

MIL-DTL-38999 Features and Application Series I



Features and Application

MIL-DTL-38999 Series I is a bayonet coupling subminiature configuration with high contact density, ideal for smaller wire gauge, general-purpose applications. These environment-resisting connectors are 100% “scoop-proof.” Pins are recessed in elongated shells to prevent the possibility of bending contacts when plugs are scooped into the mating receptacles.

This family of connectors is offered in 5 receptacle-mounting styles. They include square flange receptacles, for both front and rear panel (wall) mounting; square flange receptacles, for both front and rear box mounting; and jam nut receptacles which incorporate “O” ring seals, designed for rear panel “D” hole mounting.

Standard plugs provide RFI protection by incorporating a continuous strip of attached grounding fingers attenuating interference up to 1 GHz.

Fifty-seven insert arrangements per MIL-STD-1560 are tooled and qualified to MIL-DTL-38999 Series I, utilizing 2 to 128 contacts. Contacts come in sizes 22M, 22D, 20, 16, 12, and 8 (coax and twinax), terminating wire sizes from 28 gauge to 12 gauge including coaxial cable.

These connectors are available in wide range of shell materials and finishes. Aluminum shells are offered in electroless nickel, olive drab cadmium and bright cadmium. Other finishes such as anodic and zinc cobalt are available upon request to commercial callouts only. In addition, we offer passivated stainless steel shells with standard environment-resisting inserts (commercial callouts only), and for highly corrosive environments, nickel-aluminum-bronze shells with standard environment-resisting inserts (commercial callouts only).

Universal I/R Tool – A single, expendable plastic tool is used for both insertion and removal of contacts.

Scoop-Proof Design – Recessed pins in elongated shells minimize the possibility for contact damage. In a blind mating application, mating shells cannot “scoop” the pins, and cause a shorting or bending of contacts.

Closed-Entry Socket Insert – Hard dielectric socket face has lead-in chamfers for positive alignment of pins (even partially bent within pre-established limits) with sockets.

Interfacial Pin Insert Seal – Raised moisture barriers around each pin, which mate into lead-in chamfers of hard face socket insert, provide individual contact sealing. Interfacial seal is never touched by service tools.

Elastomer Wire Sealing Grommet – Sealing over a wide range of wire diameters is assured by a triple wire seal in each cavity at the rear of the connector.

Superior Contact Stability – Rear release crimp contact system features a stamped beryllium-copper retaining clip captivated by molded-in shoulders of each contact cavity in the insulator. A rear-inserted M81969 plastic tool expands the tines beyond the shoulder, releasing the contact.

Shell Polarization – Alternate key/keyway positions prevent cross mating of adjacent connectors having identical insert arrangement.





MIL-DTL-38999

Performance Specifications

Series I

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Performance Specifications

Operating Temperature Range

Finish B: -65°C to +175°C (-85°F to +347°F)

Finish F: -65°C to +200°C (-85°F to +392°F)

Finish A: -65°C to +150°C (-85°F to +302°F)

Material and Plating Data (Finish)

B – aluminum shell, olive drab cadmium over nickel base

F – aluminum shell, electroless nickel finish

A – aluminum shell, silver to light iridescent yellow color (bright) cadmium over electroless nickel

Corrosion Resistance

Finishes A and B withstand 500-hour salt spray.

Finish F withstands 48-hour salt spray.

Durability

Minimum of 500 mating cycles

Environmental Seal

Wired, mated connectors with specified accessories attached, shall meet the altitude-immersion test specified in MIL-DTL-38999.

Fluid Resistance

Connectors resist specified immersions in MIL-PRF-7808, MIL-PRF-23699, MIL-PRF-5606, M2-V Chevron oil, Coolanol 25, MIL-DTL-83133 (JP-8), MIL-DTL-5624 (JP-4, JP-5), SAE-AMS1424 Type I, and other solvents and cleaning agents.

Shell-to-Shell Conductivity

- Finish F = 1.0 millivolt maximum potential drop
- Finishes A and B = 2.5 millivolts maximum potential drop

Voltage Rating

| Service Rating | Suggested Operating Voltage | | Test Voltage | Test Voltage | Test Voltage | Test Voltage |
|----------------|-----------------------------|------|--------------|--------------|--------------|--------------|
| | (Sea Level) | | Sea Level | 50,000 Ft. | 70,000 Ft. | 100,000 Ft. |
| | AC (RMS) | DC | V RMS | V RMS | V RMS | V RMS |
| M | 400 | 550 | 1300 | 550 | 350 | 200 |
| N | 300 | 450 | 1000 | 400 | 260 | 200 |
| I | 600 | 850 | 1800 | 600 | 400 | 200 |
| II | 900 | 1250 | 2300 | 800 | 500 | 200 |

Note: The establishment of electrical safety factors is left entirely to the designer, as he is in the best position to know

Shielding Effectiveness

RFI and EMI attenuation at the specified frequencies meet the requirements of MIL-DTL-38999.

- RFI shielding effectiveness of mated connectors with RFI backshells is measured in a triaxial radio frequency leakage fixture.
- EMI shielding effectiveness is measured at the interface of mated connectors and tested by the mode-stirred technique specified in method 3008 of MIL-STD-1344.

Shock and Vibration Requirements

Wired, mated connectors shall not be damaged, nor shall there be a current interruption longer than one microsecond when subjected to the following:

Standard Shock

Mated connectors withstand a pulse of approximate half sine wave of 300 G ± 15 percent magnitude with duration of 3 ± 1 milliseconds applied in three axes per MIL-STD-1344, method 2004.

High Impact Shock

When mounted as specified in MIL-S-901, grade A, a drop of a 400 lb. Hammer from 1 foot, 3 feet and 5 feet applied to connector in three axes, totaling nine impacts.

Vibration

Mated connectors, with proper accessories, withstand the following vibration levels:

- Sine Vibration per MIL-STD-202, method 204, test condition G.
- Random Vibration per MIL-STD-1344, method 2005, test condition V and test condition VI, Letter “J” at ambient temperature.

exactly what peak voltages, switching currents, transients, etc., can be expected in a particular circuit.

MIL-DTL-38999
Part Number Development
Series I



Military and Aero-Electric Part Number Development

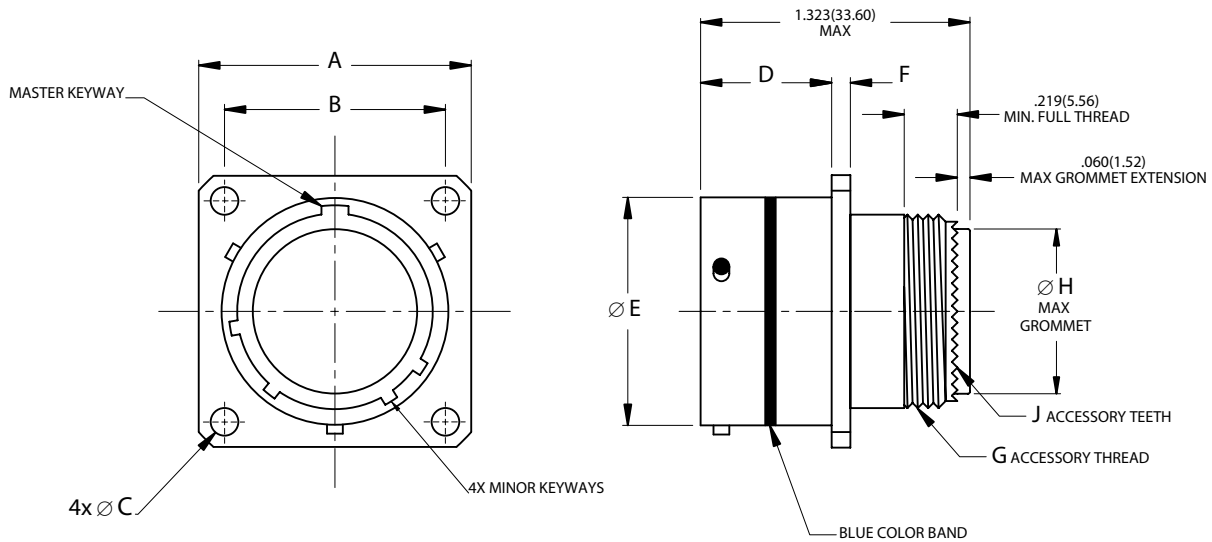
38999 S I

| Mil. Prefix | MS | 27467 | T | 13 | B | 35 | P | A | |
|---|----|-------|---|----|---|----|---|---|------|
| Aero Prefix | AE | 167 | T | 13 | B | 35 | P | A | -340 |
| Shell Type | | | | | | | | | |
| 27466 = Front, wall mount receptacle = 166 (Aero p/n) | | | | | | | | | |
| 27467 = RFI grounding plug = 167 (Aero p/n) | | | | | | | | | |
| 27468 = Jam nut receptacle = 168 (Aero p/n) | | | | | | | | | |
| 27496 = Front, box mount receptacle = 196 (Aero p/n) | | | | | | | | | |
| 27505 = Rear, box mount receptacle = 105 (Aero p/n) | | | | | | | | | |
| 27656 = Rear, wall mount receptacle = 156 (Aero p/n) | | | | | | | | | |
| Class | | | | | | | | | |
| T = With acc. thread (MS27466, MS27467, MS27468 & MS27656) | | | | | | | | | |
| E = Same as T in line above but is not approved for new design (E-nut is not included) | | | | | | | | | |
| = No acc. thread, box mount (MS27496 & MS27505) | | | | | | | | | |
| Shell Size | | | | | | | | | |
| 9, 11, 13, 15, 17, 19, 21, 23 or 25 | | | | | | | | | |
| Finish (Material & Plating) | | | | | | | | | |
| A = Aluminum shell, silver to light iridescent yellow color (bright) cadmium over nickel base | | | | | | | | | |
| B = Aluminum shell, olive drab cadmium over electroless nickel base | | | | | | | | | |
| F = Aluminum shell, electroless nickel finish | | | | | | | | | |
| S = Stainless steel shell, passivated (Aero p/n only) | | | | | | | | | |
| Insert Arrangement | | | | | | | | | |
| See page 19 thru 21 | | | | | | | | | |
| Contact Style | | | | | | | | | |
| P = Pin | | | | | | | | | |
| S = Socket | | | | | | | | | |
| A = Pin connector less pins (with intent to use non-standard pin contacts) | | | | | | | | | |
| B = Socket connector less sockets (with intent to use non-standard socket contacts) | | | | | | | | | |
| Polarization (Keying) | | | | | | | | | |
| N = Normal (Omitted in part number) | | | | | | | | | |
| A, B, C, or D (B & C keyways are not available in shell size 9) | | | | | | | | | |
| Modification (applies to Aero part numbers only) | | | | | | | | | |
| 01 = Less contacts (is not marked on the part) | | | | | | | | | |
| 340 = Connector kitted with M85049/27-XXX E-nut | | | | | | | | | |
| 341 = Connector kitted with M85049/49-2-XXX straight clamp | | | | | | | | | |
| 342 = Connector kitted with M85049/47XXX right angle clamp | | | | | | | | | |
| Consult factory for other modifications | | | | | | | | | |

Note 1: Each connector is furnished with contacts unless ordered less contacts (L/C) as follows: One spare contact for inserts requiring 1 through 26 of each contact and two spares for inserts with more than 26 contacts and a minimum of one sealing plug up to 10% of the number of contacts. Spare Coax and Twinax contacts are not supplied. One insertion/removal tool for each contact size is also included.

Note 2: Proper part number marking has no “0” in front of single digit shell size (9) and no “0” in front of single digit layout. Example of each: J MS27466T9B35S and J MS27466T11B5S. In both, “N” for normal is omitted. In addition, J or JAN must now be marked in front of the MS part number.

Bayonet Coupling, Crimp Removable, Rear Release, Scoop-Proof



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| Pages 19–21 | Insert Arrangements |
| Page 4 | Performance Specifications |
| Pages 16-18 | Insert Availability and Contact Information |
| Page 13 | Polarization |

| Shell Size | A | | B | | Ø C | | D | | Ø E | | F | | G | Ø H | | J |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------|---------|-------|--------------|
| | ±.020 | ±.51 | (TP) | | +0.10 | +0.25 | +0.00 | +0.00 | +0.01 | +0.03 | +0.15 | +0.38 | Accessory Thread | Maximum | | No. of Teeth |
| | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | | inch | mm | |
| 9 | .938 | 23.83 | .719 | 18.26 | .128 | 3.25 | .632 | 16.05 | .572 | 14.53 | .085 | 2.16 | 7/16-28 | .299 | 7.59 | 12 |
| 11 | 1.031 | 26.19 | .812 | 20.62 | .128 | 3.25 | .632 | 16.05 | .700 | 17.78 | .085 | 2.16 | 9/16-24 | .427 | 10.85 | 16 |
| 13 | 1.125 | 28.58 | .906 | 23.01 | .128 | 3.25 | .632 | 16.05 | .850 | 21.59 | .085 | 2.16 | 11/16-24 | .541 | 13.74 | 20 |
| 15 | 1.219 | 30.96 | .969 | 24.61 | .128 | 3.25 | .632 | 16.05 | .975 | 24.77 | .085 | 2.16 | 13/16-20 | .666 | 16.92 | 24 |
| 17 | 1.312 | 33.32 | 1.062 | 26.97 | .128 | 3.25 | .632 | 16.05 | 1.100 | 27.94 | .085 | 2.16 | 15/16-20 | .791 | 20.09 | 28 |
| 19 | 1.438 | 36.53 | 1.156 | 29.36 | .128 | 3.25 | .632 | 16.05 | 1.207 | 30.66 | .085 | 2.16 | 1-1/16-18 | .897 | 22.78 | 32 |
| 21 | 1.562 | 39.67 | 1.250 | 31.75 | .128 | 3.25 | .602 | 15.29 | 1.332 | 33.83 | .115 | 2.92 | 1-3/16-18 | 1.022 | 25.96 | 36 |
| 23 | 1.688 | 42.88 | 1.375 | 34.93 | .147 | 3.73 | .602 | 15.29 | 1.457 | 37.01 | .115 | 2.92 | 1-5/16-18 | 1.147 | 29.13 | 40 |
| 25 | 1.812 | 46.02 | 1.500 | 38.10 | .147 | 3.73 | .602 | 15.29 | 1.582 | 40.18 | .115 | 2.92 | 1-7/16-18 | 1.272 | 32.31 | 44 |

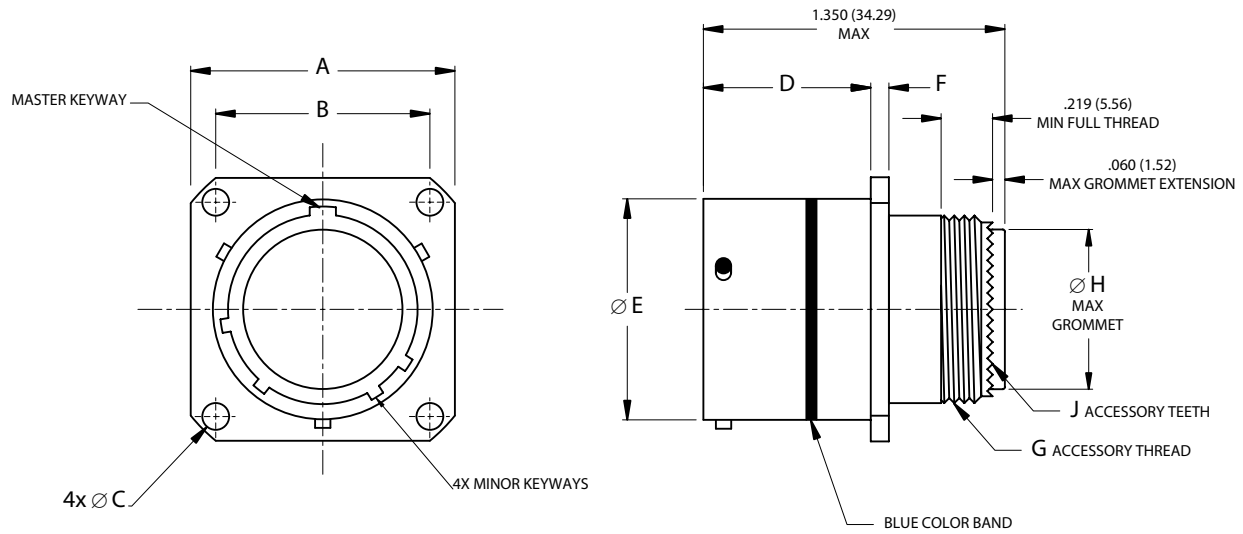
MS27656

Rear, Wall Mounting Receptacle

AE156



Bayonet Coupling, Crimp Removable, Rear Release, Scoop-Proof



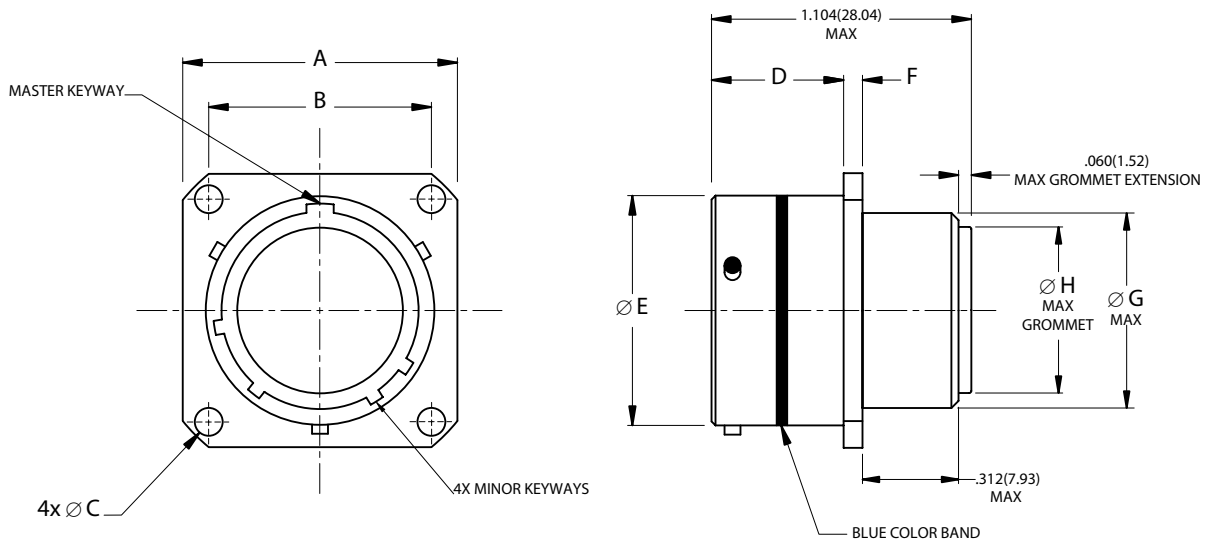
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Note: See page 14 for panel thickness.

| Shell Size | A | | B | | Ø C | | D | | Ø E | | F | | G | Ø H | | J |
|------------|-------|-------|-------|-------|--------|-------|--------|-------|--------|-------|--------|-------|------------------|---------|-------|--------------|
| | ±.020 | ±.51 | (TP) | | +0.010 | +0.25 | +0.000 | +0.00 | +0.001 | +0.03 | +0.015 | +0.38 | Accessory Thread | Maximum | | No. of Teeth |
| | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | | inch | mm | |
| 9 | .938 | 23.83 | .719 | 18.26 | .128 | 3.25 | .820 | 20.83 | .572 | 14.53 | .085 | 2.16 | 7/16-28 | .299 | 7.59 | 12 |
| 11 | 1.031 | 26.19 | .812 | 20.62 | .128 | 3.25 | .820 | 20.83 | .700 | 17.78 | .085 | 2.16 | 9/16-24 | .427 | 10.85 | 16 |
| 13 | 1.125 | 28.58 | .906 | 23.01 | .128 | 3.25 | .820 | 20.83 | .850 | 21.59 | .085 | 2.16 | 11/16-24 | .541 | 13.74 | 20 |
| 15 | 1.219 | 30.96 | .969 | 24.61 | .128 | 3.25 | .820 | 20.83 | .975 | 24.77 | .085 | 2.16 | 13/16-20 | .666 | 16.92 | 24 |
| 17 | 1.312 | 33.32 | 1.062 | 26.97 | .128 | 3.25 | .820 | 20.83 | 1.100 | 27.94 | .085 | 2.16 | 15/16-20 | .791 | 20.09 | 28 |
| 19 | 1.438 | 36.53 | 1.156 | 29.36 | .128 | 3.25 | .820 | 20.83 | 1.207 | 30.66 | .085 | 2.16 | 1-1/16-18 | .897 | 22.78 | 32 |
| 21 | 1.562 | 39.67 | 1.250 | 31.75 | .128 | 3.25 | .790 | 20.07 | 1.332 | 33.83 | .115 | 2.92 | 1-3/16-18 | 1.022 | 25.96 | 36 |
| 23 | 1.688 | 42.88 | 1.375 | 34.93 | .147 | 3.73 | .790 | 20.07 | 1.457 | 37.01 | .115 | 2.92 | 1-5/16-18 | 1.147 | 29.13 | 40 |
| 25 | 1.812 | 46.02 | 1.500 | 38.10 | .147 | 3.73 | .790 | 20.07 | 1.582 | 40.18 | .115 | 2.92 | 1-7/16-18 | 1.272 | 32.31 | 44 |

Bayonet Coupling, Crimp Removable, Rear Release, Scoop-Proof



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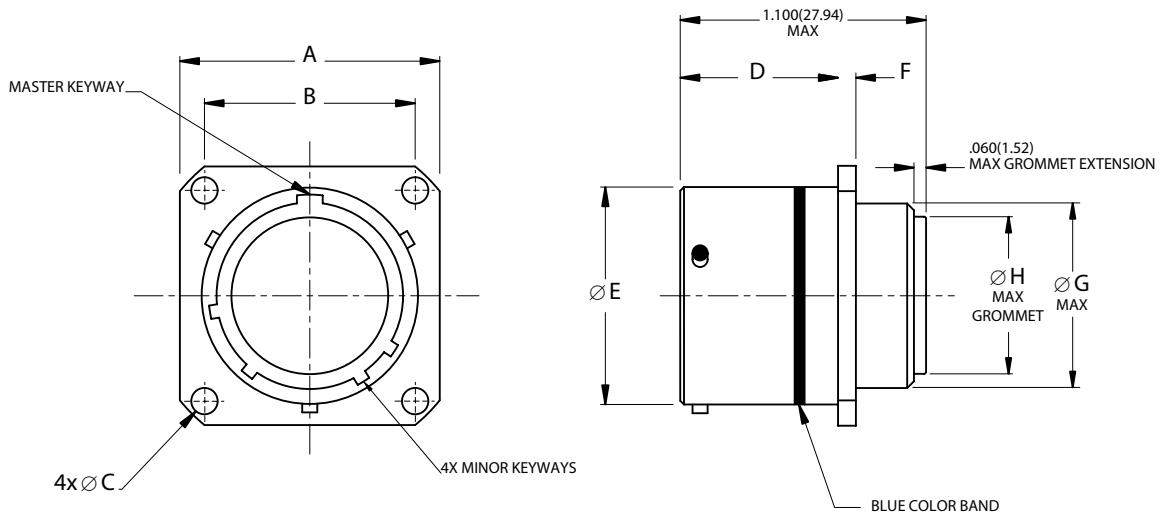
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| Shell Size | A | | B | | Ø C | | D | | Ø E | | F | | Ø G | | Ø H | |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|--------|-------|---------|-------|---------|-------|
| | ±.020 | ±.51 | (TP) | | +0.10 | +0.25 | +0.00 | +0.00 | +0.001 | +0.03 | +0.015 | +0.38 | Maximum | | Maximum | |
| | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm |
| 9 | .938 | 23.83 | .719 | 18.26 | .128 | 3.25 | .632 | 16.05 | .572 | 14.53 | .085 | 2.16 | .469 | 11.91 | .299 | 7.59 |
| 11 | 1.031 | 26.19 | .812 | 20.62 | .128 | 3.25 | .632 | 16.05 | .700 | 17.78 | .085 | 2.16 | .594 | 15.09 | .427 | 10.85 |
| 13 | 1.125 | 28.58 | .906 | 23.01 | .128 | 3.25 | .632 | 16.05 | .850 | 21.59 | .085 | 2.16 | .719 | 18.26 | .541 | 13.74 |
| 15 | 1.219 | 30.96 | .969 | 24.61 | .128 | 3.25 | .632 | 16.05 | .975 | 24.77 | .085 | 2.16 | .844 | 21.44 | .666 | 16.92 |
| 17 | 1.312 | 33.32 | 1.062 | 26.97 | .128 | 3.25 | .632 | 16.05 | 1.100 | 27.94 | .085 | 2.16 | .969 | 24.61 | .791 | 20.09 |
| 19 | 1.438 | 36.53 | 1.156 | 29.36 | .128 | 3.25 | .632 | 16.05 | 1.207 | 30.66 | .085 | 2.16 | 1.078 | 27.38 | .897 | 22.78 |
| 21 | 1.562 | 39.67 | 1.250 | 31.75 | .128 | 3.25 | .602 | 15.29 | 1.332 | 33.83 | .115 | 2.92 | 1.203 | 30.56 | 1.022 | 25.96 |
| 23 | 1.688 | 42.88 | 1.375 | 34.93 | .147 | 3.73 | .602 | 15.29 | 1.457 | 37.01 | .115 | 2.92 | 1.328 | 33.73 | 1.147 | 29.13 |
| 25 | 1.812 | 46.02 | 1.500 | 38.10 | .147 | 3.73 | .602 | 15.29 | 1.582 | 40.18 | .115 | 2.92 | 1.453 | 36.91 | 1.272 | 32.31 |

MS27505
Rear, Box Mounting Receptacle
AE105



Bayonet Coupling, Crimp Removable, Rear Release, Scoop-Proof



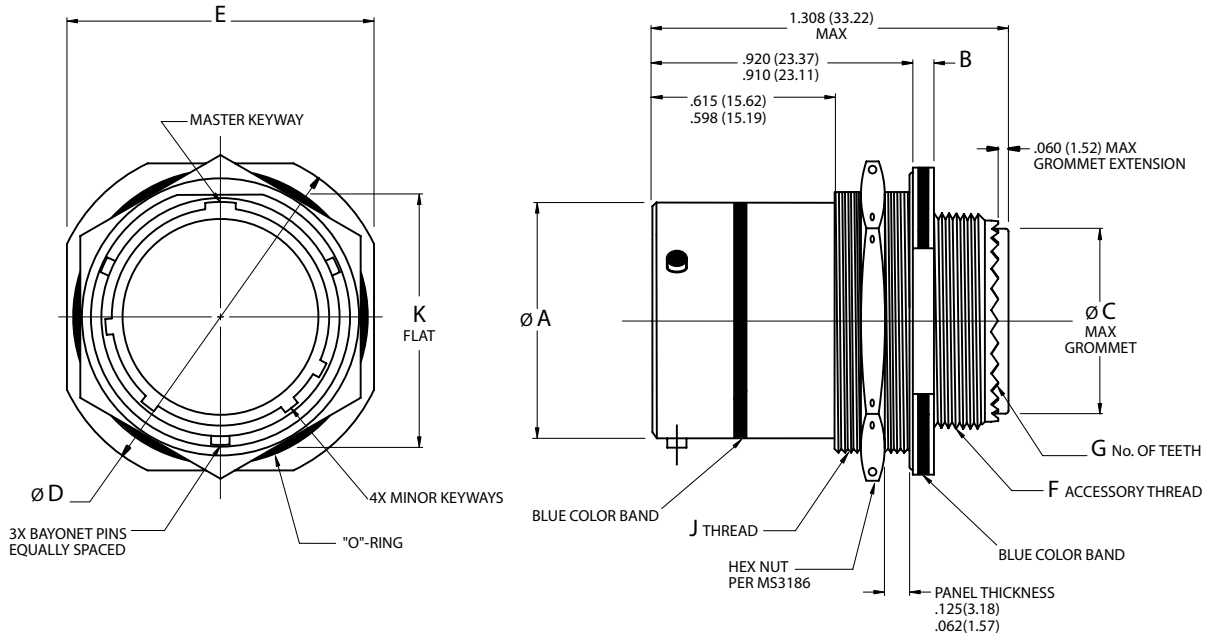
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Note: See page 14 for panel thickness.

| Shell Size | A | | B | | Ø C | | D | | Ø E | | F | | Ø G | | Ø H | |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|--------|-------|---------|-------|---------|-------|
| | ±.020 | ±.51 | (TP) | | +0.10 | +0.25 | +0.00 | +0.00 | +0.001 | +0.03 | +0.015 | +0.38 | Maximum | | Maximum | |
| | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm |
| 9 | .938 | 23.83 | .719 | 18.26 | .128 | 3.25 | .820 | 20.83 | .572 | 14.53 | .085 | 2.16 | .547 | 13.89 | .299 | 7.59 |
| 11 | 1.031 | 26.19 | .812 | 20.62 | .128 | 3.25 | .820 | 20.83 | .700 | 17.78 | .085 | 2.16 | .656 | 16.66 | .427 | 10.85 |
| 13 | 1.125 | 28.58 | .906 | 23.01 | .128 | 3.25 | .820 | 20.83 | .850 | 21.59 | .085 | 2.16 | .828 | 21.03 | .541 | 13.74 |
| 15 | 1.219 | 30.96 | .969 | 24.61 | .128 | 3.25 | .820 | 20.83 | .975 | 24.77 | .085 | 2.16 | .953 | 24.21 | .666 | 16.92 |
| 17 | 1.312 | 33.32 | 1.062 | 26.97 | .128 | 3.25 | .820 | 20.83 | 1.100 | 27.94 | .085 | 2.16 | 1.078 | 27.38 | .791 | 20.09 |
| 19 | 1.438 | 36.53 | 1.156 | 29.36 | .128 | 3.25 | .820 | 20.83 | 1.207 | 30.66 | .085 | 2.16 | 1.203 | 30.56 | .897 | 22.78 |
| 21 | 1.562 | 39.67 | 1.250 | 31.75 | .128 | 3.25 | .790 | 20.07 | 1.332 | 33.83 | .115 | 2.92 | 1.328 | 33.73 | 1.022 | 25.96 |
| 23 | 1.688 | 42.88 | 1.375 | 34.93 | .147 | 3.73 | .790 | 20.07 | 1.457 | 37.01 | .115 | 2.92 | 1.453 | 36.91 | 1.147 | 29.13 |
| 25 | 1.812 | 46.02 | 1.500 | 38.10 | .147 | 3.73 | .790 | 20.07 | 1.582 | 40.18 | .115 | 2.92 | 1.578 | 40.08 | 1.272 | 32.31 |

Bayonet Coupling, Crimp Removable, Rear Release, Scoop-Proof



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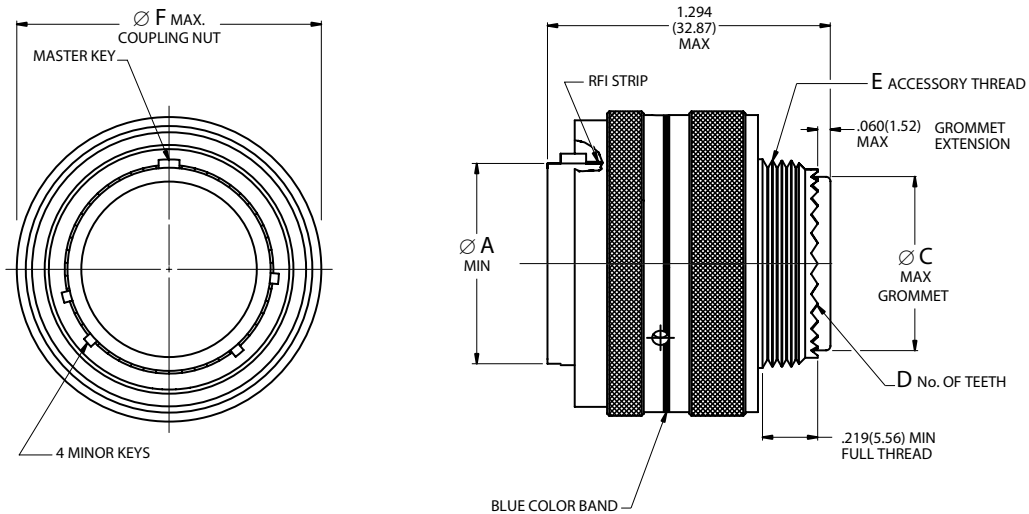
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| Shell Size | Ø A | | B | | Ø C | | Ø D | | E | | F | G | J | K | |
|------------|--------|-------|-------|-------|---------|-------|-------|-------|-------|------------------|--------------|-------------------------|--------------|-------|-------|
| | +0.01 | +0.03 | +0.11 | +0.28 | Maximum | ±0.16 | ±0.41 | ±0.16 | ±0.41 | Accessory Thread | No. of Teeth | Jam Nut Thread Class 2A | Flat | | |
| | -0.005 | -0.13 | -0.10 | -0.25 | | inch | mm | inch | mm | | | | inch | mm | |
| 9 | .572 | 14.53 | .109 | 2.77 | .299 | 7.59 | 1.188 | 30.18 | 1.062 | 26.97 | 7/16-28 | 12 | 11/16-24UNEF | .650 | 16.51 |
| 11 | .700 | 17.78 | .109 | 2.77 | .427 | 10.85 | 1.375 | 34.93 | 1.250 | 31.75 | 9/16-24 | 16 | 13/16-20UNEF | .750 | 19.05 |
| 13 | .850 | 21.59 | .109 | 2.77 | .541 | 13.74 | 1.500 | 38.10 | 1.375 | 34.93 | 11/16-24 | 20 | 1-20UNEF | .937 | 23.80 |
| 15 | .975 | 24.77 | .109 | 2.77 | .666 | 16.92 | 1.625 | 41.28 | 1.500 | 38.10 | 13/16-20 | 24 | 1-1/8-18UNEF | 1.061 | 26.95 |
| 17 | 1.100 | 27.94 | .109 | 2.77 | .791 | 20.09 | 1.750 | 44.45 | 1.625 | 41.28 | 15/16-20 | 28 | 1-1/4-18UNEF | 1.186 | 30.12 |
| 19 | 1.207 | 30.66 | .140 | 3.56 | .897 | 22.78 | 1.938 | 49.23 | 1.812 | 46.02 | 1-1/16-18 | 32 | 1-3/8-18UNEF | 1.311 | 33.30 |
| 21 | 1.332 | 33.83 | .140 | 3.56 | 1.022 | 25.96 | 2.062 | 52.37 | 1.938 | 49.23 | 1-3/16-18 | 36 | 1-1/2-18UNEF | 1.436 | 36.47 |
| 23 | 1.457 | 37.01 | .140 | 3.56 | 1.147 | 29.13 | 2.188 | 55.58 | 2.062 | 52.37 | 1-5/16-18 | 40 | 1-5/8-18UNEF | 1.561 | 39.65 |
| 25 | 1.582 | 40.18 | .140 | 3.56 | 1.272 | 32.31 | 2.312 | 58.72 | 2.188 | 55.58 | 1-7/16-18 | 44 | 1-3/4-18UNS | 1.686 | 42.82 |

MS27467
RFI Grounding Plug
AE167



Bayonet Coupling, Crimp Removable, Rear Release, Scoop-Proof



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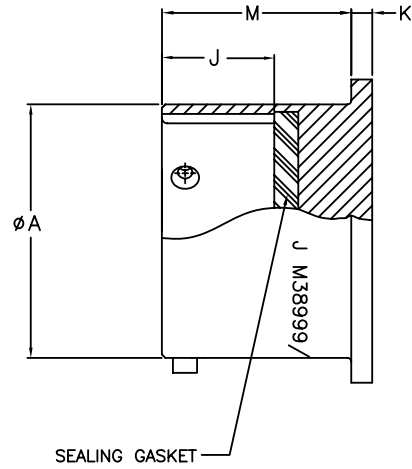
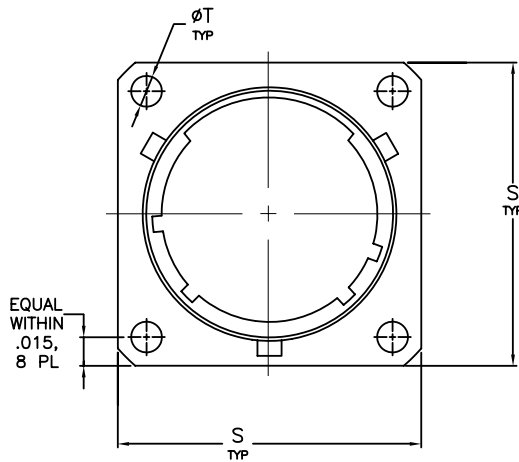
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| Shell Size | Ø A | | Ø C | | D | E | Ø F | |
|------------|---------|-------|---------|-------|--------------|---------------------------|---------|-------|
| | Minimum | | Maximum | | No. of Teeth | Accessory Thread Class 2A | Maximum | |
| | inch | mm | inch | mm | | | inch | mm |
| 9 | .417 | 10.59 | .299 | 7.59 | 12 | 7/16-28UNEF | .859 | 21.82 |
| 11 | .545 | 13.84 | .427 | 10.85 | 16 | 9/16-24UNEF | .984 | 24.99 |
| 13 | .657 | 16.69 | .541 | 13.74 | 20 | 11/16-24UNEF | 1.156 | 29.36 |
| 15 | .782 | 19.86 | .666 | 16.92 | 24 | 13/16-20UNEF | 1.281 | 32.54 |
| 17 | .907 | 23.04 | .791 | 20.09 | 28 | 15/16-20UNEF | 1.406 | 35.71 |
| 19 | 1.012 | 25.70 | .897 | 22.78 | 32 | 1-1/16-18UNEF | 1.516 | 38.51 |
| 21 | 1.137 | 28.88 | 1.022 | 25.96 | 36 | 1-3/16-18UNEF | 1.641 | 41.68 |
| 23 | 1.262 | 32.05 | 1.147 | 29.13 | 40 | 1-5/16-18UNEF | 1.766 | 44.86 |
| 25 | 1.387 | 35.23 | 1.272 | 32.31 | 44 | 1-7/16-18UNEF | 1.891 | 48.03 |



M38999/9
Dummy Storage Receptacle
AE109

Dummy Storage Receptacle, Bayonet Coupling



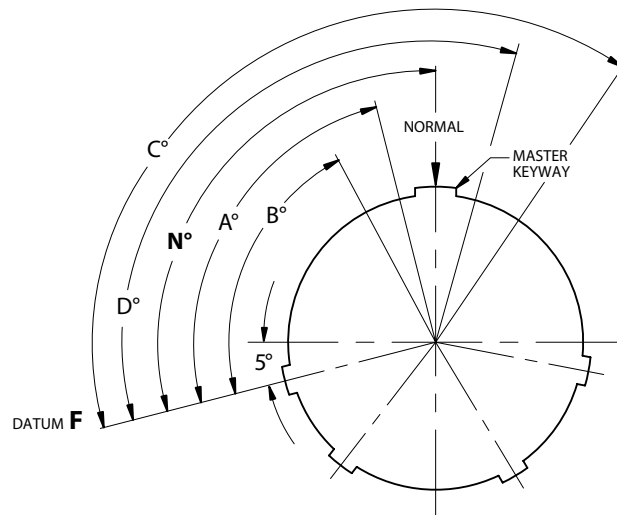
38999 S I

Part Number Configuration

| | | | | |
|---|---------------|-----------|-----------|----------|
| MIL. Prefix | M38999 | 9/ | XX | B |
| Aero Prefix | AE10 | 9- | XX | B |
| Shell Type | | | | |
| 9 = receptacle, dummy stowage, bayonet coupling | | | | |
| Shell Size | | | | |
| 9 THRU 25 (Note: single digit for shell size 9) | | | | |
| Material Finish | | | | |
| B = Aluminum, Cadmium Olive Drab | | | | |
| A = Aluminum, Bright Cadmium over Nickel base (Aero p/n only) | | | | |
| F = Aluminum shell, Electroless Nickel finish (Aero p/n only) | | | | |
| S = Stainless steel shell, passivated (Aero p/n only) | | | | |
| BN = Aluminum, Black Nickel (Aero p/n only) | | | | |
| BZ = Bronze (Aero p/n only) | | | | |

| SHELL SIZE | ϕA +.001 -.005 | K +.015 -.000 | M $\pm .010$ | ϕT +.010 -.005 | S $\pm .020$ | J +.010 -.015 |
|------------|----------------------------|---------------------|-----------------|----------------------------|-----------------|---------------------|
| 9 | .572 | .085 | .727 | .128 | .938 | .567 |
| 11 | .700 | .085 | .727 | .128 | 1.031 | .567 |
| 13 | .850 | .085 | .727 | .128 | 1.125 | .567 |
| 15 | .975 | .085 | .727 | .128 | 1.219 | .567 |
| 17 | 1.100 | .085 | .727 | .128 | 1.312 | .567 |
| 19 | 1.207 | .085 | .727 | .128 | 1.438 | .567 |
| 21 | 1.332 | .115 | .697 | .128 | 1.562 | .567 |
| 23 | 1.457 | .115 | .697 | .147 | 1.688 | .567 |
| 25 | 1.582 | .115 | .697 | .147 | 1.812 | .567 |

Keying Positions



38999 S I

Notes:

1. Mating face of receptacle shown (plug is opposite).
2. The master keyway (key) has various positions relative to DATUM **F**; the minor keyways (keys) remain fixed as shown. In the Normal position, the master keyway (key) is at 95° from DATUM **F**.
3. The angles for a given connector are the same whether it contains pin or socket inserts.
4. The insert arrangement does not rotate relative to master keyway (key).

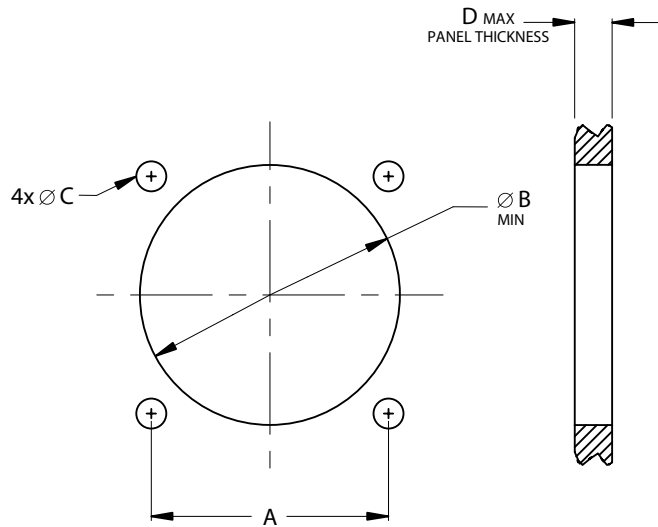
| Shell Size | Keying Positions | | | | |
|------------|------------------|----|----|-----|-----|
| | BSC | | | | |
| | N° | A° | B° | C° | D° |
| 9 | 95 | 77 | - | - | 113 |
| 11 | 95 | 81 | 67 | 123 | 109 |
| 13 | 95 | 75 | 63 | 127 | 115 |
| 15 | 95 | 74 | 61 | 129 | 116 |
| 17 | 95 | 77 | 65 | 125 | 113 |
| 19 | 95 | 77 | 65 | 125 | 113 |
| 21 | 95 | 77 | 65 | 125 | 113 |
| 23 | 95 | 80 | 69 | 121 | 110 |
| 25 | 95 | 80 | 69 | 121 | 110 |



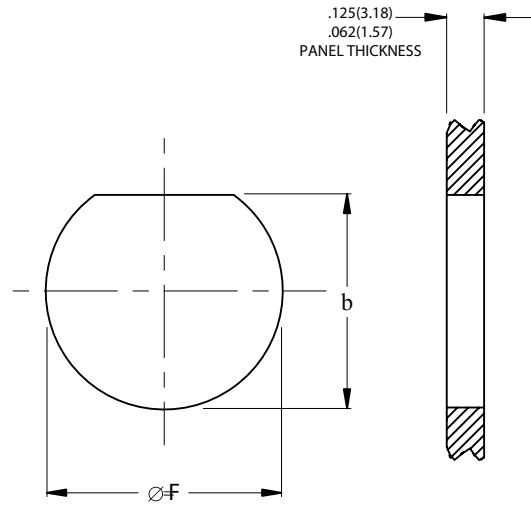
MIL-DTL-38999 Series I Flange and Jam Nut Receptacles Panel Cutouts

Panel Cutouts

FLANGE MOUNT



JAM NUT MOUNT



38999 S I

Note 1: Flange Mounting Dimensions ($\varnothing B$ cutout and D MAX) listed only for back of panel mounting (MS27505 and MS27656).

Note 2: D MAX includes mounting hardware.

Flange and Jam Nut Mounting Dimensions

| Shell Size | A | | $\varnothing B$ | | $\varnothing C$ | | D | | E | | $\varnothing F$ | |
|------------|-------|-------|-----------------|-------|-----------------|-----------|---------|------|----------------------|--------------------|--------------------|------------------|
| | (TP) | | Minimum | | $\pm .005$ | $\pm .13$ | Maximum | | $+.000^*$ $-.010$ | $+.00^*$ $-.25$ | $+.010$ $-.000$ | $+.25$ $-.00$ |
| | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm |
| 9 | .719 | 18.26 | .656 | 16.66 | .128 | 3.25 | .234 | 5.94 | .657* | 16.70* | .693 | 17.60 |
| 11 | .812 | 20.62 | .796 | 20.22 | .128 | 3.25 | .234 | 5.94 | .771 | 19.59 | .825 | 20.96 |
| 13 | .906 | 23.01 | .922 | 23.42 | .128 | 3.25 | .234 | 5.94 | .955 | 24.26 | 1.010 | 25.65 |
| 15 | .969 | 24.61 | 1.047 | 26.59 | .128 | 3.25 | .234 | 5.94 | 1.085 | 27.56 | 1.135 | 28.83 |
| 17 | 1.062 | 26.97 | 1.219 | 30.96 | .128 | 3.25 | .234 | 5.94 | 1.210 | 30.73 | 1.260 | 32.01 |
| 19 | 1.156 | 29.36 | 1.297 | 32.94 | .128 | 3.25 | .234 | 5.94 | 1.335 | 33.91 | 1.385 | 35.18 |
| 21 | 1.250 | 31.75 | 1.422 | 36.12 | .128 | 3.25 | .204 | 5.18 | 1.460 | 37.08 | 1.510 | 38.35 |
| 23 | 1.375 | 34.93 | 1.547 | 39.29 | .154 | 3.91 | .204 | 5.18 | 1.585 | 40.26 | 1.635 | 41.53 |
| 25 | 1.500 | 38.10 | 1.672 | 42.47 | .154 | 3.91 | .193 | 4.90 | 1.710 | 43.43 | 1.760 | 44.70 |

* Tolerance $\pm .10\text{mm}$ ($\pm .004''$)

MIL-DTL-38999

Contacts, Tools and Seal Plugs
Series I



38999 S I

Contacts, Plastic Insertion/Removal Tools and Seal Plugs

| Contact Size | Application | Pin Contacts | Socket Contacts | Seal Plugs | Insertion/Removal Tools |
|--------------|--------------|----------------|-----------------|--------------|-------------------------|
| | Type | Military No. | Military No. | Military No. | Military No. |
| 22D | Power/Signal | M39029/58-360 | M39029/56-348 | MS27488-22-1 | M81969/14-01 |
| 22M* | Power/Signal | M39029/58-361 | M39029/56-349 | | — |
| 22* | Power/Signal | M39029/58-362 | M39029/56-350 | | — |
| 20 | Power/Signal | M39029/58-363 | M39029/56-351 | MS27488-20-1 | M81969/14-10 |
| 16 | Power/Signal | M39029/58-364 | M39029/56-352 | MS27488-16-1 | M81969/14-03 |
| 12 | Power/Signal | M39029/58-365 | M39029/56-353 | MS27488-12-1 | M81969/14-04 |
| 12 Coax | Coax | M39029/28-211 | M39029/75-416 | | |
| 12 Coax | Coax | M39029/102-558 | M39029/103-559 | | |
| 8 Coax | Coax | M39029/60-367 | M39029/59-366 | MS27488-8-1 | M81969/14-06 |
| 8 Twinax | Twinax | M39029/90-529 | M39029/91-530 | MS27488-8-1 | M81969/14-12 |

Crimping and Metal Insertion/Extraction Tools

| Contact Size/ Type | Crimp Tool | Positioner | Positioner | Insertion Tool | Extraction Tool |
|-------------------------------|--------------|------------------------------|------------------------------|----------------|-----------------|
| | | For Pin Contacts | For Socket Contacts | Metal | Metal |
| | Military No. | Military No. | Military No. | Military No. | Military No. |
| 22D, 22M* | M22520/2-01 | M22520/2-09 | M22520/2-07 | M81969/8-01 | M81969/8-02 |
| 22* | M22520/2-01 | M22520/2-09 | M22520/2-07 | M81969/8-03 | M81969/8-04 |
| 20 | M22520/1-01 | M22520/1-04 | M22520/1-04 | M81969/8-05 | M81969/8-06 |
| | M22520/2-01 | M22520/2-10 | M22520/2-10 | | |
| 16 | M22520/1-01 | M22520/1-04 | M22520/1-04 | M81969/8-07 | M81969/8-08 |
| 12 | M22520/1-01 | M22520/1-04 | M22520/1-04 | M81969/8-09 | M81969/8-10 |
| 12 Coax Inner | M22520/2-01 | M22520/2-34 | M22520/2-34 | | |
| 12 Coax Outer | M22520/31-01 | M22520/31-02 | M22520/31-02 | | |
| 8 Coax Inner | M22520/2-01 | M22520/2-31 | M22520/2-31 | M81969/8-13** | M81969/8-14 |
| 8 Coax Outer | M22520/5-01 | M22520/5-05 Die Closure B | M22520/5-05 Die Closure B | | |
| 8 Twinax Center | M22520/2-01 | M22520/2-37 | M22520/2-37 | — | — |
| 8 Twinax Outer & Intermediate | M22520/5-01 | M22520/5-200 | M22520/5-200 | | |

Contact and Wire Data

| Contact Size | Test Current | Voltage | Crimp Well Data | | | Wire Range | | Finished Wire Ø Range | | | |
|--------------|--------------|------------|-----------------|-------------------|------|------------|-----------------|-----------------------|------|---------|------|
| | DC Test | Max. Drop | Well Dia. | Minimum Well Dept | | AWG | mm ² | Minimum | | Maximum | |
| | Amps | Millivolts | inch | inch | mm | | | inch | mm | inch | mm |
| 22D | 5.0 | 73 | .0345 ±.0010 | .141 | 3.58 | 28-22 | .08-.33 | .030 | .76 | .054 | 1.37 |
| 22M* | 3.0 | 45 | .028 ±.001 | .141 | 3.58 | 28-24 | .08-.20 | .030 | .76 | .050 | 1.27 |
| 22* | 5.0 | 73 | .0365 ±.0010 | .141 | 3.58 | 26-22 | .13-.33 | .034 | .86 | .060 | 1.52 |
| 20 | 7.5 | 55 | .047 ±.001 | .209 | 5.31 | 24-20 | .20-.52 | .040 | 1.02 | .083 | 2.11 |
| 16 | 13.0 | 49 | .067 ±.001 | .209 | 5.31 | 20-16 | .52-1.31 | .065 | 1.65 | .109 | 2.77 |
| 12 | 23.0 | 42 | .100 ±.002 | .209 | 5.31 | 14-12 | 2.08-3.31 | .097 | 2.46 | .142 | 3.61 |

* Inactive for new design
** Insertion tool is not required.

Note 2: Size 12 coax contacts purchased in bulk.

Note 1: Test Current and Maximum Voltage Drop when tested with silver-plated wire at 25°C.

Note 3: Size 8 coax contacts are used with M17/095-RG180 cable, while size 8 Twinax contacts are used with M17/176-00002 cable.



MIL-DTL-38999

**Contact Installation Instructions
Series I**

38999 S I

Contact Installation Instructions

Crimping Contacts

1. Select the appropriate crimp tool and ensure that the proper crimp head positioner is used.
2. Cycle the tool to be sure the indentors are open.
3. Determine the correct selector setting for the wire size from the data plate on the positioner (turret head assembly) and set the selector knob on the crimp tool to match.
4. Place the contact, mating end first, into the tool.
5. Insert the stripped wire into the hollow end of the contact. Be sure the wire is inserted as far as it will go.
6. Close the tool completely to crimp. Unless the tool is closed completely, the tool will not release the contact.
7. Remove the crimped contact from the tool. Check the inspection hole to verify that the wire is fully inserted.

Insertion of Contacts

1. Before inserting the contacts, unscrew the accessories (clamps, backshells or adapters) from rear of plug or receptacle. Slide the hardware over the wire bundle in the proper order for reassembly after all the contacts are inserted.
2. To assist insertion of contacts, lubricate insulator (grommet) cavities with isopropyl alcohol. Alcohol will evaporate and will not leave a conductive film. **Caution: Never use any lubricant other than isopropyl alcohol.**

3. Place the correct insertion tool on the contact so that the wire runs along the groove in the tool. (Tool tip will butt against the shoulder.) Hold the plug or receptacle body firmly.
4. Beginning with a center cavity, insert the contact into the insulator with a slow, even pressure until the contact snaps into position. Make sure the contact and tool are held perpendicular to the face of the insert during the contact installation or the grommet could be damaged.
 - 4.1 If contacts are not inserted all the way prior to removing insertion tool, do not try to reinsert the insertion tool. Instead, remove the contact and try again; otherwise reinserting the insertion tool may damage the inside of the contact cavity.
5. Remove tool and check the face of the connector for proper contact installation. Proper installation may also be checked by pulling back lightly on the wire to make sure the contact is properly seated.

Completion

After all the cavities have been filled, slide the hardware back into position on the connector and tighten.

Extraction of Contacts (Rework)

1. Slide the hardware back over the wire bundle.
2. Select the appropriate tool. Place the wire into the extraction tool of the pin or socket.
3. Slowly slide the extraction tool down wire into the contact cavities until the tool tip bottoms against the contact shoulder, expanding the clip retaining tines. Hold the wire firmly in the tool and pull the wired contact and tool straight out of the rear of the insulator.

| Size | Pin Contact | Socket Contact | Basic Crimp Tool | Pin Positioner | Socket Positioner | Insertion/Removal Tool |
|------|---------------|----------------|------------------|--------------------|--------------------|------------------------|
| 22D | M39029/58-360 | M39029/56-348 | M22520/2-01 | M22520/2-09 | M22520/2-07 | M81969/14-01 |
| 22M | M39029/58-361 | M39029/56-349 | M22520/2-01 | M22520/2-09 | M22520/2-07 | M81969/14-01 |
| 22 | M39029/58-362 | M39029/56-350 | M22520/2-01 | M22520/2-09 | M22520/2-07 | M81969/14-01 |
| 20 | M39029/58-363 | M39029/56-351 | M22520/1-01 | M22520/1-04 Red | M22520/1-04 Red | M81969/14-10 |
| | | | M22520/2-01 | M22520/2-10 | M22520/2-10 | |
| 20 | M39029/58-364 | M39029/56-352 | M22520/1-01 | M22520/1-04 Blue | M22520/1-04 Blue | M81969/14-03 |
| 12 | M39029/58-365 | M39029/56-353 | M22520/1-01 | M22520/1-04 Yellow | M22520/1-04 Yellow | M81969/14-04 |

For coax and twinax contacts refer to instructions that are supplied with contacts.

MIL-DTL-38999 Series I
Insert Availability and Contact Information
per MIL-STD-1560



Insert Availability and Contact Information

| Insert Arrangement | Aero-Electric | | Service | Total | Quantity of Contacts | | | | | | | |
|--------------------|---------------|--------|---------|----------|----------------------|-----|----|----|----|----|----|---|
| | Status | | | No. of | (by Size) | | | | | | | |
| Series I | QPL'd | Tooled | Rating | Contacts | 22D | 22M | 22 | 20 | 16 | 12 | 10 | 8 |
| 9-6* | Yes | Yes | M | 6 | | 6 | | | | | | |
| 9-35 | Yes | Yes | M | 6 | 6 | | | | | | | |
| 9-98 | Yes | Yes | I | 3 | | | | 3 | | | | |
| 11-2 | Yes | Yes | I | 2 | | | | | 2 | | | |
| 11-4 | Yes | Yes | I | 4 | | | | 4 | | | | |
| 11-5 | Yes | Yes | I | 5 | | | | 5 | | | | |
| 11-13* | Yes | Yes | M | 13 | | 13 | | | | | | |
| 11-35 | Yes | Yes | M | 13 | 13 | | | | | | | |
| 11-98 | Yes | Yes | I | 6 | | | | 6 | | | | |
| 11-99 | Yes | Yes | I | 7 | | | | 7 | | | | |
| 13-4 | Yes | Yes | I | 4 | | | | | 4 | | | |
| 13-8 | Yes | Yes | I | 8 | | | | 8 | | | | |
| 13-22* | Yes | Yes | M | 22 | | 22 | | | | | | |
| 13-35 | Yes | Yes | M | 22 | 22 | | | | | | | |
| 13-98 | Yes | Yes | I | 10 | | | | 10 | | | | |
| 15-5 | Yes | Yes | II | 5 | | | | | 5 | | | |
| 15-15 | Yes | Yes | I | 15 | | | | 14 | 1 | | | |
| 15-18 | Yes | Yes | I | 18 | | | | 18 | | | | |
| 15-19 | Yes | Yes | I | 19 | | | | 19 | | | | |
| 15-35 | Yes | Yes | M | 37 | 37 | | | | | | | |
| 15-37* | Yes | Yes | M | 37 | | 37 | | | | | | |
| 15-97 | Yes | Yes | I | 12 | | | | 8 | 4 | | | |
| 17-6 | Yes | Yes | I | 6 | | | | | | 6 | | |
| 17-8 | Yes | Yes | II | 8 | | | | | 8 | | | |
| 17-26 | Yes | Yes | I | 26 | | | | 26 | | | | |
| 17-35 | Yes | Yes | M | 55 | 55 | | | | | | | |
| 17-55* | Yes | Yes | M | 55 | | 55 | | | | | | |
| 17-99 | Yes | Yes | I | 23 | | | | 21 | 2 | | | |
| 19-11 | Yes | Yes | II | 11 | | | | | 11 | | | |
| 19-28 | Yes | Yes | I | 28 | | | | 26 | 2 | | | |
| 19-30 | Yes | Yes | I | 30 | | | | 29 | 1 | | | |
| 19-32 | Yes | Yes | I | 32 | | | | 32 | | | | |
| 19-35 | Yes | Yes | M | 66 | 66 | | | | | | | |
| 19-66* | Yes | Yes | M | 66 | | 66 | | | | | | |

See next page for Shell Sizes 21 thru 25 layouts.

* Not approved for new design. Toolled and qualified but their separate pictorials are not shown on pages 19 thru 21, as they are the same as corresponding (-35) layouts that take the same quantity of 22D contacts, but are supplied with 22M contacts instead.

38999 S I



MIL-DTL-38999 Series I
Insert Availability and Contact Information
per MIL-STD-1560

Insert Availability and Contact Information (continued)

| Insert Arrangement | Aero-Electric | | Service | Total | Quantity of Contacts | | | | | | | |
|--------------------|---------------|--------|---------|----------|----------------------|-----|----|----|----|----|----|------------|
| | Status | | | No. of | (by Size) | | | | | | | |
| Series I | QPL'd | Tooled | Rating | Contacts | 22D | 22M | 22 | 20 | 16 | 12 | 10 | 8 |
| 21-1* | Yes | Yes | M | 79 | | 79 | | | | | | |
| 21-11 | Yes | Yes | I | 11 | | | | | | 11 | | |
| 21-16 | Yes | Yes | II | 16 | | | | | 16 | | | |
| 21-35 | Yes | Yes | M | 79 | 79 | | | | | | | |
| 21-39 | Yes | Yes | I | 39 | | | | 37 | 2 | | | |
| 21-41 | Yes | Yes | I | 41 | | | | 41 | | | | |
| 21-48** | N/A | Yes | I | 4 | | | | | | | | 4 (Power) |
| 21-75 | Yes | Yes | Twinax | 4 | | | | | | | | 4 (Twinax) |
| 23-1* | Yes | Yes | M | 100 | | 100 | | | | | | |
| 23-2*** | Yes | Yes | M | 85 | | | 85 | | | | | |
| 23-21 | Yes | Yes | II | 21 | | | | | 21 | | | |
| 23-32 | Yes | Yes | I | 32 | | | | 32 | | | | |
| 23-35 | Yes | Yes | M | 100 | 100 | | | | | | | |
| 23-53 | Yes | Yes | I | 53 | | | | 53 | | | | |
| 23-55 | Yes | Yes | I | 55 | | | | 55 | | | | |
| 25-1* | Yes | Yes | M | 128 | | 128 | | | | | | |
| 25-4 | Yes | Yes | I | 56 | | | | 48 | 8 | | | |
| 25-19 | Yes | Yes | I | 19 | | | | | | 19 | | |
| 25-24 | Yes | Yes | I | 24 | | | | | 12 | 12 | | |
| 25-29 | Yes | Yes | I | 29 | | | | | 29 | | | |
| 25-35 | Yes | Yes | M | 128 | 128 | | | | | | | |
| 25-43 | Yes | Yes | I | 43 | | | | 23 | 20 | | | |
| 25-46 | Yes | Yes | I, Coax | 46 | | | | 40 | 4 | | | 2 (Coax) |
| 25-61 | Yes | Yes | I | 61 | | | | 61 | | | | |

38999 S I

* Not approved for new design. Tooled and qualified but their separate pictorials are not shown on pages 19 thru 21, as they are same as corresponding (-35) layouts that take the same quantity of 22D contacts, but are supplied with 22M contacts instead.

** 21-48 layout is not to MIL-STD-1560. It is tooled and intended for commercial use only.

*** Not approved for new design. Pictorial is shown on page 20.

MIL-STD-1560
Insert Arrangements (Pin Front View)
for MIL-DTL-38999 Series I Connectors



Insert Arrangements Views

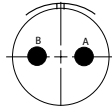
38999 S I



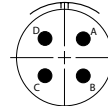
9-35
6 # 22D, M



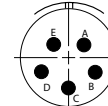
9-98
3 # 20, I



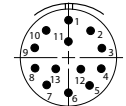
11-2
2 # 16, I



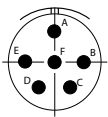
11-4
4 # 20, I



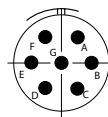
11-5
5 # 20, I



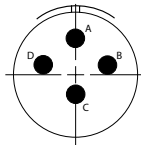
11-35
13 # 22D, M



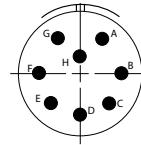
11-98
6 # 20, I



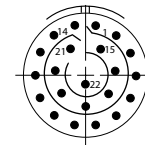
11-99
7 # 20, I



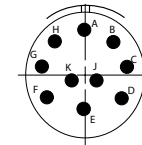
13-4
4 # 16, I



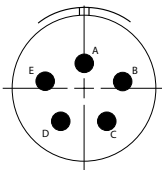
13-8
8 # 20, I



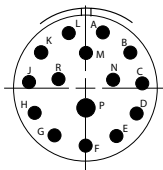
13-35
22 # 22D, M



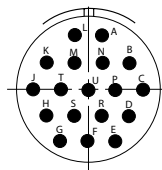
13-98
10 # 20, I



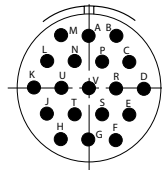
15-5
5 # 16, II



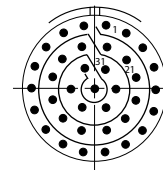
15-15
1 # 16, 14 # 20, I



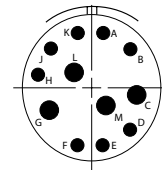
15-18
18 # 20, I



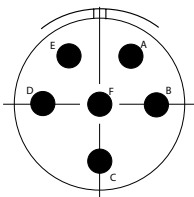
15-19
19 # 20, I



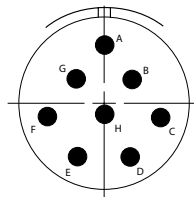
15-35
37 # 22D, M



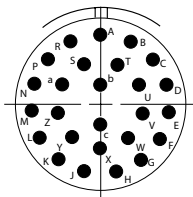
15-97
4 # 16, 8 # 20, I



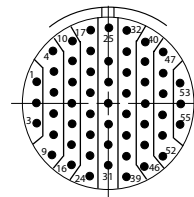
17-6
6 # 12, I



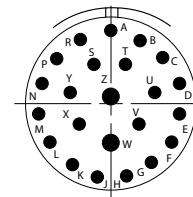
17-8
8 # 16, II



17-26
26 # 20, I



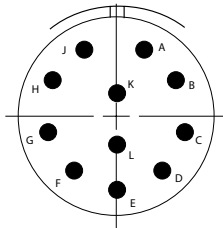
17-35
55 # 22D, M



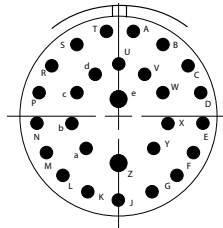
17-99
2 # 16, 21 # 20, I



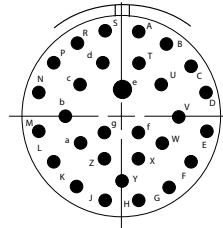
Insert Arrangements Views



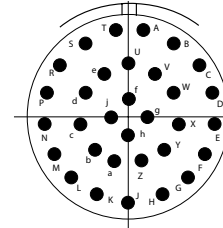
19-11
11 # 16, II



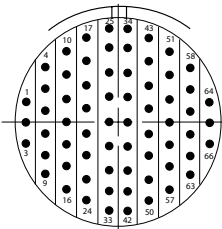
19-28
2 # 16, 26 # 20, I



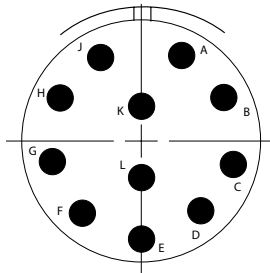
19-30
1 # 16, 29 # 20, I



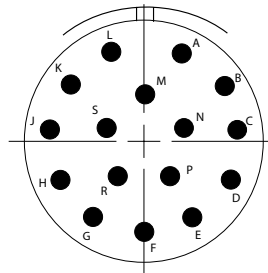
19-32
32 # 20, I



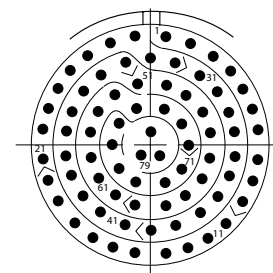
19-35
66 # 22D, M



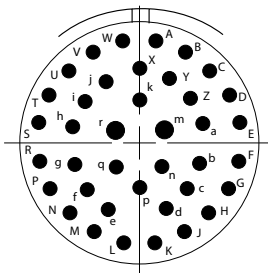
21-11
11 # 12, I



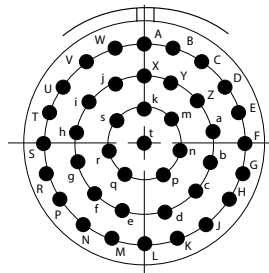
21-16
16 # 16, II



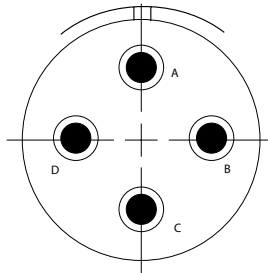
21-35
79 # 22D, M



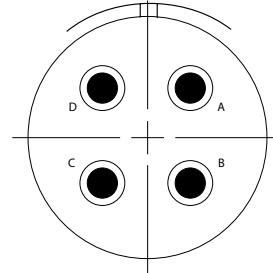
21-39
2 # 16, 37 # 20, I



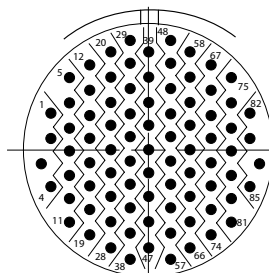
21-41
41 # 20, I



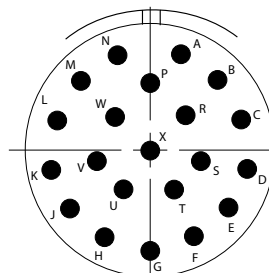
21-48**
4 # 8 Power, I



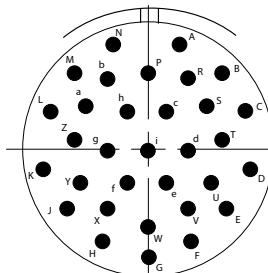
21-75
4 # 8 Twinax, Twinax



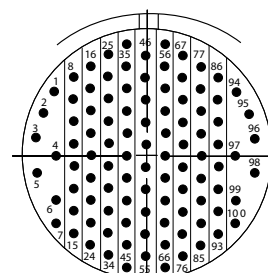
23-2*
85 # 22, M



23-21
21 # 16, II



23-32
32 # 20, I



23-35
100 # 22D, M

* Inactive for new design.
** Not MIL-STD-1560 layout (not QPL'd.).

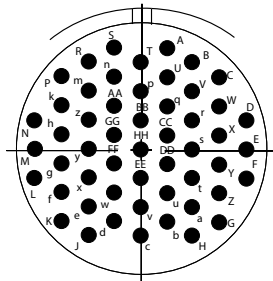
MIL-STD-1560

Insert Arrangements (Pin Front View) for MIL-DTL-38999 Series I Connectors

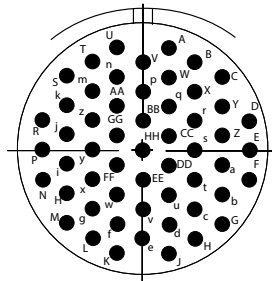


38999 S I

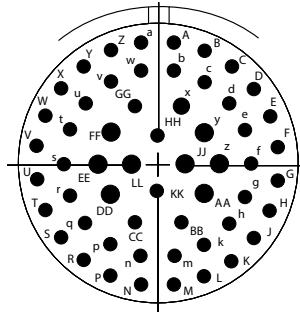
Insert Arrangements Views



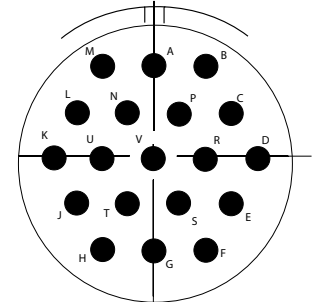
23-53
55 # 20, I



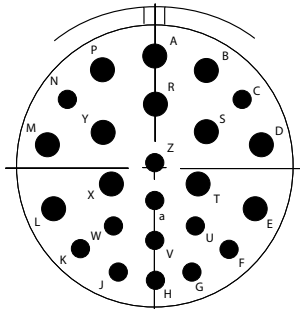
23-55
55 # 20, I



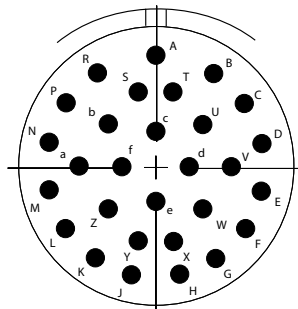
25-4
8 # 16, 48 # 20, I



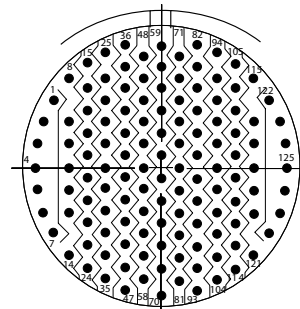
25-19
19 # 12, I



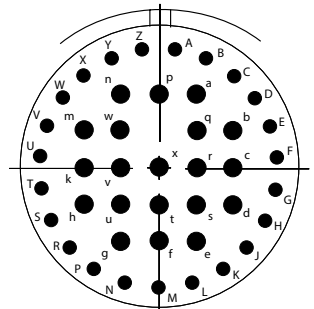
25-24
12 # 12, 12 # 16, I



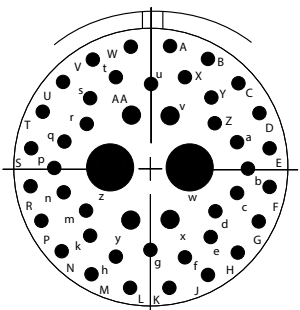
25-29
29 # 16, I



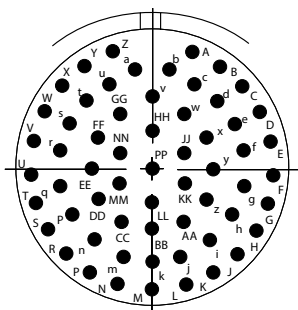
25-35
128 # 22D, M



25-43
20 # 16, 23 # 20, I



25-46
40 # 20, 4 # 16, 2 # 8 Coax, I / Coax



25-61
61 # 20, I