4	5	6
8	0.3895 (9.89)	0.553 (14.05)	0.290 (7.37)	0.989 (25.12)	1.072 (27.23)	0.598 (15.19)	5/8-20UN-2A	AS3582-018	40	40	40	40	40	40
	0.3845 (9.77)	0.547 (13.89)	0.280 (7.11)	0.969 (24.61)	1.052 (26.72)	0.590 (14.99)								
10	0.5145 (13.07)	0.678 (17.22)	0.415 (10.54)	1.114 (28.30)	1.197 (30.40)	0.723 (18.36)	3/4-20UNEF-2A	AS3582-020	60	46	46	60	89	60
	0.5095 (12.94)	0.672 (17.07)	0.405 (10.29)	1.094 (27.79)	1.177 (29.90)	0.715 (18.16)								
14	0.7645 (19.42)	0.928 (23.57)	0.665 (16.89)	1.401 (35.59)	1.510 (38.35)	0.973 (24.71)	1-20UNEF-2A	AS3582-024	60	46	46	60	89	60
	0.7595 (19.29)	0.922 (23.42)	0.655 (16.64)	1.381 (35.08)	1.490 (37.85)	0.965 (24.51)								
16	0.8905 (22.62)	1.054 (26.77)	0.791 (20.09)	1.526 (38.76)	1.635 (41.53)	1.098 (27.89)	1-1/8-20UN-2A	AS3582-026	50	50	50	50	50	50
	0.8855 (22.49)	1.048 (26.62)	0.781 (19.84)	1.506 (38.25)	1.615 (41.02)	1.090 (27.69)								
18	1.0145 (25.77)	1.178 (29.92)	0.916 (23.27)	1.651 (41.94)	1.745 (44.32)	1.222 (31.04)	1-1/4-20UN-2A	AS3582-028	50	50	50	50	50	50
	1.0095 (25.64)	1.172 (29.77)	0.906 (23.01)	1.631 (41.43)	1.725 (43.82)	1.214 (30.84)								

TABLE 28A - FIGURE 7 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.003	0.08	0.040	1.02	0.157	3.99	0.290	7.37	0.545	13.84
0.005	0.13	0.046	1.17	0.163	4.14	0.360	9.14	0.770	19.56
0.006	0.15	0.062	1.57	0.169	4.29	0.380	9.65	0.778	19.76
0.009	0.23	0.067	1.70	0.200	5.08	0.443	11.25	1.145	29.08
0.010	0.25	0.073	1.85	0.203	5.16	0.463	11.76	1.160	29.46
0.015	0.38	0.083	2.11	0.230	5.84	0.482	12.24	1.275	32.39
0.020	0.51	0.090	2.29	0.253	6.43	0.502	12.75	1.340	34.04
0.021	0.53	0.094	2.39	0.275	6.99	0.535	13.59		

TABLE 28B - FIGURE 7 DIMENSIONS (CLOSED ENTRY)

Contact Size	X Diameter	Y Diameter
23-22	0.035 (0.89)	0.075 (1.91)
	0.032 (0.81)	0.065 (1.65)
20-20	0.053 (1.35)	0.085 (2.16)
	0.050 (1.27)	0.080 (2.03)
16-16	0.077 (1.96)	0.108 (2.74)
	0.074 (1.88)	0.103 (2.62)
12-12	0.130 (3.30)	0.170 (4.32)
	0.126 (3.20)	0.166 (4.22)

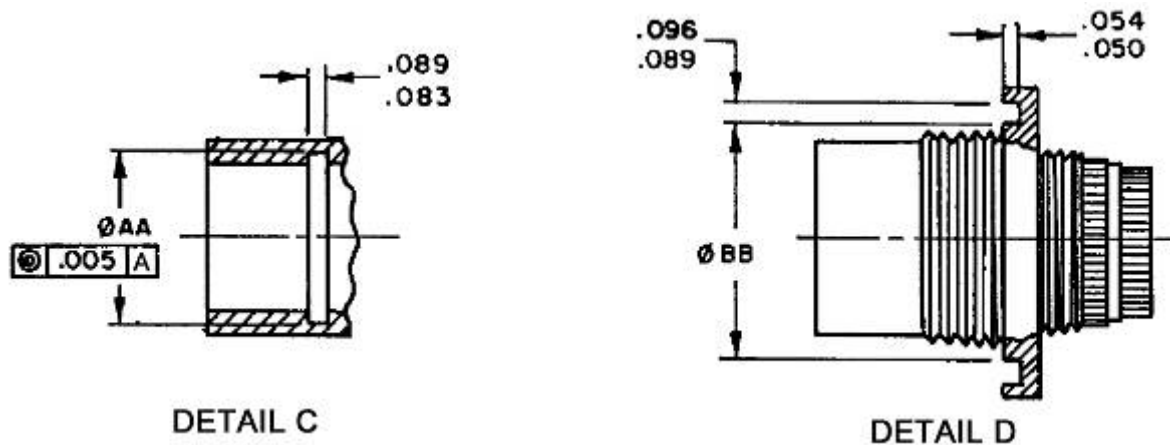


FIGURE 7A - CONNECTOR, RECEPTACLE, JAM NUT MOUNT (SERIES 2 - DETAIL C AND D)

TABLE 29 - FIGURE 7A DIMENSIONS

Size	AA Diameter	BB Diameter
8	0.493 (12.52)	0.724 (18.39)
	0.488 (12.40)	0.713 (18.11)
10	0.618 (15.70)	0.849 (21.56)
	0.613 (15.57)	0.838 (21.29)
14	0.868 (22.05)	1.099 (27.91)
	0.863 (21.92)	1.088 (27.64)
16	0.994 (25.25)	1.221 (31.01)
	0.989 (25.12)	1.210 (30.73)
18	1.118 (28.40)	1.356 (34.44)
	1.113 (28.27)	1.345 (34.16)

Figure 7 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 4.
3. Distance from the face of the 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.
4. Distance from the front of the shell to the point at which a gage pin having the same basic diameter as the plug shell, engages the spring member.
5. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
6. All dimensions are for a connector with the contact retention system in the locked position.
7. The slotted nut shall conform to AS81511/20.
8. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 18.
9. The dimension includes the contact slack.



TABLE 30 - FIGURE 8 DIMENSIONS

Shell Size	A ø	B ø	C ø	G Across Flats	K ø	L Across Flats	N Thread	Panel "O" Ring	EE° BSC					
									Position					
									1	2	3	4	5	6
8	0.3895 (9.89)	0.553 (14.05)	0.290 (7.37)	0.989 (25.12)	1.072 (27.23)	0.598 (15.19)	5/8-20UN-2A	AS3582-018	40	40	40	40	40	40
	0.3845 (9.77)	0.547 (13.89)	0.280 (7.11)	0.969 (24.61)	1.052 (26.72)	0.590 (14.99)								
10	0.5145 (13.07)	0.678 (17.22)	0.415 (10.54)	1.114 (28.30)	1.197 (30.40)	0.723 (18.36)	3/4-20UNEF-2A	AS3582-020	60	46	46	60	89	60
	0.5095 (12.94)	0.672 (17.07)	0.405 (10.29)	1.094 (27.79)	1.177 (29.90)	0.715 (18.16)								
14	0.7645 (19.42)	0.928 (23.57)	0.665 (16.89)	1.401 (35.59)	1.510 (38.35)	0.973 (24.71)	1-20UNEF-2A	AS3582-024	60	46	46	60	89	60
	0.7595 (19.29)	0.922 (23.42)	0.655 (16.64)	1.381 (35.08)	1.490 (37.85)	0.965 (24.51)								
16	0.8905 (22.62)	1.054 (26.77)	0.791 (20.09)	1.526 (38.76)	1.635 (41.53)	1.098 (27.89)	1-1/8-20UN-2A	AS3582-026	50	50	50	50	50	50
	0.8855 (22.49)	1.048 (26.62)	0.781 (19.84)	1.506 (38.25)	1.615 (41.02)	1.090 (27.69)								
18	1.0145 (25.77)	1.178 (29.92)	0.916 (23.27)	1.651 (41.94)	1.745 (44.32)	1.222 (31.04)	1-1/4-20UN-2A	AS3582-028	50	50	50	50	50	50
	1.0095 (25.64)	1.172 (29.77)	0.906 (23.01)	1.631 (41.43)	1.725 (43.82)	1.214 (30.84)								

TABLE 30A - FIGURE 8 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.003	0.08	0.035	0.89	0.094	2.39	0.275	6.99	0.535	13.59
0.005	0.13	0.040	1.02	0.157	3.99	0.290	7.37	0.545	13.84
0.006	0.15	0.046	1.17	0.163	4.14	0.360	9.14	0.770	19.56
0.009	0.23	0.062	1.57	0.169	4.29	0.380	9.65	0.778	19.76
0.010	0.25	0.067	1.70	0.200	5.08	0.443	11.25	1.167	29.64
0.015	0.38	0.073	1.85	0.203	5.16	0.463	11.76	1.187	30.15
0.020	0.51	0.083	2.11	0.230	5.84	0.482	12.24		
0.021	0.53	0.090	2.29	0.253	6.43	0.502	12.75		

TABLE 30B - FIGURE 8 DIMENSIONS (O-RING GROOVE AND VIEW A DIMENSIONS)

Size	AA Diameter	BB Diameter
8	0.493 (12.52)	0.724 (18.39)
	0.488 (12.40)	0.713 (18.11)
10	0.618 (15.70)	0.849 (21.56)
	0.613 (15.57)	0.838 (21.29)
14	0.868 (22.05)	1.099 (27.91)
	0.863 (21.92)	1.088 (27.64)
16	0.994 (25.25)	1.221 (31.01)
	0.989 (25.12)	1.210 (30.73)
18	1.118 (28.40)	1.356 (34.44)
	1.113 (28.27)	1.345 (34.16)

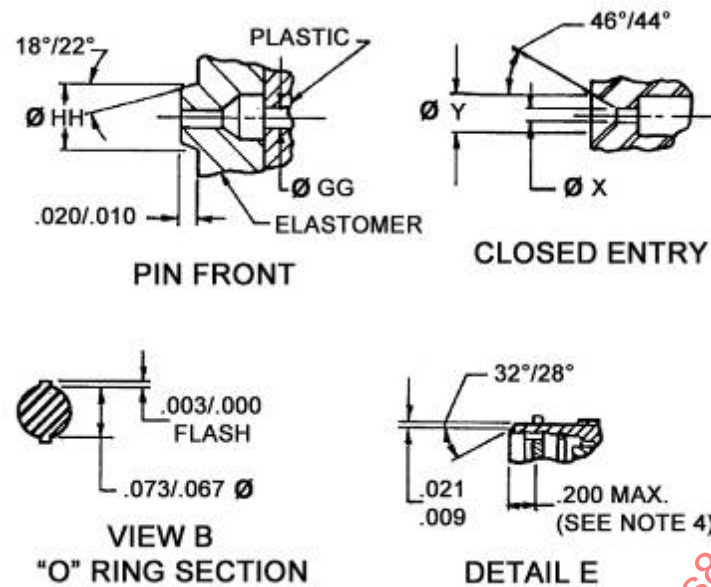


FIGURE 8A - CONNECTOR, RECEPTACLE, JAM NUT MOUNT (SERIES 4 - CONTINUED)

TABLE 31 - FIGURE 8A DIMENSIONS

Contact Size	X Diameter	Y Diameter	GG Diameter	HH Diameter	KK (max)
23-22	0.035 (0.89)	0.075 (1.91)	0.0280 (0.71)	0.068 (1.73)	0.083 (2.11)
	0.032 (0.81)	0.065 (1.65)	0.0300 (0.76)	0.062 (1.57)	
20-20	0.053 (1.35)	0.085 (2.16)	0.0415 (1.05)	0.083 (2.11)	0.090 (2.29)
	0.050 (1.27)	0.080 (2.03)	0.0445 (1.13)	0.077 (1.96)	
16-16	0.077 (1.96)	0.108 (2.74)	0.0950 (2.41)	0.106 (2.69)	0.105 (2.67)
	0.074 (1.88)	0.103 (2.62)	0.0990 (2.52)	0.100 (2.54)	
12-12	0.130 (3.30)	0.170 (4.32)	0.1540 (3.91)	0.169 (4.29)	0.105 (2.67)
	0.126 (3.20)	0.166 (4.22)	0.1580 (4.01)	0.163 (4.14)	

Figure 8 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 4.
3. Distance from the face of the 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.
4. Distance from the front of the shell to the point at which a gage pin having the same basic diameter as the plug shell, engages the spring member.
5. The slotted nut shall conform to AS81511/20.
6. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 19.
7. The dimension includes the contact slack.
8. For insert arrangements containing size 12 contacts, the insert protrusion shall be 0.020/0.070.



TABLE 32 - FIGURE 9 DIMENSIONS

Shell Size	A ø	B ø	C ø	K ø	CC ø	JJ ø
8	0.3815	0.566	0.290	0.850	0.301	0.3815
	(9.69)	(14.38)	(7.37)	(21.59)	(7.65)	(9.69)
	0.3755	0.558	0.280	0.830	0.293	0.3730
10	(9.54)	(14.17)	(7.11)	(21.08)	(7.45)	(9.47)
	0.5065	0.691	0.415	0.975	0.426	0.5065
	(12.87)	(17.55)	(10.54)	(24.77)	(10.82)	(12.87)
14	0.5005	0.683	0.405	0.955	0.418	0.4980
	(12.71)	(17.35)	(10.29)	(24.26)	(10.62)	(12.65)
	0.7565	0.941	0.665	1.255	0.676	0.7565
16	(19.22)	(23.90)	(16.89)	(31.12)	(17.17)	(19.22)
	0.7505	0.933	0.655	1.205	0.668	0.7460
	(19.06)	(23.70)	(16.64)	(30.61)	(16.97)	(18.95)
18	0.8825	1.068	0.791	1.350	0.802	0.8825
	(22.42)	(27.13)	(20.09)	(34.29)	(20.37)	(22.42)
	0.8765	1.060	0.781	1.330	0.794	0.8720
18	(22.26)	(26.92)	(19.84)	(33.78)	(20.17)	(22.15)
	1.0065	1.191	0.916	1.475	0.927	1.0065
	(25.57)	(30.25)	(23.27)	(37.41)	(23.55)	(25.57)
18	1.0005	1.183	0.906	1.455	0.919	0.9960
	(25.41)	(30.05)	(23.01)	(36.96)	(23.35)	(25.30)

TABLE 32A - FIGURE 9 DIMENSIONS (CLOSED ENTRY AND DETAIL A)

Contact Size	X Diameter	Y Diameter
23-22	0.035 (0.89)	0.075 (1.91)
	0.032 (0.81)	0.065 (1.65)
20-20	0.053 (1.35)	0.085 (2.16)
	0.050 (1.27)	0.080 (2.03)
16-16	0.077 (1.96)	0.108 (2.74)
	0.074 (1.88)	0.103 (2.62)
12-12	0.130 (3.30)	0.170 (4.32)
	0.126 (3.20)	0.166 (4.22)

TABLE 32B - FIGURE 9 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.005	0.13	0.036	0.91	0.163	4.14	0.240	6.10	0.540	13.72
0.006	0.15	0.047	1.19	0.169	4.29	0.260	6.60	0.905	22.99
0.008	0.20	0.083	2.11	0.203	5.16	0.270	6.86	0.920	23.37
0.012	0.30	0.094	2.39	0.206	5.23	0.275	6.99	1.035	26.29
0.015	0.38	0.100	2.54	0.211	5.36	0.290	7.37	1.100	27.94
0.018	0.46	0.112	2.84	0.215	5.46	0.464	11.79		
0.022	0.56	0.125	3.18	0.220	5.59	0.474	12.04		
0.028	0.71	0.157	3.99	0.235	5.97	0.530	13.46		

Figure 9 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 4.
3. Distance from the front of the 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.
4. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
5. All dimensions are for a connector with the contact retention system in the locked position.
6. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 18.



TABLE 33 - FIGURE 10 DIMENSIONS

Shell Size	A ø	B ø	C ø	K ø	CC ø	JJ ø
8	0.3815 (9.69)	0.566 (14.38)	0.290 (7.37)	0.850 (21.59)	0.301 (7.65)	0.3815 (9.69)
	0.3755 (9.54)	0.558 (14.17)	0.280 (7.11)	0.830 (21.08)	0.293 (7.45)	0.3730 (9.47)
10	0.5065 (12.87)	0.691 (17.55)	0.415 (10.54)	0.975 (24.77)	0.426 (10.82)	0.5065 (12.87)
	0.5005 (12.71)	0.683 (17.35)	0.405 (10.29)	0.955 (24.26)	0.418 (10.62)	0.4980 (12.65)
14	0.7565 (19.22)	0.941 (23.90)	0.665 (16.89)	1.255 (31.12)	0.676 (17.17)	0.7565 (19.22)
	0.7505 (19.06)	0.933 (23.70)	0.655 (16.64)	1.205 (30.61)	0.668 (16.97)	0.7460 (18.95)
16	0.8825 (22.42)	1.068 (27.13)	0.791 (20.09)	1.350 (34.29)	0.802 (20.37)	0.8825 (22.42)
	0.8765 (22.26)	1.060 (26.92)	0.781 (19.84)	1.330 (33.78)	0.794 (20.17)	0.8720 (22.15)
18	1.0065 (25.57)	1.191 (30.25)	0.916 (23.27)	1.475 (37.41)	0.927 (23.55)	1.0065 (25.57)
	1.0005 (25.41)	1.183 (30.05)	0.906 (23.01)	1.455 (36.96)	0.919 (23.35)	0.9960 (25.30)

TABLE 33A - FIGURE 10 DIMENSIONS (PIN FRONT AND DETAIL B)

Contact Size	X Diameter	Y Diameter	GG Diameter	HH Diameter	KK (max)
23-22	0.035 (0.89)	0.075 (1.91)	0.0280 (0.71)	0.068 (1.73)	0.083 (2.11)
	0.032 (0.81)	0.065 (1.65)	0.0300 (0.76)	0.062 (1.57)	
20-20	0.053 (1.35)	0.085 (2.16)	0.0415 (1.05)	0.083 (2.11)	0.090 (2.29)
	0.050 (1.27)	0.080 (2.03)	0.0445 (1.13)	0.077 (1.96)	
16-16	0.077 (1.96)	0.108 (2.74)	0.0950 (2.41)	0.106 (2.69)	0.105 (2.67)
	0.074 (1.88)	0.103 (2.62)	0.0990 (2.52)	0.100 (2.54)	
12-12	0.130 (3.30)	0.170 (4.32)	0.1540 (3.91)	0.169 (4.29)	0.105 (2.67)
	0.126 (3.20)	0.166 (4.22)	0.1580 (4.01)	0.163 (4.14)	

TABLE 33B - FIGURE 10 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.005	0.13	0.035	0.89	0.157	3.99	0.235	5.97	0.530	13.46
0.006	0.15	0.036	0.91	0.163	4.14	0.240	6.10	0.540	13.72
0.008	0.20	0.047	1.19	0.169	4.29	0.260	6.60	0.927	23.55
0.012	0.30	0.083	2.11	0.203	5.16	0.270	6.86	0.947	34.05
0.015	0.38	0.094	2.39	0.206	5.23	0.275	6.99		
0.018	0.46	0.100	2.54	0.211	5.36	0.290	7.37		
0.022	0.56	0.112	2.84	0.215	5.46	0.464	11.79		
0.028	0.71	0.125	3.18	0.220	5.59	0.474	12.04		

Figure 10 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 4.
3. Distance from the front of the 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.
4. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 19.
5. For insert arrangements containing size 12 contacts, the insert protrusion shall be 0.020/0.070.

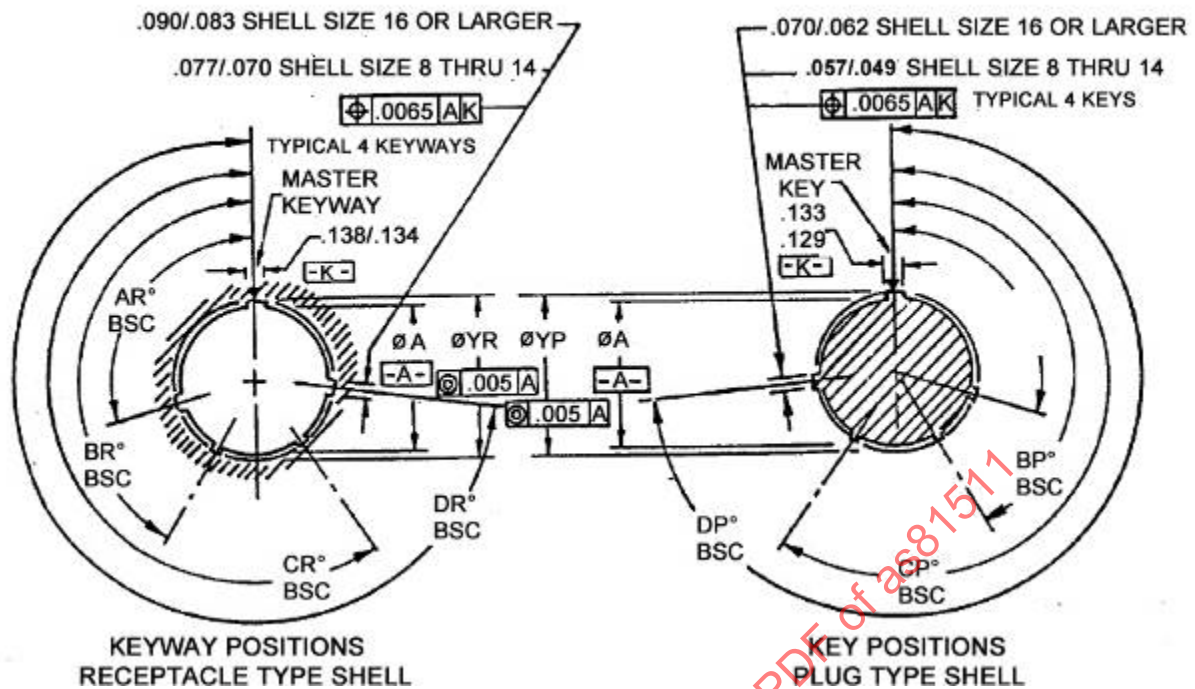


FIGURE 11 - CONNECTOR, ELECTRICAL, MATING POSITION KEY AND KEYWAYS, (SERIES 1 & 3)

TABLE 34 - FIGURE 11 DIMENSIONS

Shell size	Key & Keyway Arrangement	AR° or AP° BSC	BR° or BP° BSC	CR° or CP° BSC	DR° or DP° BSC	YR Diameter	YP Diameter
8	1	105	140	215	265	0.482 (12.24) 0.470 (11.94)	0.460 (11.68) 0.452 (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	0.607 (15.42) 0.595 (15.11)	0.585 (14.86) 0.577 (14.66)
	2	113	156	182	292		
	3	90	145	195	252	0.857 (21.77) 0.845 (21.46)	0.835 (21.21) 0.827 (21.01)
	4	53	156	220	255		
	5	119	146	176	298		
	6	51	141	184	242		
16 AND 18	1	80	142	196	293	0.983 (24.97) 0.971 (24.66)	0.961 (24.41) 0.953 (24.21)
	2	135	170	200	310		
	3	49	169	200	244	1.107 (27.61) 1.095 (27.81)	1.085 (27.56) 1.077 (27.36)
	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)	1.210 (30.73) 1.202 (30.53)
	2	135	170	200	310		
	3	49	169	200	244	1.357 (34.47) 1.345 (34.16)	1.335 (33.91) 1.327 (33.71)
	4	66	140	200	257		
	5	62	145	180	280		
	6	79	153	197	272		

TABLE 34A - FIGURE 11 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.005	0.13	0.057	1.45	0.077	1.96	0.129	3.28	0.138	3.51
0.008	0.20	0.062	1.57	0.083	2.11	0.133	3.38		
0.049	1.24	0.070	1.78	0.090	2.29	0.134	3.40		

Figure 11 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. For datum "A", refer to Figures 12 through 17.

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TABLE 35 - FIGURE 12 DIMENSIONS

Shell Size	A ø	B ø	C ø	G	H Basic	J ø	FF Radius	JJ ø	M	MM	EE° BSC					
											Position					
											1	2	3	4	5	6
8	0.4095 (10.40)	0.553 (14.05)	0.290 (7.37)	0.820 (20.83)	0.594 (15.09)	0.549 (13.94)	0.120 (3.05)	0.3895 (9.89)	1.291 (32.79)	1.471 (37.36)	60	46	43	60	89	43
	0.4045 (10.27)	0.547 (13.89)	0.280 (7.11)	0.804 (24.61)		0.539 (13.69)	0.100 (2.54)	0.3845 (9.77)	1.276 (32.41)	1.406 (35.71)						
	0.5345 (13.58)	0.678 (17.22)	0.415 (10.54)	0.945 (24.00)		0.674 (17.12)	0.120 (3.05)	0.5145 (13.07)	1.291 (32.79)	1.471 (37.36)						
10	0.5295 (13.45)	0.672 (17.07)	0.405 (10.29)	0.929 (23.60)	0.719 (18.26)	0.664 (16.87)	0.100 (2.54)	0.5095 (12.94)	1.276 (32.41)	1.406 (35.71)	53	87	51	77	87	87
	0.7845 (19.93)	0.928 (23.57)	0.665 (16.89)	1.133 (28.78)		0.924 (23.47)	0.120 (3.05)	0.7645 (19.42)	1.291 (32.79)	1.471 (37.36)						
	0.7795 (19.80)	0.922 (23.42)	0.655 (16.64)	1.117 (28.37)		0.914 (23.22)	0.100 (2.54)	0.7595 (19.29)	1.276 (32.41)	1.406 (35.71)						
14	0.9105 (23.13)	1.054 (26.77)	0.791 (20.09)	1.258 (31.95)	0.969 (24.61)	1.050 (26.67)	0.150 (3.81)	0.8905 (22.62)	1.291 (32.79)	1.471 (37.36)	98	98	98	98	98	98
	0.9055 (23.00)	1.048 (26.62)	0.781 (19.84)	1.242 (31.55)		1.040 (26.42)	0.130 (3.30)	0.8855 (22.49)	1.276 (32.41)	1.406 (35.71)						
	1.0345 (26.28)	1.178 (29.92)	0.916 (23.27)	1.351 (34.22)		1.173 (29.79)	0.150 (3.81)	1.0145 (25.77)	1.291 (32.79)	1.471 (37.36)						
16	1.0295 (26.15)	1.172 (29.77)	0.906 (23.01)	1.335 (33.91)	1.062 (26.97)	1.163 (29.54)	0.130 (3.30)	1.0095 (25.64)	1.276 (32.41)	1.406 (35.71)	98	98	98	98	98	98
	1.1595 (29.45)	1.303 (33.10)	1.041 (26.44)	1.475 (37.47)		1.298 (32.97)	0.150 (3.81)	1.1395 (28.94)	1.371 (34.82)	1.551 (39.40)						
	1.1545 (29.32)	1.297 (32.94)	1.031 (26.19)	1.459 (37.06)		1.288 (32.72)	0.130 (3.30)	1.1345 (28.82)	1.356 (34.44)	1.486 (37.74)						
18	1.2835 (32.60)	1.428 (36.27)	1.166 (29.62)	1.570 (39.88)	1.250 (31.75)	1.423 (36.14)	0.150 (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)	0.130 (3.30)	1.2595 (31.99)	1.356 (34.44)	1.486 (37.74)						
	1.4095 (35.80)	1.553 (39.45)	1.291 (32.79)	1.711 (43.46)		1.548 (39.32)	0.150 (3.81)	1.3895 (35.29)	1.371 (34.82)	1.551 (39.40)						
20	1.4045 (35.67)	1.547 (32.54)	1.281 (32.54)	1.695 (43.05)	1.375 (34.92)	1.538 (39.07)	0.130 (3.30)	1.3845 (35.17)	1.356 (34.44)	1.486 (37.74)	98	98	98	98	98	98

TABLE 35A - FIGURE 12 DIMENSIONS (CLOSED ENTRY)

Contact Size	X Diameter	Y Diameter
23-22	0.035 (0.89)	0.075 (1.91)
	0.032 (0.81)	0.065 (1.65)
20-20	0.053 (1.35)	0.085 (2.16)
	0.050 (1.27)	0.080 (2.03)
16-16	0.077 (1.96)	0.108 (2.74)
	0.074 (1.88)	0.103 (2.62)
12-12	0.130 (3.30)	0.170 (4.32)
	0.126 (3.20)	0.166 (4.22)

TABLE 35B - FIGURE 12 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.003	0.08	0.040	1.02	0.090	2.29	0.275	6.99	0.678	17.22
0.004	0.10	0.046	1.17	0.094	2.39	0.290	7.37	0.894	22.71
0.005	0.13	0.052	1.32	0.116	2.95	0.450	11.43	0.906	23.01
0.006	0.15	0.065	1.65	0.126	3.20	0.460	11.68	1.276	32.41
0.009	0.23	0.067	1.70	0.157	3.99	0.524	13.31	1.291	32.79
0.010	0.25	0.073	1.85	0.163	4.14	0.544	13.82	1.406	35.71
0.015	0.38	0.074	1.88	0.169	4.29	0.574	14.58	1.471	37.36
0.016	0.41	0.075	1.91	0.203	5.16	0.594	15.09		
0.021	0.53	0.083	2.11	0.230	5.84	0.668	16.97		

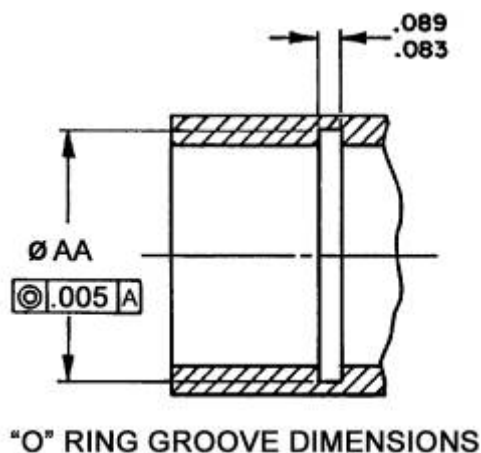


FIGURE 12B - CONNECTOR, RECEPTACLE, ELECTRICAL, FLANGE MOUNT (SERIES 1 - CONTINUED)

TABLE 36 - FIGURE 12B DIMENSIONS ("O" RING GROOVE)

Size	AA Diameter
8	0.493 (12.52)
	0.488 (12.40)
10	0.618 (15.70)
	0.613 (15.57)
14	0.868 (22.05)
	0.863 (21.92)
16	0.994 (25.25)
	0.989 (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)

Figure 12 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 11.
3. Distance from the face of the 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.
4. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
5. All dimensions are for a connector with the contact retention system in the locked position.
6. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 18.
7. The dimension includes the contact slack.

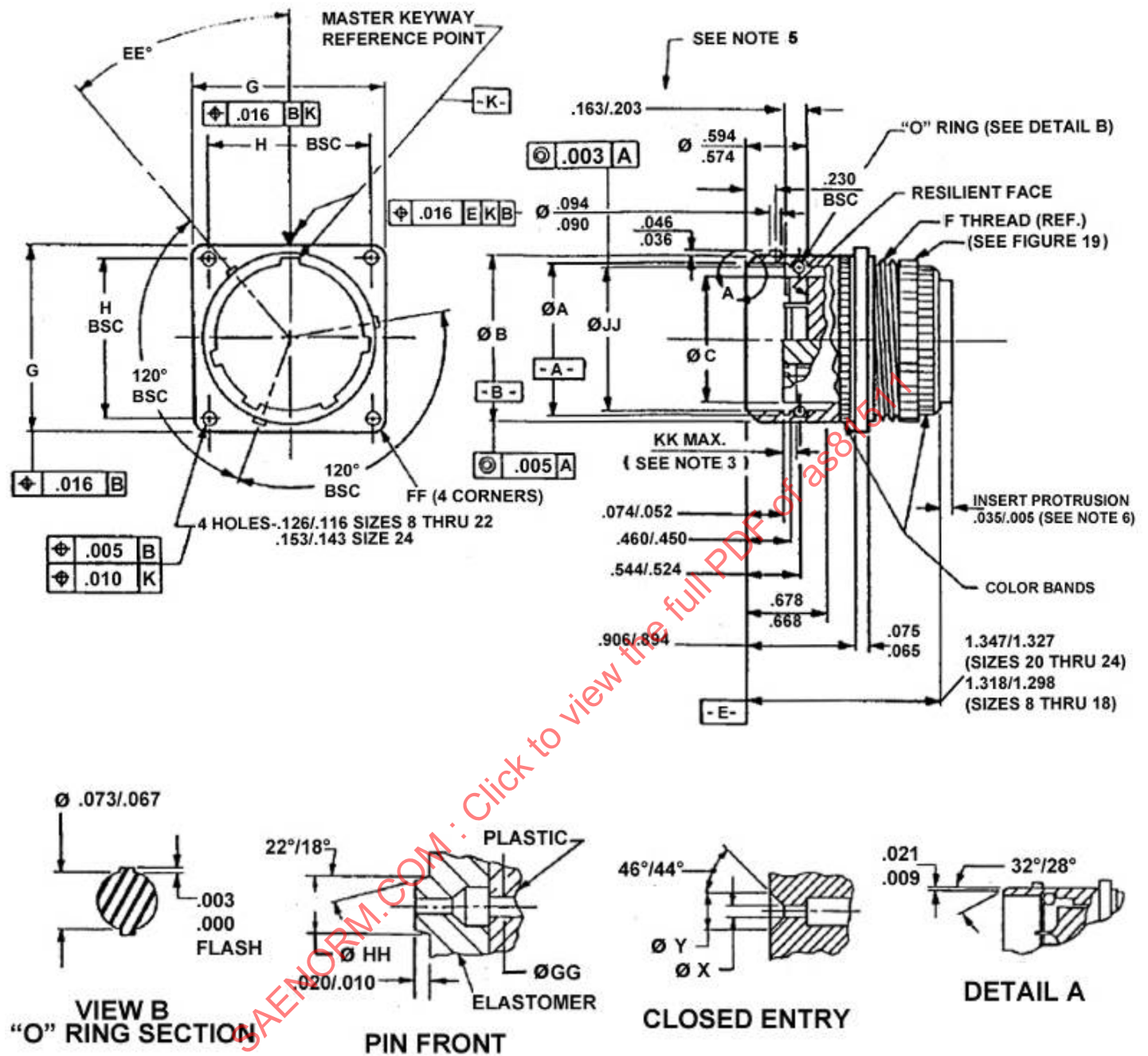


FIGURE 13 - CONNECTOR, RECEPTACLE, ELECTRICAL, FLANGE MOUNT (SERIES 3)

TABLE 37 - FIGURE 13 DIMENSIONS

Shell Size	A ø	B ø	C ø	G	H Basic	J ø	FF Radius	JJ ø	EE° BSC					
									Position					
									1	2	3	4	5	6
8	0.4095 (10.40)	0.553 (14.05)	0.290 (7.37)	0.820 (20.83)	0.594 (15.09)	0.549 (13.94)	0.120 (3.05)	0.3895 (9.89)	60	46	43	60	89	43
	0.4045 (10.27)	0.547 (13.89)	0.280 (7.11)	0.804 (24.61)		0.539 (13.69)	0.100 (2.54)	0.3845 (9.77)						
10	0.5345 (13.58)	0.678 (17.22)	0.415 (10.54)	0.945 (24.00)	0.719 (18.26)	0.674 (17.12)	0.120 (3.05)	0.5145 (13.07)	53	87	51	77	87	87
	0.5295 (13.45)	0.672 (17.07)	0.405 (10.29)	0.929 (23.60)		0.664 (16.87)	0.100 (2.54)	0.5095 (12.94)						
14	0.7845 (19.93)	0.928 (23.57)	0.665 (16.89)	1.133 (28.78)	0.906 (23.01)	0.924 (23.47)	0.120 (3.05)	0.7645 (19.42)	53	87	51	77	87	87
	0.7795 (19.80)	0.922 (23.42)	0.655 (16.64)	1.117 (28.37)		0.914 (23.22)	0.100 (2.54)	0.7595 (19.29)						
16	0.9105 (23.13)	1.054 (26.77)	0.791 (20.09)	1.258 (31.95)	0.969 (24.61)	1.050 (26.67)	0.150 (3.81)	0.8905 (22.62)	98	98	98	98	98	98
	0.9055 (23.00)	1.048 (26.62)	0.781 (19.84)	1.242 (31.55)		1.040 (26.42)	0.130 (3.30)	0.8855 (22.49)						
18	1.0345 (26.28)	1.178 (29.92)	0.916 (23.27)	1.351 (34.22)	1.062 (26.97)	1.173 (29.79)	0.150 (3.81)	1.0145 (25.77)	98	98	98	98	98	98
	1.0295 (26.15)	1.172 (29.77)	0.906 (23.01)	1.335 (33.91)		1.163 (29.54)	0.130 (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)	0.160 (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)	0.130 (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)	0.160 (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)	0.130 (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)	0.160 (4.06)	1.3895 (35.29)	98	98	98	98	98	98
	1.4045 (35.67)	1.547 (39.45)	1.281 (32.54)	1.695 (43.05)		1.538 (39.07)	0.130 (3.30)	1.3845 (35.17)						

TABLE 37A - FIGURE 13 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.003	0.08	0.035	0.89	0.090	2.29	0.275	6.99	0.894	22.71
0.004	0.10	0.040	1.02	0.094	2.39	0.290	7.37	0.906	23.01
0.005	0.13	0.046	1.17	0.100	2.54	0.450	11.43	1.298	32.97
0.006	0.15	0.052	1.32	0.116	2.95	0.460	11.68	1.318	33.48
0.009	0.23	0.065	1.65	0.126	3.20	0.524	13.31	1.327	33.71
0.010	0.25	0.067	1.70	0.143	3.63	0.544	13.82	1.347	34.21
0.015	0.38	0.073	1.85	0.153	3.89	0.574	14.58		
0.016	0.41	0.074	1.88	0.163	4.14	0.594	15.09		
0.020	0.51	0.075	1.91	0.203	5.16	0.668	16.97		
0.021	0.53	0.083	2.11	0.230	5.84	0.678	17.22		

TABLE 37B - FIGURE 13 DIMENSIONS (PIN FRONT/CLOSED ENTRY)

Contact Size	X Diameter	Y Diameter	GG Diameter	HH Diameter	KK (max)
23-22	0.035 (0.89)	0.075 (1.91)	0.0280 (0.71)	0.068 (1.73)	0.083 (2.11)
	0.032 (0.81)	0.065 (1.65)	0.0300 (0.76)	0.062 (1.57)	
20-20	0.053 (1.35)	0.085 (2.16)	0.0415 (1.05)	0.083 (2.11)	0.090 (2.29)
	0.050 (1.27)	0.080 (2.03)	0.0445 (1.13)	0.077 (1.96)	
16-16	0.077 (1.96)	0.108 (2.74)	0.0950 (2.41)	0.106 (2.69)	0.105 (2.67)
	0.074 (1.88)	0.103 (2.62)	0.0990 (2.52)	0.100 (2.54)	
12-12	0.130 (3.30)	0.170 (4.32)	0.1540 (3.91)	0.169 (4.29)	0.105 (2.67)
	0.126 (3.20)	0.166 (4.22)	0.1580 (4.01)	0.163 (4.14)	

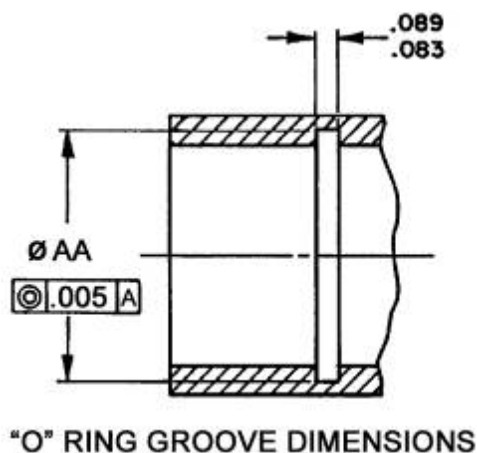


FIGURE 13A - CONNECTOR, RECEPTACLE, ELECTRICAL, FLANGE MOUNT (SERIES 3) - "O" RING GROOVE

TABLE 38 - FIGURE 13A DIMENSIONS

Size	AA Diameter
8	0.493 (12.52)
	0.488 (12.40)
10	0.618 (15.70)
	0.613 (15.57)
14	0.868 (22.05)
	0.863 (21.92)
16	0.994 (25.25)
	0.989 (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)

Figure 13 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 11.
3. Distance from the face of the 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.
4. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 19.
5. The dimension includes the contact slack.
6. For arrangements containing size 12 contacts, the insert protrusion shall be 0.020/0.070.

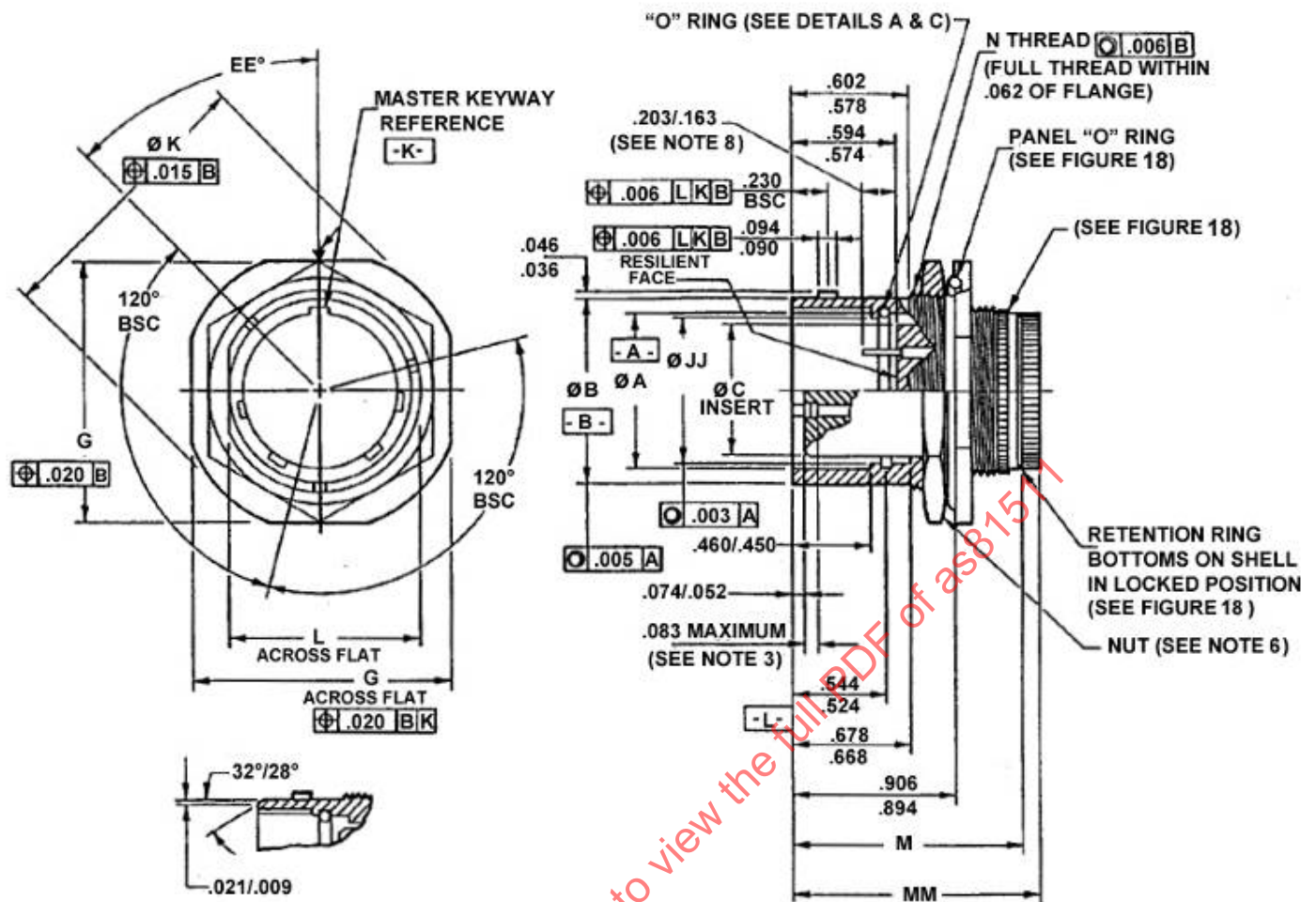


FIGURE 14 - CONNECTOR, RECEPTACLE, ELECTRICAL, JAM NUT MOUNT (SERIES 1)

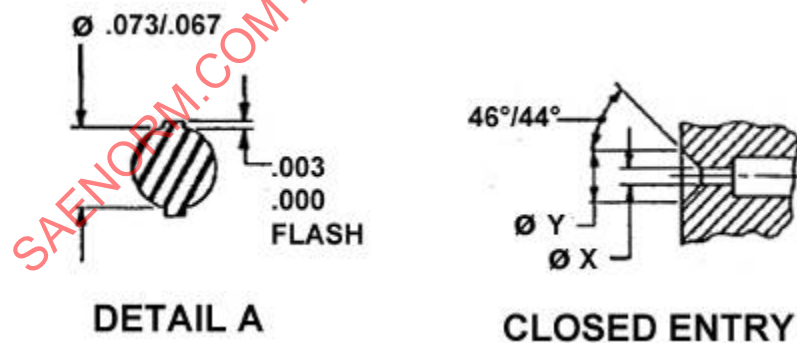


FIGURE 14A - CONNECTOR, RECEPTACLE, ELECTRICAL, JAM NUT MOUNT (SERIES 1 - CONTINUED)

TABLE 39 - FIGURE 14 DIMENSIONS

Shell Size	A ø	B ø	C ø	G Across Flats	K ø	L Across Flats	CC ø	JJ ø	M	MM
8	0.4095 (10.40)	0.553 (14.05)	0.290 (7.37)	0.989 (25.12)	1.072 (27.23)	0.598 (15.19)	0.301 (7.65)	0.3895 (9.89)	1.291 (32.79)	1.471 (37.36)
	0.4045 (10.27)	0.547 (13.89)	0.280 (7.11)	0.969 (24.61)	1.052 (26.72)	0.590 (14.99)	0.293 (7.45)	0.3845 (9.77)	1.276 (32.41)	1.406 (35.71)
	0.5345 (13.58)	0.678 (17.22)	0.415 (10.54)	1.114 (28.30)	1.197 (30.40)	0.723 (18.36)	0.426 (10.82)	0.5145 (13.07)	1.291 (32.79)	1.471 (37.36)
10	0.5295 (13.45)	0.672 (17.07)	0.405 (10.29)	1.094 (27.79)	1.177 (29.90)	0.715 (18.16)	0.418 (10.62)	0.5095 (12.94)	1.276 (32.41)	1.406 (35.71)
	0.7845 (19.93)	0.928 (23.57)	0.665 (16.89)	1.401 (35.59)	1.510 (38.35)	0.973 (24.71)	0.676 (17.17)	0.7645 (19.42)	1.291 (32.79)	1.471 (37.36)
	0.7795 (19.80)	0.922 (23.42)	0.655 (16.64)	1.381 (35.08)	1.490 (37.85)	0.965 (24.51)	0.668 (16.97)	0.7595 (19.29)	1.276 (32.41)	1.406 (35.71)
16	0.9105 (23.13)	1.054 (26.77)	0.791 (20.09)	1.526 (38.76)	1.635 (41.53)	1.098 (27.89)	0.802 (20.37)	0.8905 (22.62)	1.291 (32.79)	1.471 (37.36)
	0.9055 (23.00)	1.048 (26.62)	0.781 (19.84)	1.506 (38.25)	1.615 (41.02)	1.090 (27.69)	0.794 (20.17)	0.8855 (22.49)	1.276 (32.41)	1.406 (35.71)
	1.0345 (26.28)	1.178 (29.92)	0.916 (23.27)	1.651 (41.94)	1.745 (44.32)	1.222 (31.04)	0.927 (23.55)	1.0145 (25.77)	1.291 (32.79)	1.471 (37.36)
18	1.0295 (26.15)	1.172 (29.77)	0.906 (23.01)	1.631 (41.43)	1.725 (43.82)	1.214 (30.84)	0.919 (23.35)	1.0095 (25.64)	1.276 (32.41)	1.406 (35.71)
	1.1595 (29.45)	1.303 (33.10)	1.041 (26.44)	1.776 (45.11)	1.870 (47.50)	1.347 (28.94)	1.052 (26.72)	1.1395 (28.94)	1.371 (34.82)	1.551 (39.40)
	1.1545 (29.32)	1.297 (32.94)	1.031 (26.19)	1.756 (44.60)	1.850 (46.99)	1.339 (34.01)	1.044 (26.52)	1.1345 (28.82)	1.356 (34.44)	1.486 (37.74)
22	1.2845 (32.63)	1.428 (36.27)	1.166 (29.62)	1.901 (48.29)	1.995 (50.67)	1.472 (37.39)	1.177 (29.90)	1.2645 (32.12)	1.371 (34.82)	1.551 (39.40)
	1.2795 (32.50)	1.422 (36.12)	1.156 (29.36)	1.881 (47.78)	1.975 (50.17)	1.464 (37.19)	1.169 (29.70)	1.2595 (31.99)	1.356 (34.44)	1.486 (37.74)
	1.4095 (35.80)	1.553 (39.45)	1.291 (32.79)	2.026 (51.46)	2.120 (53.85)	1.597 (40.56)	1.302 (33.07)	1.3895 (35.29)	1.371 (34.82)	1.551 (39.40)
24	1.4045 (35.67)	1.547 (39.45)	1.281 (32.54)	2.006 (50.95)	2.100 (53.34)	1.589 (40.36)	1.295 (32.90)	1.3845 (35.17)	1.356 (34.44)	1.486 (37.74)

TABLE 39A - FIGURE 14 DIMENSIONS (CONTINUED)

Shell Size	H Thread	Panel "O" Ring	EE° BSC					
			Position					
			1	2	3	4	5	6
8	5/8-20UN-2A	AS3582-018	60	46	43	60	89	43
10	3/4-20UNEF-2A	AS3582-020	53	87	51	77	87	87
14	1-20UNEF-2A	AS3582-024	53	87	51	77	87	87
16	1-1/8-20UN-2A	AS3582-026	98	98	98	98	98	98
18	1-1/4-20UN-2A	AS3582-028	98	98	98	98	98	98
20	1-3/8-20UN-2A	AS3582-029	98	98	98	98	98	98
22	1-1/2-20UN-2A	AS3582-030	98	98	98	98	98	98
24	1-5/8-20UN-2A	AS3582-031	98	98	98	98	98	98

TABLE 39B - FIGURE 14 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.003	0.08	0.035	0.89	0.090	2.29	0.524	13.31	0.906	23.01
0.004	0.10	0.040	1.02	0.094	2.39	0.544	13.82	1.276	32.41
0.005	0.13	0.046	1.17	0.157	3.99	0.574	14.58	1.291	32.79
0.006	0.15	0.052	1.32	0.163	4.14	0.578	14.68	1.406	35.71
0.009	0.23	0.062	1.57	0.169	4.29	0.594	15.09	1.471	37.36
0.010	0.25	0.067	1.70	0.203	5.16	0.602	15.29		
0.015	0.38	0.073	1.85	0.230	5.84	0.668	16.97		
0.020	0.51	0.074	1.88	0.450	11.43	0.678	17.22		
0.021	0.53	0.083	2.11	0.460	11.68	0.894	22.71		

TABLE 39C - FIGURE 14 DIMENSIONS (DETAIL A/CLOSED ENTRY)

Contact Size	X Diameter	Y Diameter
23-22	0.035 (0.89)	0.075 (1.91)
	0.032 (0.81)	0.065 (1.65)
20-20	0.053 (1.35)	0.085 (2.16)
	0.050 (1.27)	0.080 (2.03)
16-16	0.077 (1.96)	0.108 (2.74)
	0.074 (1.88)	0.103 (2.62)
12-12	0.130 (3.30)	0.170 (4.32)
	0.126 (3.20)	0.166 (4.22)

SAENORM.COM : Click to view the full PDF of AS81511

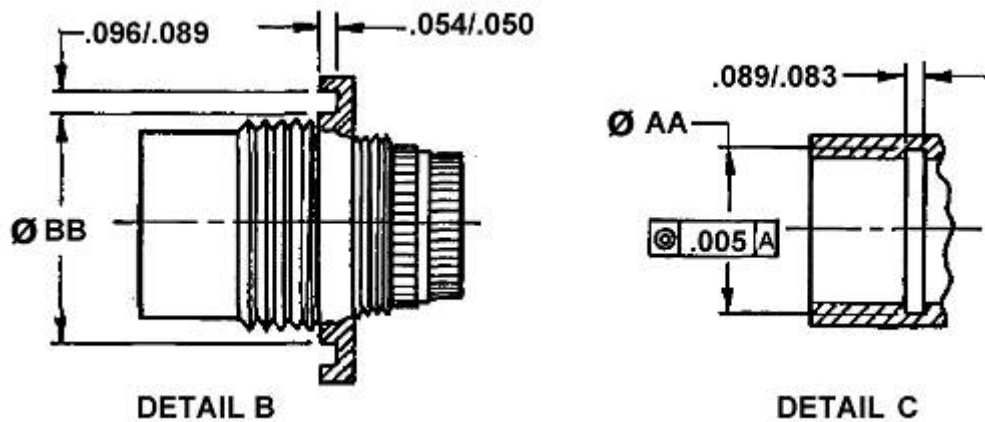


FIGURE 14B - CONNECTOR, RECEPTACLE, ELECTRICAL, JAM NUT MOUNT (SERIES 1 - CONTINUED)

TABLE 40 - FIGURE 14B DIMENSIONS (DETAILS B AND C)

Size	AA Diameter	BB Diameter
8	0.493 (12.52)	0.724 (18.39)
	0.488 (12.40)	0.713 (18.11)
10	0.618 (15.70)	0.849 (21.56)
	0.613 (15.57)	0.838 (21.29)
14	0.868 (22.05)	1.099 (27.91)
	0.863 (21.92)	1.088 (27.64)
16	0.994 (25.25)	1.221 (31.01)
	0.989 (25.12)	1.210 (30.73)
18	1.118 (28.40)	1.356 (34.44)
	1.113 (28.27)	1.345 (34.16)
20	1.243 (31.57)	1.481 (37.62)
	1.238 (31.45)	1.470 (37.34)
22	1.368 (34.75)	1.606 (40.79)
	1.363 (34.62)	1.595 (40.51)
24	1.493 (37.92)	1.731 (43.97)
	1.488 (37.80)	1.720 (43.69)

Figure 14 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 11.
3. Distance from the face of the 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.
4. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
5. All dimensions are for a connector with the contact retention system in the locked position.
6. Slotted nut shall conform to AS81511/20.
7. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 18.
8. The dimension includes the contact slack.

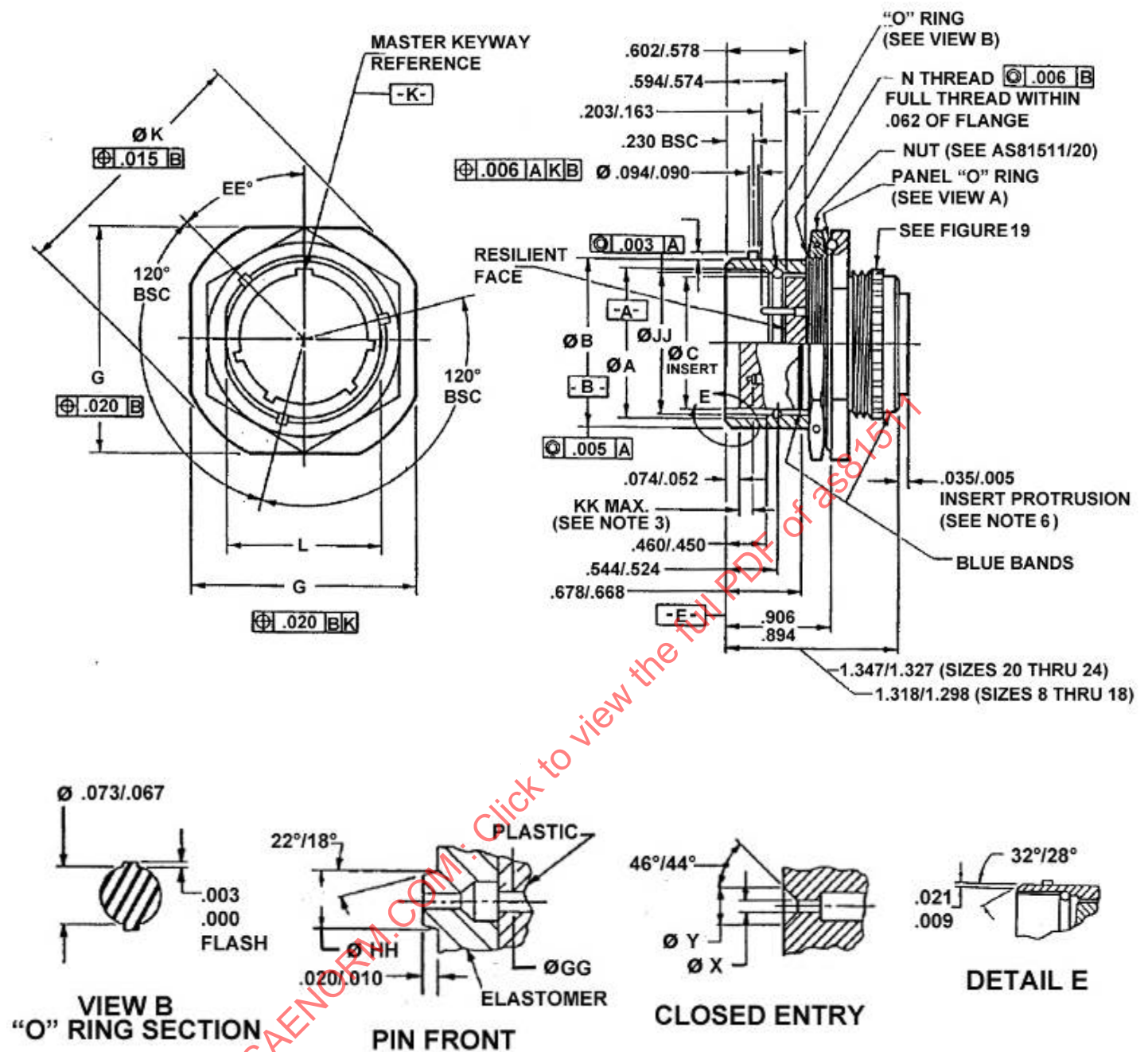


FIGURE 15 - CONNECTOR, RECEPTACLE, ELECTRICAL, JAM NUT MOUNT (SERIES 3)

TABLE 41 - FIGURE 15 DIMENSIONS

Shell Size	A ø	B ø	C ø	G Across Flats	K ø	L Across Flats	N Thread	JJ ø	Panel "O" Ring	EE° BSC					
										Position					
										1	2	3	4	5	6
8	0.4095 (10.40)	0.553 (14.05)	0.290 (7.37)	0.989 (25.12)	1.072 (27.23)	0.598 (15.19)	5/8-20UN-2A	0.3895 (9.89)	AS3582-018	60	46	43	60	89	43
	0.4045 (10.27)	0.547 (13.89)	0.280 (7.11)	0.969 (24.61)	1.052 (26.72)	0.590 (14.99)		0.3845 (9.77)							
10	0.5345 (13.58)	0.678 (17.22)	0.415 (10.54)	1.114 (28.30)	1.197 (30.40)	0.723 (18.36)	3/4-20UNEF-2A	0.5145 (13.07)	AS3582-020	53	37	51	77	87	87
	0.5295 (13.45)	0.672 (17.07)	0.405 (10.29)	1.094 (27.79)	1.177 (29.90)	0.715 (18.16)		0.5095 (12.94)							
14	0.7845 (19.93)	0.928 (23.57)	0.665 (16.89)	1.401 (35.59)	1.510 (38.35)	0.973 (24.71)	1-20UNEF-2A	0.7645 (19.42)	AS3582-024	53	87	51	77	87	87
	0.7795 (19.80)	0.922 (23.42)	0.655 (16.64)	1.381 (35.08)	1.490 (37.85)	0.965 (24.51)		0.7595 (19.29)							
16	0.9105 (23.13)	1.054 (26.77)	0.791 (20.09)	1.526 (38.76)	1.635 (41.53)	1.098 (27.89)	1-1/8-20UN-2A	0.8905 (22.62)	AS3582-026	98	98	98	98	98	98
	0.9055 (23.00)	1.048 (26.62)	0.781 (19.84)	1.506 (38.25)	1.615 (41.02)	1.090 (27.69)		0.8855 (22.49)							
18	1.0345 (26.28)	1.178 (29.92)	0.916 (23.27)	1.651 (41.94)	1.745 (44.32)	1.222 (31.04)	1-1/4-20UN-2A	1.0145 (25.77)	AS3582-028	98	98	98	98	98	98
	1.0295 (26.15)	1.172 (29.77)	0.906 (23.01)	1.631 (41.43)	1.725 (43.82)	1.214 (30.84)		1.0095 (25.64)							
20	1.1595 (29.45)	1.303 (33.10)	1.041 (26.44)	1.776 (45.11)	1.870 (47.50)	1.347 (28.94)	1-3/8-20UN-2A	1.1395 (28.94)	AS3582-029	98	98	98	98	98	98
	1.1545 (29.32)	1.297 (32.94)	1.031 (26.19)	1.756 (44.60)	1.850 (46.99)	1.339 (34.01)		1.1345 (28.82)							
22	1.2835 (32.60)	1.428 (36.27)	1.166 (29.62)	1.901 (48.29)	1.995 (50.67)	1.472 (37.39)	1-1/2-20UN-2A	1.2645 (32.12)	AS3582-030	98	98	98	98	98	98
	1.2795 (32.50)	1.422 (36.12)	1.156 (29.36)	1.881 (47.78)	1.975 (50.17)	1.464 (37.19)		1.2595 (31.99)							
24	1.4095 (35.80)	1.553 (39.45)	1.291 (32.79)	2.026 (51.46)	2.120 (53.85)	1.597 (40.56)	1-5/8-20UN-2A	1.3895 (35.29)	AS3582-031	98	98	98	98	98	98
	1.4045 (35.67)	1.547 (39.32)	1.281 (32.54)	2.006 (50.95)	2.100 (53.34)	1.589 (40.36)		1.3845 (35.17)							

TABLE 41A - FIGURE 15 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.003	0.08	0.035	0.89	0.090	2.29	0.524	13.31	0.906	23.01
0.004	0.10	0.040	1.02	0.094	2.39	0.544	13.82	1.298	32.97
0.005	0.13	0.046	1.17	0.157	3.99	0.574	14.58	1.318	33.48
0.006	0.15	0.052	1.32	0.163	4.14	0.578	14.68	1.327	33.71
0.009	0.23	0.062	1.57	0.169	4.29	0.594	15.09	1.347	34.21
0.010	0.25	0.067	1.70	0.203	5.16	0.602	15.29		
0.015	0.38	0.073	1.85	0.230	5.84	0.668	16.97		
0.020	0.51	0.074	1.88	0.450	11.43	0.678	17.22		
0.021	0.53	0.083	2.11	0.460	11.68	0.894	22.71		

TABLE 41B - FIGURE 15 DIMENSIONS (PIN FRONT/CLOSED ENTRY)

Contact Size	X Diameter	Y Diameter	GG Diameter	HH Diameter	KK (max)
23-22	0.035 (0.89)	0.075 (1.91)	0.0280 (0.71)	0.068 (1.73)	0.083 (2.11)
	0.032 (0.81)	0.065 (1.65)	0.0300 (0.76)	0.062 (1.57)	
20-20	0.053 (1.35)	0.085 (2.16)	0.0415 (1.05)	0.083 (2.11)	0.090 (2.29)
	0.050 (1.27)	0.080 (2.03)	0.0445 (1.13)	0.077 (1.96)	
16-16	0.077 (1.96)	0.108 (2.74)	0.0950 (2.41)	0.106 (2.69)	0.105 (2.67)
	0.074 (1.88)	0.103 (2.62)	0.0990 (2.52)	0.100 (2.54)	
12-12	0.130 (3.30)	0.170 (4.32)	0.1540 (3.91)	0.169 (4.29)	0.105 (2.67)
	0.126 (3.20)	0.166 (4.22)	0.1580 (4.01)	0.163 (4.14)	

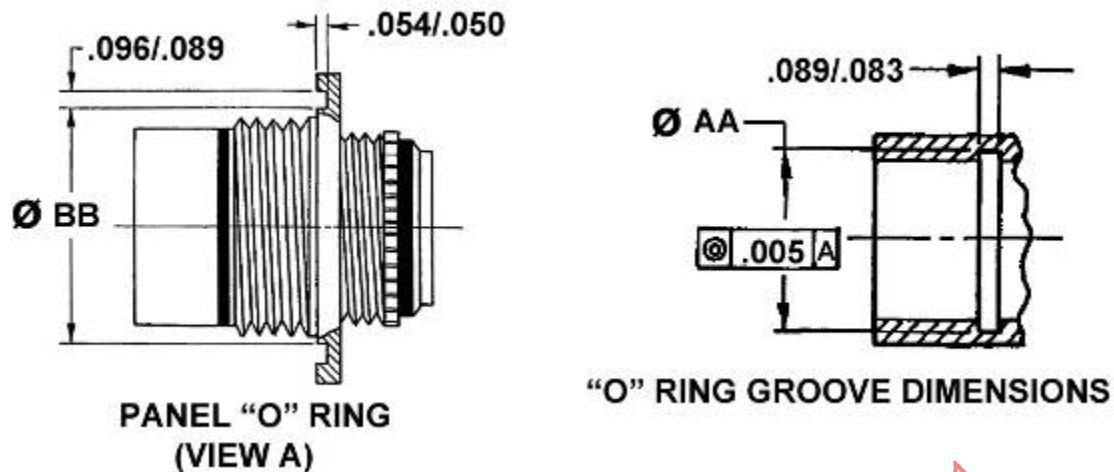


FIGURE 15A - FIGURE 15 DIMENSIONS (VIEW A AND "O" RING DIMENSIONS)

TABLE 42 - FIGURE 15A DIMENSIONS (VIEW A AND "O" RING DIMENSIONS)

Size	AA Diameter	BB Diameter
8	0.493 (12.52)	0.724 (18.39)
	0.488 (12.40)	0.713 (18.11)
10	0.618 (15.70)	0.849 (21.56)
	0.613 (15.57)	0.838 (21.29)
14	0.868 (22.05)	1.099 (27.91)
	0.863 (21.92)	1.088 (27.64)
16	0.994 (25.25)	1.221 (31.01)
	0.989 (25.12)	1.210 (30.73)
18	1.118 (28.40)	1.356 (34.44)
	1.113 (28.27)	1.345 (34.16)
20	1.243 (31.57)	1.481 (37.62)
	1.238 (31.45)	1.470 (37.34)
22	1.368 (34.75)	1.606 (40.79)
	1.363 (34.62)	1.595 (40.51)
24	1.493 (37.92)	1.731 (43.97)
	1.488 (37.80)	1.720 (43.69)

Figure 15 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 11.
3. Distance from the face of the 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.
4. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 19.
5. The dimension includes the contact slack.
6. For arrangements containing size 12 contacts, the insert protrusion shall be 0.020/0.070.



TABLE 43 - FIGURE 16 DIMENSIONS

Shell Size	A ø	B ø	C ø	K ø	M	CC ø	JJ ø	MM
8	0.4015 (10.20)	0.566 (14.38)	0.290 (7.37)	0.850 (21.59)	1.265 (32.13)	0.301 (7.65)	0.3815 (9.69)	1.445 (36.70)
	0.3955 (10.05)	0.558 (14.17)	0.280 (7.11)	0.830 (21.08)	1.250 (31.75)	0.293 (7.45)	0.3730 (9.47)	1.380 (35.05)
	0.5265 (13.37)	0.691 (17.55)	0.415 (10.54)	0.975 (24.77)	1.265 (32.13)	0.426 (10.82)	0.5065 (12.87)	1.445 (36.70)
10	0.5205 (13.22)	0.683 (17.35)	0.405 (10.29)	0.955 (24.26)	1.250 (31.75)	0.418 (10.62)	0.4980 (12.65)	1.380 (35.05)
	0.7765 (19.72)	0.941 (23.90)	0.665 (16.89)	1.255 (31.12)	1.265 (32.13)	0.676 (17.17)	0.7565 (19.22)	1.445 (36.70)
	0.7705 (19.57)	0.933 (23.70)	0.655 (16.64)	1.205 (30.61)	1.250 (31.75)	0.668 (16.97)	0.7460 (18.95)	1.380 (35.05)
16	0.9025 (22.92)	1.068 (27.13)	0.791 (20.09)	1.350 (34.29)	1.265 (32.13)	0.802 (20.37)	0.8825 (22.42)	1.445 (36.70)
	0.8965 (22.77)	1.060 (26.92)	0.781 (19.84)	1.330 (33.78)	1.250 (31.75)	0.794 (20.17)	0.8720 (22.15)	1.380 (35.05)
	1.0265 (26.07)	1.191 (30.25)	0.916 (23.27)	1.475 (37.41)	1.265 (32.13)	0.927 (23.55)	1.0065 (25.57)	1.445 (36.70)
18	1.0205 (25.92)	1.183 (30.05)	0.906 (23.01)	1.455 (36.96)	1.250 (31.75)	0.919 (23.35)	0.9960 (25.30)	1.380 (35.05)
	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 (30.05)	1.031 (26.19)	1.604 (40.74)	1.330 (33.78)	1.044 (26.52)	1.1210 (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)	1.2460 (31.65)	1.460 (37.08)
	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)
24	1.3955 (35.45)	1.558 (39.57)	1.281 (32.54)	1.854 (47.09)	1.330 (33.78)	1.295 (32.90)	1.3710 (34.82)	1.460 (37.08)

TABLE 43A - FIGURE 16 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.005	0.13	0.047	1.19	0.163	4.14	0.286	7.26	0.556	14.12
0.006	0.15	0.049	1.24	0.169	4.29	0.290	7.37	0.568	14.43
0.008	0.20	0.083	2.11	0.203	5.16	0.291	7.39	0.667	16.94
0.015	0.38	0.094	2.39	0.228	5.79	0.295	7.49	0.677	17.20
0.018	0.46	0.100	2.54	0.233	5.92	0.300	7.62	1.250	31.75
0.022	0.56	0.112	2.84	0.260	6.60	0.400	10.16	1.265	32.13
0.025	0.64	0.125	3.18	0.270	6.86	0.544	13.82		
0.028	0.71	0.157	3.99	0.275	6.99	0.548	13.92		

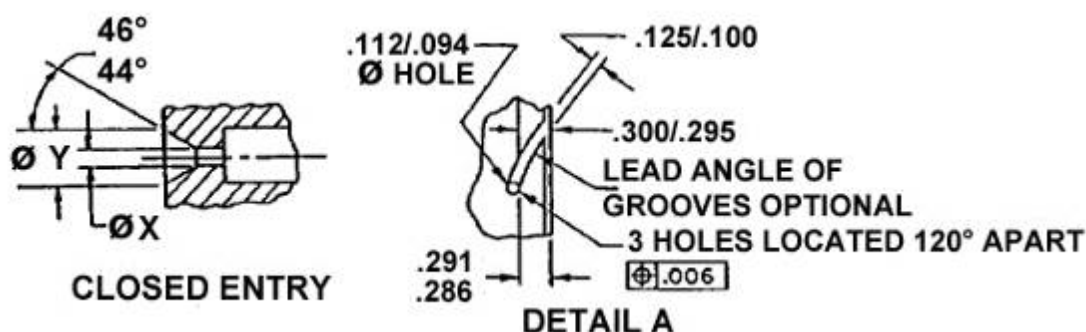


FIGURE 16A - CONNECTOR, PLUG, ELECTRICAL (SERIES 1 - CLOSED ENTRY AND DETAIL A)

TABLE 43B - FIGURE 16A DIMENSIONS (DETAIL A/CLOSED ENTRY)

Contact Size	X Diameter	Y Diameter
23-22	0.035 (0.89)	0.075 (1.91)
	0.032 (0.81)	0.065 (1.65)
20-20	0.053 (1.35)	0.085 (2.16)
	0.050 (1.27)	0.080 (2.03)
16-16	0.077 (1.96)	0.108 (2.74)
	0.074 (1.88)	0.103 (2.62)
12-12	0.130 (3.30)	0.170 (4.32)
	0.126 (3.20)	0.166 (4.22)

Figure 7 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 11.
3. Distance from the face of the 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.
4. Distance from the front of the shell to the point at which a gage ring having the same basic diameter as the receptacle shell, engages the spring member.
5. This design information establishes connector intermating criteria and interchangeability of accessory hardware.
6. All dimensions are for a connector with the contact retention system in the locked position.
7. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 18.
8. The dimension includes the contact slack.

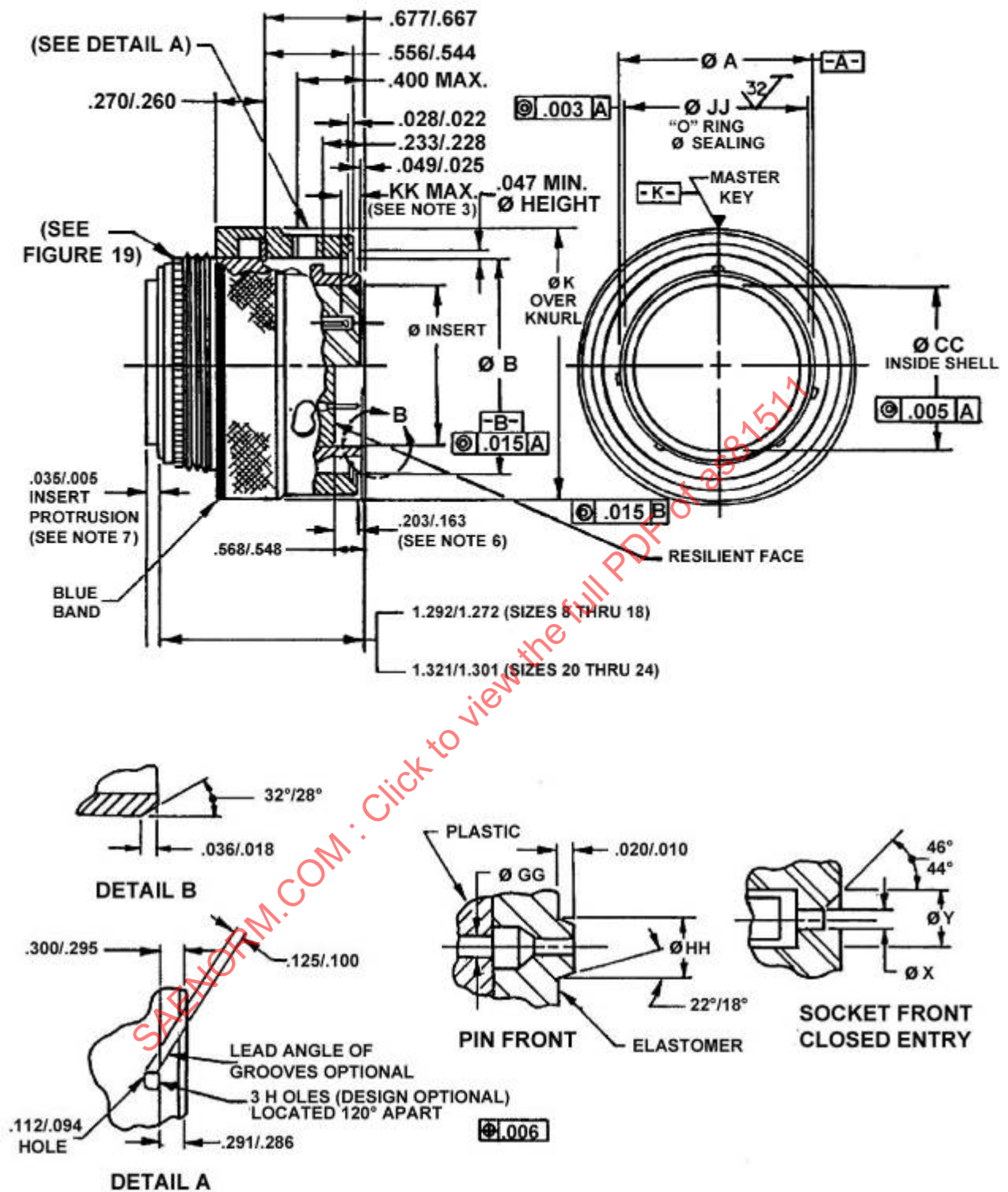


FIGURE 17 - CONNECTOR, PLUG, ELECTRICAL (SERIES 3)

TABLE 44 - FIGURE 17 DIMENSIONS

Shell Size	A ø	B ø	C ø	K ø	CC ø	JJ ø
8	0.4015 (10.20)	0.566 (14.38)	0.290 (7.37)	0.850 (21.59)	0.301 (7.65)	0.3815 (9.69)
	0.3955 (10.05)	0.558 (14.17)	0.280 (7.11)	0.830 (21.08)	0.293 (7.45)	0.3730 (9.47)
10	0.5265 (13.37)	0.691 (17.55)	0.415 (10.54)	0.975 (24.77)	0.426 (10.82)	0.5065 (12.87)
	0.5205 (13.22)	0.683 (17.35)	0.405 (10.29)	0.955 (24.26)	0.418 (10.62)	0.4980 (12.65)
14	0.7765 (19.72)	0.941 (23.90)	0.665 (16.89)	1.255 (31.12)	0.676 (17.17)	0.7565 (19.22)
	0.7705 (19.57)	0.933 (23.70)	0.655 (16.64)	1.205 (30.61)	0.668 (16.97)	0.7460 (18.95)
16	0.9025 (22.92)	1.068 (27.13)	0.791 (20.09)	1.350 (34.29)	0.802 (20.37)	0.8825 (22.42)
	0.8965 (22.77)	1.060 (26.92)	0.781 (19.84)	1.330 (33.78)	0.794 (20.17)	0.8720 (22.15)
18	1.0265 (26.07)	1.191 (30.25)	0.916 (23.27)	1.475 (37.41)	0.927 (23.55)	1.0065 (25.57)
	1.0205 (25.92)	1.183 (30.05)	0.906 (23.01)	1.455 (36.96)	0.919 (23.35)	.9960 (25.30)
20	1.1515 (29.25)	1.316 (33.43)	1.041 (26.44)	1.624 (41.25)	1.052 (26.72)	1.1315 (28.74)
	1.1455 (29.10)	1.308 (30.05)	1.031 (26.19)	1.604 (40.74)	1.044 (26.52)	1.1210 (28.47)
22	1.2765 (32.42)	1.441 (36.60)	1.166 (29.62)	1.749 (44.42)	1.177 (29.90)	1.2565 (31.92)
	1.2705 (32.27)	1.433 (36.40)	1.156 (29.36)	1.729 (43.92)	1.169 (29.70)	1.2460 (31.65)
24	1.4015 (35.60)	1.566 (39.78)	1.291 (32.79)	1.874 (47.60)	1.302 (33.07)	1.3815 (35.09)
	1.3955 (35.45)	1.558 (39.57)	1.281 (32.54)	1.854 (47.09)	1.295 (32.90)	1.3710 (34.82)

TABLE 44A - FIGURE 17 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.005	0.13	0.047	1.19	0.169	4.29	0.291	7.39	0.677	17.20
0.006	0.15	0.049	1.24	0.203	5.16	0.295	7.49	1.272	32.31
0.008	0.20	0.083	2.11	0.228	5.79	0.300	7.62	1.292	32.82
0.015	0.38	0.094	2.39	0.233	5.92	0.400	10.16	1.301	33.05
0.018	0.46	0.100	2.54	0.260	6.60	0.544	13.82	1.321	33.55
0.022	0.56	0.112	2.84	0.270	6.86	0.548	13.92		
0.025	0.64	0.125	3.18	0.275	6.99	0.556	14.12		
0.028	0.71	0.157	3.99	0.286	7.26	0.568	14.43		
0.035	0.89	0.163	4.14	0.290	7.37	0.667	16.94		

TABLE 44B - FIGURE 17 DIMENSIONS (PIN FRONT/CLOSED ENTRY)

Contact Size	X Diameter	Y Diameter	GG Diameter	HH Diameter	KK (max)
23-22	0.035 (0.89)	0.075 (1.91)	0.0280 (0.71)	0.068 (1.73)	0.083 (2.11)
	0.032 (0.81)	0.065 (1.65)	0.0300 (0.76)	0.062 (1.57)	
20-20	0.053 (1.35)	0.085 (2.16)	0.0415 (1.05)	0.083 (2.11)	0.090 (2.29)
	0.050 (1.27)	0.080 (2.03)	0.0445 (1.13)	0.077 (1.96)	
16-16	0.077 (1.96)	0.108 (2.74)	0.0950 (2.41)	0.106 (2.69)	0.105 (2.67)
	0.074 (1.88)	0.103 (2.62)	0.0990 (2.52)	0.100 (2.54)	
12-12	0.130 (3.30)	0.170 (4.32)	0.1540 (3.91)	0.169 (4.29)	0.105 (2.67)
	0.126 (3.20)	0.166 (4.22)	0.1580 (4.01)	0.163 (4.14)	

Figure 17 notes:

1. Dimensions are in inches and apply after plating. Metric equivalents are in parentheses, are given for general information only and are based upon 1 inch = 25.4 mm.
2. Mating keyway positions and dimensions are shown in Figure 11.
3. Distance from the face of the 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.
4. Distance from the front of the shell to the point at which a gage ring having the same basic diameter as the receptacle shell, engages the spring member.
5. The rear end connector design for attachment of non-rotatable accessory hardware is shown on Figure 19.
6. The dimension includes the contact slack.
7. For arrangements containing size 12 contacts, the insert protrusion shall be 0.020/0.070.

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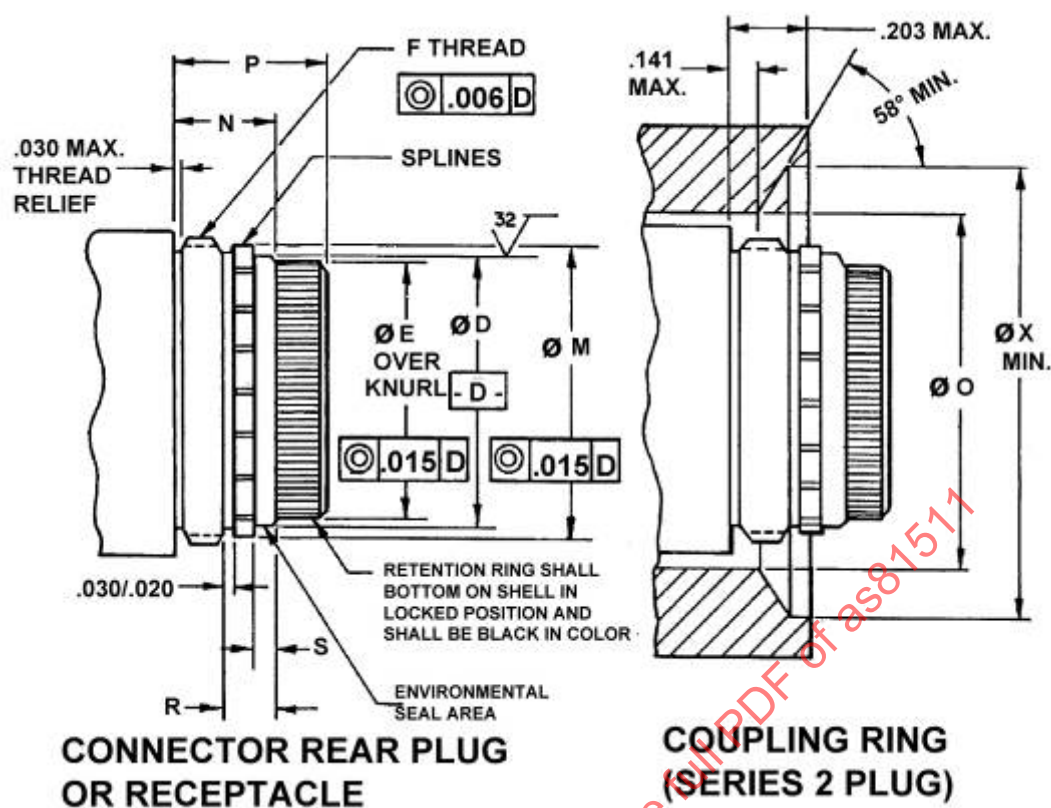


FIGURE 18 - SERIES 1 AND 2 CONNECTOR BACK END CONFIGURATION

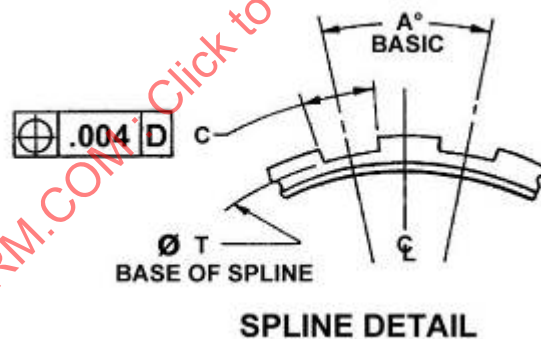


FIGURE 18A - SERIES 1 AND 2 CONNECTOR BACK END CONFIGURATION (SPLINE DETAILS)

TABLE 45 - FIGURE 18 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.004	0.10	0.015	0.38	0.030	0.76	0.203	5.16
0.006	0.15	0.020	0.51	0.141	3.58		

Notes:

1. Dimensions are in inches, apply after plating and with the contact retention system in the locked position. Metric equivalents are given for general information only and are based on 1 inch = 25.4 mm.

TABLE 46 - FIGURE 18 DIMENSIONS

Shell Size	A (Degrees)	C	D ø	E ø	F (Thread)	M ø	N
8	20	0.051 (1.30) 0.046 (1.17)	0.430 (10.92) 0.424 (10.77)	0.422 (10.72) 0.407 (10.34)	1/2-28UNEF-2A	0.463 (11.76) 0.457 (11.61)	0.290 (7.37) 0.280 (7.11)
10	15	0.049 (1.24) 0.044 (1.12)	0.555 (14.10) 0.549 (13.94)	0.548 (13.92) 0.533 (13.54)	5/8-28UN-2A	0.588 (14.94) 0.582 (14.78)	0.290 (7.37) 0.280 (7.11)
14	12	0.054 (1.37) 0.049 (1.24)	0.805 (20.45) 0.799 (20.29)	0.798 (20.27) 0.783 (19.89)	7/8-28UN-2A	0.838 (21.29) 0.832 (21.13)	0.290 (7.37) 0.280 (7.11)
16	10	0.053 (1.35) 0.048 (1.22)	0.930 (23.62) 0.924 (23.47)	0.924 (23.47) 0.909 (23.09)	1-28UN-2A	0.963 (24.46) 0.957 (24.31)	0.290 (7.37) 0.280 (7.11)
18	9	0.053 (1.35) 0.048 (1.22)	1.055 (26.80) 1.049 (26.64)	1.048 (26.62) 1.033 (26.24)	1-1/8-28UN-2A	1.088 (27.64) 1.082 (27.48)	0.290 (7.37) 0.280 (7.11)
20	9	0.059 (1.50) 0.054 (1.37)	1.180 (29.97) 1.174 (29.82)	1.173 (29.79) 1.158 (29.41)	1-1/4-28UN-2A	1.213 (30.81) 1.207 (30.66)	0.364 (9.25) 0.349 (8.86)
22	9	0.062 (1.57) 0.057 (1.45)	1.305 (33.15) 1.299 (32.99)	1.298 (32.97) 1.283 (32.59)	1-3/8-28UN-2A	1.338 (33.99) 1.332 (33.83)	0.364 (9.25) 0.349 (8.86)
24	9	0.069 (1.75) 0.064 (1.63)	1.430 (36.32) 1.424 (36.17)	1.423 (36.14) 1.408 (35.76)	1-1/2-28UN-2A	1.463 (37.16) 1.457 (37.01)	0.364 (9.25) 0.349 (8.86)

TABLE 46A - FIGURE 18 DIMENSIONS (CONTINUED)

Shell Size	P Max.	R	S	T ø	O ø	X Min. ø
8	0.454 (11.53)	0.169 (4.29) 0.157 (3.99)	0.076 (1.93) 0.063 (1.60)	0.439 (11.15) 0.433 (11.00)	0.579 (14.71) 0.559 (14.20)	0.645 (16.38)
10	0.454 (11.53)	0.169 (4.29) 0.157 (3.99)	0.076 (1.93) 0.063 (1.60)	0.564 (14.33) 0.558 (14.17)	0.704 (17.88) 0.684 (17.37)	0.770 (19.56)
14	0.454 (11.53)	0.169 (4.29) 0.157 (3.99)	0.076 (1.93) 0.063 (1.60)	0.814 (20.68) 0.808 (20.52)	0.954 (24.33) 0.934 (23.72)	1.020 (25.91)
16	0.454 (11.53)	0.169 (4.29) 0.157 (3.99)	0.076 (1.93) 0.063 (1.60)	0.939 (23.85) 0.933 (23.70)	1.082 (27.48) 1.060 (26.92)	1.145 (29.08)
18	0.454 (11.53)	0.169 (4.29) 0.157 (3.99)	0.076 (1.93) 0.063 (1.60)	1.064 (27.03) 1.058 (26.87)	1.204 (30.58) 1.184 (30.07)	1.279 (32.49)
20	0.530 (13.46)	0.217 (5.51) 0.205 (5.21)	0.092 (2.34) 0.079 (2.01)	1.189 (30.20) 1.183 (30.05)	1.315 (33.40) 1.305 (33.15)	N/A
22	0.530 (13.46)	0.217 (5.51) 0.205 (5.21)	0.092 (2.34) 0.079 (2.01)	1.314 (33.38) 1.308 (33.22)	1.440 (36.58) 1.430 (36.32)	N/A
24	0.530 (13.46)	0.217 (5.51) 0.205 (5.21)	0.092 (2.34) 0.079 (2.01)	1.439 (36.55) 1.433 (36.40)	1.565 (39.75) 1.555 (39.50)	N/A

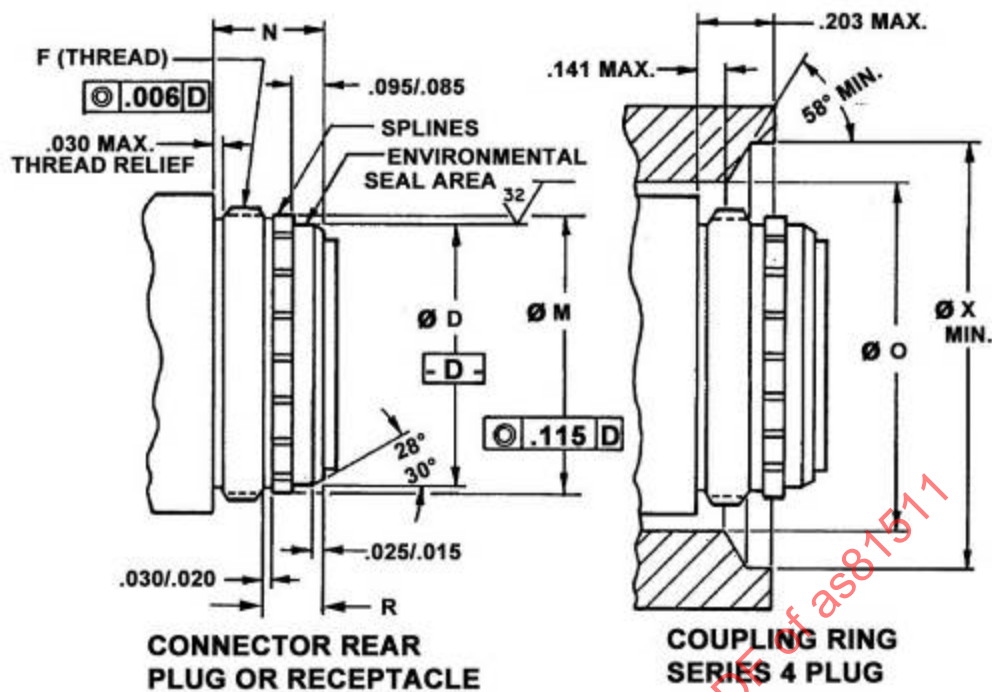


FIGURE 19 - SERIES 3 AND 4 CONNECTOR BACK END CONFIGURATION

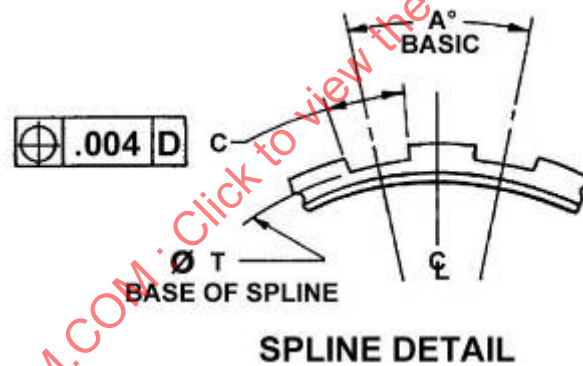


FIGURE 19A - SERIES 3 AND 4 CONNECTOR BACK END CONFIGURATION (SPLINE DETAILS)

TABLE 47 - FIGURE 19 DIMENSIONS (METRIC EQUIVALENTS)

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
0.006	0.15	0.020	0.51	0.030	0.76	0.095	2.41	0.141	3.58
0.015	0.38	0.025	0.64	0.085	2.16	0.115	2.92	0.203	5.16

Notes:

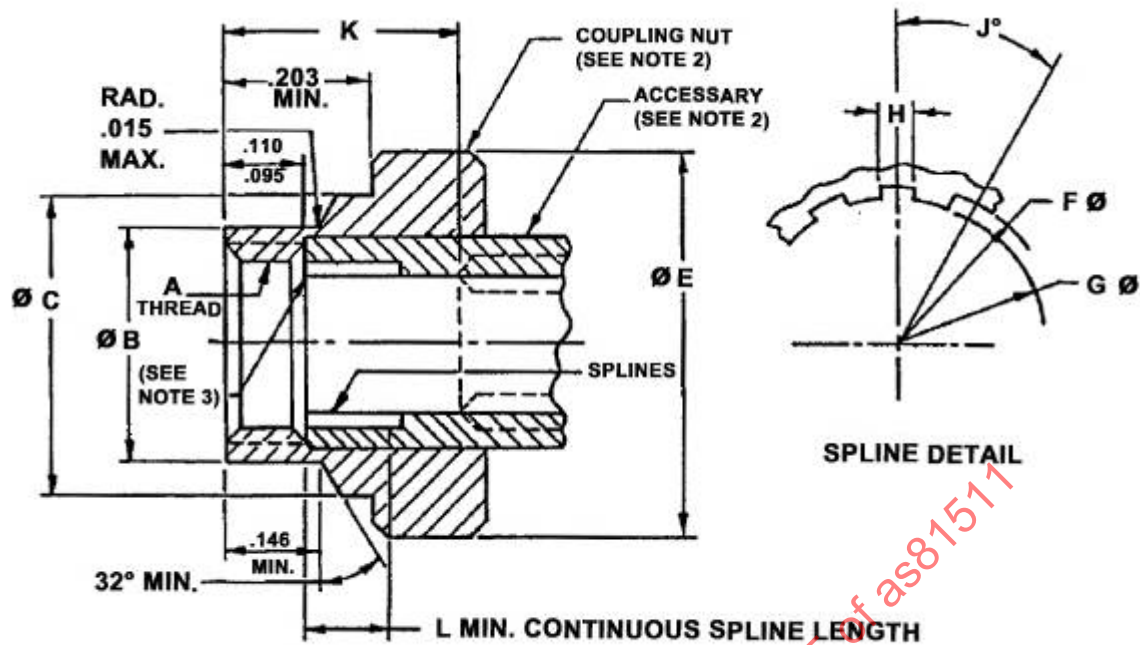
1. Dimensions are in inches and apply after plating. Metric equivalents are given for general information only and are based on 1 inch = 25.4 mm.

TABLE 48 - FIGURE 19 DIMENSIONS

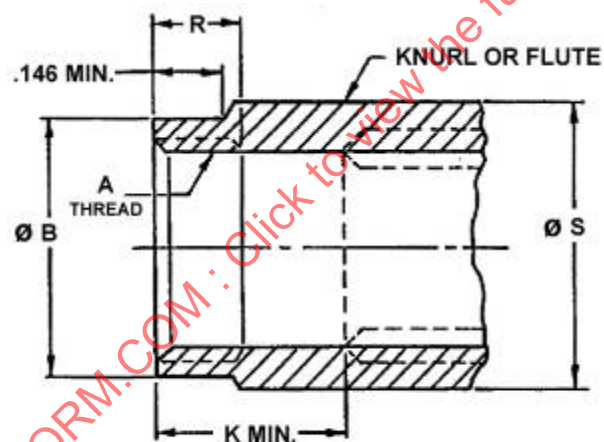
Shell Size	A (Degrees)	C	D ø	F (Thread)	M ø	N
8	20	0.051 (1.30) 0.046 (1.17)	0.430 (10.92) 0.424 (10.77)	1/2-28UNEF-2A	0.463 (11.76) 0.457 (11.61)	0.320 (8.13) 0.300 (7.62)
10	15	0.049 (1.24) 0.044 (1.12)	0.555 (14.10) 0.549 (13.94)	5/8-28UN-2A	0.588 (14.94) 0.582 (14.78)	0.320 (8.13) 0.300 (7.62)
14	12	0.054 (1.37) 0.049 (1.24)	0.805 (20.45) 0.799 (20.29)	7/8-28UN-2A	0.838 (21.29) 0.832 (21.13)	0.320 (8.13) 0.300 (7.62)
16	10	0.053 (1.35) 0.048 (1.22)	0.930 (23.62) 0.924 (23.47)	1-28UN-2A	0.963 (24.46) 0.957 (24.31)	0.320 (8.13) 0.300 (7.62)
18	9	0.053 (1.35) 0.048 (1.22)	1.055 (26.80) 1.049 (26.64)	1-1/8-28UN-2A	1.088 (27.64) 1.082 (27.48)	0.320 (8.13) 0.300 (7.62)
20	9	0.059 (1.50) 0.054 (1.37)	1.180 (29.97) 1.174 (29.82)	1-1/4-28UN-2A	1.213 (30.81) 1.207 (30.66)	0.358 (9.09) 0.338 (8.59)
22	9	0.062 (1.57) 0.057 (1.45)	1.305 (33.15) 1.299 (32.99)	1-3/8-28UN-2A	1.338 (33.99) 1.332 (33.83)	0.358 (9.09) 0.338 (8.59)
24	9	0.069 (1.75) 0.064 (1.63)	1.430 (36.32) 1.424 (36.17)	1-1/2-28UN-2A	1.463 (37.16) 1.457 (37.01)	0.358 (9.09) 0.338 (8.59)

TABLE 48A - FIGURE 19 DIMENSIONS (CONTINUED)

Shell Size	O ø	R	T ø	X Min. ø
8	0.579 (14.71) 0.559 (14.20)	0.190 (4.83) 0.160 (4.06)	0.439 (11.15) 0.433 (11.00)	0.645 (16.38)
10	0.704 (17.88) 0.684 (17.37)	0.190 (4.83) 0.160 (4.06)	0.564 (14.33) 0.558 (14.17)	0.770 (19.56)
14	0.954 (24.33) 0.934 (23.72)	0.190 (4.83) 0.160 (4.06)	0.814 (20.68) 0.808 (20.52)	1.020 (25.91)
16	1.082 (27.48) 1.060 (26.92)	0.190 (4.83) 0.160 (4.06)	0.939 (23.85) 0.933 (23.70)	1.145 (29.08)
18	1.204 (30.58) 1.184 (30.07)	0.190 (4.83) 0.160 (4.06)	1.064 (27.03) 1.058 (26.87)	1.279 (32.49)
20	N/A	0.220 (5.59) 0.190 (4.83)	1.189 (30.20) 1.183 (30.05)	N/A
22	N/A	0.220 (5.59) 0.190 (4.83)	1.314 (33.38) 1.308 (33.22)	N/A
24	N/A	0.220 (5.59) 0.190 (4.83)	1.439 (36.55) 1.433 (36.40)	N/A



DESIGN STANDARD FOR NON-ROTATABLE ACCESSORY HARDWARE



DESIGN STANDARD FOR ROTATABLE ACCESSORY HARDWARE

**FIGURE 20 - DESIGN STANDARD FOR ROTATABLE AND NON-ROTATABLE CONNECTOR ACCESSORIES
(FOR USE ON ALL SERIES)**

Notes:

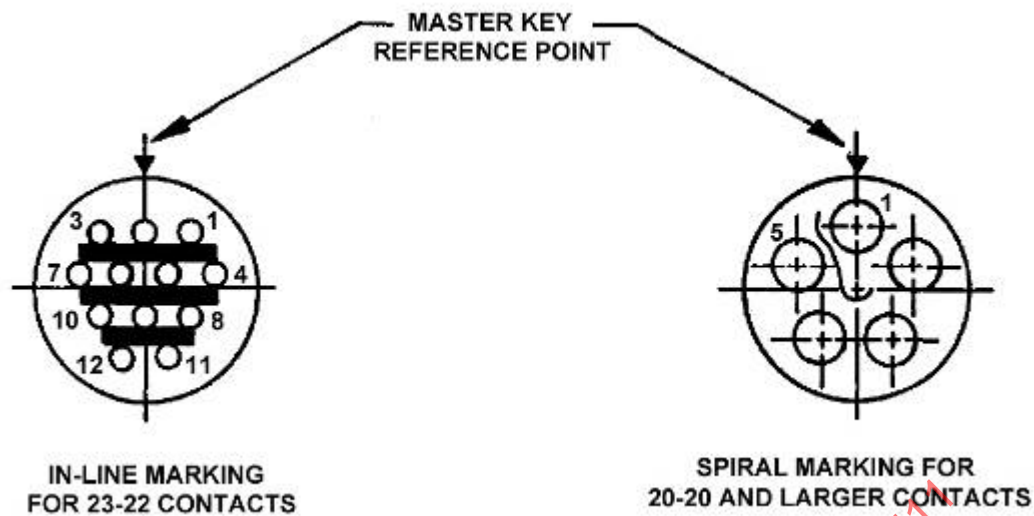
1. Dimensions are in inches and apply after plating. Metric equivalents are given for general information only and are based on 1 inch = 25.4 mm.
2. The coupling nut shall be captivated to and free to rotate on accessory.
3. Non-rotatable hardware shall bottom on lead thread (Dimension F thread) of connectors. See Figures 18 and 19.

TABLE 49 - FIGURE 20 DIMENSIONS

Shell Size	A (Degrees)	Modified Minor Diameter	B $\varnothing$	C $\varnothing$	E $\varnothing$ Max.	F $\varnothing$	G $\varnothing$
8	1/2-28UNEF-2B	0.470 (11.94) 0.464 (11.79)	0.558 (14.17) 0.546 (13.87)	0.640 (16.26) 0.635 (16.13)	0.850 (21.59)	0.473 (12.01) 0.469 (11.91)	0.446 (11.34) 0.443 (11.25)
10	5/8-28UN-2B	0.595 (15.11) 0.589 (14.96)	0.683 (17.35) 0.671 (17.04)	0.765 (19.43) 0.760 (19.30)	0.975 (24.77)	0.598 (15.19) 0.594 (15.09)	0.571 (14.50) 0.568 (14.43)
14	7/8-28UN-2B	0.845 (21.46) 0.839 (21.31)	0.933 (23.70) 0.921 (23.39)	1.015 (25.78) 1.010 (25.65)	1.225 (31.12)	0.848 (21.54) 0.844 (21.44)	0.821 (20.85) 0.818 (20.78)
16	1-28UN-2B	0.970 (24.64) 0.964 (24.49)	1.059 (26.90) 1.047 (26.59)	1.140 (28.96) 1.135 (28.83)	1.350 (34.29)	0.973 (24.71) 0.969 (24.61)	0.946 (24.03) 0.943 (23.95)
18	1-1/8-28UN-2B	1.095 (27.81) 1.089 (27.66)	1.183 (30.05) 1.171 (29.74)	1.274 (32.36) 1.269 (32.23)	1.475 (37.47)	1.098 (27.89) 1.094 (27.79)	1.071 (27.20) 1.068 (27.13)
20	1-1/4-28UN-2B	1.220 (30.99) 1.214 (30.84)	1.308 (33.22) 1.296 (32.92)	1.410 (35.81) 1.405 (35.69)	1.624 (41.25)	1.223 (31.06) 1.219 (30.96)	1.196 (30.38) 1.193 (30.30)
22	1-3/8-28UN-2B	1.345 (34.16) 1.339 (34.01)	1.433 (36.40) 1.421 (36.09)	1.535 (38.99) 1.530 (38.86)	1.749 (44.42)	1.348 (34.24) 1.344 (34.14)	1.321 (33.55) 1.318 (33.48)
24	1-1/2-28UN-2B	1.470 (37.34) 1.464 (37.19)	1.558 (39.57) 1.546 (39.27)	1.649 (41.88) 1.644 (41.76)	1.874 (47.60)	1.473 (37.41) 1.469 (37.31)	1.446 (36.73) 1.443 (36.65)

TABLE 49A - FIGURE 20 DIMENSIONS (CONTINUED)

Shell Size	H	J	K Min.	L Min.	R	S $\varnothing$
8	0.050 (1.27) 0.048 (1.22)	20 degrees	0.500 (12.70)	0.078 (1.98)	0.300 (7.62) 0.190 (4.83)	0.640 (16.26) 0.590 (14.99)
10	0.048 (1.22) 0.046 (1.17)	15 degrees	0.500 (12.70)	0.078 (1.98)	0.300 (7.62) 0.190 (4.83)	0.765 (19.43) 0.715 (18.16)
14	0.053 (1.35) 0.051 (1.30)	12 degrees	0.500 (12.70)	0.078 (1.98)	0.300 (7.62) 0.190 (4.83)	1.015 (25.78) 0.967 (24.56)
16	0.052 (1.32) 0.050 (1.27)	10 degrees	0.500 (12.70)	0.078 (1.98)	0.300 (7.62) 0.190 (4.83)	1.140 (28.96) 1.090 (27.69)
18	0.052 (1.32) 0.050 (1.27)	9 degrees	0.500 (12.70)	0.078 (1.98)	0.300 (7.62) 0.190 (4.83)	1.274 (32.36) 1.220 (30.99)
20	0.059 (1.50) 0.056 (1.42)	9 degrees	0.576 (14.63)	0.109 (2.77)	0.328 (8.33) 0.218 (5.54)	1.410 (35.81) 1.340 (34.04)
22	0.062 (1.57) 0.059 (1.50)	9 degrees	0.576 (14.63)	0.109 (2.77)	0.328 (8.33) 0.218 (5.54)	1.535 (38.99) 1.465 (37.21)
24	0.069 (1.75) 0.066 (1.68)	9 degrees	0.576 (14.63)	0.109 (2.77)	0.328 (8.33) 0.218 (5.54)	1.649 (41.88) 1.590 (40.39)



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 21 - INSERT ARRANGEMENT MARKING (TYPICAL)

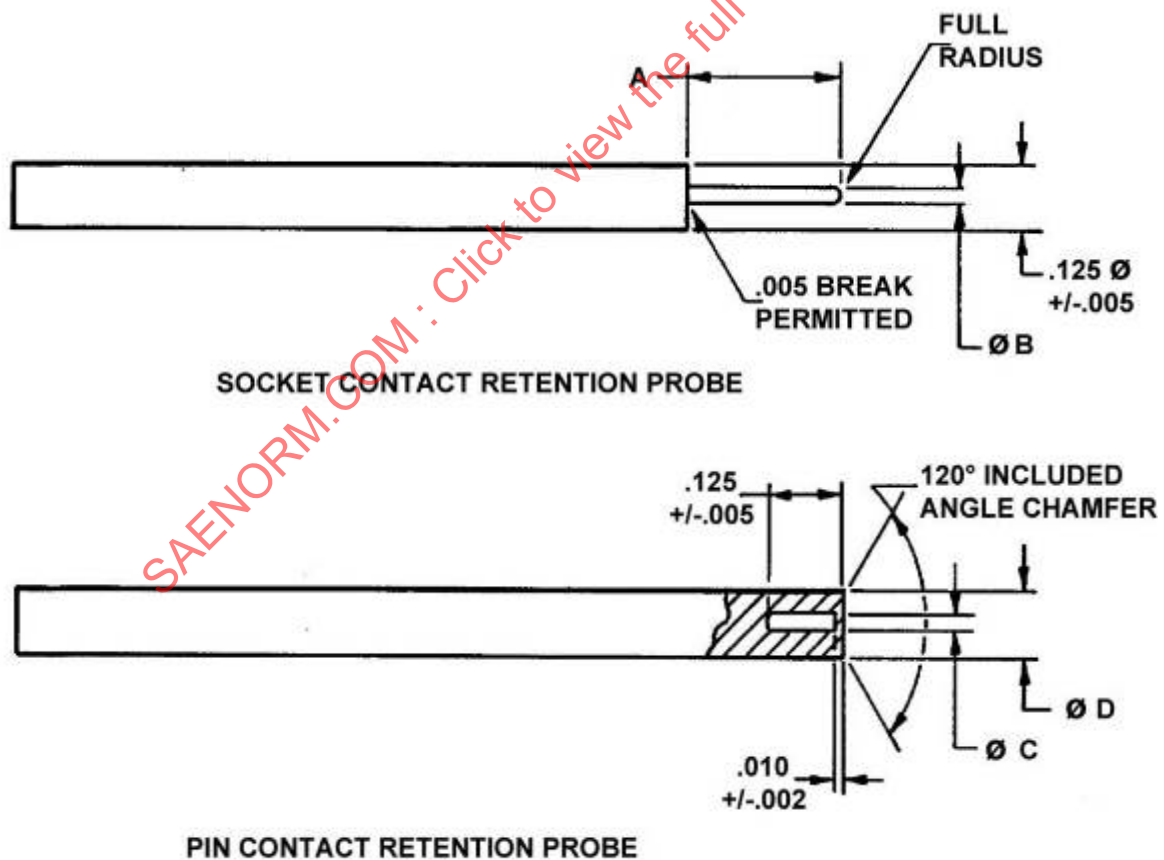


FIGURE 22 - CONTACT RETENTION PROBES

TABLE 50 - FIGURE 22 DIMENSIONS

Contact Size	A ± 0.010 (± 0.25)	B Diameter ± 0.001 (± 0.03)	C Diameter ± 0.001 (± 0.03)	D Diameter ± 0.005 (± 0.13)
23	0.300 (7.62)	0.026 (0.66)	0.029 (0.74)	0.125 (3.18)
20	0.410 (10.41)	0.039 (0.99)	0.043 (1.09)	0.125 (3.18)
16	0.410 (10.41)	0.061 (1.55)	0.065 (1.65)	0.125 (3.18)
12	0.410 (10.41)	0.093 (2.36)	0.097 (2.46)	0.156 (3.96)

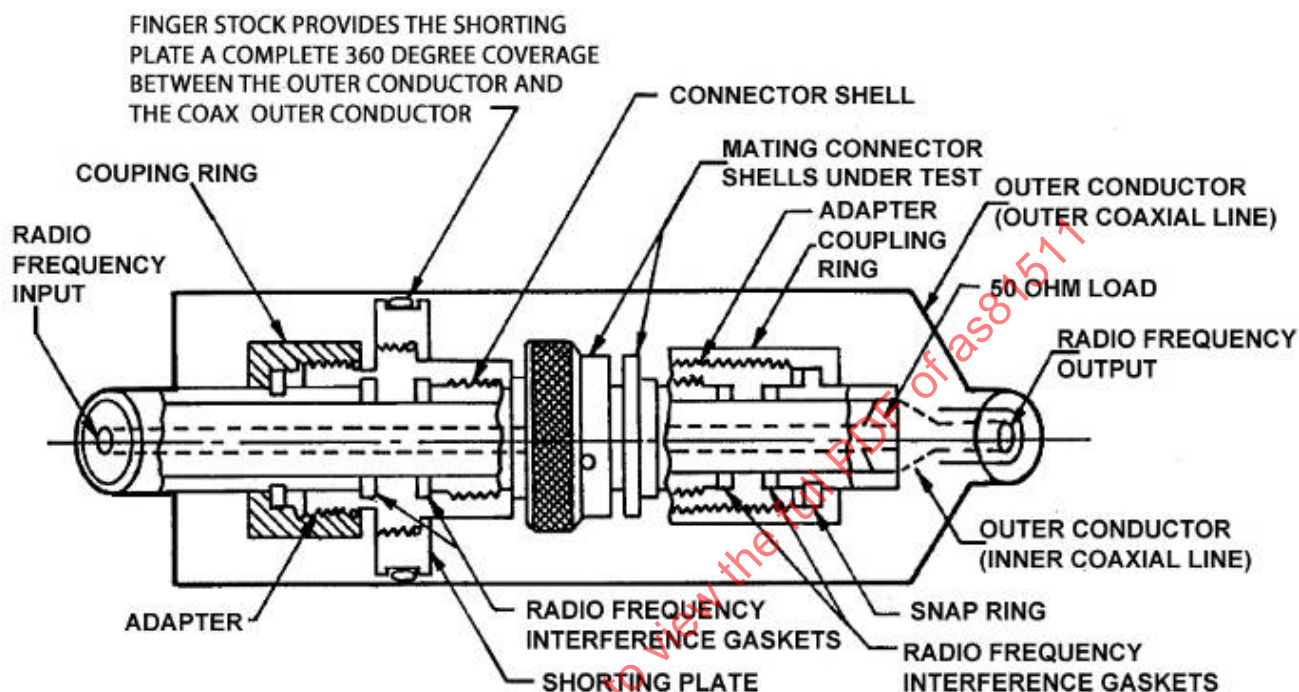
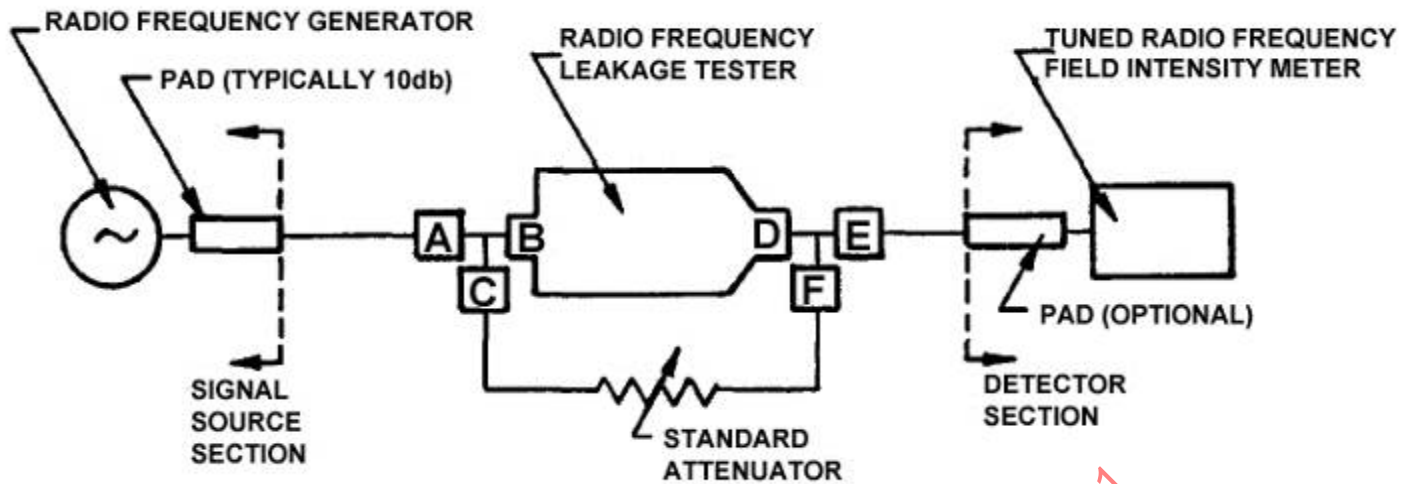


FIGURE 23 - TRI-AXIAL RF LEAKAGE TESTER

The mated pairs of connector shells shall be connected to the center coaxial line and tested as shown in figure 23. The connector shells shall be attached to the outer conductor of the inner coaxial line. Preventing radio frequency emission leakage through the adapter fixtures shall be accomplished by using conductive material.

Test design requirements and terminations:

1. The characteristic impedances of the coaxial lines comprising the leakage tester shall be a nominal 50 Ω .
2. The voltage standing wave ratio ($Z_0 = 50 \Omega$) looking into B (radio frequency input) shall have a VSWR of 1.5 or less when the mated pairs of connector shells are removed and replaced by a 50 Ω line section.
3. The outer coaxial line must not support higher order modes, especially the transverse electric II (TEM) mode, at frequencies below 1400 MHz.
4. The input and output voltage standing wave ratio of the standard attenuator (see Figure 23) should be less than 1.5 in the 20 to 100 db attenuation range.
5. The output impedance of the signal source and the input impedance of the detector (see Figure 23) shall be a nominal 50 Ω having a maximum allowable voltage standing wave ratio of 1.5.
6. Connectors A, B, C, D, E, and F (see Figure 24) should be of a low leakage type which exhibit radio frequency leakage attenuation of greater than 100 db.



A standard attenuator capable of providing at least 100 db (accuracy +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 Band 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 Band 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 24 - TEST PROCEDURE FOR TRI-AXIAL RADIO FREQUENCY LEAKAGE TESTER

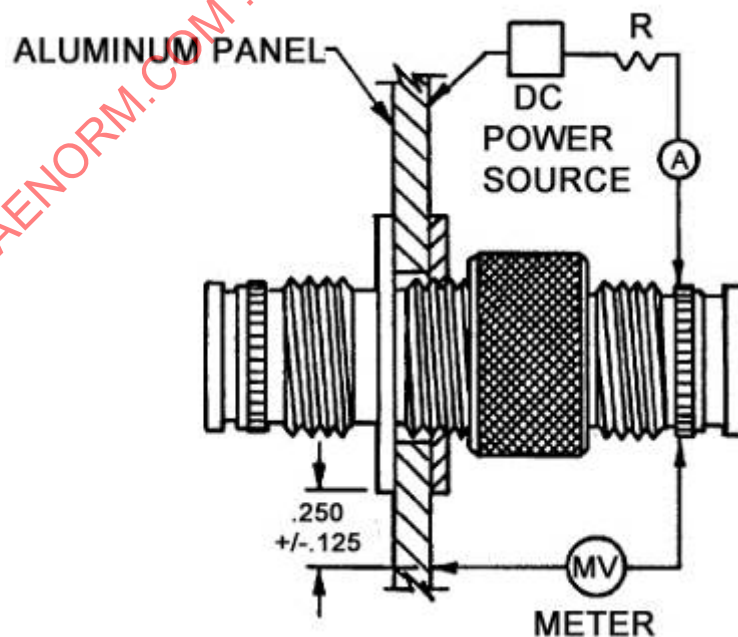


FIGURE 25 - SHELL TO SHELL CONTINUITY TEST DIAGRAM

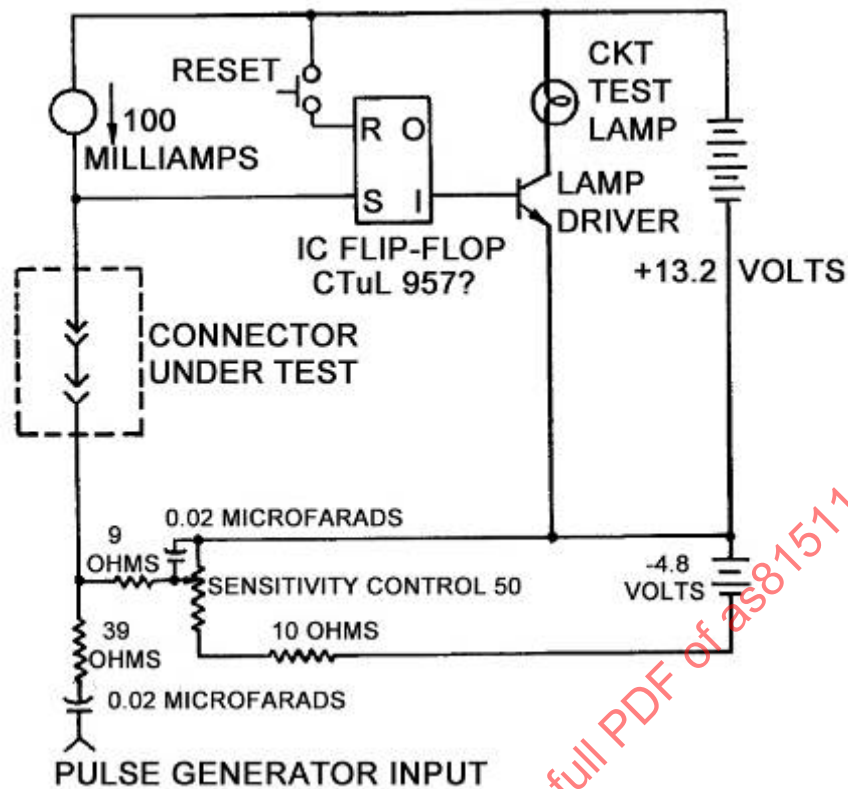


FIGURE 27 - CONTACT RESISTANCE CHANGE MONITOR CIRCUIT

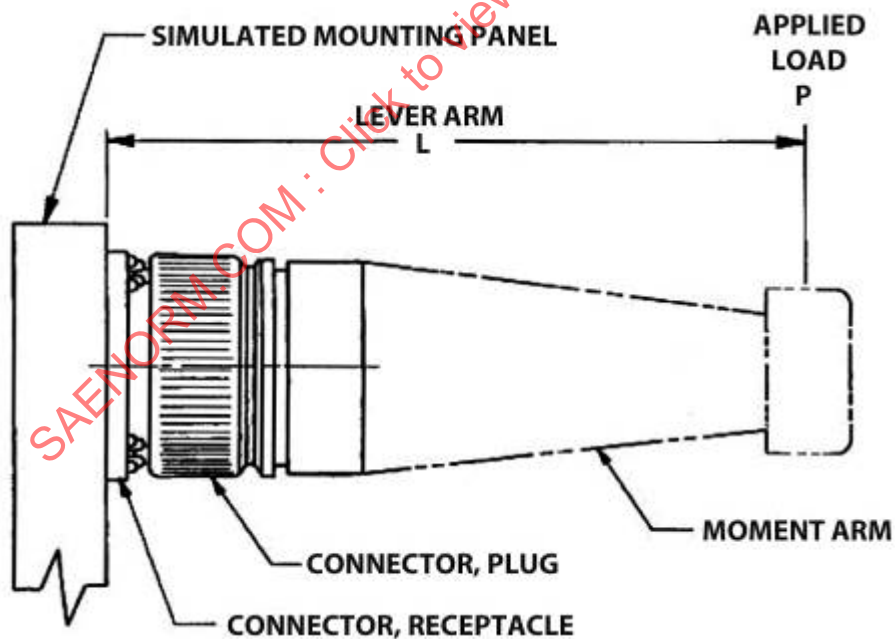


FIGURE 28 - EXTERNAL BENDING MOMENT TEST SET-UP

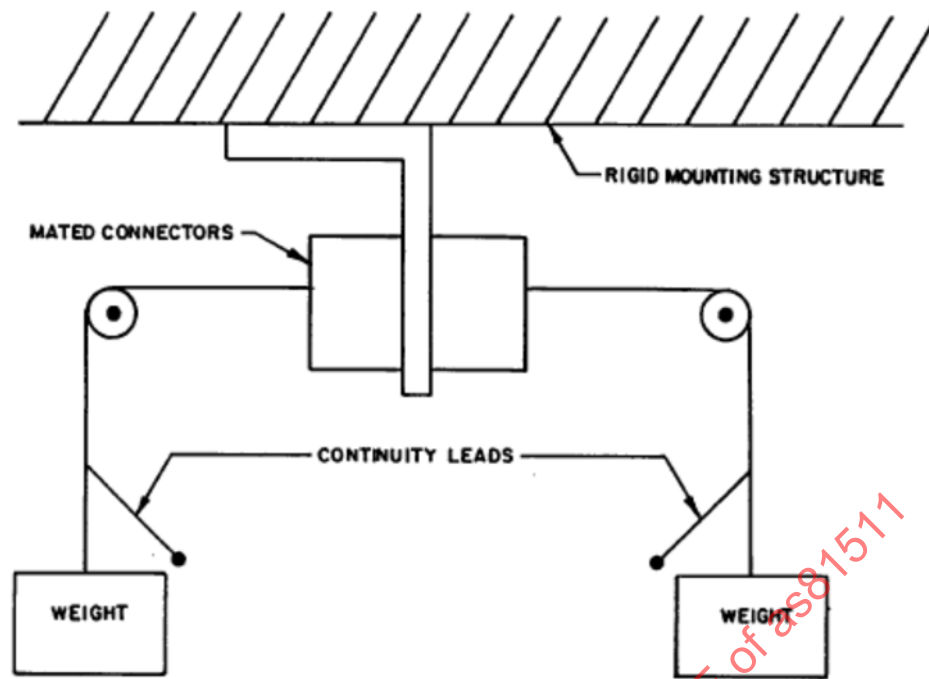
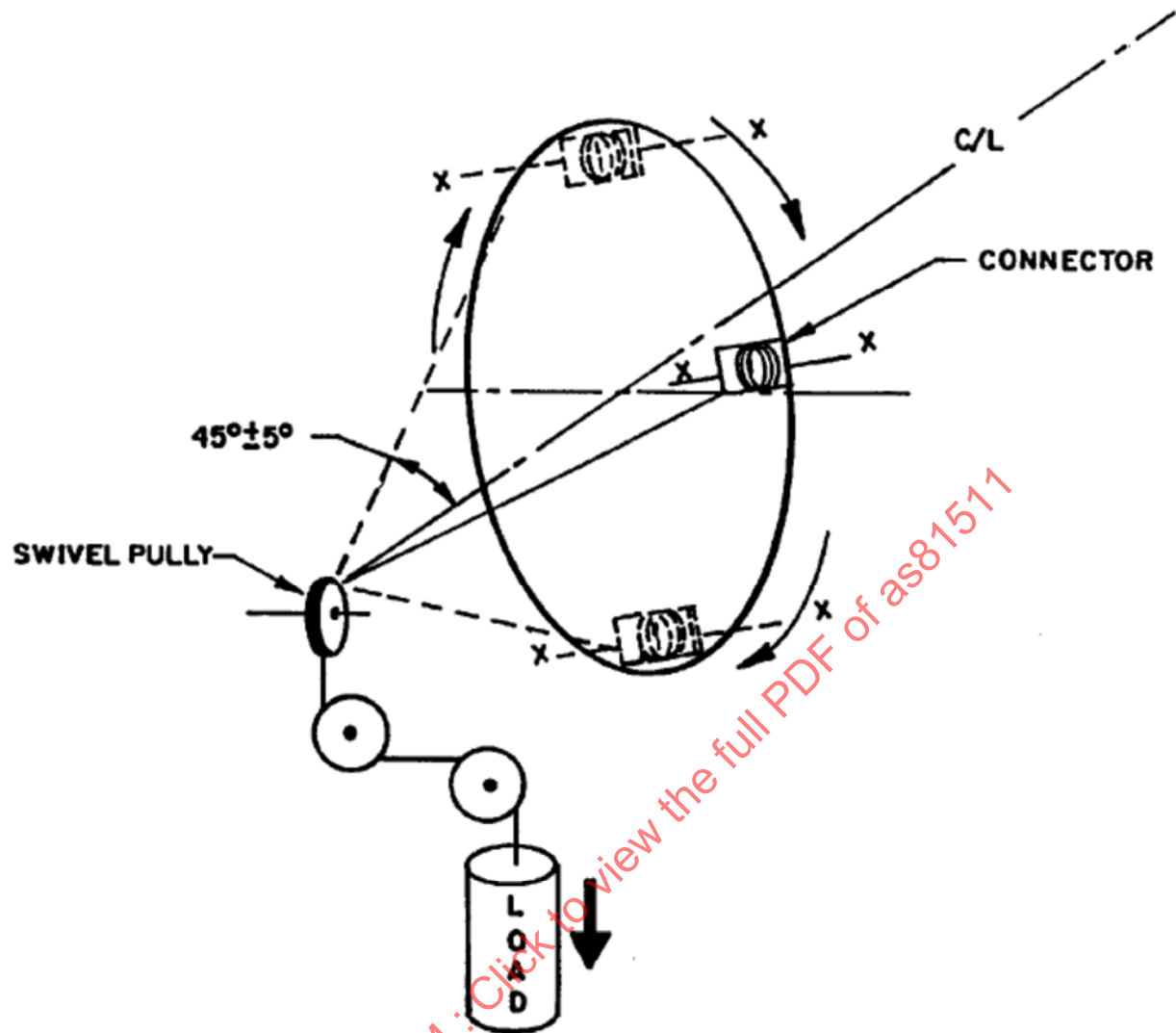
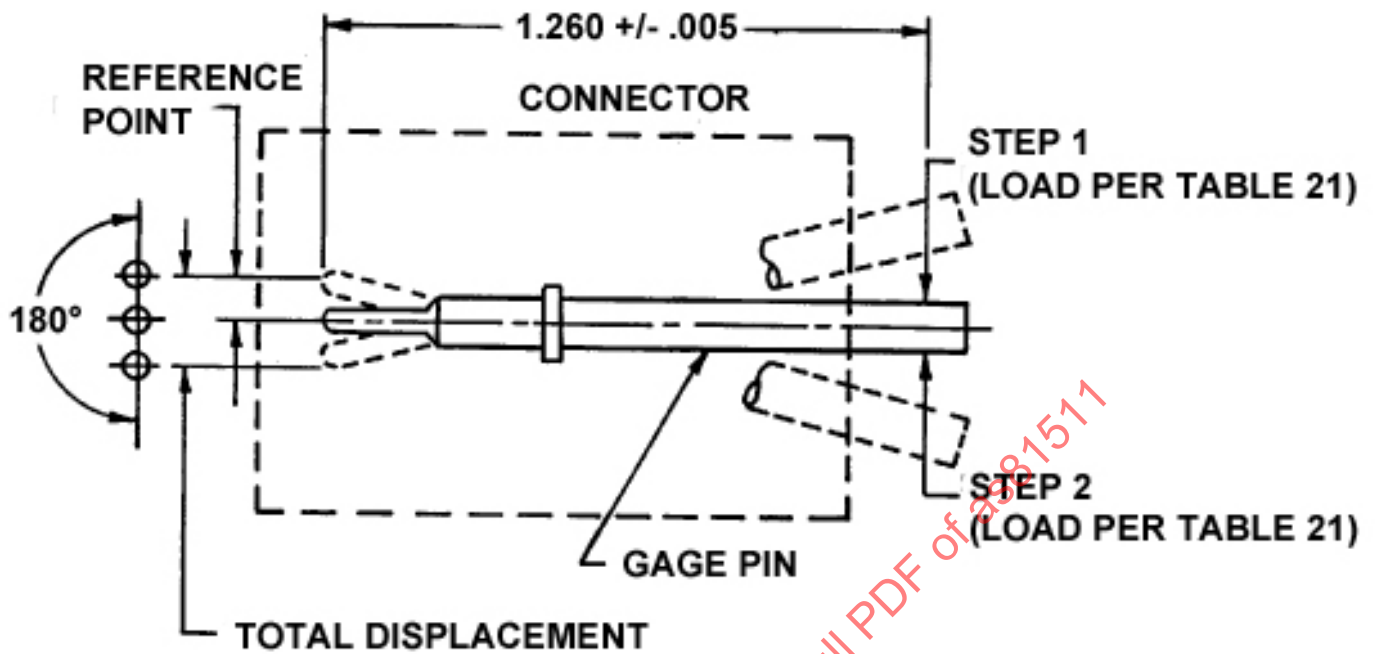


FIGURE 29 - TEMPERATURE LIFE WITH CONTACT RETENTION



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

FIGURE 30 - CONTACT WALK OUT



STEP 1 - APPLY LOAD TO DETERMINE REFERENCE POINT.

STEP 2 - APPLY LOAD IN OPPOSITE DIRECTION (180° DEGREES) AND MEASURE TOTAL DEFLECTION

FIGURE 31 - PIN CONTACT STABILITY

APPENDIX A - INSERT ARRANGEMENTS

Appendix A provides details for all AS81511 insert patterns. All dimensions are in inches. Unless otherwise indicated, dimensions are symmetrical about centerlines. Dimensions and markings shown are for engaging face of pin insert (socket insert opposite). ▼ Indicates centerline of insert arrangement and master key or key way of connector shell. For datum A, refer to Figures 4 through 17.

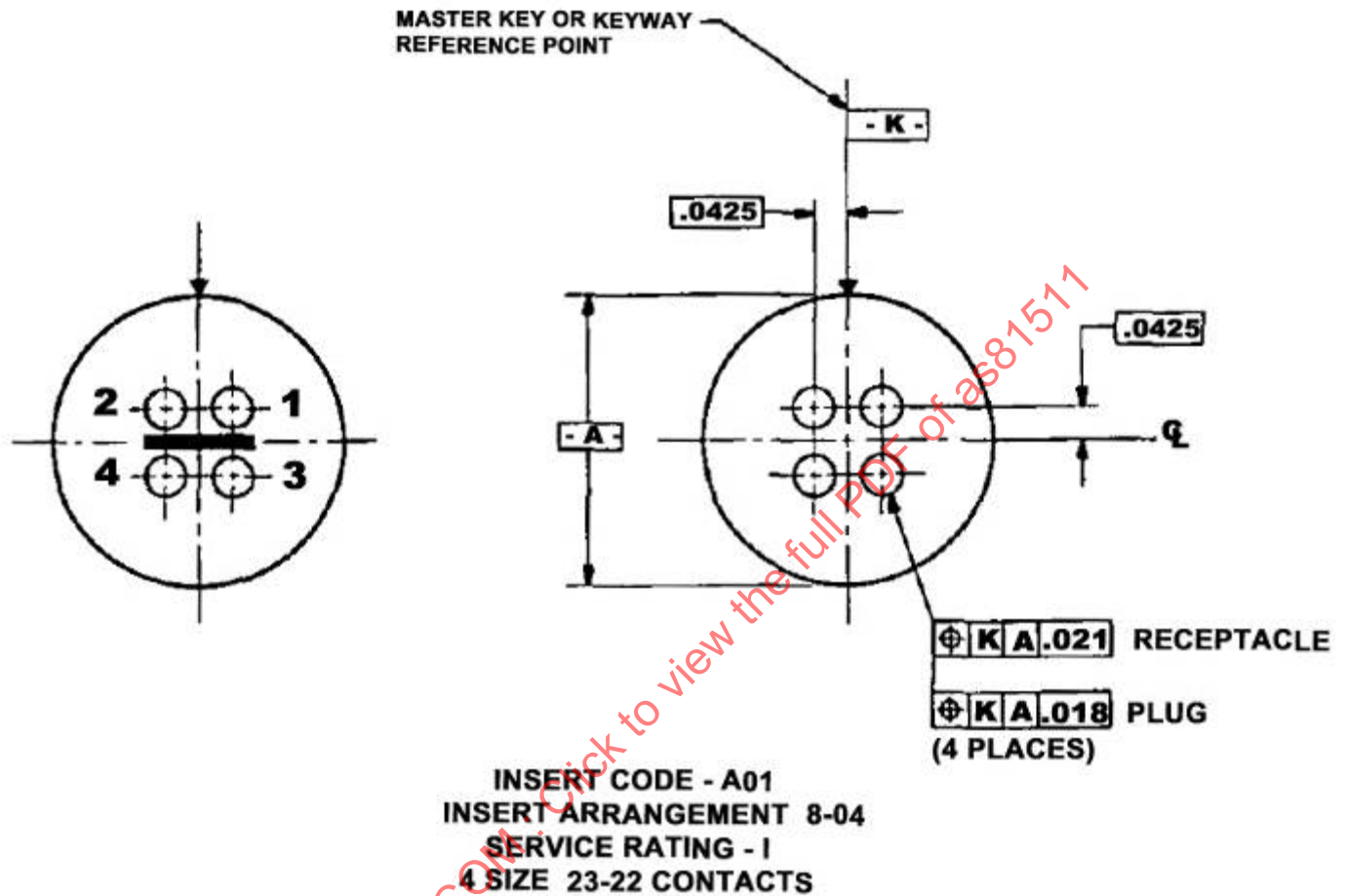


FIGURE A1 - INSERT ARRANGEMENT 8-04 (INSERT CODE A01)

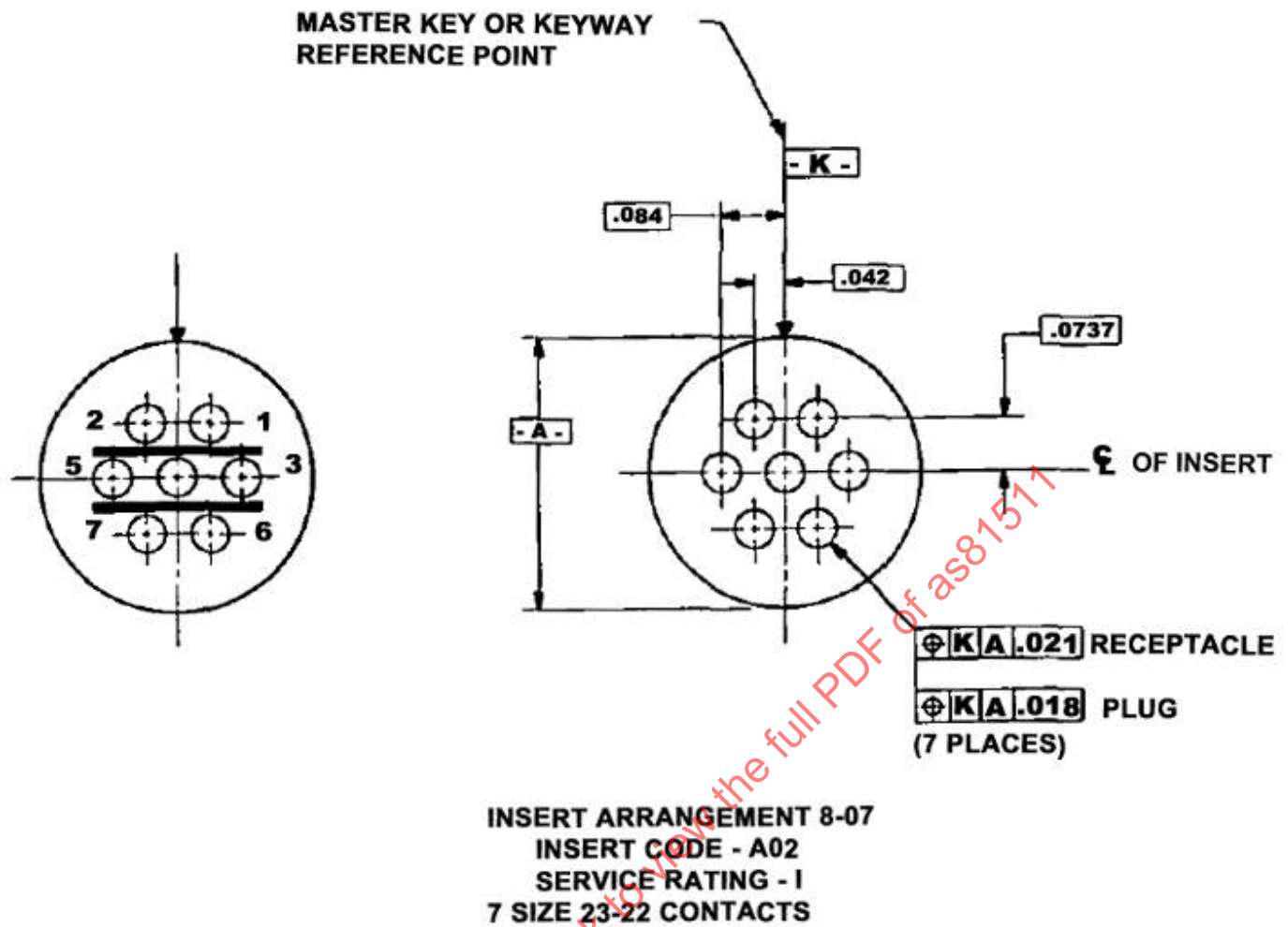


FIGURE A2 - INSERT ARRANGEMENT 8-07 (INSERT CODE A02)

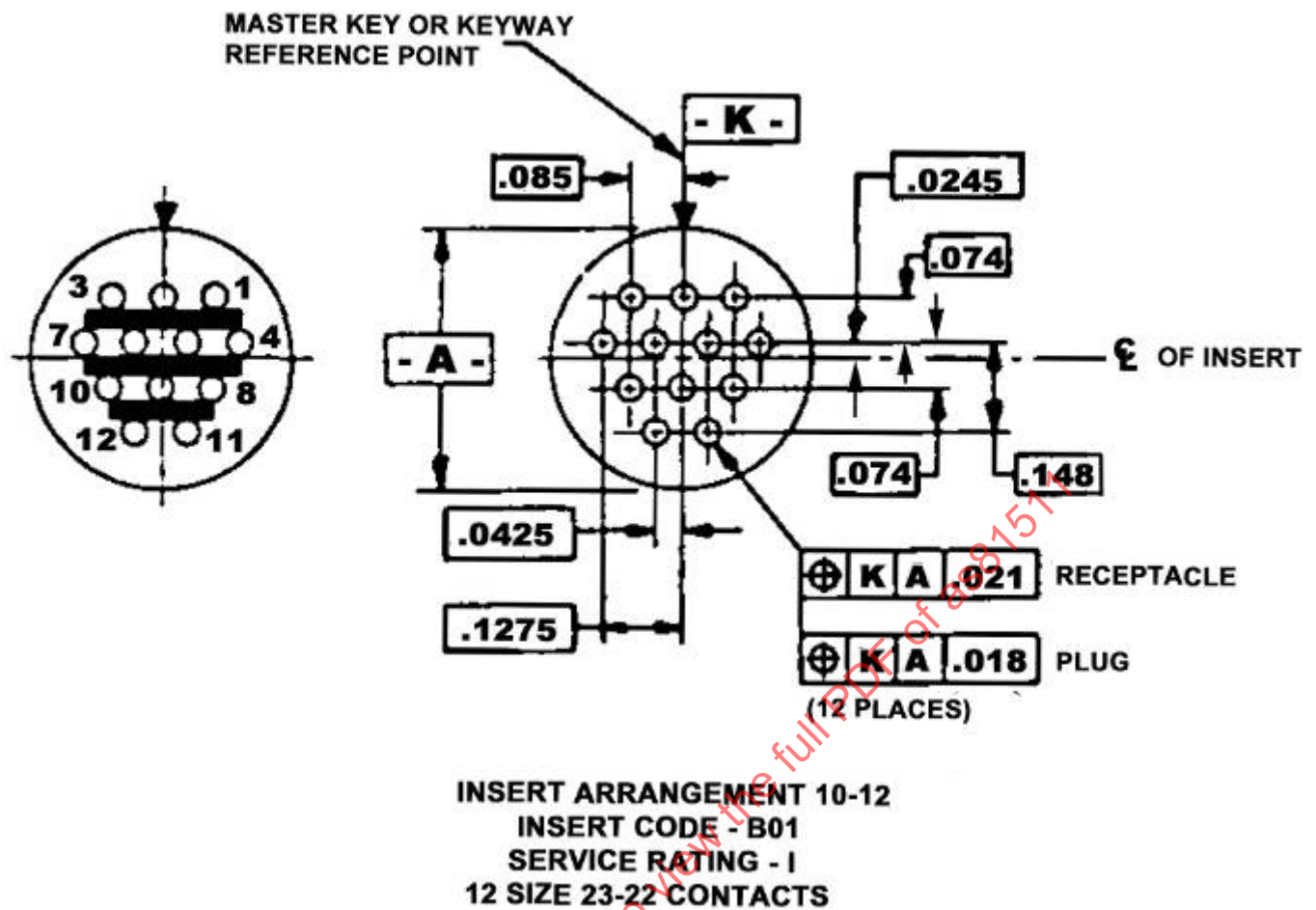


FIGURE A3 - INSERT ARRANGEMENT 10-12 (INSERT CODE B01)

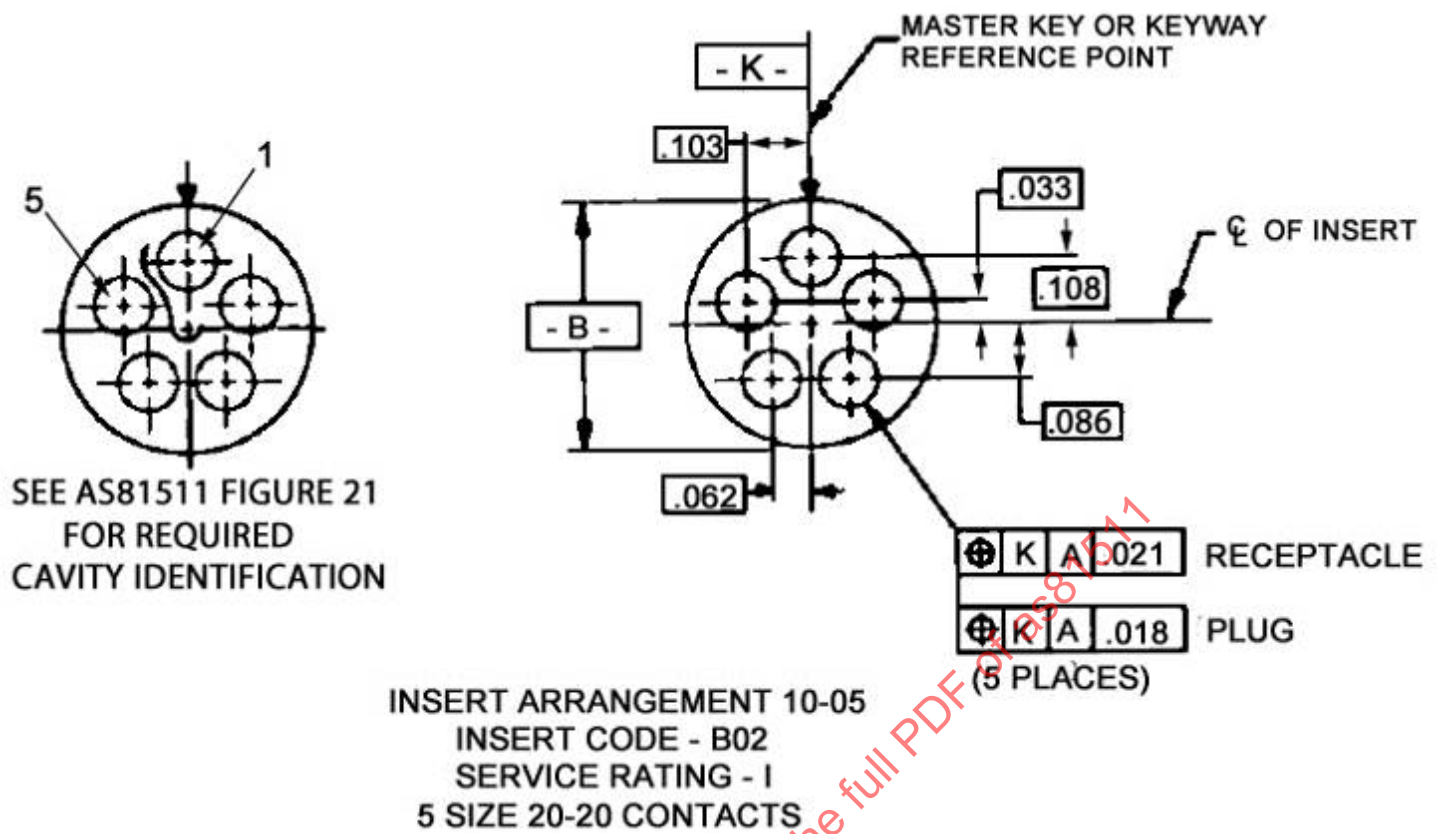
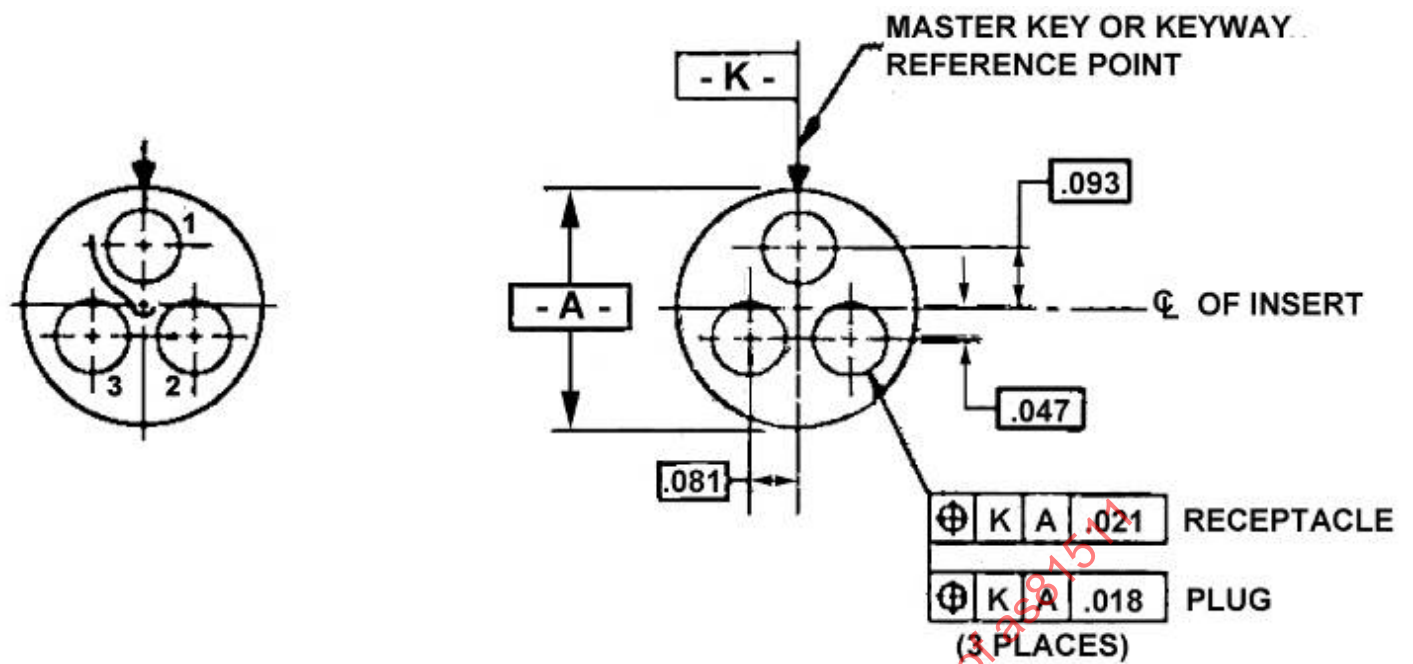


FIGURE A4 - INSERT ARRANGEMENT 10-05 (INSERT CODE B02)



INSERT ARRANGEMENT 10-03

INSERT CODE - B03

SERVICE RATING - I

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FIGURE A5 - INSERT ARRANGEMENT 10-03 (INSERT CODE B03)