QwikConnect

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CONNECTOR REFERENCE GUIDE

WELCOME INTERCONNECT PROFESSIONALS!

High performance MS type electrical connectors have been around since the late ’30s. As military and aerospace electronics became more prevalent and sophisticated, so did the requirements for interconnection devices. As you may know, Glenair is the largest connector accessory supplier in the world building the widest range of backshells, dustcaps, and other accessories for connectors past and present. And in case you haven’t noticed, may we point out, in addition backshells, Glenair can now deliver a broad range of connector solutions, from MIL-DTL-38999 to various forms of MIL-DTL-5015 and other high-performance connector solutions.

In this special edition of *QwikConnect*—which we think you’ll agree belongs in your permanent reference library—we are happy to provide you with some of the most essential information for use in identifying and specifying MS type connectors and accessories.

Environmental Connector Types:

Free Cable Plugs and Mounted Receptacles

Environmental cable plugs and receptacles are “bread and butter” products in the high-reliability I/O connector industry. Regardless of product series, Glenair is able to supply both military standard, VG qualified as well as custom-designed special purpose plug-and-receptacle connectors. The products are typically produced from aluminum alloy, composite plastic, stainless steel, or, occasionally, titanium. Insert arrangements include standard signal as well as power and RF layouts. Coupling styles run the complete range from bayonet to push-pull lanyard release or standard threaded designs.

Bulkhead Feed-Throughs

Bulkhead Feed-Throughs eliminate the need to permanently fix cable harnesses to panels–affording increased system flexibility, superior mechanical integrity, and greater serviceability. Glenair hermetic and environmental bulkhead feed-through connectors are available in MIL-DTL-38999 Series I, II, III and IV configurations. Hermetic Versions are ideally suited for high-pressure/low-leakage applications in air, sea and space environments, meeting a leak rate of 1 X 10^{-7} cm^3 per second. Environmental versions offer IP67 level sealing.

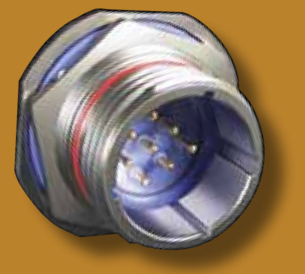
Sav-Con® Connector Savers

Glenair Sav-Con® Connector Savers protect connectors subject to repeated mating and unmating cycles. Sav-Con® Connector Savers prevent costly repair or replacement of expensive connectors and cables while preserving the quality and integrity of connector performance. Sav-Con® Connector Savers take the abuse of repeated connection cycles instead of “black box” or other equipment connectors. Equipment connectors that are mated and unmated frequently during manufacturing, check-out phases and environmental test programs can be protected by Glenair Sav-Con® Connector Savers at considerable savings in time and money.

Series 80 “Mighty Mouse” Connectors

The Series 80 “Mighty Mouse” Connector is currently available with 45 high density insert arrangements from 1 to 130 contacts on 0.076″ spacing, in bayonet, triple-start threaded and push-pull coupling styles. The connector series is broadly applied in ground soldier ensembles—including Land Warrior—and offers virtually equal performance to MIL-DTL-38999 interconnects with up to 71% weight and 52% size savings. The Series 80 “Mighty Mouse” supports a flexible range of contact types, including #23 and #20 signal contacts, #16 and #12 power contacts, size #16 and #12 coaxial and twinax contacts, as well as #12 pneumatic contacts. Fiber Optic termini? Yes, those too.

MIL-DTL-38999 Type Environmental Connectors



Environmental class plugs and receptacles are offered in high-density insert arrangements (up to 128 contacts) with crimp removable contacts, PC tails, and solder cups—in Series I, II, III and IV configurations. Glenair manufactures a wide range of environmental class MIL-DTL-38999 type connectors including lanyard-release products, composites, specialty metal cable plugs and receptacles, and coax, twinax and quadrax contact equipped products. Both MIL-qualified and one-off “specials” are available to meet the requirements of every application.

Series ITS Reverse Bayonet MIL-DTL-5015 Type

The Glenair ITS connector series is based on the MIL-DTL-5015 standard, but in lieu of threads, features an improved reverse bayonet coupling that provides positive mating and excellent shock and vibration resistance. These rugged connectors are available in hundreds of power and signal insert arrangements, and offer exceptional environmental protection.

MIL-DTL-83723

The MIL-DTL 83723 Series III Type connector is ideally suited for use on commercial, military, and aerospace interconnect systems that demand high vibration resistance and reliability in a medium-density cylindrical connector. Glenair can supply over 30 insert arrangements, from 2 to 61 contacts. The MIL-DTL-83723 uses Mil-Standard AS39029 crimp contacts as well as solder cups and PC Tail terminations in sizes 12, 16, and 20

Series IPT and IPT SE (MIL-DTL-26482 Type)

The Glenair Series IPT SE Bayonet-Lock Signal Connector is ideally suited for all general and environmental applications that require a high-performance military type cylindrical connector with crimp-removable contacts. Qualified to VG95328, the bayonet mechanism provides fast and easy coupling, especially when the connector is situated in an awkward or hard to reach location. Glenair also supplies a selection of higher performance hermetic and environmental MIL-DTL-26482 Type connectors under our 230 series product code

MIL-DTL-28840

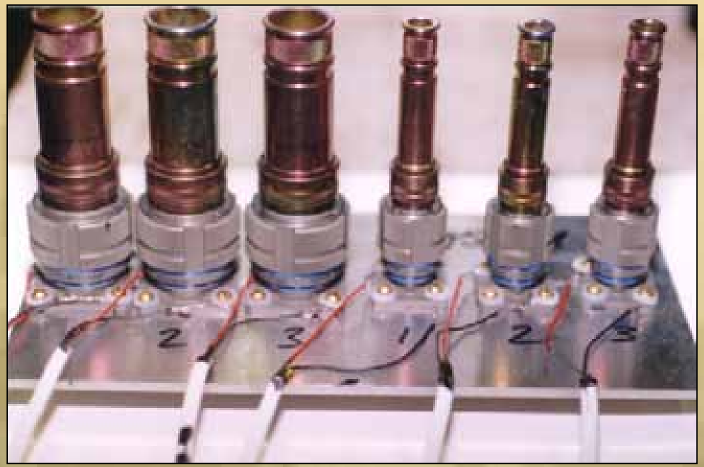
The standard connector and backshell series for shipboard use, MIL-DTL-28840 offers high-density insert arrangement and high-shock performance. The MIL-DTL-28840 features RFI/EMI shielding, scoop-proof shells and corrosion resistant materials and finishes. Glenair’s qualified product line is fully tooled and highly available.

Introduction to
MILITARY STANDARD CYLINDRICAL CONNECTORS

The purpose of a connector is easy to describe: connectors bridge gaps between individual pieces of electronic equipment to make assembly, repair and upgrades easier. Instead of struggling with a gordian knot of soldered circuits and spliced wiring, connectors enable technicians to make interconnections with ease and convenience.

Connectors bridge the gap between individual wires to provide contact between two conductive elements of an electronic system. The connection they make enables electrical current (or light waves in the case of fiber optics) to flow from one conductor to the next. Edward's Publishing's indispensable Encyclopedia of Connectors defines the connector thus: *"An electromechanical device which permits two or more circuit elements to be electrically and mechanically separated and reconnected at will without disturbing any other elements of the circuit. A connector performs no circuit function and should have no effect on the electrical performance of the device to which it is attached. If the connectors of a device were eliminated and the corresponding wires joined together, the circuit would not be affected."*

When connectors are used to connect one set of wires to another, they are called wire-to-wire connectors. Wire-to-board connectors connect a wire to a Printed Circuit Board (PCB). And board-to-board connectors directly interconnect PCB's.



Connector testing is designed to simulate a lifetime of use over a short period of time. Environmental, mechanical and electrical tests are conducted to measure both the reliability of the connector and the system. The number-one criterion of reliability is a change in contact resistance.

Connectors facilitate fabrication and assembly of electronic products by enabling designers to treat each subassembly as a unique, modular unit. Interconnection can then be accomplished at the most convenient time and place in the production process. Connectors also facilitate equipment repair by allowing technicians to quickly and easily replace suspect components. Without opening black box cabinets and without introducing contaminants like solder and flux into the system, technicians can swap out suspect equipment and have a system back on line in a matter of minutes. Connectors also permit upgrades to electronic equipment without major disruptions to the overall system. Connectors give engineers the flexibility to integrate new products and components into existing systems simply by maintaining a consistent connector specification.

While there is great variety in the makeup and design of each type of connector, as a family they generally share a common set of design elements and component parts. In fact, in order to function as a separable interconnect device, a connector must house the following elements:

- **Contact Interface:** a mechanical means of joining the conductive contacts together under normal force
- **Contact Spring Members:** a means of generating the normal force required to maintain the electrical path between conductive contact elements
- **Contact Finish:** a means of protecting the contacts from corrosion, and for optimizing the lubricity and durability of the contact interface
- **Contact Housing:** a means of holding the contacts and spring members in place and maintaining their exact position and alignment. The contact housing also shields the contacts from the operating environment.

Connectors are selected with consideration to electrical, mechanical and environmental requirements. Electrical requirements include wire type and size, contact resistance, transfer impedance and current rating. Mechanical specifications, such as thermal shock, vibration and durability indicate how well a connector will perform under critical stress factors. Environmental requirements include moisture absorption, temperature resistance, corrosion and resistance to electromagnetic interference. Environmentally resistant connectors are required for interconnect systems which are subjected to fluids in combination with vibration, shock, thermal extremes and corrosion.

While the same basic connector design may be used for both signal and/or power distribution, power connectors use contacts designed specifically for the unique requirements of power distribution. This is due to the relatively higher current/voltage requirements of power applications and the temperature rise experienced by power connectors. A disk drive in a personal computer, for example, uses both signal and power connectors. The power connector bridges the circuit that drives the unit. The signal connector carries the digital data. While the signal and power contacts may be combined into a single connector housing, each contact type is uniquely suited for its role in transmitting either signal or power electrical energy.

The Military Standard Connector

The multi-contact electrical connector used in Air Force, Navy and other high-reliability applications is a critical subassembly within the wiring system. Military connectors find many diversified applications due to severe environments, mobility, and field repairability. The key attribute of such connectors is better reliability when compared to less expensive commercial connectors. The reliability of a system is essentially a measure of the failure rate of its components. Connectors can fail due to plug dependent mechanisms, wear mechanisms or corrosion mechanisms. Total system life, power on-hours (POH) and system on/off cycles (number of times that a product powers on and off) are important factors determining system reliability. Military standard connectors (and their commercial equivalents) are chosen for their performance and reliability even in the most severe interconnect applications.

"Power" contacts carry contacts
from size 4/0 to 16
"Miniature" contacts from size 12 to 20
"High-density" contacts from size 20 to 22
"Ultraminiature " contacts size 23
"Microminiature" contacts size 24
"Nanominature" contacts size 30

The military standard connector is made up of two separate component assemblies known as the "plug and receptacle" which intermate to connect wires with pin and socket contacts. Connector families are defined in this high-reliability world by the military detail specifications which spell out the exact requirements for every aspect of the connector's design and performance. Connector families are distinguished by their coupling mechanisms, physical shape, contact types, environmental classes and termination methodologies.

Plug and receptacle connector pairs are available in various mounting configurations to accommodate different levels of interconnection and different application requirements. The most common configurations are in-line (wire-to-wire) applications, or various bulkhead, chassis and enclosure mountings. In general, connectors are available to accommodate any fixed mounting or in-line requirement.

Circular connectors are selected because of their compact, rugged design and their ability to effectively seal the connector from environmental hazards. Circular connectors may incorporate bayonet couplings, threaded couplings, ball detent couplings (push/pull), and/or breech lock couplings as their mechanism for locking the mated pairs together.

Rectangular connectors are selected to maximize the number of contacts possible in a restricted space. However, rectangulars are not as easily sealed against fluid damage and other environmental hazards. Spring style rack/panel couplings as well as standard jackscrew fasteners are both common coupling styles in rectangular connectors.

Both circulars and rectangulars can accommodate multiple contact types including power or high-voltage contacts, signal contacts, coaxial and triaxial contacts, or fiber-optic termini. High reliability contacts are usually made from gold plated, copper alloy material. Large diameter power contacts and solder type contacts may be either gold or silver plated copper alloy.

Crimp style contacts are preferred for all aerospace and other high-reliability applications (except those requiring a hermetic seal) due to their relative ease of assembly and maintenance. Solder type contacts are usually selected when cost is the primary consideration and repairability secondary. Solder type contacts are also used in hermetic connectors.

Installation of both crimp and solder type contact connectors requires unobstructed working room behind the connector. Rear release crimp contacts require additional working room to install the extraction tool to remove the contact. Another important design feature of crimp type contact connectors is the connector insert wire sealing grommet. The grommet provides moisture sealing around each individual wire.

The shell of a circular connector is a cylinder available in incremental sizes starting as small as .375" diameter up to 3.25" diameter and larger. The most common shell sizes are available in .0625" increments starting at shell size 8 (.50") to shell size 36 (2.25"). Shell size may be determined by multiplying the shell size number by .0625. Shell size 24, for example, has a 1.50" outside diameter (24 x .0625" = 1.50"). This nomenclature becomes significant, as backshells (accessories which attach onto the connector shell) must inter mate with the connector shell rear-end geometry. Connector and accessory manufacturers both use the term "shell size" to designate the size of their respective products.

Making Sense of Connector Part Numbers

Military standard connectors are organized under specification series numbers: MIL-C-5015, MIL-DTL-38999 and so on. The specification series number identifies the master document which explains everything about the particular connector family. The actual part numbers of connector components are designed to call out the physical connector type and its dimensional attributes. For example, a MIL-C-5015 receptacle connector designed to be mounted on a box would have a part number such as MS3402DS28-21PY. The number can be dissected as follows:

The first 4 digits after the MS (Military Standard) designate the physical connector type, like so:

3400 - Wall mounted receptacle
3401 - In line receptacle
3402 - Box mount receptacle
3404 - Jam nut receptacle
3406 - Straight plug
3408 - 90° plug
3409 - 45° plug
3412 - Box mount receptacle with rear threads

The single character which follows indicates the connector service class:

D - High Shock
K - Firewall
L - High Temperature
W - General Purpose

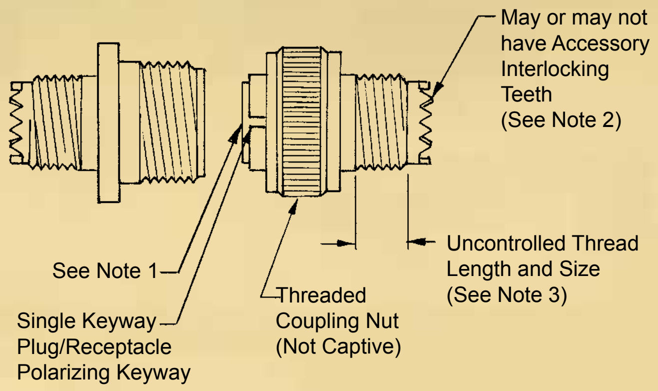
The next character, S in our example, indicates the shell material; in this case stainless steel. The next two characters, 28 in our example, identify the shell size. The following pair of numbers, 21 in our example, identifies the contact arrangement. If this pair of characters is followed by an "S," it indicates female-style (socket) contacts. If they are followed by a "P," it indicates male contacts (Pin). The final character, Y in our example, indicates the choice of polarization keying.

That's all there is to it. While there are many part number complexities and nuances throughout the various MS connector families, they all follow the same basic approach to part number development.

DESIGN ELEMENTS OF COMMON MILITARY STANDARD CONNECTORS

The following pages recap standard circular military connector design features including illustrations of the individual design characteristics important to the accessory manufacturer when selecting or designing backshells.

SAE AS50151 Connectors, Circular, MS3100 Series, Solder Types; Glenair Designator Code B (Glenair equivalent: IT)



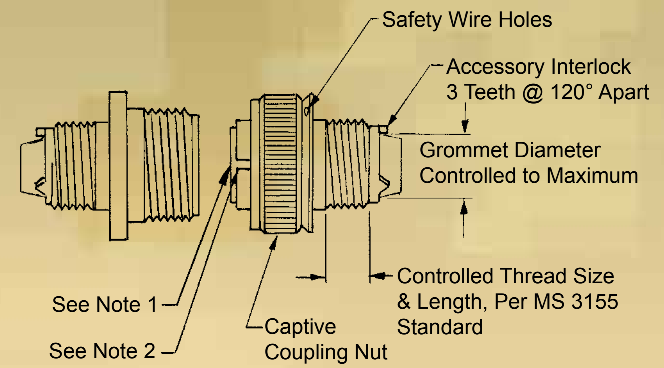
Design Features:

- Threaded coupling design.
- Fifteen shell sizes—Range 8 thru 48 (.500" to 3.000" diameter).
- Wide variety of contact sizes, standard density; 1 to 100 contacts.
- Conductive finish—Cadmium/Olive drab, 96-hour corrosion protection.

Notes:

1. Contacts may mate prior to connector shell mating.
2. Single keying may not always ensure shell polarizing.
3. Uncontrolled accessory interface.
4. Plug or receptacle may have pin or socket contacts.
5. Connector shell may strike pin contacts, thus power should always be on socket contacts.

SAE AS50151 Connectors, Circular MS3400 (Front Release Contact) and MS3450 (Rear Release Contact) Series Crimp Type Contacts; Glenair Designator Code A



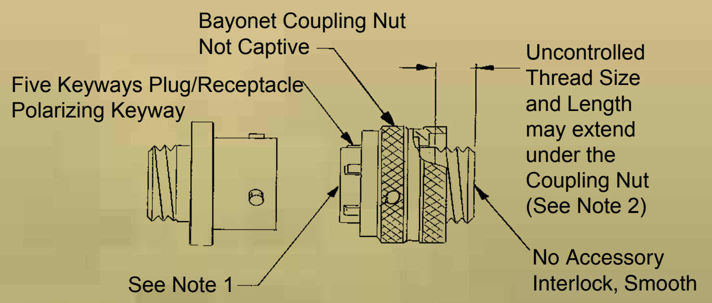
Design Features:

- Threaded coupling design, captive.
- Fifteen shell sizes—Range 8 thru 48 (.500" to 3.000" diameter).
- Wide variety of contact sizes, standard density; 1 to 100 contacts.
- Cadmium/Olive drab conductive finish, 500 hour salt spray; electroless-nickel options.

Notes:

1. Same interface features as MS3100 and MS3106; intermateable.
2. Single keying may not always ensure shell polarizing.

MIL-C-26482 Connectors, Circular MS3110 and MS3116 Series 1, Solder Contacts Glenair Designator Code D (Glenair equivalent: IPT)



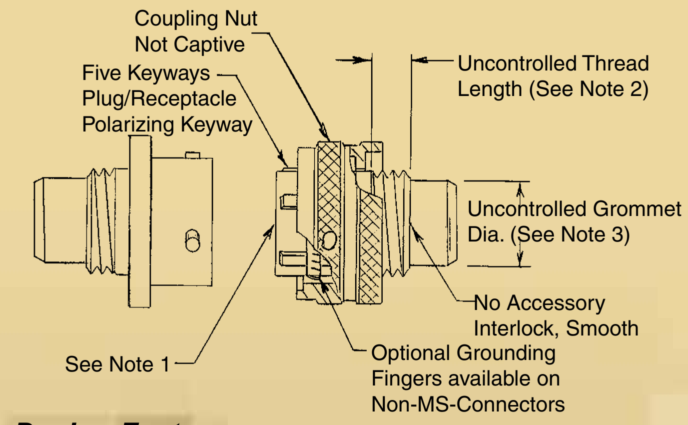
Design Features:

- Bayonet coupling design, quick disconnect.
- Ten shell sizes—Range 6 through 24 (.3750” to 1.500” diameter).
- 12, 16, and 20 gauge contacts, standard density, 3 to 61 contacts.
- Conductive and non-conductive finishes; Cadmium/Olive drab and anodic.

Notes:

1. Contacts may mate prior to connector shell mating.
2. Plug may have less than three threads.

MIL-C-26482 Connectors, Circular, MS3120 and MS3126 Series 1, Crimp Contacts, Front Release; Glenair Designator Code D (Glenair equivalent: IPT SE)



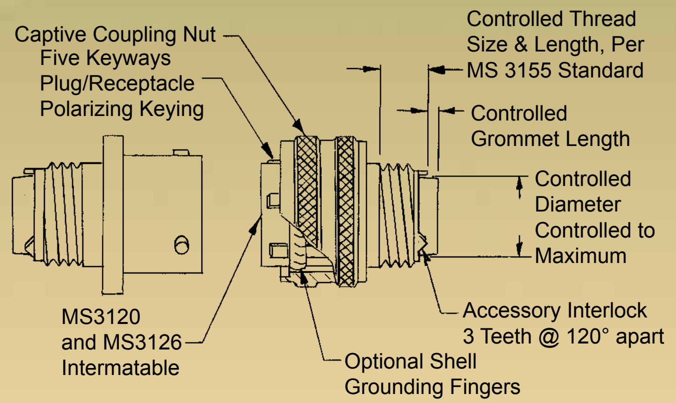
Design Features:

- Bayonet coupling design, quick disconnect.
- Eight shell sizes—Range 8 thru 24 (.500” to 1.500” diameter).
- 12, 16, 20, and 22 gauge contacts, standard density, 3 to 61 contacts.

Notes:

1. Contacts may mate prior to connector shell mating when grounding fingers not supplied.
2. Same limitations as MS3110 and MS3116 solder type connectors.
3. Uncontrolled wire seal grommet geometry; accessories properly mate.

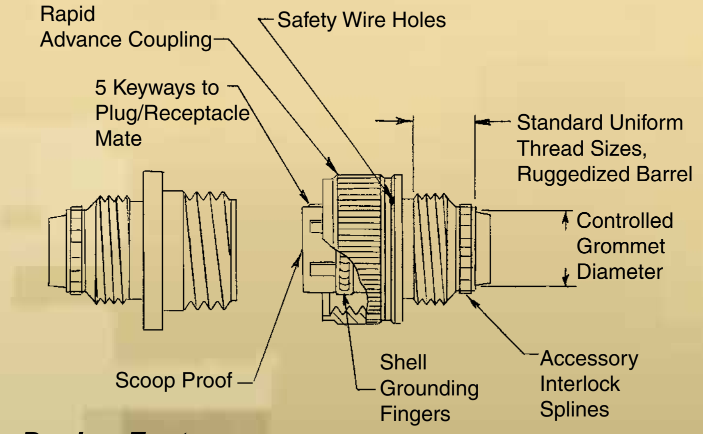
MIL-C-26482 Connectors, Circular, MS3470 Series 2, Crimp Contacts, Rear Release; Glenair Designator Code A



Design Features:

- Bayonet coupling design, quick disconnect.
- Nine shell sizes—8 through 24 (.500” to 1.500” dia)
- 12, 16, 20, and 22 gauge contacts, standard density, 3 to 61 contacts.

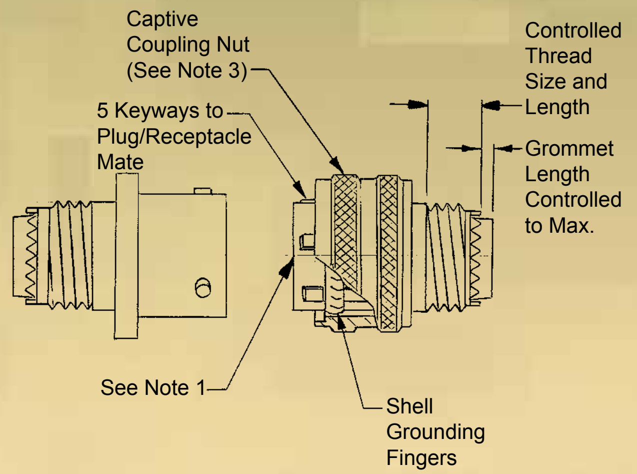
MIL-DTL-28840 Connectors, Circular, Front Release, Crimp Contacts Glenair Designator Code G



Design Features:

- Threaded coupling design, rapid advance, captive, scoop proof.
- Nine shell sizes—Range 11 through 33 (.500 to 2.000 diameter).
- 20 gauge high density contacts, 7 to 155.

MIL-DTL-38999 Connectors, Series I Crimp Contacts, Rear Release; Glenair Designator Code F (Glenair Series 231-105*)



Design Features:

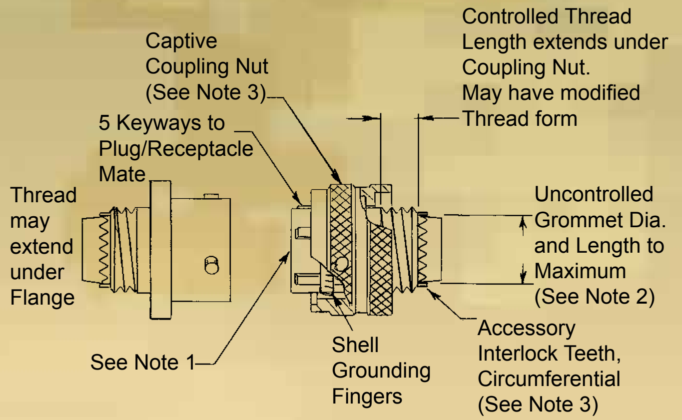
- Bayonet coupling design, quick disconnect.
- Nine shell sizes—Range 8 through 24 (.500” to 1.500” diameter).
- 8, 10, 12, 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts.
- Scoop-proof shell design to prevent shell to contact problem.
- Controlled accessory interface per MIL-DTL-38999, figure 11.
- Cork and bottle primary insert interface seal and shell environmental seal, fuel resistant silicone elastomers.
- Conductive and non-conductive finishes; electroless nickel, Cadmium/Olive drab 500 hour salt spray, and anodic.

Notes:

1. Long barrel design to prevent shell striking contacts.
2. Serrated accessory interlocking tooth design may prevent reliable moisture seal or EMI bond to accessories.
3. Bayonet coupling may not perform under severe conditions with large diameter cable and backshell.

* In development

MIL-DTL-38999 Connectors, Series II Crimp Type Contacts, Rear Release; Glenair Designator Code F (Glenair Series 232-105*)



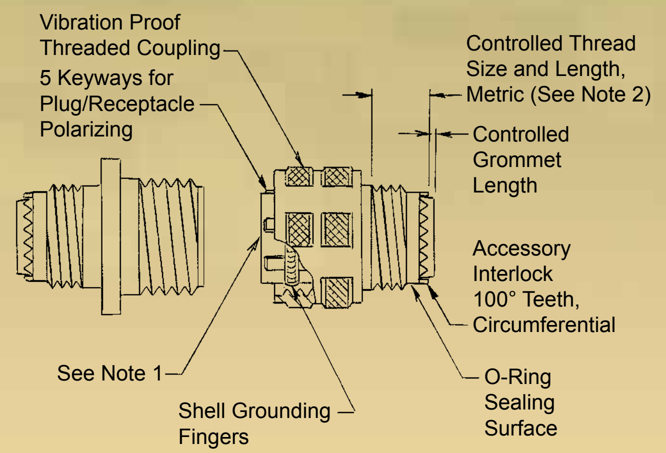
Design Features:

- Bayonet coupling design, quick disconnect, captive.
- Nine shell sizes—Range 8 through 24 (.500” to 1.500” diameter).
- 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts.
- Shell ground available on MS and commercial part numbers.
- Controlled accessory interface per MIL-DTL-38999 figure II.
- Cork and bottle primary interface and shell environmental seals, fluid resistant silicone elastomers.
- Conductive and non-conductive finishes; electroless nickel, Cadmium/Olive drab, 500-hour salt spray, and anodic.
- Short barrel construction for minimum envelope.

Notes:

1. Very short barrel, shell may strike pin contacts.
2. Wire seal grommet controlled to maximum condition only, over compression will cause contact splaying.
3. Same limitations as D38999 Series I.

MIL-DTL-38999 Connectors, Series III Circular, Crimp Contacts Rear Release; Glenair Code H (Glenair Equivalent 233-105*)



Design Features:

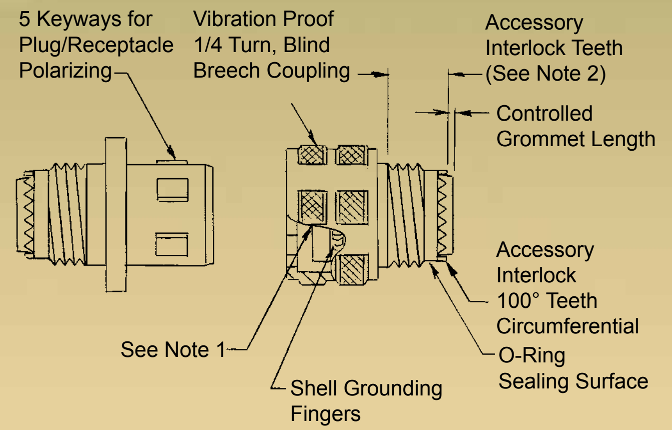
- Threaded coupling design, rapid advance, self-locking.
- Nine shell sizes—Range 9 through 25 (.500” to 1.500” diameter).
- 8, 10, 12, 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts.
- 16 gauge fiber-optic insert arrangement.
- Scoop-proof shell design to prevent shell to contact problem.
- Controlled accessory interface with metric threads.
- Diaphragm contact seal interface and shell environmental seal, fluid resistant fluorosilicone elastomers.
- Conductive and non-conductive finishes; Cadmium/Olive drab 500 hour salt spray, electroless nickel, anodic and stainless steel.
- Conductive composite shell, cadmium/olive drab over electroless nickel, and electroless nickel, 2000 hour salt spray.

Notes:

1. Same barrel features as MIL-DTL-38999 Series I, except metric threads.
2. 100 percent scoop proof, positive shell mating.

* Meets requirements

MIL-DTL-38999 Connectors, Series IV Circular, Crimp Contacts Rear Release; Glenair Code H (Glenair Series 234-105**)



Design Features:

- Breech lock coupling design, rapid advance, self-locking.
- Eight shell sizes—Range 11 through 25 (.500” to 1.500” diameter).
- 12, 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts.
- 16 gauge fiber-optic insert arrangements.
- Scoop proof shell design to prevent shell to contact problems.
- Controlled accessory interface with metric threads.
- Ruggedized construction for shipboard service.
- Cork and bottle primary interface and shell environmental seals, fluid resistant fluorosilicone elastomers.
- Conductive and non-conductive finishes; Cadmium/Olive drab 500 hour salt spray, electroless nickel, anodic, and stainless steel.

Notes:

1. 100 percent scoop proof, positive shell mating.
2. Same accessory interlock teeth as MIL-DTL-38999, Series III.
3. Same O-ring seal features as MIL-DTL-38999, Series III.

** Possible future development

MILITARY STANDARD CONNECTOR INDEX

The following is a listing of circular connectors defined by US Military Specifications, cross-referenced to the applicable active or inactive part number series. The symbols in the Connector Designator column are an essential element in Glenair’s backshell part number developments.

PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
MS3100	B	SAE AS50151	MS3100	Receptacle Wall Mount (Solder)***
MS3101	B	SAE AS50151	MS3100	Plug (Solder)***
MS3102	**	SAE AS50151	MS3100	Receptacle Box Mount (Solder)***
MS3103	**	SAE AS50151	MS3100	Receptacle Potting (Solder)***
MS3105	**	SAE AS50151	MS3100	Dummy Receptacle***
MS3106	B	SAE AS50151	MS3100	Plug Straight (Solder)***
MS3107	B	SAE AS50151	MS3100	Plug Quick Disconnect (Solder)***
MS3108	B	SAE AS50151	MS3100	Plug 90° (Solder)***
MS3110	D-729	MIL-DTL-26482	1	Receptacle Wall Mount
MS3111	D	MIL-DTL-26482	1	Plug Cable Connecting
MS3112	**	MIL-DTL-26482	1	Receptacle Box Mount
MS3113	**	MIL-DTL-26482	1	Receptacle Solder Mount
MS3114	D-717	MIL-DTL-26482	1	Receptacle Jam Nut
MS3115	**	MIL-DTL-26482	1-2	Dummy Receptacle
MS3116	D	MIL-DTL-26482	1	Plug Straight
MS3119	**	MIL-DTL-26482	1	Receptacle Thru-Bulkhead
MS3120	D	MIL-DTL-26482	1	Receptacle Wall Mount (Crimp)
MS3121	D	MIL-DTL-26482	1	Plug Straight (Crimp)
MS3122	**	MIL-DTL-26482	1	Receptacle Box Mount (Crimp)
MS3124	D-717	MIL-DTL-26482	1	Receptacle Rear Mount Jam Nut (Crimp)
MS3126	D	MIL-DTL-26482	1	Plug Straight (Crimp)
MS3127	**	MIL-DTL-26482	1	Receptacle Box Mount (Crimp)
MS3128	D	MIL-DTL-26482	1	Receptacle Wall Mount (Crimp)
MS3130	*	QPL-81703	1	Receptacle Push Pull Wall Mount Flange
MS3132	X-706	QPL-81703	1	Receptacle Push Pull Box Mount
MS3134	X-706	QPL-81703	1	Receptacle Push Pull Jam Nut
MS3135	**	QPL-81703	1	Dummy Receptacle
MS3137	X-706	QPL-81703	1	Plug Straight Push Pull
MS3138	X-706	QPL-81703	1	Plug Lanyard Push Pull
MS3139	**	QPL-81703	1	Receptacle Thru-Bulkhead (Wall Mount)
MS3140	X-706B	QPL-81703	2	Receptacle Push Pull Wall Mount
MS3142	**	MIL-C-5015	MS3100	Receptacle Hermetic Box Mount (Solder)
MS3143	**	MIL-C-5015	MS3100	Receptacle Hermetic Solder Mount
MS3144	X-706B	QPL-81703	2	Receptacle Push Pull Jam Nut
MS3145	**	QPL-81703	3	Receptacle Hermetic Push Pull Box Mount
MS3146	**	QPL-81703	3	Receptacle Push Pull Hermetic Solder Mount
MS3147	X-706B	QPL-81703	2	Plug Push Pull (Crimp)
MS3148	X-706B	QPL-81703	2	Plug Push Pull Lanyard (Crimp)
MS3149	**	QPL-81703	3	Receptacle Push Pull Hermetic (Single-Hole Mount)
MS3400	A	MIL-C-5015	MS3400	Receptacle Wall Mount (Crimp)

* Consult Factory ** Connector does not accommodate rear accessories ***Inactive for new design

Military Standard Connector Index

PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
MS3401	A	SAE AS50151	MS3400	Receptacle Cable Connecting (Crimp)
MS3402	**	SAE AS50151	MS3400	Receptacle,Box Mount (Crimp)
MS3404	A	SAE AS50151	MS3400	Receptacle Jam Nut (Crimp)
MS3406	A	SAE AS50151	MS3400	Plug (Crimp)
MS3408	A	SAE AS50151	MS3400	Plug 90° (Crimp)
MS3409	A	SAE AS50151	MS3400	Plug 45° (Crimp)
MS3412	A	SAE AS50151	MS3400	Receptacle Wall Mount (Crimp)
MS3424	A	SAE AS81703	3	Receptacle Push Pull Wall Mount
MS3440	**	MIL-DTL-26482	2	Receptacle Narrow Flange Mount (was M83723/9/10)
MS3442	**	MIL-DTL-26482	2	Receptacle Wide Flange Mount
MS3443	**	MIL-DTL-26482	2	Receptacle Solder Flange Mount
MS3445	*	QPL-81703	2	Plug Push Pull Rack & Panel Mount
MS3446	A	QPL-81703	3	Plug Push Pull Rack & Panel Mount
MS3449	**	MIL-DTL-26482	2	Receptacle Push Pull Single Hole Mount
MS3450	A	SAE AS50151	MS3450	Receptacle Wall Mount (was M83723/19/20) (Crimp)
MS3451	A	SAE AS50151	MS3450	Receptc Cbl Connecting (was M83723/17/18) (Crimp)
MS3452	**	SAE AS50151	MS3450	Receptacle Box Mount (was M83723/21/22) (Crimp)
MS3454	A	SAE AS50151	MS3450	Receptacle Jam Nut (Crimp)
MS3456	A	SAE AS50151	MS3450	Plug Straight (was M83723/23/24) (Crimp)
MS3459	A	SAE AS50151	MS3450	Plug Straight Self Locking (was M83723/52/53)
MS3463	**	QPL-81703	3	Receptacle Push Pull (Hermetic)
MS3464	A	QPL-81703	3	Receptacle Push Pull Jam Nut
MS3466	**	QPL-81703	3	Receptacle Push Pull Hermetic (Box Mount)
MS3467	A	QPL-81703	3	Plug Push Pull
MS3468	A	QPL-81703	3	Plug Push Pull Lanyard
MS3469	**	QPL-81703	3	Receptacle Push Pull Hermetic Jam Nut
MS3470	A	MIL-DTL-26482	2	Receptacle Narrow Flange Mount (was M83723/1/2)
MS3471	A	MIL-DTL-26482	2	Receptacle Cable Connecting (was M83723/7/8)
MS3472	A	MIL-DTL-26482	2	Receptacle Wide Flange Mount (was M83723/3/4)
MS3473	**	MIL-DTL-26482	2	Receptacle Solder Mount Hermetic
MS3474	A	MIL-DTL-26482	2	Receptacle Rear Mount Jam Nut (was M83723/5/6)
MS3475	A	MIL-DTL-26482	2	Plug RFI Shielded (was M83723/42/43)
MS3476	A	MIL-DTL-26482	2	Plug Straight (was M83723/13/14)
MS3477	**	MIL-DTL-26482	2	Receptacle Hermetic Box Mount
MS3479	**	MIL-DTL-26482	2	Receptacle Hermetic Rear Mount Jam Nut
MS17343	C	MIL-DTL-22992	R	Receptacle Wall Mount
MS17344	C	MIL-DTL-22992	R	Plug Straight
MS17345	C	MIL-DTL-22992	R	Plug Cable Connecting (Female)
MS17346	C	MIL-DTL-22992	R	Receptacle Box Mount
MS17347	C	MIL-DTL-22992	R	Receptacle Jam Nut
MS17348	**	MIL-DTL-22992	R	Receptacle Jam Nut Box Mount
MS18062	**	MIL-DTL-22992	R	Dummy Receptacle
MS20026	*	MIL-DTL-27599	I	Receptacle Wall Mount Solder***
MS20027	*	MIL-DTL-27599	I	Receptacle Line***
MS20028	*	MIL-DTL-27599	I	Plug Straight***
MS20029	**	MIL-DTL-27599	I	Receptacle Jam Nut Mount***
MS20030	*	MIL-DTL-27599		Receptacle Box Mount Hermetic

* Consult Factory   ** Connector does not accommodate rear accessories   ***Inactive for new design

PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
MS20031	**	MIL-DTL-27599		Receptacle Jam Nut Hermetic***
MS20032	**	MIL-DTL-27599		Receptacle Solder Mount Hermetic***
MS20034	*	MIL-DTL-27599		Receptacle Wall Mount***
MS20035	*	MIL-DTL-27599		Receptacle Box Mount***
MS24264	E	MIL-C-26500	F G & R	Receptacle Flange Mount*** Use MIL-DTL-83723
MS24265	E	MIL-C-26500	F G & R	Receptacle Single Hole Mount*** Use MIL-DTL-83723
MS24266	E	MIL-C-26500	F G & R	Plug Straight*** Use MIL-DTL-83723
MS25183	**	SAE AS50151	MS3100	Plug Potting Seal (Solder)
MS27034	**	MIL-C-26500		Receptacle Hermetic Solder Mount
MS27334	*	MIL-DTL-27599		Receptacle Wall Mount ***
MS27335	**	MIL-DTL-27599		Receptacle Box Mount ***
MS27336	*	MIL-DTL-27599		Plug Straight ***
MS27337	*	MIL-DTL-27599		Receptacle Jam Nut ***
MS27338	*	MIL-DTL-27599		Receptacle Wall Mount Hermetic
MS27339	**	MIL-DTL-27599		Receptacle Box Mount Hermetic
MS27340	**	MIL-DTL-27599		Receptacle Jam Nut Mount Hermetic
MS27341	**	MIL-DTL-27599		Receptacle Solder Mount Hermetic
MS27466	F	MIL-DTL-38999	I	Receptacle Wall Mount
MS27467	F	MIL-DTL-38999	I	Plug Straight
MS27468	F	MIL-DTL-38999	I	Receptacle Jam Nut
MS27469	**	MIL-DTL-38999	I	Receptacle Wall Mount Hermetic
MS27470	**	MIL-DTL-38999	I	Receptacle Jam Nut Hermetic
MS27471	**	MIL-DTL-38999	I	Receptacle Solder Mount Hermetic
MS27472	F	MIL-DTL-38999	II	Receptacle Wall Mount
MS27473	F	MIL-DTL-38999	II	Plug Straight
MS27474	F	MIL-DTL-38999	II	Receptacle Jam Nut
MS27475	F	MIL-DTL-38999	II	Receptacle Wall Mount
MS27476	**	MIL-DTL-38999	II	Receptacle Box Mount Hermetic
MS27477	**	MIL-DTL-38999	II	Receptacle Jam Nut Hermetic
MS27478	**	MIL-DTL-38999	II	Receptacle Solder Mount Hermetic
MS27479	F	MIL-DTL-38999	II	Inactive Use MS27472
MS27480	F	MIL-DTL-38999	II	Inactive Use MS27473
MS27481	F	MIL-DTL-38999	II	Inactive Use MS27474
MS27482	F	MIL-DTL-38999	II	Inactive Use MS27475
MS27483	**	MIL-DTL-38999	II	Inactive Use MS27474
MS27484P	**	MIL-DTL-38999	II	Plug Straight
MS27484T	F	MIL-DTL-38999	II	Plug Straight
MS27496	**	MIL-DTL-38999	I	Receptacle Box Mount
MS27497	F	MIL-DTL-38999	II	Receptacle Back Panel Wall Mount
MS27498	F	MIL-DTL-38999	I	Plug 90° (MS27467)
MS27499	**	MIL-DTL-38999	II	Receptacle Box Mount
MS27500	F	MIL-DTL-38999	II	Inactive See MS27473
MS27503	**	MIL-DTL-38999	II	Inactive See MS27478
MS27504	**	MIL-DTL-38999	II	Inactive See MS27499
MS27505	**	MIL-DTL-38999	I	Receptacle Back Panel Box Mount
MS27508	**	MIL-DTL-38999	II	Receptacle Back Panel Box Mount
MS27513	**	MIL-DTL-38999	II	Receptacle Box Mount

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PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
MS27515	F	MIL-DTL-38999	I	Inactive Use MS27656
MS27613	E-710	MIL-DTL-26500		Receptacle Panel Mount ***Use MIL-DTL-83723
MS27614	E-710	MIL-DTL-26500		Receptacle D-Hole Mount ***Use MIL-DTL-83723
MS27615	E-710	MIL-DTL-26500		Plug Straight ***Use MIL-DTL-83723
MS27652	F	MIL-DTL-38999	I	Inactive Use MS27466
MS27653	F	MIL-DTL-38999	I	Inactive Use MS27467
MS27654	F	MIL-DTL-38999	I	Inactive Use MS27656
MS27656	F	MIL-DTL-38999	I	Receptacle Back Panel Wall Mount (MS27499)
MS27661	F-752	MIL-DTL-38999	I	Plug Lanyard Release
MS27662	**	MIL-DTL-38999	I	Receptacle Thru-Bulkhead
MS27664	**	MIL-DTL-38999	II	Receptacle Back-Panel Wall Mount
MS27665	F	MIL-DTL-38999	I	Plug Rack & Panel Mount
MS27667	**	MIL-DTL-38999	II	Receptacle Thru-Bulkhead
MS90555	*	MIL-DTL-22992	L	Receptacle Wall Mount
MS90556	*	MIL-DTL-22992	L	Plug Straight
MS90557	*	MIL-DTL-22992	L	Plug Cable Connecting
MS90558	*	MIL-DTL-22992	L	Receptacle w/Coupling Ring Wall Mount
M28840/10	G	MIL-DTL-28840		Receptacle Wall Mount
M28840/11	G	MIL-DTL-28840		Receptacle Cable Connecting
M28840/12	**	MIL-DTL-28840		Receptacle Box Mount
M28840/14	G	MIL-DTL-28840		Receptacle Jam Nut
M28840/16	G	MIL-DTL-28840		Plug Straight
D38999/20	H	MIL-DTL-38999	III	Receptacle Wall Mount
D38999/21	**	MIL-DTL-38999	III	Receptacle Hermetic (Box Mount)
D38999/23	**	MIL-DTL-38999	III	Receptacle Hermetic Jam Nut
D38999/24	H	MIL-DTL-38999	III	Receptacle Jam Nut
D38999/25	**	MIL-DTL-38999	III	Receptacle Hermetic Solder Mount
D38999/26	H	MIL-DTL-38999	III	Plug Straight
D38999/27	**	MIL-DTL-38999	III	Receptacle Hermetic Weld Mount
D38999/29	H-701	MIL-DTL-38999	III	Plug Lanyard Release
D38999/30	H-701	MIL-DTL-38999	III	Plug Lanyard Release
D38999/31	H	MIL-DTL-38999	III	Plug Lanyard Release
D38999/36	H	MIL-DTL-38999	III	Plug Lanyard Release
D38999/40	H	MIL-DTL-38999	IV	Receptacle Wall Mount
D38999/41	**	MIL-DTL-38999	IV	Box Mount Receptacle Hermetic
D38999/42	**	MIL-DTL-38999	IV	Receptacle Box Mount
D38999/43	H	MIL-DTL-38999	IV	Jam Nut Mount Hermetic Receptacle
D38999/44	H-715	MIL-DTL-38999	IV	Receptacle Jam Nut
D38999/45	**	MIL-DTL-38999	IV	Solder Mount Hermetic Receptacle
D38999/46	H	MIL-DTL-38999	IV	Plug Straight EMI
D38999/47	H	MIL-DTL-38999	IV	Plug Straight
D38999/49	H	MIL-DTL-38999	IV	In Line Cable Receptacle
D38999/60	H	MIL-DTL-38999	III	Tight Tolerance Fiber Optic Plug
D38999/61	H	MIL-DTL-38999	III	Tight Tolerance Wall Mount Fiber Optic Receptacle
M81511/1	J	MIL-C-81511	2	Receptacle Flange Mount
M81511/2	**	MIL-C-81511	2	Receptacle Solder Flange
M81511/3	J	MIL-C-81511	2	Receptacle Jam Nut

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PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
M81511/4	**	MIL-C-81511	2	Receptacle Jam Nut ***
M81511/5	J	MIL-C-81511	2	Plug Cable Connecting ***
M81511/6	J	MIL-C-81511	2	Plug ***
M81511/21	J	MIL-C-81511	1	Receptacle Flange Mount ***
M81511/22	**	MIL-C-81511	1	Receptacle Solder Flange Mount ***
M81511/23	J	MIL-C-81511	1	Receptacle Jam Nut ***
M81511/24	**	MIL-C-81511	1	Receptacle Jam Nut ***
M81511/25	J	MIL-C-81511	1	Receptacle Cable Connecting ***
M81511/26	J	MIL-C-81511	1	Plug ***
M81511/27	**	MIL-C-81511	1	Receptacle Thru-Bulkhead Jam Nut ***
M81511/28	**	MIL-C-81511	2	Receptacle Thru-Bulkhead Single Hole Mount ***
M81511/31	J	MIL-C-81511	2	Receptacle Flange Mount ***
M81511/32	J	MIL-C-81511	2	Receptacle Jam Nut Mount ***
M81511/33	J	MIL-C-81511	2	Recepacle,Cable Connecting ***
M81511/34	J	MIL-C-81511	2	Plug ***
M81511/35	J	MIL-C-81511	1	Receptacle Flange Mount ***
M81511/36	J	MIL-C-81511	1	Receptacle Jam Nut ***
M81511/37	J	MIL-C-81511	1	Receptacle Cable Connecting ***
M81511/38	J	MIL-C-81511	1	Plug ***
M81511/41	J	MIL-C-81511	3	Receptacle Flange Mount ***
M81511/42	**	MIL-C-81511	3	Receptacle Solder Flange Mount ***
M81511/44	**	MIL-C-81511	3	Receptacle Jam Nut ***
M81511/45	J	MIL-C-81511	3	Receptacle Cable Connecting ***
M81511/46	J	MIL-C-81511	3	Plug ***
M81511/47	**	MIL-C-81511	3	Receptacle Solder Flange Mount ***
M81511/48	**	MIL-C-81511	3	Receptacle Jam Nut ***
M81511/49	J	MIL-C-81511	3	Receptacle Jam Nut ***
M81511/50	**	MIL-C-81511	4	Receptacle Jam Nut ***
M81511/51	J	MIL-C-81511	4	Receptacle Flange Mount ***
M81511/52	**	MIL-C-81511	4	Receptacle Solder Flange Mount ***
M81511/53	J	MIL-C-81511	4	Receptacle Jam Nut ***
M81511/54	**	MIL-C-81511	4	Receptacle Jam Nut ***
M81511/55	J	MIL-C-81511	4	Receptacle Cable Connecting ***
M81511/56	J	MIL-C-81511	4	Plug ***
M81511/57	**	MIL-C-81511	4	Receptacle Solder Flange Mount ***
M81582/1	*	MIL-C-81582		Receptacle Jam Nut Mount ***
M81582/2	*	MIL-C-81582		Plug Lanyard Release ***
M83723/1	A	MIL-DTL-83723	I	Superseded by MS3470
M83723/2	A	MIL-DTL-83723	I	Superseded by MS3470
M83723/3	A	MIL-DTL-83723	I	Superseded by MS3472
M83723/4	A	MIL-DTL-83723	I	Superseded by MS3472
M83723/5	A	MIL-DTL-83723	I	Superseded by MS3474
M83723/6	A	MIL-DTL-83723	I	Superseded by MS3474
M83723/7	A	MIL-DTL-83723	I	Superseded by MS3471
M83723/8	A	MIL-DTL-83723	I	Superseded by MS3471
M83723/9	**	MIL-DTL-83723	I	Superseded by MS3440
M83723/10	**	MIL-DTL-83723	I	Superseded by MS3442

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PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
M83723/11	**	MIL-DTL-83723	I	Superseded by MS3443
M83723/12	**	MIL-DTL-83723	I	Superseded by MS3443
M83723/13	A	MIL-DTL-83723	I	Superseded by MS3476
M83723/14	A	MIL-DTL-83723	I	Superseded by MS3476
M83723/17	K	MIL-DTL-83723	II	Superseded by MS3451 ***
M83723/18	K	MIL-DTL-83723	II	Superseded by MS3451 ***
M83723/19	K	MIL-DTL-83723	II	Superseded by MS3450 ***
M83723/20	K	MIL-DTL-83723	II	Superseded by MS3450 ***
M83723/21	**	MIL-DTL-83723	II	Superseded by MS3452 ***
M83723/22	**	MIL-DTL-83723	II	Superseded by MS3452 ***
M83723/23	K	MIL-DTL-83723	II	Superseded by MS3456 ***
M83723/24	K	MIL-DTL-83723	II	Superseded by MS3456 ***
M83723/25	**	MIL-DTL-83723	II	Superseded by MS3142 ***
M83723/26	**	MIL-DTL-83723	II	Superseded by MS3143 ***
M83723/36	A	MIL-DTL-83723	I	Inactive For New Design
M83723/37	A	MIL-DTL-83723	I	Inactive For New Design
M83723/38	A	MIL-DTL-83723	I	Inactive For New Design
M83723/39	A	MIL-DTL-83723	I	Inactive For New Design
M83723/40	A	MIL-DTL-83723	I	Inactive For New Design
M83723/41	A	MIL-DTL-83723	I	Inactive For New Design
M83723/42	A	MIL-DTL-83723	I	Superseded by MS3475
M83723/43	A	MIL-DTL-83723	I	Superseded by MS3475
M83723/45	**	MIL-DTL-83723	I	Superseded by MS3115
M83723/48	A	MIL-DTL-83723	I	Inactive For New Design
M83723/49	A	MIL-DTL-83723	I	Inactive For New Design
M83723/52	K	MIL-DTL-83723	II	Superseded by MS3459
M83723/53	K	MIL-DTL-83723	II	Superseded by MS3459
M83723/66	A	MIL-DTL-83723	III	Plug Push Pull (Pin Contacts)
M83723/67	A	MIL-DTL-83723	III	Plug Push Pull (Socket Contacts)
M83723/68	A	MIL-DTL-83723	III	Plug Push Pull Lanyard (Pin Contacts)
M83723/69	A	MIL-DTL-83723	III	Plug Push Pull Lanyard (Socket Contacts)
M83723/71	A	MIL-DTL-83723	III	Receptacle Bayonet Flange Mount (Socket Contact)
M83723/72	A	MIL-DTL-83723	III	Receptacle Bayonet Flange Mount (Pin Contact)
M83723/73	A	MIL-DTL-83723	III	Receptc Bayonet Single Hole Mount (Socket Contact)
M83723/74	A	MIL-DTL-83723	III	Receptacle Bayonet Single Mount (Pin Contact)
M83723/75	A	MIL-DTL-83723	III	Plug Bayonet (Socket Contact)
M83723/76	A	MIL-DTL-83723	III	Plug Bayonet (Pin Contact)
M83723/77	A	MIL-DTL-83723	III	Plug Bayonet RFI (Socket Contact)
M83723/78	A	MIL-DTL-83723	III	Plug Bayonet RFI (Pin Contact)
M83723/79	**	MIL-DTL-83723	III	Receptacle Bayonet Flange Mount Hermetic
M83723/80	**	MIL-DTL-83723	III	Receptacle Bayonet Solder Flange Mount Hermetic
M83723/81	**	MIL-DTL-83723	III	Receptacle Bayonet Single Hole Mount Hermetic
M83723/82	A	MIL-DTL-83723	III	Receptacle Threaded Flange Mount (Socket Contact)
M83723/83	A	MIL-DTL-83723	III	Receptacle Threaded Flange Mount (Pin Contact)
M83723/84	A	MIL-DTL-83723	III	Receptc Threaded Single Hole Mount (Socket Contact)
M83723/85	A	MIL-DTL-83723	III	Receptacle Threaded Single Hole Mount (Pin Contact)
M83723/86	A	MIL-DTL-83723	III	Plug Threaded (Socket Contact)
M83723/87	A	MIL-DTL-83723	III	Plug Threaded (Pin Contact)
M83723/88	**	MIL-DTL-83723	III	Receptacle Threaded Flange Mount (Pin Contact)
M83723/89	**	MIL-DTL-83723	III	Receptacle Threaded Single Hole Mount Hermetic
M83723/90	**	MIL-DTL-83723	III	Receptacle Threaded Solder Flange Mount Hermetic
M83723/91	A	MIL-DTL-83723	III	Plug Threaded RFI (Socket Contact)
M83723/92	A	MIL-DTL-83723	III	Plug Threaded RFI (Pin Contact)
M83723/93	**	MIL-DTL-83723	III	Receptacle Bayonet Solder Flange Mount Hermetic
M83723/94	**	MIL-DTL-83723	III	Receptacle Bayonet Single Hole Mount Hermetic
M83723/95	A	MIL-DTL-83723	III	Plug Threaded (Socket Contact) Self Locking
M83723/96	A	MIL-DTL-83723	III	Plug Threaded (Pin Contact) Self Locking
M83723/97	A	MIL-DTL-83723	III	Plug Threaded RFI (Socket Contact) Self Locking
M83723/98	A	MIL-DTL-83723	III	Plug Threaded RFI (Pin Contact) Self Locking
NATC00	H*	SSQ21635		Receptacle Flange
NATC06	H*	SSQ21635		Plug
NATC07	H*	SSQ21635		Receptacle Jam Nut
NATC09	***	SSQ21635		Receptacle Weld Mount
NATC77	***	SSQ21635		Receptacle Jam Nut Bulkhead Feed-Thru
NATC99	***	SSQ21635		Receptacle Weld Mount
NBO	A	40M39569		Receptacle Flange Mount
NBOH	**	40M39569		Receptacle Hermetic
NB3H	**	40M39569		Receptacle Hermetic
NB4	A	40M39569		Receptacle Flange Mount
NB5H	**	40M39569		Thru-Bulkhead Hermetic
NB6	A	40M39569		Plug Straight
NB6G	A	40M39569		Plug Straight,EMI
NB7	A	40M39569		Receptacle Jam Nut
NB7H	**	40M39569		Receptacle Hermetic
NB8H	**	40M39569		Receptacle Hermetic
NLSO	F	40M38277		Receptacle Flange Mount
NLS3H	**	40M38277		Receptacle Hermetic
NLS6	F	40M38277		Plug Straight
NLS6G	F	40M38277		Plug Straight EMI
NLS7	F	40M38277		Receptacle Jam Nut
NLS7H	**	40M38277		Receptacle Jam Nut
NZGL00	H**	SSQ21635		Receptacle Flange
NZGL03	***	SSQ21635		Receptacle Lever
NZGL06	H**	SSQ21635		Plug
NZGL07	H**	SSQ21635		Receptacle Weld Mount
NZGL09	***	SSQ21635		Receptacle Weld Mount
NZGL66	H**	SSQ21635		Plug
NZGL77	***	SSQ21635		Receptacle Jam Nut
NZGL99	***	SSQ21635		Receptacle Weld Mount

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Military Specification Comparison Tables

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE				CONTACT TYPE				SHELL		
		DESCRIPTION	WATER RESISTANCE	RESILIENT MATERIAL	OPERATING TEMP	SOLDER or EYELET	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE
							FRONT	REAR				
SAE AS50151 Solder Series I (IT)	A	Non-Environmental Solid Shell	Moisture-proof	–	125°C	•	–	–	16 12 8 4 1/0	Aluminum	96 hr. Cad O.D.	Threaded
	B	Non-Environmental Split Shell	Moisture-proof	–	125° C	•	–	–		Aluminum	96 hr. Cad O.D.	
	C	Pressurized	Moisture-proof	–	125°C	•	–	–		Aluminum	96 hr. Cad O.D.	
	E	Environmental Grommet Seal	Moisture-proof	Neoprene	125°C	•	–	–		Aluminum	96 hr. Cad O.D.	
	F	Environmental Grommet Seal with Clamp	Moisture-proof	Neoprene	125°C	•	–	–		Aluminum	96 hr. Cad O.D.	
	HS	Hermetic	Submersible	Silicone	125°C	•	–	–		Stainless Steel	96 hr. Cad O.D.	
	P	Environmental Potting Seal	Moisture-proof	Polyamide	125°C	•	–	–		Aluminum	96 hr. Cad O.D.	
	K	Non-Environmental Firewall	Moisture-proof	–	125°C	Non-Removable Crimp				Carbon Steel	96 hr. Cad O.D.	
	R	Environmental Grommet Seal with 'O' Ring	Moisture-proof	Neoprene	125°C	•	–	–		Aluminum	96 hr. Cad O.D.	
SAE AS50151 Crimp Front Release Series II	D	Environmental High Shock	Splash-proof	Silicone	175°C	–	•	–	16 12 8 4 1/0	Aluminum	500 hr. Cad O.D.	Threaded
	DJ	Environmental High Shock	Splash-proof	Silicone	175°C	–	•	–		Aluminum	500 hr. Cad O.D.	
	DJS	Environmental High Shock	Splash-proof	Silicone	175°C	–	•	–		Stainless Steel	Black Cad	
	DS	Environmental High Shock	Splash-proof	Silicone	175°C	–	•	–		Stainless Steel	Black Cad	
	K	Environmental Firewall	Submersible	Silicone	175°C	–	•	–		Carbon Steel	Electroless Nickel	
	KS	Environmental Firewall	Submersible	Silicone	175°C	–	•	–		Stainless Steel	Passivated	
	KT	Environmental Firewall	Submersible	Silicone	175°C	–	•	–		Carbon Steel	96 hr. Cad O.D.	
	L	Environmental High Temperature	Submersible	Silicone	200°C	–	•	–		Aluminum	Electroless Nickel	
	LS	Environmental High Temperature	Submersible	Silicone	200°C	–	•	–		Stainless Steel	Passivated	
	U	Environmental High Temperature	Splash-proof	Silicone	200°C	–	•	–		Aluminum	Electroless Nickel	
	US	Environmental High Temperature	Splash-proof	Silicone	200°C	–	•	–		Stainless Steel	Passivated	
	W	Environmental General Purpose	Splash-proof	Silicone	175°C	–	•	–		Aluminum	96 hr. Cad O.D.	
SAE AS50151 Crimp Rear Release Series III	K	Environmental Firewall	Submersible	Silicone	175°C	–	–	•	16 12 8 4 1/0	Carbon Steel	Electroless Nickel	Threaded
	KS	Environmental Firewall	Submersible	Silicone	175°C	–	–	•		Stainless	Passivated	
	KT	Environmental Firewall	Submersible	Silicone	175°C	–	–	•		Carbon Steel	96 hr. Cad O.D.	
	L	Environmental High Temperature	Submersible	Silicone	200°C	–	–	•		Aluminum	Electroless Nickel	
	LS	Environmental High Temperature	Submersible	Silicone	200°C	–	–	•		Stainless Steel	Passivated	
	U	Environmental High Temperature	Splash-proof	Silicone	200°C	–	–	•		Aluminum	Electroless Nickel	
	US	Environmental High Temperature	Splash-proof	Silicone	200°C	–	–	•		Stainless Steel	Passivated	
	W	Environmental General Purpose	Splash-proof	Silicone	175°C	–	–	•		Aluminum	96 hr. Cad O.D.	
MIL-C-10544	ALL	Environmental Signal Corps Audio U Series	Moisture-proof	Neoprene	125°C	Solder & Taper Pin Terminations			16	Stainless Steel	Passivated	Reverse Bayonet
MIL-C-12520	ALL	Environmental Signal Corps Power UW Series	Moisture-proof	Neoprene	125°C	•	–	–	20 16 12 8	Aluminum	Cad O.D.	Center Lock Screw
MIL-C-22249	ALL	Environmental High Pressure Bulkhead	Submersible	Silicone	73°C	•	–	–	20 16	Stainless Steel	Passivated	Threaded
MIL-C-22539	ALL	Environmental High Pressure Bulkhead	Submersible	Dially Phthalate	73°C	•	–	–	16 12	Stainless Steel	Passivated	Threaded

Military Specification Comparison Tables (continued)

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE				CONTACT TYPE				SHELL		
		DESCRIPTION	WATER RESISTANCE	RESILIENT MATERIAL	OPERATING TEMP	SOLDER or EYELET	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE
							FRONT	REAR				
MIL-DTL-22992 Class C, J & R	C*C*	Environmental Pressurized	Moisture-proof	Neoprene	125°C	•	–	–	16 12 8 4 1/0	Aluminum	500 hr Cad O.D	Threaded Double Start
	C*N*	Environmental Pressurized	Moisture-proof	Neoprene	125°C	–	–			Aluminum	Black Anodize	
	J*C*	Environmental Pressurized, with Grommet	Moisture-proof	Neoprene	125°C	–	–			Aluminum	500 hr Cad O.D.	
	J*N*	Environmental Pressurized, with Grommet	Moisture-proof	Neoprene	125°C	–	–			Aluminum	Black Anodize	
	R*C*	Environmental	Moisture-proof	Neoprene	125°C	–	–			Aluminum	500 hr Cad O.D.	
	R*N*	Environmental	Moisture-proof	Neoprene	125°C	–	–			Aluminum	Black Anodize	
MIL-DTL-22992 Class L	L (C)	Environmental, Gland Seal Backshell	Moisture-proof	Neoprene	125°C	•			6 4 2 1/0 4/0	Aluminum	500 hr Cad O.D.	
	L (N)	Environmental, Gland Seal Backshell	Moisture-proof	Neoprene	125°C	•				Aluminum	Black Anodize	
MIL-C-24217	ALL	High Pressure Bulkhead	Submersible	Silicone	75C	•	–	–	16 12 8 4 1/0	Stainless Steel	Passivated	Coupling
MIL-C-25955	–	Environmental	Moisture-proof	Neoprene	125°C	–	•	–	20	Aluminum	Cadmium	Threaded Double Start
	–	Hermetic	Moisture-proof	Neoprene	125°C	•	–	–		Carbon Steel	Tinned	
MIL-DTL-26482 Series 1 Solder (IPT)	E	Environmental with Grommet Nut	Moisture-proof	Neoprene	125°C	•	–	–	20 16 12	Aluminum	96 hr Cad O.D.	Bayonet
	F	Environmental with Strain Relief	Moisture-proof	Neoprene	125°C	•	–	–		Aluminum	96 hr Cad O.D.	
	H*A*	Hermetic	Moisture-proof		125°C	•				Stainless Steel	Passivate	
	H*B*	Hermetic	Moisture-proof		125°C	•				Stainless Steel	Passivate	
	H*C*	Hermetic	Moisture-proof		125°C	•				Carbon Steel	Tinned	
	H*Y*	Hermetic	Moisture-proof		125°C	•				Carbon Steel	Tinned	
	J	Environmental Gland Seal	Moisture-proof	Neoprene	125°C	•				Aluminum	96 hr Cad O.D.	
	P	Environmental Potting Seal	Moisture-proof	Neoprene	125°C	•				Aluminum	96 hr Cad O.D.	
MIL-DTL-26482 Series 1 Crimp (IPT SE)	E	Environmental with Grommet Nut	Moisture-proof	Neoprene	125°C	–	•	–	20 16 12	Aluminum	96 hr Cad O.D.	Bayonet
	F	Environmental with Strain Relief	Moisture-proof	Neoprene	125°C	–	•	–		Aluminum	96 hr Cad O.D.	
	P	Environmental Potting Seal	Moisture-proof	Neoprene	125°C	–	•	–		Aluminum	96 hr Cad O.D.	
MIL-DTL-26482	A	Environmental	Submersible	Silicone	200°C	–	–	•	20 16 12	Aluminum	Black Anodize	Bayonet
	E	Environmental	Submersible	Silicone	175°C					Aluminum	Electroless Nickel	
	H*A*	Hermetic	Submersible	Silicone	200°C	•	–	–		Stainless Steel	Passivate	
	H*B*	Hermetic	Submersible	Silicone	200°C	•	–	–		Stainless Steel	Passivate	
	H*C*	Hermetic	Submersible	Silicone	175°C	•	–	–		Carbon Steel	Tinned	
	H*Y*	Hermetic	Submersible	Silicone	175°C	•	–	–		Carbon Steel	Tinned	
	L	Environmental	Submersible	Silicone	200°C	–	–	•		Aluminum	Electroless Nickel	
	N	Hermetic	Submersible	Silicone	175°C	–	–	•		Carbon Steel	Tinned	
	W	Environmental	Submersible	Silicone	175°C	–	–	•		Aluminum	500 hr Cad O.D.	
MIL-DTL-26500	E	Environmental, High Temperature	Splash-proof	Silicone	200°C	–	•	–	20 16 12	Stainless Steel	Passivate	Bayonet or Threaded
	F	Environmental, Fluid Resistant	Submersible	Silicone	175°C	–	•	–		Aluminum	Anodic Coating	
	G	Environmental, Grounding	Splash-proof	Silicone	200°C	–	•	–		Aluminum	Electroless Nickel	
	H*C	Hermetic	Splash-proof	Silicone	200°C	•	–	–		Carbon Steel	Tinned	
	H*E	Hermetic	Splash-proof	Silicone	200°C	•	–	–		Carbon Steel	Tinned	
	K	Environmental, FIrewall	Splash-proof	Silicone	200°C	–	•	–		Stainless Steel	Passivate	
	R	Environmental	Splash-proof	Silicone	175°C	–	•	–		Aluminum	Black Anodize	

Military Specification Comparison Tables (continued)

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE				CONTACT TYPE				SHELL		
		DESCRIPTION	WATER RESISTANCE	RESILIENT MATERIAL	OPERATING TEMP	SOLDER or EYELET	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE
							FRONT	REAR				
MIL-DTL-27599 Series I	P*A	Potting Seal	–	None	150°C	•			22M 22D 20 16 12	Aluminum	Bright/Gold Cad over Nickel	Bayonet
	P*B	Potting Seal	–	None	150°C	•				Aluminum	Bright/Gold Cad over Nickel	
	T*A	Non-Environmental	–	None	175°C	•				Aluminum	500 hr Cad O.D.	
	T*B	Non-Environmental	–	None	175°C	•				Aluminum	500 hr Cad O.D.	
MIL-DTL-27599 Series II	P*A	Potting Seal	–	None	150°C	•			22M 22D 20 16 12	Aluminum	Bright/Gold Cad over Nickel	Bayonet
	P*B	Potting Seal	–	None	150°C	•				Aluminum	Bright/Gold Cad over Nickel	
	T*A	Non-Environmental	–	None	175°C	•				Aluminum	500 hr Cad O.D.	
	T*B	Non-Environmental	–	None	175°C	•				Aluminum	500 hr Cad O.D.	
MIL-DTL-28840	D	Environmental	Splash-proof	Fluorosilicone	175°C		•		20	Aluminum	500 hr Cad O.D. over Nickel	Threaded Double Start
	DS	Environmental	Splash-proof	Fluorosilicone	175°C		•			Stainless Steel	Stainless Steel, Cadmium-Black over Nickel	
	T	Environmental	Splash-proof	Fluorosilicone	175°C		•			Aluminum	Nickel PTFE	
	Z	Environmental	Splash-proof	Fluorosilicone	175°C		•			Aluminum	Black Zinc Nickel	
MIL-C-28876	ALL	Environmental	Submersible	Fluorosilicone	65°C	Fiber Optic			–	Aluminum	500 hr Cad O.D.	Threaded
SAE AS29600 Series A MIL-DTL-38999 Insert	E	Environmental	Submersible	Silicone	175°C	•			22D 22 20 16 12	Composite	None	Threaded Triple Start
	G	Environmental, Space Grade	Submersible	Silicone	175°C	•				Composite	Tin	
	R	Environmental	Submersible	Silicone	175°C	•				Composite	Tin	
SAE AS29600 Series B MIL-C-81511 Insert	E	Environmental	Submersible	Silicone	175°C			•	23 20 16 12	Composite	None	Threaded Triple Start
	G	Environmental, Space Grade	Submersible	Silicone	175°C			•		Composite	Tin	
	R	Environmental	Submersible	Silicone	175°C			•		Composite	Tin	
MIL-DTL-38999 Series I Scoop Proof and Series II Low Profile (231 & 232)	E	Environmental (Superseded by Class T)	Submersible	Silicone or Fluorosilicone	150°C-200°C			•	22M 22D 22 20 16 12 10 8	Aluminum	See MIL-DTL-38999 Series I Plating Tables page 56	Bayonet
	G	Environmental, Space Grade	Submersible	Silicone or Fluorosilicone	150°C-200°C			•		Aluminum		
	H	Hermetically Sealed - Space Grade	Submersible	Silicone or Fluorosilicone	150°C-200°C	•				Carbon or Stainless Steel		
	P	Environmental with Potting Seal	Submersible	Silicone or Fluorosilicone	150°C-200°C			•		Aluminum		
	T	Environmental with Accessory Threads	Submersible	Silicone or Fluorosilicone	150°C-200°C			•		Aluminum		
	Y	Hermetic	Submersible	Silicone or Fluorosilicone	150°C-200°C	•				Carbon or Stainless Steel		

Military Specification Comparison Tables (continued)

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE				CONTACT TYPE				SHELL		
		DESCRIPTION	WATER RESISTANCE	RESILIENT MATERIAL	OPERATING TEMP	SOLDER or EYELET	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE
							FRONT	REAR				
MIL-DTL-38999 Series III Scoop Proof and Series IV Scoop Proof (233 & 234)	C	Environmental Nonconductive	Submersible	Silicone or Fluorosilicone	200°C			•	22M 22D 22 20 16 12 10 8	Aluminum	Anodic (nonconductive)	Threaded Triple Start
	F	Environmental Conductive	Submersible	Silicone or Fluorosilicone	200°C			•		Aluminum	Electroless Nickel	
	G	Environmental, Space Grade	Submersible	Silicone or Fluorosilicone	200°C			•		Aluminum	Electroless Nickel	
	H	Hermetic, Space Grade	Submersible	Silicone or Fluorosilicone	200°C	•				Stainless Steel	Electroless Nickel	
	J	Environmental Composite	Submersible	Silicone or Fluorosilicone	175°C			•		Composite	2000 hr Salt Spray	
	K	Environmental, Firewall	Submersible	Silicone or Fluorosilicone	200°C			•		Stainless Steel	Passivated	
	L	Environmental, Stainless	Submersible	Silicone or Fluorosilicone	200°C			•		Stainless Steel	Electroless Nickel	
	M	Environmental, Composite	Submersible	Silicone or Fluorosilicone	200°C			•		Composite	Electroless Nickel	
	N	Hermetic	Submersible	Silicone or Fluorosilicone	200°C	•				Stainless Steel	Electro deposited Nickel	
	P	Environmental, Alumiplate	Submersible	Silicone or Fluorosilicone	175°C			•		Aluminum	Pure Electrodeposited Aluminum	
	R	Environmental Corrosion Resistant	Submersible	Silicone or Fluorosilicone	200°C			•		Aluminum	Electroless Nickel	
	S	Environmental Firewall	Submersible	Silicone or Fluorosilicone	200°C			•		Stainless Steel	Electro deposited Nickel	
	T	Environmental Nickel PTFE	Submersible	Silicone or Fluorosilicone	175°C			•		Aluminum	Nickel PTFE	
	W	Environmental	Submersible	Silicone or Fluorosilicone	175°C			•		Aluminum	500 hr Cad O.D.	
	X	Environmental Corrosion Resistant	Submersible	Silicone or Fluorosilicone	175°C			•		Aluminum	Corrosion Resistant Cad O.D.	
	Y	Hermetic	Submersible	Silicone or Fluorosilicone	200°C	•				Stainless Steel	Electroless Nickel	
	Z	Environmental Zinc Nickel Plating	Submersible	Silicone or Fluorosilicone	175°C			•		Aluminum	Conductive Zinc Nickel	
MIL-C-55116	–	Environmental, Cable Seal	Splash-proof	Neoprene	125°C	•			20	Stainless Steel	Passivated	Reverse Bayonet
MIL-C-55181	–	Environmental, Cable Seal	Splash-proof	Neoprene	125°C	•				Carbon Steel	96 hr Cad O.D.	Center Lock Screw
MIL-C-55243	–	Environmental, Cable Seal	Splash-proof	Neoprene	125°C	•				Aluminum	96 hr Cad O.D.	Reverse Bayonet
MIL-C-81511 Series1 Gang Release* Superseded by Series III	A	Environmental	Submersible	Silicone	200°C			•	23 20 16 12	Aluminum	Electroless Nickel	Bayonet
	E	Environmental	Splash-proof	Silicone	150°C			*		Aluminum	96 hr Cad O.D.	
	F	Environmental	Submersible	Silicone	175°C			•		Aluminum	Electroless Nickel	
	H	Hermetic	Submersible	Silicone	150°C	*				Carbon Steel	Tinned	
MIL-C-81511 Series 2 Gang Release* Superseded by Series IV	A	Environmental	Submersible	Silicone	200°C			*	23 20 16 12	Aluminum	Electroless Nickel	Bayonet
	E	Environmental	Splash-proof	Silicone	150°C			*		Aluminum	96 hr Cad O.D.	
	F	Environmental	Submersible	Silicone	175°C			*		Aluminum	Electroless Nickel	
	H	Hermetic	Submersible	Silicone	150°C	•				Carbon Steel	Tinned	
MIL-C-81511 Series III	A	Environmental	Submersible	Silicone	200°C			•	23 20 16 12	Aluminum	Electroless Nickel	Bayonet
	D	Hermetic	Submersible	Silicone	175°C	•				Stainless	Passivated	
	F	Environmental	Submersible	Silicone	175°C			•		Aluminum	Electroless Nickel	
	W	Environmental	Submersible	Silicone	175°C			•		Aluminum	500 hr Cad O.D.	
MIL-C-81511 Series IV	A	Environmental	Submersible	Silicone	200°C			•	23 20 16 12	Aluminum	Electroless Nickel	Bayonet
	D	Hermetic	Submersible	Silicone	175°C	•				Carbon Steel	Passivated	
	F	Environmental	Submersible	Silicone	175°C			•		Aluminum	Electroless Nickel	
	W	Environmental	Submersible	Silicone	175°C			•		Aluminum	500 hr Cad O.D.	
SAE-AS81703 Series I	E	Environmental	Splash-proof	Neoprene	125°C	•			20 16 12	Aluminum	96 hr Cad O.D.	Push Pull
	H	Hermetic	Splash-proof	Neoprene	125°C	•				Carbon Steel	Tinned	
	J	Gland Seal	Splash-proof	Neoprene	125°C	•				Aluminum	96 hr Cad O.D.	
	P	Environmental, Potting Seal	Splash-proof	Neoprene	125°C	•				Aluminum	96 hr Cad O.D.	
SAE-AS81703 Series II	E	Environmental	Splash-proof	Neoprene	175°C		•		20 16 12	Aluminum	96 hr Cad O.D.	Push Pull
	J	Gland Seal	Splash-proof	Neoprene	175°C		•			Aluminum	96 hr Cad O.D.	

Military Specification Comparison Tables (continued)

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE				CONTACT TYPE				SHELL		
		DESCRIPTION	WATER RESISTANCE	RESILIENT MATERIAL	OPERATING TEMP	SOLDER or EYELET	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE
							FRONT	REAR				
SAE-AS81703 Series III	E	Environmental	Submersible	Silicone	200°C			•	20 16 12	Aluminum	500 hr Cad O.D.	Push Pull
	H	Hermetic	Submersible	Silicone	200°C	•				Stainless Steel	Passivated	
	L	Environmental	Submersible	Silicone	175°C			•		Aluminum	500 hr Cad O.D.	
	N	Hermetic	Submersible	Silicone	200°C			•		Stainless Steel	Passivated	
MIL-C-83526 Fiber Optic	ALL	Environmental	Submersible	Aluminum	65C	Fiber Optic			–	Aluminum	Grey Anodize	Threaded
MIL-DTL-83723 Series II (Inactive for new design)	A	Environmental	Submersible	Silicone	200°C			•	16 12 8 4 1/0	Aluminum	Black Anodized	Threaded
	G	Environmental	Submersible	Silicone	200°C			•		Stainless Steel	Passivated	
	H	Hermetic	Splash-proof	Silicone	150°C	•				Carbon Steel	Tinned	
	J	Hermetic	Submersible	Silicone	150°C	•				Carbon Steel	Tinned	
	K	Environmental, Firewall	Submersible	Silicone	200°C			•		Stainless Steel	Passivated	
	L	Hermetic	Submersible	Silicone	200°C	•				Stainless Steel	Electrodeposited Nickel	
	M	Environmental	Submersible	Silicone	175°C			•		Aluminum	Electrodeposited Aluminum	
	N	Hermetic, Firewall	Submersible	Silicone	200°C	•				Stainless Steel	Electrodeposited Nickel	
	P	Hermetic	Submersible	Silicone	200°C	•				Stainless Steel	Passivated	
	R	Environmental	Submersible	Silicone	200°C			•		Aluminum	Electronless Nickel	
	S	Environmental, Firewall	Submersible	Silicone	200°C			•		Stainless Steel	Passivated	
	T	Environmental	Submersible	Silicone	175°C			•		Aluminum	Nickel PTFE	
	W	Environmental	Submersible	Silicone	175°C			•		Aluminum	500 Hr. Conductive Cadmium	
	Y	Hermetic	Submersible	Silicone	200°C	•				Stainless Steel	Passivated	
	Z	Environmental	Submersible	Silicone	175°C			•		Aluminum	Conductive Zinc Nickel	
MIL-DTL-83723 Series III Type B Bayonet or Type T Threaded	A	Environmental	Submersible	Silicone	200°C			•	20 16 12	Aluminum	Black Anodized	Bayonet or Threaded
	G	Environmental	Submersible	Silicone	200°C			•		Stainless Steel	Passivated	
	H	Hermetic	Splash-proof	Silicone	150°C	•				Carbon Steel	Tinned	
	J	Hermetic	Submersible	Silicone	150°C	•				Carbon Steel	Tinned	
	K	Environmental, Firewall	Submersible	Silicone	200°C			•		Stainless Steel	Passivated	
	L	Hermetic	Submersible	Silicone	200°C	•				Stainless Steel	Electrodeposited Nickel	
	M	Environmental	Submersible	Silicone	175°C			•		Aluminum	Electrodeposited Aluminum	
	N	Hermetic, Firewall	Submersible	Silicone	200°C	•				Stainless Steel	Electrodeposited Nickel	
	P	Hermetic	Submersible	Silicone	200°C	•				Stainless Steel	Passivated	
	R	Environmental	Submersible	Silicone	200°C			•		Aluminum	Electronless Nickel	
	S	Environmental, Firewall	Submersible	Silicone	200°C			•		Stainless Steel	Passivated	
	T	Environmental	Submersible	Silicone	175°C			•		Aluminum	Nickel PTFE	
	W	Environmental	Submersible	Silicone	175°C			•		Aluminum	500 Hr. Conductive Cadmium	
	Y	Hermetic	Submersible	Silicone	200°C	•				Stainless Steel	Passivated	
	Z	Environmental	Submersible	Silicone	175°C			•		Aluminum	Conductive Zinc Nickel	

Glenair Sav-Con® Connector Savers: The Smart Solution for Preventing Contact Damage and Extending the Service Life of Cable and Box Assemblies

- **For MIL-DTL-26482, MIL-DTL-83723, MIL-C-5015, MIL-DTL-38999 Series I, II and III Connectors**
- **All Standard Materials and Finish Platings**
- **Environmental and Hermetic Designs Available**
- **Gender Changers**
- **Optional Locking Mechanism**
- **Keyed Polarization**
- **Fully Repairable**

Sav-Con® Connector Index

Connector Specification	Series	Part Number
MIL-STD-1533		
MIL-STD-1760		94*-021
MIL-C-5015		94*-011
MIL-DTL-26482	I-II	94*-001
MIL-C-28840		94*-002
MIL-DTL-38999	I	94*-003
MIL-DTL-38999	II	94*-004
MIL-DTL-38999	III	94*-005
MIL-DTL-83723	I	
MIL-DTL-83723	IIIB	94*-006
MIL-DTL-83723	IIIT	94*-007
MIL-DTL-83723		
40M38277		
40M38298		94*-010
40M39569		
LN29504		
LN 29729 (SJT)		94*-001
PAN6432-1		
PAN6433-1		
PATT 105 - 602		94*-009
PATT 616		
NFC C93-422	HE 301B	
NFC C93-422	HE 302	
NFC C93-422	HE 308	
NFC C93-422	HE 309	
NFC C93-422	HE 312	
VG 95328		

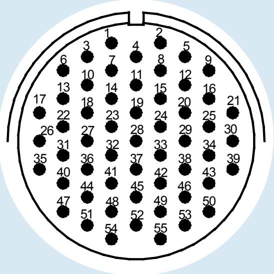
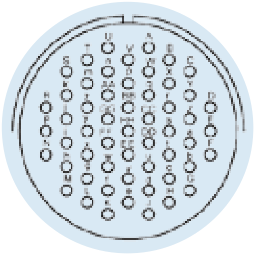
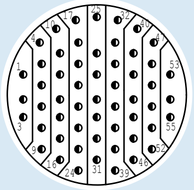
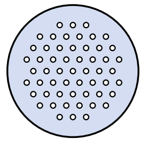
* 0 = General Duty 1 = Environmental 2 = High Reliability

Glenair Sav-Con® Connector Savers are designed to protect connectors that are subject to repeated mating and unmating cycles. Sav-Con® Connector Savers prevent costly repair or replacement of expensive connectors and cables while preserving the quality and integrity of connector performance. Sav-Con® Connector Savers take the abuse of repeated connection cycles instead of "black box" or other equipment connectors. Equipment connectors that are mated and unmated frequently during manufacturing, check-out phases and environmental test programs can be protected by Glenair Sav-Con® Connector Savers at considerable savings in time and money.

Glenair Sav-Con® Connector Savers feature one-piece, non-removable pin/socket contacts for maximum reliability and minimum effect on circuit resistance. Each Glenair Sav-Con® Connector Saver series meets the same durability requirements as the Military Specification series with which it mates. The mating portions of the pin-and-socket contacts are in strict compliance with the applicable Military Specification contacts used in each connector series. The one-piece design adds resistance to a circuit equal to a mated pin and socket contact, thus it has little or no effect on sensitive circuits.

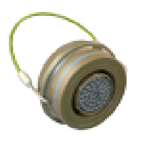
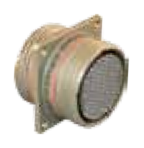
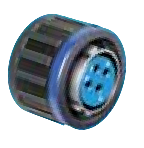
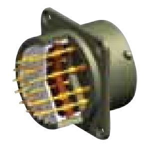
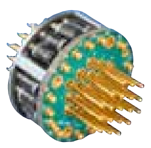
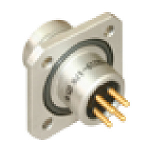
When a Sav-Con® Connector Saver is installed between a receptacle and a plug, the effective additional length is less than the length of an equivalent mated plug and receptacle. When using bayonet coupled Sav-Con® Connector Savers, Glenair recommends our Lock Ring design feature in applications where large cable bundles may induce unwanted stress to the coupling mechanism and potential unwanted contact displacement.

Center-to-Center Contact Densities in Standard MS Type Cylindrical Connectors

Standard	Miniature	Subminiature	Ultraminiature
			
MIL-DTL-5015 MIL-DTL-22992 VG95234 (ITS) MIL-DTL-28840	MIL-DTL-26482	MIL-DTL-38999	Series 80 "Mighty Mouse"
Insert arrangement shown: 24-A55 55 #20 Contacts	Insert arrangement shown: 22-55 55 #20 Contacts	Insert arrangement shown: E35 55 #22D Contacts	Insert arrangement shown: 16-55 55 #23 Contacts

TYPE	Connector Specification	Insert Arrangement Specification	Shell Size	Number of Contacts	Contact Size	Center-to-Center
Standard	MIL-DTL-5015	MIL-STD-1651	48	85	16	0.241"
	MIL-DTL-22992	MIL-STD-1651	44	104	16	0.193"
	VG95234	MIL-STD-1651	26	52	16	0.203"
	MIL-DTL-28840	MIL-STD-1698	33	155	20	0.114"
Miniature	MIL-DTL-26482	MIL-STD-1669	24	61	20	0.135"
	MIL-DTL-26500	MIL-STD-1554	24	61	20	0.131"
	MIL-DTL-83723	MIL-STD-1554	24	61	20	0.131"
Subminiature	MIL-DTL-38999	MIL-STD-1560	24	128	22D	0.095"
Ultra-miniature	Series 80 "Mighty Mouse"		23	130	23	0.076"

Examples of Electrical, Mechanical, Environmental and Packaging Modifications to Standard MS Type Connectors

 Integrated Band and Boot Porch	 Non-MS Shielded Contact Choices	 Space Grade Processing and Bakeout
 Solder or Weld-Mount Flange Modifications	 Unique Coupling Nut Castellations and Coatings	 Pure Gas Tube and Pitot Tube Contact Integration
 Splined Accessory Attachment	 High Density Contact Arrangements	 Umbilical Designs with Lanyard Release
 TBH's Panel Thickness Modifications	 Butt-Joint Fiber Optic Integration	 High-Temperature Tolerant Materials
 Alternative Plating and Material Options (e.g. Composite)	 Expanded-Beam Fiber Optic Integration	 Non-Standard MS Couplings such as Push-Pulls
 Back Potting for Advanced Environmental Sealing	 Auxiliary Ground Spring Integration	 Flange Modifications
 PC Tail Length and Diameter Modifications	 Center Jackpost and/or Guide Pin Integration	 Bulkhead Penetrators
 Insertable Solder Pots	 Gender Changers and Other Unique Connector Savers	 Overmolded Connectors
 Hybrid, Non-Standard Contact Layouts	 Integrated EMI Filtering	 Unique PCB Standoffs
 High-Speed and Matched Impedance Layouts	 Integrated EMP Diodes	 O-Ring Equipped Panel and Box Mount Designs

International Standards IP Protection Classification

IEC Publication 60529 Classification of Degrees of Protection by Enclosures provides a system for specifying enclosures of electrical equipment on the basis of the degree of protection required. IEC 60529 does not specify degrees of protection against risk of explosions or conditions such as moisture (produced, for example, by condensation), corrosive vapors, fungus, or vermin. NEMA Standards Publication 250 does test for environmental conditions such as corrosion, rust, icing, oil, and coolants. For this reason, and because the tests and evaluations for other characteristics are not identical, the IEC enclosure classification designations cannot be exactly equated with NEMA enclosure Type numbers.

First Numeral			Second Numeral	
IP	**Protection of Persons**	**Protection of Equipment**	**IP**	**Protection of Equipment**
0	No Protection	No Protection	0	No Protection
1	Protected against contact with large areas of the body (back of hand)	Protected against objects over 50 mm in diameter	1	Protected against vertically falling drops of water, e.g. condensation
2	Protected against contact with fingers	Protected against solid objects over 12 mm in diameter	2	Protected against direct sprays of water up to 15° from vertical
3	Protected against tools and wires over 2.5 mm in diameter	Protected against solid objects over 2.5 mm in diameter	3	Protected against sprays to 60° from vertical
4	Protected against tools and wires over 1 mm in diameter	Protected against objects over 1 mm in diameter	4	Protected against water sprayed from all directions (limited ingress permitted)
5	Protected against tools ad wires over 1 mm in diameter	Protected against dust (limited ingress, no harmful deposit	5	Protected against low pressure jets of water from all directions (limited ingress permitted)
6	Protected against tools and wires over 1 mm in diameter	Totally protected against dust	6	Protected against strong jets of water
			7	Protected against the effects of immersion between 15 cm and 1 m
			8	Protected against long periods of immersion under pressure

Example Rating

If the 1st IP number is...	and the 2nd IP number is...	Then the IP rating is
2	3	IP 2 3
(protection against solid objects)	(protection against liquids)	(Protection against touch with a finger and penetration of solid objects greater than 12 mm and against spraying water.)

Levels of Sealing

Connector Type	Seal Rating	Sealing Method	Typical Shell Material	Contact Material
Dust Tight	IP 65	Elastomer and/or epoxy	Aluminum or Plastic	BeCu/Brass/others
Environmental	IP 66	Elastomer and/or epoxy	Aluminum or Plastic	BeCu/Brass/others
Environmental	IP 67	Elastomer and/or epoxy	Aluminum or Plastic	BeCu/Brass/others
Environmental	IP 68	Elastomer and/or epoxy	Aluminum or Plastic	BeCu/Brass/others
Semi-Hermetic (-491 Mod Code)	1 X 10^{-4} Epoxy Special	Aluminum	Special	
Hermetic	1 X 10^{-4}	Glass (soft) to Metal	Aluminum	BeCu/other
Hermetic	1 X 10^{-6}	Glass to Metal	Cold Rolled Steel or Titanium	Alloy 52 or Kovar
Hermetic	1 X 10^{-8}	Glass to Metal	Stainless Steel or Kovar	Alloy 52 or Kovar
Hermetic	1 X 10^{-10}	Glass to Metal	Inconel or Stainless Steel	Inconel or Stainless Steel

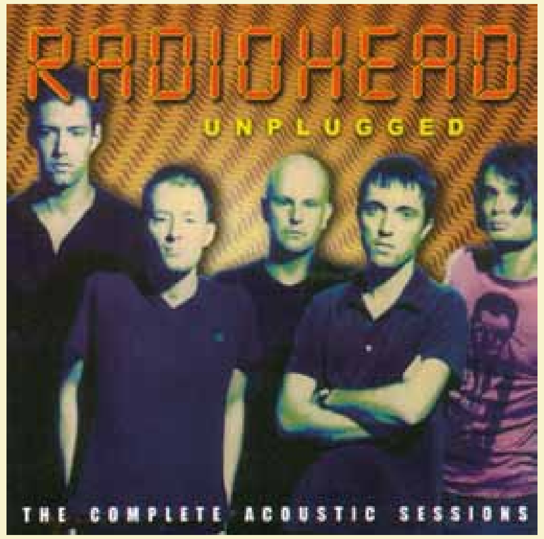
Hermetic leak rate = CC He/Sec

Six Degrees of Separation:
ELECTRICAL CONNECTORS AND ROCK & ROLL

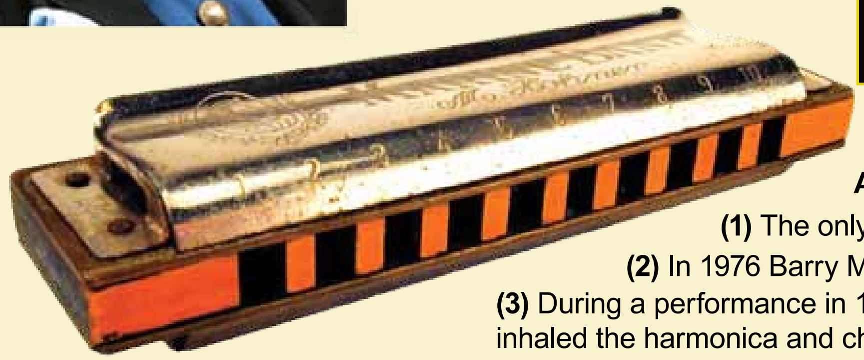
We love a good challenge. So when *QwikConnect* publisher Chris Toomey (please direct all negative e-mail directly to him) suggested a rock-themed centerfold we jumped at the chance. While some may claim the relationship between the interconnect industry and this slice of the music business is tenuous at best, we will argue otherwise in this authoritative broadside; proving beyond all reasonable doubt that these two seemingly unrelated cultures are in fact–dare we say it–connected at the hip.

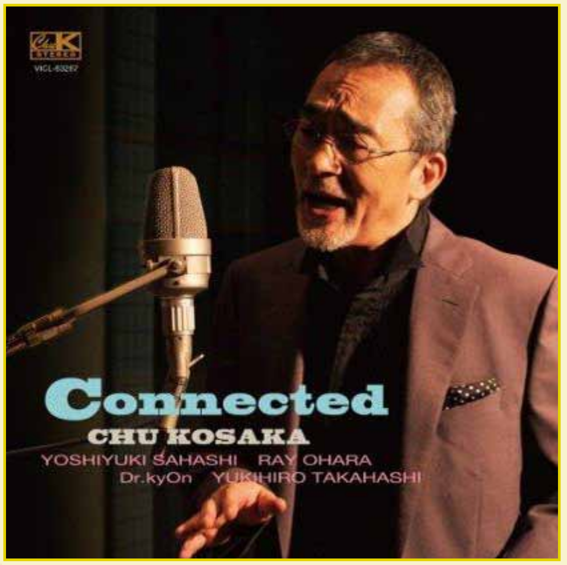
Fact Number One: Electrical current and rock-and-roll share common origins. Australian brothers Malcolm and Angus Young formed the popular Heavy Metal Rock Band AC/DC in 1973. In an unmistakable homage to the electrical interconnect industry, the brothers named the group after alternating current (AC) in which the movement of electric charge periodically reverses direction, and direct current (DC), in which the flow of electric charge is only in one direction.

Fact Number Two: Phil Spector, the widely successful rock music impresario and celebrity hit-man, holds several important interconnect-industry patents for Electrostatic Discharge (ESD) and lightning-strike products.



Fact Number Three: Many rock bands lamely attempt to rebel, to distance themselves from the interconnect industry, (which they decry as painfully "uncool") by producing special unplugged versions of their songs. Kind of sad really.





Fact Number Four: World-famous Japanese rock-gospel singer Chu Kosaka spoke truth to power in his landmark tribute to the interconnect industry. The album, titled simply and touchingly, *Connected,* features a rare cavalcade of hits including "Pastor" Chu's signature song *Power Connectors in the Sky,* and B-side hit *Be My Reverse Bayonet.*

Fact Number Five: The T-Connection: The pinnacle (or perhaps the nadir) of the historical rock-disco-connector industry relationship. The band's name famously relates to a much beloved conduit fitting, or splitter, used on one of their most powerful road amps.

Fact Number Six: It should be obvious, but we'll make the point anyway, Tom Petty wrote his hit ballad, *Make That Connection*, with the MIL-DTL-38999 connector in mind. Just check out the song's chorus to see what we mean:

I want to make that connection,
that connection to you

I want to make that connection,
that connection to you.

We're pretty sure Tom must be a Series III man, so we've added a little eye-candy to this page just for him. Rock on, Tom!

And finally, under the heading "Missed Connections" check out these stunning facts:

(1) The only guy in ZZ Top who doesn't have a beard is Frank Beard.

(2) In 1976 Barry Manilow sang a chart-topping song titled *I Write the Songs*. The song wasn't written by him.

(3) During a performance in 1994, Ramon Barrero, a Mexican musician famous for playing the world's smallest harmonica, inhaled the harmonica and choked to death on stage.

We can't help but point out that these are precisely the types of ironies we experience almost daily in our beloved interconnect industry. In fact, the parallels and connections couldn't be clearer. Your Honor, we rest our case!

Cylindrical Connector

✿ TERMS AND DEFINITIONS ✿

Back-Mounted: A connector design used in panel or box applications in which the mounting flange is located inside the equipment enclosure.

Bayonet Coupling: A mating design utilizing pins on the receptacle and slots on the plug for quick-connect and disconnect coupling. “Reverse” bayonet puts the pins on the plug and slots on the receptacle.

Circular Connector: Any of a thousand flavors of multipin interconnects with cylindrical contact housings and circular contact interface geometries. Circular connectors are selected for ease of engagement and disengagement, their ability to conveniently house different types of contacts, their wide range of allowable contact voltages and currents, their ease of environmental sealing and their rugged mechanical performance. In military and other high-rel applications, the MIL-C-5015 and MIL-DTL-38999 are the most commonly specified types. Note: A disadvantage of the circular design is loss of panel space when used in arrays.

Closed Entry: A contact cavity design in which the entry diameter of the socket insulator is smaller than the outside dimension of the socket contact. Closed entry limits the size or position of the mating contact to a maximum dimension.

Connector Body: The metal or plastic shell of a connector. Its main purpose is to house the contacts, maintain their position and shield them from dust, dirt, moisture, and electrical interference.

Coaxial Contacts (and Cable): A contact with inner and outer conductive elements separated by a center dielectric element. Coaxial contacts terminate coaxial cable, and are employed in high bandwidth, high-frequency applications such as video and audio. The cable offers a closed, controlled impedance medium for the transmission of RF energy. It also provides high frequency performance and RFI shielding.

Contact: The conductive element in a connector. Contacts mate mechanically and electrically to transmit signals and/or power across a connector interface. Crimp style contacts are the most common type found in high-reliability cylindrical connectors. Male contacts are sometimes referred to as leads, posts or pins. Female contacts are universally known as sockets.

Contact Arrangement or Pattern: The gauge, number, spacing and arrangement of contacts in a connector. Contact arrangement selections are based on the current and voltage requirements of the application, and the space available for the connector package.

Contact Engaging and Separating Force: Tensile force required to engage or separate mating contacts. Measured in ounces, the force increases with contact size.

Contact (or Circuit) Identifier: Wiring schematics identify and label each and every circuit with numbers, letters or special codes. On the connector, this process is maintained by marking small numbers or letters next to each contact cavity on the connector.

Contact Resistance: The measure of electrical resistance across a pair of fully mated contacts. Measured in ohms or millivolt drop at a specified current, contact resistance is affected by normal force (the static force on the contact interface), plating quality and the physical geometry of the contact.

Contact Retainer: A locking clip or tang used to secure a crimp contact in place within the connector insert. Contact retention specifications define the force required to remove a properly seated contact for each class of connector.

Contact Retention: The pressure a contact can withstand, in either direction, without being dislodged from the retaining clip which holds it within the connector.

Contact Size: An assigned number denoting the outside diameter of the engaging end of the pin contact. The larger the number, the smaller the size.

Contact Spacing: Also referred to as pitch, the distance, center-to-center, between adjacent contacts.

Coupling Ring: An accessory feature of the connector plug which aids in mating and unmating plugs and receptacles and prevents decoupling of the connector. Self-locking coupling rings are used for high-vibration applications.

Crimp: The physical compression (deformation) of a contact barrel around a conductor in order to make an electrical connection.

Crimp Contact: A connector pin or socket, shipped loose with the connector body, and designed to be crimped onto the end of the wire conductor with a special tool. Often referred to as “crimp and poke” contacts, the terminated contact is poked into the connector body either by hand, or in the case of small gauge wires, with the aid of a hand-held tool. The ease of assembly and maintenance afforded by crimp contacts is preferred for aerospace and other high reliability applications not requiring a hermetic seal.

Dielectric: A material having electrical insulating properties, such as the contact insulator in a connector or the jacketing on a wire.

Electrical Connector: A separable device which provides mechanical and electrical contact between two elements of an electronic system without unacceptable signal distortion or power loss.

Electromagnetic interference (EMI) is conducted, radiated or magnetically induced voltage that degrades, obstructs, or repeatedly interrupts performance of electronic equipment.

Environmentally Sealed: Connectors and backshells designed to prevent fluids, moisture, air or dust from degrading the performance of electrical contacts and conductors. “Environmental” components typically use gaskets, grommets, potting materials or interfacial and O-ring seals to prevent the penetration of foreign substances into the body of the part.

Filter Contact or Filter Connector: Contact design which provides EMI suppression in addition to its normal function of transmitting electrical energy. Filtered connectors are typically specified for highspeed signal paths. Filtering is accomplished through the integration of capacitors into the contact to separate high-frequency noise from low-frequency signals.

Firewall Connector: A class of high-reliability, feedthrough connectors designed to prevent fire or sparks from penetrating through a sealed bulkhead. Firewall connectors must continue to function for a specific period of time when exposed to fire, and are typically specified in military applications such as fighter jets and Navy ships.

Flange: The integral mounting plate on some bulkhead and feed-through connectors used to attach the connector to the chassis or panel. The connector flange is typically square, and is mounted to the panel with threaded screws.

Front Mounted: A connector design used in panel or box applications in which the mounting flange is located on the inside or outside of the equipment enclosure.

Front Release: “Crimp and poke” style contacts may be removed from the connector for maintenance using a special hand-held tool. The proper insertion and removal tool must be used at all times. In front release designs, the tool is inserted into the mating face of the connector to disengage the contact from its retaining clip. The disengaged contact is then removed from the back (cable-side) of the connector by lightly pulling on the attached wire.

Grommet: An elastomeric seal used on the back side of a connector to seal out fluids, moisture, air and dust.

Grounding (or EMI) Fingers: A set of spring fingers in certain connectors, used to facilitate shell to shell grounding and enhance EMI performance. The grounding fingers engage before contact mating and remain engaged until after contact separation.

Guide Pins: Metal posts with a rounded or pointed tip which projects beyond the contact interface, used to assist in the correct alignment and mating of connector shells and contacts. The post mates with a corresponding cavity on the mating connector before contacts are allowed to engage. Guide pins are typically used in rack and panel packaging and in other “blind-mate” applications. Guide pins can also be used to insure correct polarization.

Hermetic Connector: A class of connectors equipped with a pressure seal for use in maintaining pressurized application environments. The hermetic element of the connector is typically fabricated from vitreous glass.

Insert: A molded piece of dielectric material that fits inside the connector shell and supports the connector contacts. Inserts are tooled for each shell size, and contact arrangement. Inserts made from resilient materials also contribute to environmental properties.

Insulation Displacement: Forcing an insulated wire into a terminal slot smaller than the conductor diameter, displacing the insulation to make electrical contact.

Interfacial Seal: An elastomeric seal providing overall sealing of the mated connectors and their individual contacts. "Cork & bottle" style seals feature a raised shoulder around each pin contact that compresses into a corresponding hole on the socket contact insulator.

Key: A short pin (sometimes referred to as a "dog" by crusty old machinists) which slides into a corresponding slot or keyway to guide the plug and receptacle together during mating. The principal function of the key is to insure polarization of the mating contacts.

Levels of Interconnection: A classification system for connectors defining connector types in terms of interconnect system function. The levels of most use include Level 4 (subassembly to subassembly), Level 5 (subassembly to I/O) and Level 6 (system to system). The lower levels (1, 2 and 3) all concern interconnection inside the microscopic world of printed circuit boards.

Mating and Unmating Force: The force required to join and separate two halves of a connector. This is the sum of contact engaging forces plus any additional force necessary to overcome minor misalignment of connector halves and any dimensional variations in the connector shells.

Normal Force: A measure of the spring pressure applied perpendicularly to contacts in mated connectors. The force of this spring pressure creates the gas-tight interface between contact surfaces which prevents corrosive contaminants from penetrating or forming between the contacts. High normal force reduces resistance across the contacts, but contributes to contact wear and may overstress the connector housing and even damage the spring properties of contact sockets. However, maintaining a constant normal force is an essential requirement for electrical integrity in the connector.

Package Size: The length, width and height of the connector; or alternatively the dimensions of the entire interconnect system. Package size is an issue in many applications where system miniaturization, faster operating speeds, higher operating temperatures and other application requirements place new demands on the envelope of space the connector and its accessories may occupy.

Plug: The half of a connector pair which is designed to attach to a wire or cable; as opposed to the receptacle half which is typically mounted to a bulkhead, panel or box. Even though we usually picture plugs as having male (pin) contacts, they can in fact house any type of contact—pins, sockets or even both. Thus it is the design and location of the connector which makes it a plug, not the gender of its contacts.

Polarize: Design features on mating connectors—such as keyways or shell geometries—that insure connectors can be mated in only one possible orientation. The shape of a D-Sub connector shell, for example, assures that the two halves of the connector can be mated in only one way.

Potting: The permanent sealing of the cable end of a connector with a compound or material to exclude moisture or to provide a strain relief. Glenair typically uses epoxy compounds for this purpose because of their dimensional stability and high-temperature resistance.

Radio frequency interference (RFI) is a type of EMI that occurs between the audio and infrared frequencies in the electromagnetic spectrum. Many natural RF signals exist in nature, but typically RFI is a man-made electromagnetic wave such as might originate in unfiltered electronic circuitry.

Rear Release: "Crimp and poke" style contacts (see Crimp Contacts above) may be removed from the connector for maintenance using a special hand-held tool. The proper insertion and removal tool must be used to install and remove wires from such crimp and poke connectors. In rear release designs, the tool is inserted into the rear (cable side) of the connector to disengage the contact from its retaining clip. The disengaged contact is then removed from the connector by lightly pulling on the attached wire.

Receptacle: The other half of the connector pair, designed to be mounted—with jam nut fittings or other fastener hardware—to a bulkhead, panel or box. Inline receptacles are also available for cable-to-cable connections. As with the plug, it is the design and location of the receptacle in the system, not the gender of its contacts, which makes it a receptacle.

Rectangular Connector: Any of the thousands of multipin interconnects with rectangular shell housings and rectangular insert interface geometries. Rectangular connectors are typically mounted in rack and panel configurations in which large arrays of fixed receptacle connectors are mated with plugs attached to a movable rack for efficient utilization of space. D-Subminiatures are the world's most common rectangular connectors.

Scoop-proof: Scoop-proof connectors feature a nice, long shell on the receptacle which prevents damage to the exposed contact pins during mating. No matter how hard that swabbie tries, it is impossible to cock the mating plug so as to damage the pins or electrically short the contacts.

Service Rating: Also called Current Rating, the maximum voltage or current load a connector is designed to carry during continuous, long-term use. Good engineering practice usually entails preliminary testing of connectors which will be operated with most or all contacts at the maximum rated load. Designers will often maximize contact and wire size in such situations.

Solder Cup: A connector design that typically uses potting material to permanently affix the contacts inside the connector shell. Termination of contact to wire is then accomplished by soldering the wire into the cup-like barrel on the back of the contact. In the United Kingdom it is important to pronounce the "l" in solder. Brits also prefer to say "bucket" rather than "cup" when specifying solder contacts.

Standoff Part of a connector shell, a standoff provides additional working room between the connector shell, and, for example, a printed circuit board

Surface Mount: A termination method in which solder "tails" or leads on the connector are soldered directly to a printed circuit board. In high-reliability commercial and military applications, surface mount receptacle connectors are typically limited to rectangular designs such as D-Subminiatures and Micro-D's. But some surface-mount applications do use a cylindrical connector mounted to the box with ribbon cable or flying leads soldered directly to the PCB. The reason here is to provide a low-resistance pathway to ground of the shielded cable. In severe EMI applications, it is less satisfactory to bring the shielded cable directly to the printed circuit board because of the difficulty in shielding out interference conducted along the cable.

Termination: Termination is the physical act of attaching a wire conductor to a contact. Effective termination contributes to electrical performance and to the durability and reliability of the interconnect system. Common termination methods include crimp, insulation displacement, surface mount, and soldering. Termination can also refer to the mechanical attachment of EMI shielding to the connector backshell.

Threaded Coupling: An interconnect mating design which utilizes a threaded nut on the plug, and a corresponding set of threads on the receptacle, to mate the pair of components. The coupling nut is usually equipped with flats or knurling for easy assembly. Different thread types, profiles and geometries provide different functionality. "Buttress" threads, for example, are often specified on plastic connectors due to their enhanced tensile strength. The MIL-DTL-38999 Series III connector incorporates a triple-start threaded coupling mechanism for greater vibration protection and faster mating and unmating.

Wall Mount A square-flanged receptacle connector in which the mounting flange is located on the outside of the equipment enclosure.

Wiping Effectiveness: Maintaining a clean, metallic path is essential if contacts are to perform with low and stable contact resistance. Surface films and contaminants are removed from the surface of plated contacts each time mating occurs. This displacement of surface contaminants during mating is called contact wiping. Wiping effectiveness depends on the contact geometry, engagement length and normal force. Interestingly, oxide film does not form on gold plated contacts, so wiping pressure can be lighter to displace only the occasional surface contaminant.

Wire Pull-Out Force: This defines the force required to separate a wire from a contact. In properly terminated crimp contacts, the wire will generally break before it pulls away from the contact.

AS39029 Crimp Contact Selection Guide

Military Part Number	Glenair Part Number	Contact Size	Wire Accommodation	Pin / Socket	BIN Color Striping		
M39029/56-348	850-001-22-348	22	22-28 AWG	Socket	Orange	Yellow	Grey
M39029/56-351	850-001-20-351	20	20-24 AWG	Socket	Orange	Green	Brown
M39029/56-352	850-001-16-352	16	16-20 AWG	Socket	Orange	Green	Red
M39029/56-353	850-001-12-353	12	12-14 AWG	Socket	Orange	Green	Orange
M39029/56-527	850-001-10-527	10	10 AWG	Socket	Green	Red	Violet
M39029/57-354	850-003-22-354	22	22-28 AWG	Socket	Orange	Green	Yellow
M39029/57-357	850-003-20-357	20	20-24 AWG	Socket	Orange	Green	Violet
M39029/57-358	850-003-16-358	16	16-20 AWG	Socket	Orange	Green	Grey
M39029/57-359	850-003-12-359	12	12-14 AWG	Socket	Orange	Green	White
M39029/58-360	850-002-22-360	22	22-28 AWG	Pin	Orange	Blue	Black
M39029/58-363	850-002-20-363	20	20-24 AWG	Pin	Orange	Blue	Orange
M39029/58-364	850-002-16-364	16	16-20 AWG	Pin	Orange	Blue	Yellow
M39029/58-365	850-002-12-365	12	12-14 AWG	Pin	Orange	Blue	Green
M39029/58-528	850-002-10-528	10	10 AWG	Pin	Green	Red	Grey
M39029/63-368	850-021-20-368	20	20-24 AWG	Socket	Orange	Blue	Grey
M39029/64-369	850-022-20-369	20	20-24 AWG	Pin	Orange	Blue	White

BIN Color Coding									
0	1	2	3	4	5	6	7	8	9
BLACK	BROWN	RED	ORANGE	YELLOW	GREEN	BLUE	VIOLET	GREY	WHITE

AS39029 Crimp Contact Selection Guide

Military Part Number	Glenair Part Number	Contact Size	Wire Accommodation	Pin / Socket	BIN Color Striping		
M39029/83-450	850-004-20-450	20	22-26 AWG	Pin	Yellow	Green	Black
M39029/83-451	850-004-20-451	20	28-32 AWG	Pin	Yellow	Green	Brown
M39029/83-508	850-004-20-508	20	20-24 AWG	Pin	Green	Black	Grey
M39029/84-452	850-005-20-452	20	22-26 AWG	Socket	Yellow	Green	Red
M39029/84-453	850-005-20-453	20	28-32 AWG	Socket	Yellow	Green	Orange
M39029/84-509	850-005-20-509	20	20-24 AWG	Socket	Green	Black	White
M39029/106-614	850-006-22-614	22	22-28 AWG	Socket	Blue	Brown	Yellow
M39029/106-615	850-006-20-615	20	20-24 AWG	Socket	Blue	Brown	Green
M39029/106-616	850-006-16-616	16	16-20 AWG	Socket	Blue	Brown	Blue
M39029/106-617	850-006-12-617	12	12-14 AWG	Socket	Blue	Brown	Violet
M39029/106-618	850-006-10-618	10	10 AWG	Socket	Blue	Brown	Grey
M39029/107-620	850-007-22-620	22	22-28 AWG	Pin	Blue	Red	Black
M39029/107-621	850-007-20-621	20	20-24 AWG	Pin	Blue	Black	Brown
M39029/107-622	850-007-16-622	16	16-20 AWG	Pin	Blue	Red	Red
M39029/107-623	850-007-12-623	12	12-14 AWG	Pin	Blue	Red	Orange
M39029/107-624	850-007-10-624	10	10 AWG	Pin	Blue	Red	Yellow

BIN Color Coding									
0	1	2	3	4	5	6	7	8	9
BLACK	BROWN	RED	ORANGE	YELLOW	GREEN	BLUE	VIOLET	GREY	WHITE

AS39029 Shielded Contact Selection Guide

Military Part Number	Glenair Part Number	Contact Size	Pin / Socket	Type	BIN Color Striping		
M39029/27-210	852-001-12-210	12	Socket	Coaxial	Red	Brown	Black
M39029/27-402	852-001-12-402	12	Socket	Coaxial	Yellow	Black	Red
M39029/27-403	852-001-12-403	12	Socket	Coaxial	Yellow	Black	Orange
M39029/27-404	852-001-12-404	12	Socket	Coaxial	Yellow	Black	Yellow
M39029/27-405	852-001-12-405	12	Socket	Coaxial	Yellow	Black	Green
M39029/27-406	852-001-12-406	12	Socket	Coaxial	Yellow	Black	Blue
M39029/27-407	852-001-12-407	12	Socket	Coaxial	Yellow	Black	Violet
M39029/27-408	852-001-12-408	12	Socket	Coaxial	Yellow	Black	Gray
M39029/28-211	852-002-12-211	12	Pin	Coaxial	Red	Brown	Brown
M39029/28-409	852-002-12-409	12	Pin	Coaxial	Yellow	Black	White
M39029/28-410	852-002-12-410	12	Pin	Coaxial	Yellow	Brown	Black
M39029/28-411	852-002-12-411	12	Pin	Coaxial	Yellow	Brown	Brown
M39029/28-412	852-002-12-412	12	Pin	Coaxial	Yellow	Brown	Red
M39029/28-413	852-002-12-413	12	Pin	Coaxial	Yellow	Brown	Orange
M39029/28-414	852-002-12-414	12	Pin	Coaxial	Yellow	Brown	Yellow
M39029/28-415	852-002-12-415	12	Pin	Coaxial	Yellow	Brown	Green
M39029/59-366	852-006-08-366	08	Socket	Coaxial	Orange	Blue	Blue
M39029/60-367	852-007-08-367	08	Pin	Coaxial	Orange	Blue	Violet
M39029/75-416	852-003-12-416	12	Socket	Coaxial	Yellow	Brown	Blue
M39029/75-417	852-003-12-417	12	Socket	Coaxial	Yellow	Brown	Violet
M39029/75-418	852-003-12-418	12	Socket	Coaxial	Yellow	Brown	Gray
M39029/75-419	852-003-12-419	12	Socket	Coaxial	Yellow	Brown	White
M39029/75-420	852-003-12-420	12	Socket	Coaxial	Yellow	Red	Black
M39029/75-421	852-003-12-421	12	Socket	Coaxial	Yellow	Red	Brown
M39029/75-422	852-003-12-422	12	Socket	Coaxial	Yellow	Red	Red
M39029/75-423	852-003-12-423	12	Socket	Coaxial	Yellow	Red	Orange
M39029/76-424	852-008-16-424	16	Pin	Coaxial	Yellow	Red	Yellow
M39029/76-425	852-008-16-425	16	Pin	Coaxial	Yellow	Red	Green

AS39029 Shielded Contact Selection Guide

Military Part Number	Glenair Part Number	Contact Size	Pin / Socket	Type	BIN Color Striping		
M39029/76-426	852-008-16-426	16	Pin	Coaxial	Yellow	Red	Blue
M39029/76-427	852-008-16-427	16	Pin	Coaxial	Yellow	Red	Violet
M39029/77-428	852-009-16-428	16	Socket	Coaxial	Yellow	Red	Gray
M39029/77-429	852-009-16-429	16	Socket	Coaxial	Yellow	Red	White
M39029/77-430	852-009-16-430	16	Socket	Coaxial	Yellow	Orange	Black
M39029/77-431	852-009-16-431	16	Socket	Coaxial	Yellow	Orange	Brown
M39029/78-432	852-010-16-432	16	Socket	Coaxial	Yellow	Orange	Red
M39029/78-433	852-010-16-433	16	Socket	Coaxial	Yellow	Orange	Orange
M39029/78-434	852-010-16-434	16	Socket	Coaxial	Yellow	Orange	Yellow
M39029/78-435	852-010-16-435	16	Socket	Coaxial	Yellow	Orange	Green
M39029/90-529	853-001-08-529	8	Pin	Concentric Twinax	Green	Red	White
M39029/91-530	853-002-08-530	8	Socket	Concentric Twinax	Green	Orange	Black
M39029/102-558	852-004-12-558	12	Pin	Coaxial	Green	Green	Gray
M39029/103-559	852-005-12-559	12	Socket	Coaxial	Green	Green	White
M39029/113-625	853-003-08-625	8	Pin	Concentric Twinax	Blue	Red	Green
M39029/113-626	853-003-08-626	8	Pin	Concentric Twinax	Blue	Red	Blue
M39029/114-628	853-004-08-628	8	Socket	Concentric Twinax	Blue	Red	Gray
M39029/114-629	853-004-08-629	8	Socket	Concentric Twinax	Blue	Red	White
N/A	854-001-01	8	Pin	Quadrax	N/A		
N/A	854-001-02	8	Pin	Quadrax	N/A		
N/A	854-001-03	8	Pin	Quadrax	N/A		
N/A	854-001-04	8	Pin	Quadrax	N/A		
N/A	854-001-05	8	Pin	Quadrax	N/A		
N/A	854-002-01	8	Socket	Quadrax	N/A		
N/A	854-002-02	8	Socket	Quadrax	N/A		
N/A	854-002-03	8	Socket	Quadrax	N/A		
N/A	854-002-04	8	Socket	Quadrax	N/A		
N/A	854-002-05	8	Socket	Quadrax	N/A		

Fiber Optic Contact Selection Guide

Glenair Part Number	Part Description	Contact Size	Pin / Socket	Connector Series
MIL-DTL-38999 Fiber Optic Contacts				
181-001	M29504/5 Socket Terminus	16	Socket	D38999 Series III
181-002	M29504/4 Pin Terminus	16	Pin	D38999 Series III
181-035	Socket, Large Core Fiber	16	Socket	D38999 Series III
181-036	Pin, Large Core Fiber	16	Pin	D38999 Series III
181-052	Jewel Pin Terminus	16	Pin	D38999 Series III
181-053	Jewel Socket Terminus	16	Socket	D38999 Series III
181-048	Sealing Plug	16	Pin	D38999 Series III
181-065	#20 Pin Terminus	20	Pin	D38999 Series III
181-066	#20 Socket Terminus	20	Socket	D38999 Series III
MIL-PRF-28876 Fiber Optic Contacts				
181-039	M29504/14 Pin Terminus	16	Pin	M28876
181-040	M29504/15 Socket Terminus	16	Socket	M28876
181-051	M29504/3 Dummy Terminus	16	Dummy	M28876
Series 80 Mighty Mouse Fiber Optic Contacts				
181-057	Mighty Mouse Pin Terminus	16	Pin	Series 80 Mighty Mouse
181-075	Mighty Mouse Socket Terminus	16	Socket	Series 80 Mighty Mouse

Fiber Optic Contact Selection Guide

Glenair Part Number	Part Description	Contact Size	Pin / Socket	Connector Series
Special Fiber Optic COTS Contacts Size 16 Front Release				
181-011	Front Release Socket with Pressure Sealing O-Ring(s)	16	Socket	COTS
181-012	Front Release Pin	16	Pin	COTS
181-051	Dummy Terminus	16	Dummy	COTS
ARINC Type Fiber Optic Contacts				
181-076	ARINC 801 Terminus	16	Genderless Pin	ARINC 801
187-079	M29504/6 Pin Terminus	16	Pin	ARINC 404, 600
187-080	M29504/7 Socket Terminus	16	Socket	ARINC 404, 600
Glenair High Density (GHD) Fiber Optic Contacts				
181-056	GHD Terminus, Non-keyed	18	Genderless Pin	GHD
181-047	GHD Terminus, Keyed	18	Genderless Pin	GHD
181-058	Dummy Terminus	18	Dummy	GHD
Glenair GFOCA Fiber Optic Contacts				
181-050	GFOCA Terminus		Genderless Pin	GFOCA
181-059	Dummy Terminus		Dummy	GFOCA
Next Generation Fiber Optic (NGCON) Contacts				
181-043	M29504/18	16	Genderless Pin	M64266

Special Contact Selection Guide

Glenair Part Number	Part Description	Contact Size	Type
859-012	Grommet Sealing Plugs (MS27488 Type)	0-23	Sealing Plug
809-001	Series 80 Mighty Mouse Pin Contact	23	Crimp Contact
809-002	Series 80 Mighty Mouse Socket Contact	23	Crimp Contact
857-010	Pneumatic Socket Contact for Series 79	12	Pneumatic
857-011	Pneumatic Pin Contact for Series 79	12	Pneumatic
850-010	PCB Pin Contact to fit D38999/20 and /24	12-22	PCB Pin
850-011	PCB Socket Contact to fit D38999/20 and /24	12-22	PCB Socket
850-013	High Power Socket Contact	8	Power Socket
850-014	High Power Pin Contact	8	Power Pin
850-015	M39029/56 Type Socket Contact with Solder Cup	10-22	Solder Cup
850-016	Pin Contact with Solder Cup	10-22	Solder Cup
850-017	M39029/58 Type Pin Contact with Solder Cup	12-22	Solder Cup
850-018	M39029/56-348 Type Socket Contact	22	Crimp Contact
850-019	M39029/58-360 Type Pin Contact	22	Crimp Contact
850-020	M39029/57 Type Socket Contact	22	Crimp Contact
857-027	M39029/58 Type High Power Pin with PC Tails	8	PCB Power
857-028	M39029/56 Type High Power Socket with PC Tails	8	PCB Power
687-348	Wire to Contact Crimp Adapter	4-22	Crimp Adapter
850-023	M39029/87 Thermocouple Pin Contact	16-22	Thermocouple
850-024	M39029/88 Thermocouple Socket Contact; Series I, II, IV	16-22	Thermocouple
850-025	M39029/89 Thermocouple Socket Contact; Series II	16-22	Thermocouple

Connector Manufacturers Index for Backshell and Accessory Specifications

This index of US and international connector manufacturers provides a cross-reference of manufacturers' proprietary series designations to applicable specifications. This information does not imply qualification status but serves to indicate that the manufacturers' series is "in conformance with" the noted specifications or documents. The symbols in the Connector Designator column are an essential element in Glenair's accessory part number developments. For connector manufacturers' part number series not shown in these listings, please consult factory for applicable accessory part numbers.

MFG SERIES	GLENAIR CONNECTOR DESIGNATOR	SPECIFICATION REFERENCE	SERIES
Aero-Electric Connector Company			
AE22	H	MIL-DTL-38999	III
AE46	F	MIL-DTL-38999	I
AE47	F	MIL-DTL-38999	II
AE48	F	MIL-DTL-38999	II
AE49	F	MIL-DTL-38999	I
AE55	A	MIL-C-5015	MS3400
AE66	E	MIL-DTL-26500	Aluminum
AE77	A	MIL-DTL-26482	II
AE83	A	MIL-DTL-83723	III
AB Electronics			
CT-R	F	MIL-DTL-38999	II
MK	8	S	PATT 105
MK	12	S	PATT 603
MK	18	S	PATT 608
Amphenol Limited			
JT	F	PAN	6433-1
SJT	L	JN	1003
SJT	L	LN29729	
SJT	L	PAN	6433-2
118	A	LN	29504
162GB	S	PATT	603
348	J	VG	95329
418-1	F	PATT	616
418-2	F	PATT	614
418-5	L	NFC 93422	HE 306
418-5	L	PATT	615
602GB	A	PAN	6432-1
602GB	A	PATT	602
62GB	S	PATT	105
652	A	LN	29504
Amphenol Products			
BG	D	MIL-DTL-26482	I
JT	*	MIL-C-27599	
JT-R	F	MIL-DTL-38999	II
Amphenol Products (Continued)			
JT-R	F	40M38277	
LJT	*	MIL-C-27599	
LJT-R	F	MIL-DTL-38999	I
MF-S	D	MIL-DTL-26482	I
PT	D	MIL-DTL-26482	I
PT-SE	D	MIL-DTL-26482	I
PTS-DR	A	MIL-DTL-26482	II
PTS-DR	A	MIL-DTL-83723	I
QWLD	C	MIL-DTL-22992	R
SC	B	MIL-C-5015	MS3100
SJT	L	LN	29729
SM	B	MIL-C-5015	MS3100
TV	H	MIL-DTL-38999	III
TVRB	H	CECC 75201.002	III
TVS	H	MIL-DTL-38999	III
10-72	B	MIL-C-5015	MS3100
10-214	B	MIL-C-5015	MS3100
10-475	F	40M38277	
48	E	MIL-DTL-26500	Aluminum
69	B	MIL-C-5015	MS3100
97	B	MIL-C-5015	MS3100
118	A	MIL-DTL-26482	II
118	A	MIL-DTL-83723	I
246	*	MIL-C-5015	
348	J	MIL-C-81511	I-II
418-1	F	MIL-DTL-38999	I
418-2	F	MIL-DTL-38999	II
518	A	MIL-DTL-83723	III
71	B	MIL-C-5015	MS3100
91-483	A	MIL-DTL-26482	II
91-483	A	MIL-DTL-83723	I
Amphenol/Pyle National			
B	A	MIL-DTL-83723	III
T3	H	MIL-DTL-38999	III

MFG SERIES	GLENAIR CONNECTOR DESIGNATOR	SPECIFICATION REFERENCE	SERIES
Amphenol/Pyle National (Continued)			
ZZW	E	MIL-DTL-26500	Aluminum
ZZY	E	MIL-DTL-26500	Aluminum
	A	ESC 10, ESC 11	
Amphenol/Tuchel Electronics GmbH			
118	A	LN	29504
162GB	*	VG	95328
348	J	VG	95329
602GB	A	DEF	5326-3
602GB	A	PAN	6432-1
602GB	A	PATT	602
62GB	*	DEF	5326-3
652	A	LN	29504
Cie Deutsch & Compagnie Deutsch GmbH			
AFD	A	LN	29504
AFD	A	MIL-DTL-26482	I
AFD	A	PAN	6432-1
DBAS	A	QPL-81703	III
DBAS	A	PAN	6432-2
DFE	A	LN	29504
DVG	A	VG	95328
FDBA	A	LN	29504
951	A	PRL	53125
9.815	J	MIL-C-81511	III & IV
991	A	PAN	6432-4
999.1	F	MIL-DTL-38999	I
	A	ESC 10	
	A	ESC 11	
Deutsch Engineered Connecting Devices			
AFD5	A	MIL-DTL-26482	II
AFD	A	MIL-DTL-83723	I
A815	J	MIL-C-81511	III
B815	J	MIL-C-81511	IV
BMS	E	MIL-C-26500	
BTK	D	MIL-DTL-26482	I
DBA	A	40M39569	
DBA7	A	QPL-81703	III
DTS	H	MIL-DTL-38999	III
DIV4	H	MIL-DTL-38999	IV
DL6	A	MIL-DTL-83723	III
D817	A	QPL-81703	III
LPT	D	MIL-DTL-26482	I
381	A	40M39569	
450	D	MIL-DTL-26482	I
460	D	MIL-DTL-26482	I
Deutsch Engineered Connecting Devices (Continued)			
837	A	MIL-DTL-83723	III
Deutsch Limited			
LL	J	MIL-C-81511	III-IV
DBAS	A	PAN	6432-2
DTS	H	MIL-DTL-38999	III
HDJ	L	JN	1003
RR	A	PAN	6432-1
RR	A	PATT	602
RR70	A	QPL-81703	III
SLPT	*	MIL-DTL-26482	I
Glenair			
90	G	MIL-DTL-28840	
80	M	Mighty Mouse	800 Thru 805
22	W	Geo-Marine®	
ITS, IT	R	MIL-C-5015	
231	F	MIL-DTL-38999	1
232	F	MIL-DTL-38999	2
233	H	MIL-DTL-38999	3
Souriau			
BT	D	MIL-DTL-26482	I
G	D	MIL-DTL-26482	I
L	D	MIL-DTL-26482	I
L-T	D	MIL-DTL-26482	I
M-T	D	MIL-DTL-26482	I
JVS	H	CECC 75201.002	
8LT	F	MIL-DTL-38999	I
8LT	F	NFC 93422	HE 308
8ST	L	JN 1003	8ST-034
8ST	L	LN 29729	
8ST	L	NFC 93422	HE 306
8ST	L	PAN 6433-2	
8ST	L	PATT 615	
8ST	L	VG 96912	
8T	F	MIL-DTL-38999	II
8T	F	NFC 93422	HE 309
85	D	MIL-DTL-26482	I
851	S	PATT 603	
851-50	*	NFL53125	
851-50	*	VG 95328	
8525	A	NFC 93422	HE 302
8525.1	A	LN 29504	
8526	A	MIL-DTL-26482	II
8526	A	PAN 6432-1	
8526	A	PATT 602	
Souriau (continued)			
8533	A	EN 2992	
8533	A	ESC 10	
8534	A	ESC 11	8534
Flight Connector Corporation			
FC	*	MIL-C-5015	
FF	A	MIL-C-5015	MS3400
FH	*	MIL-C-5015	
FHA	K	MIL-DTL-83723	II
PL	H	MIL-DTL-38999	IV
G & H Technologies			
BL	H	MIL-DTL-38999	IV
NC	G	MIL-DTL-28840	
ITT Cannon			
CA3106B	*	VG95234	
CA-E / R	B	MIL-C-5015	MS3100
CA-RX	B	MIL-C-5015	MS3100
CVA	K	MIL-DTL-83723	II
CV340	A	MIL-C-5015	MS3400
CV345	A	MIL-C-5015	MS3450
KFS	G	MIL-DTL-28840	
KJ	F	MIL-DTL-38999	II
KJ	F	40M38277	
KJA	H	MIL-DTL-38999	III
KJL	F	MIL-DTL-38999	I
KPSE	D	MIL-DTL-26482	I
KPT	D	MIL-DTL-26482	I
MF	A	MIL-DTL-83723	III
PV-G	A	40M39569	
PVA	A	MIL-DTL-83723	I
PV7	A	MIL-DTL-26482	II
A	ESC 10	KE, SE	
ITT Cannon Electric France SA			
KJ	F	MIL-DTL-38999	II
KJ	F	PAN	6433-1
KJL	F	MIL-DTL-38999	I
251	*	MIL-DTL-26482	I
ITT Cannon UK Ltd.			
KJ	F	PATT	614
KPSE	D	MIL-DTL-26482	I
PV-S	A	MIL-DTL-83723	I
PVW	A	LN29504	
PVX	A	PAN	6432-1
PVX	A	PATT	602
A	ESC 10	KE, SE	
ITT Cannon Electric GmbH			
CA3106B	*	VG 95234	
CGK	L	LN 29729	
CWLD	C	MIL-DTL-22992	R
KJ	F	PAN 6433-1	
KPSE	*	VG 95328	
KPT	*	VG 95328	
PVW	A	LN 29504	
PVX	A	PAN 6432-1	
J-Tech			
JT 3400	A	MIL-C-5015	MS3400
JT 3450	A	MIL-C-5015	MS3450
JTVG95234	A	VG95234	
Labinal/Cinch			
CNO930	A	MIL-DTL-83723	III
48	E	MIL-DTL-26500	Aluminum
RMS			
RO	MIL-DTL-26500	Aluminum	
Schaltbau GmbH			
650	J	VG 95329	
674	*	VG 95328	
675	*	VG 95328	
679	J	VG 95329	
SICEM			
SCB	*	VG 95234	
Sunbank			
JSC	MIL-DTL-28840		
ITT Cannon			
TT	F	PAN 6433-1	
PT	S	PATT 105	
PT-SE	S	PATT 603	
STT	L	LN 29729	
STT	L	PAN 6433-2	
STT	L	PATT 615	
STT	L	VG 96912	
ITT VEAM			
CIR	*	VG 95234	
VPT	D	MIL-DTL-26482	I
VPT-SE	*	MIL-DTL-26482	I
VPT-SE	*	VG 95328	

Mod 429 Space Grade Processing Information

What is Outgassing?

Plastic and rubber materials give off gaseous molecules. For example, the smell inside a new car is caused by polymer outgassing. Heat and vacuum increase the rate of diffusion. In a spacecraft the gases coming off polymers can contaminate optical surfaces and instruments. The result is degraded performance.

How is Outgassing Measured?

The space industry has adopted a standardized test procedure, ***ASTM E 595***, to evaluate out-gassing properties of polymers. Small samples of material are heated to 125° C. at a vacuum of 5 X 10^{-5} torr for 24 hours. Then the sample is weighed to calculate the ***Total Mass Loss*** (TML). The TML cannot exceed 1.00% of the total initial mass. During the test, outgassed matter condenses on a cooled collector plate. The quantity of outgassed matter is calculated to determine the ***Collected Volatile Condensable Material*** (CVCM). The CVCM cannot exceed 0.10% of the original specimen mass.

SCREENING REQUIREMENTS

Inspection/ Test	Glenair Level 1 (Mod 429B)	Glenair Level 2 (Mod 429)
Visual Inspection	100% (10X)	100%
Mechanical	100%	2 pcs.
Voltage (DWV)	100%	100%
Insulation Resistance	100%	100%
Low Level Contact Resistance	100% (Read and Record)	2 pcs. (Read and Record)
Mating Force	2 pcs.	N/A
Contact/Wire Retention	2 pcs.	N/A
Solderability/Resistance to Soldering Heat	2 pcs.	N/A

Do All Connectors Require Special Outgassing Processing?

No. Most connectors meet NASA outgassing requirements without special processing.

What is NASA Screening?

NASA specification EEE-INST-002 provides instructions on selecting, screening and qualifying parts for use on NASA GSFC space flight projects. Table 2J in the NASA spec contains specific inspection instructions for Nanominiature connectors. These screening requirements exceed the standard mil spec inspection levels.

What Screening Level is Required for Space Applications?

NASA defines three levels of screening: level 1 for highest reliability, level 2 for high reliability, and level 3 for standard reliability.

Is Glenair NASA Certified?

Yes. Meeting NASA requirements means not only inspecting per EEE-INST-002, but also building parts in accordance with NASA Technical Standard NASA-STD-8739.4 “Crimping, Interconnecting Cables, Harnesses, and Wiring”. Glenair fully meets these requirements and has obtained NASA certification. Our extra inspection steps reflect the fact that pre-wired connectors not only require best practices on the assembly floor, but also require thorough final electrical and mechanical testing.

Spacecraft designers generally avoid the use of ferromagnetic materials, which can become magnetized and can interfere with sensitive instruments.

What about cryogenics?

Most Glenair environmental connectors are rated to -65° C. Glenair has not performed testing below this temperature. EEE-INST-002 states “...experience has proven it is possible for (non-certified) connector types to be used successfully at cryogenic temperatures. It is recommended that connector samples should be subjected to five cycles of cryogenic temperature...(followed by examination for cracks and DWV)”. Cadmium plated shells are prohibited from space programs. Other plating materials are acceptable.

Specifying Space Grade Connectors

STEP 1

Select suitable shell materials and plating

Titanium shells, nickel-plated aluminum shells and stainless steel shells are suitable for use in vacuum environments. Cadmium plating is prohibited for space flight.

STEP 2

Select a NASA Screening Level

The term “Screening Level” refers to the final inspection procedure.
Level 1 for mission-critical highest reliability
Level 2 for high reliability
Level 3 for standard reliability

STEP 3

Outgassing Processing

Most Glenair connectors are certified to meet NASA outgassing requirements without special processing. However, if additional outgassing processing is required, choose the appropriate suffix code from the table below.

STEP 4

Select the Mod 429 Code that Matches the Desired Level of Screening and Outgassing

Use the following table to choose the right modification code. Add the mod code to the connector part number.
Example: 233-105-07-M11-21SN-**429**

NASA Screening Level	Special Screening Only	8 Hour Oven Bake 400° F.	Thermal Vacuum Outgassing 24 hrs. 125° C.
Level 1 Highest Reliability	Mod 429B	Mod 429J	Mod 429C
Level 2 High Reliability	Mod 429	Mod 429K	Mod 429A
Level 3 Standard Reliability	(Use standard part number)	Mod 186	Mod 186M

Outgassing Properties and Processing

Nonmetallic materials such as rubber, plastic, adhesives and potting compounds can give off gasses when subjected to a vacuum or high heat. The space industry has adopted a standardized test procedure, ASTM E 595, to evaluate outgassing properties of products that contain polymer materials. In the ASTM test, material samples are heated to 125° C at a vacuum of 5 X 10^{-5} torr for 24 hours. The test sample is then weighed to calculate the Total Mass Loss (TML), which may not exceed 1.00% of the total initial mass. Likewise the quantity of outgassed matter is weighed to determine the Collected Volatile Condensable Material (CVCM), which may not exceed 0.10% of the original specimen mass.

For space grade applications, Glenair is able to offer both an 8 hour 400° bakeout process as well as a 24 hour 125° thermal vacuum outgassing process on connector products that must conform to NASA screening or other outgassing standards. Our experience has been that the simpler bakeout process is more than adequate to meet the ASTM E 595 benchmark of 1.00% TML and 0.10% CVCM.

Glenair is well versed in supplying connector products that are optimized for use in space grade applications, and we supply MIL-DTL-38999 type compliant to EEE-INST-002, Table 2G, the recognized standard for space grade connectors. Section C2 “Connectors and Contacts” of NASA EEE-INST-002 provides guidelines for materials used in connectors for space flight applications: Aluminum is a preferred material for connector components, and electroless nickel is the preferred finish. Beryllium copper is a preferred material for contacts. 50 microinch minimum gold plating is the preferred contact finish. Epiall is a preferred material for dielectric insulating materials. Specify “M” for aluminum shells with electroless nickel finish.

OUTGASSING PROPERTIES OF TYPICAL AEROSPACE CONNECTOR MATERIALS

Component	Material	TML %	TCVML %	Test Reference
Front and Rear Insulator	Liquid Crystal Polymer Vectra C130	0.03	0.0	NASA Test # GSC17478
Rear Grommet Interfacial Seal Peripheral Seal	Blended fluorosilicone/silicone elastomer, 30% silicone per AA-59588, 70% flourosilicone per MIL-DTL-25988	0.48	0.14	Glenair testing conducted at NuSil Technology 02/27/2001
Front-To-Rear Insulator Bonding Material	Eccobond 104 A/B	0.52	0.08	Emerson & Cuming Data Sheet
Insulator-to-Rubber Bonding Material	DC3145 RTV, per MIL-A-46146	1.74	0.90	NASA Test GSFC0191
Coupling Nut Retainer	Torlon® 4203L	1.88	0.01	Glenair Test at NuSil Technology 03-12-2003
Coupling Nut Epoxy	Hysol C9-4215	0.48	0.01	Glenair Test
White Epoxy Ink for Silk-screening	Markem 7224 White	0.49	0.03	NASA Test #GSC19899
Potting Compound, Solder Cup and PC Tail Connectors	Hysol C9-4215	0.48	0.01	Glenair Test
Potting Compound, Filter Receptacles	Stycast epoxy, 2850FT/Catalyst 11	0.29	0.02	Mfgr Data Sheet

1. Fluorosilicone rubber components such as O-rings and grommets exceed NASA outgassing limits.
2. NASA recommends outgassing processing to reduce outgassing to acceptable levels.
3. An inexpensive oven bakeout has better results than the more costly thermal vacuum outgassing. The higher temperature of the oven bakeout is more effective at removing volatile materials. However, both methods assure compliance with outgassing limits.
4. Glenair Mod 429 codes provide an easy ordering solution, whatever the outgassing option. Spacecraft designers generally avoid the use of ferromagnetic materials, which can become magnetized and can interfere with sensitive instruments. Aluminum shell connectors have a maximum permeability of 2 mu. Hermetic connector pins are iron alloy, a highly magnetic material.
5. Space programs sometimes need cryogenic connectors capable of withstanding temperatures as low as -270° C. D38999 connectors are rated to -65° C. Glenair does not have data to validate these connectors for cryogenic applications. EEE-INST-002 states “...experience has proven it is possible for (non-certified) connector types to be used successfully at cryogenic temperatures. It is recommended that connector samples should be subjected to five cycles of cryogenic temperature...(followed by examination for cracks and DWV)”.

MIL-DTL-38999 CONNECTOR MATERIALS APPROVED FOR SPACE FLIGHT

Component	Material	Notes
Shells, Coupling Nuts, Jam Nuts	Aluminum alloy 6061 per ASTM B211, electroless nickel plated	Approved for Space Flight
Rigid Insulators	Glass-filled Epoxy, Epial 1908	Approved for Space Flight
Contact Retention Clip	Beryllium copper, heat-treated, unplated	Approved for Space Flight
Grommet, Peripheral Seal, Interfacial Seal, O-ring	Blended fluorosilicone/silicone elastomer, 30% silicone per AA-59588, 70% fluorosilicone per MIL-DTL-25988	Requires outgassing processing
Hermetic Insert	Vitreous glass	Approved for Space Flight
Pin Contact	Beryllium copper alloy per ASTM B197, 50 microinches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate per QQ-N-290 Class 2, 50-100 microinches	Approved for Space Flight
Pin Contact, Hermetic	Nickel-iron alloy per ASTM F30 (Alloy 52),50 microinches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate per QQ-N-290 Class 2, 50-100 microinches	Ferromagnetic material.
Socket Contact	Beryllium copper alloy per ASTM B197, 50 microinches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate per QQ-N-290 Class 2, 50-100 microinches.	Approved for Space Flight
Socket Contact Hood	Stainless steel, passivated per AMS-QQ-P-35	Approved for Space Flight
Adhesives	RTV and epoxies (see following table for outgassing info)	Requires outgassing processing
Potting Compound, PCB and Solder Cup Versions	Environmental and Hermetic Connectors: Stycast 2651/Catalyst 9 epoxy encapsulant. Filter Connectors: Stycast 2850FT/Catalyst 11 thermally conductive epoxy encapsulant.	Approved for Space Flight
Filter Element	Multilayer Ceramic Planar Array, ferrite inductors	Approved for Space Flight

Glenair Connector Material and Finish Options

This chart presents a selection of the broad range of base materials and plating options available from Glenair. Innovation and qualification of material and finish types is a major Glenair strength.

Code	Material	Finish	Finish Specification	Hrs. Salt Spray	Electrical Conductivity	Operating Temp. Range	RoHS	Notes
AB	Marine Bronze	Unplated	AMS 4640 alloy, unplated	1000	Conductive	-65 to +200°C	✓	Marine and geo-physical applications
AL	Aluminum	AlumiPlate, Clear Chromate	MIL-DTL-83488, Class 2, Type II over electroless nickel	500	Conductive	-65 to +175°C	✓	Approved for MIL-DTL-38999L and MIL-DTL-83513G.
C	Aluminum	Anodize, Black	AMS-A-8625 Type II Class 2	336	Non-Conductive	-65 to +175°C	✓	Glenair's standard black anodize finish.
E	Aluminum	Chem Film	MIL-DTL-5541 Type 1 Class 3	168	Conductive	-65 to +175°C		Glenair's standard chem film finish.
G	Aluminum	Anodize, Hardcoat	AMS-A-8625, Type III, Class 1, .001" thick	336	Non-Conductive	-65 to +200°C	✓	Glenair's preferred hardcoat finish.
JF	Aluminum	Cadmium, Gold	SAE-AMS-QQ-P-416 Type II, Class 2 over electroless nickel	48	Conductive	-65 to +175°C		Glenair's preferred gold cadmium finish.
LF	Aluminum	Cadmium, Clear	SAE-AMS-QQ-P-416 Type II Class 2 over electroless nickel	48	Conductive	-65 to +175°C		Glenair's preferred clear cadmium finish.
M	Aluminum	Electroless Nickel	AMS-C-26074 Class 4 Grade B; ASTM-B-733, SC 2, Type IV	48	Conductive	-65 to +200°C	✓	Glenair's standard electroless nickel finish.
MT	Aluminum	Nickel-PTFE	SAE AMS2454	500	Conductive	-65 to +175°C	✓	Approved for MIL-DTL-38999L and MIL-DTL-83513G.
NC	Aluminum	Zinc-Cobalt, Olive Drab	ASTM B 840 Grade 6 Type D over electroless nickel	350	Conductive	-65 to +175°C		Glenair's standard olive drab zinc-cobalt finish.
NF	Aluminum	Cadmium, Olive Drab	SAE-AMS-QQ-P-416 Type II Class 2 over electroless nickel	500	Conductive	-65 to +175°C		Glenair's standard olive drab cadmium finish.
TP2	Titanium	Electrodeposited Nickel	SAE-AMS-QQ-N-290 Class 1 Grade F	96	Conductive	-65 to +200°C	✓	Glenair's preferred finish for titanium connectors.
UC	Aluminum	Zinc-Cobalt, Black	ASTM B 840 Grade 6 Type D over electroless nickel	240	Conductive	-65 to +175°C		Glenair's standard black zinc-cobalt finish.
UCR	Aluminum	Zinc-Cobalt, Black	ASTM B 840 Grade 6 Type D over electroless nickel	240	Conductive	-65 to +175°C	✓	RoHS version of UC.
UF	Aluminum	Cadmium, Black	SAE-AMS-QQ-P-416 Type II Class 2over electroless nickel	48	Conductive	-65 to +175°C		Glenair's preferred black cadmium finish.
XAL	Composite	AlumiPlate	MIL-DTL-86448, Class 2, Type II over electroless nickel	2000	Conductive	-65 to +175°C	✓	Approved for MIL-DTL-38999L.
XB	Composite	Unplated Black		2000	Non-Conductive	-65 to +175°C	✓	Glenair's standard unplated composite.
XM	Composite	Electroless Nickel	AMS-C-26074 Class 4, Grade B	2000	Conductive	-65 to +200°C	✓	Glenair's standard electroless nickel finish over composite.
XMT	Composite	Nickel-PTFE	GMF-002 Type II Class 2	2000	Conductive	-65 to +200°C	✓	Approved for MIL-DTL-38999L.
XW	Composite	Cadmium, Olive Drab	SAE-AMS-QQ-P-416 Type II Class 3 over electroless nickel	2000	Conductive	-65 to +175°C		Glenair's standard olive drab cadmium finish over composite.
XZN	Composite	Zinc-Nickel, Black	ASTM B841 Grade 5 over electroless nickel	2000	Conductive	-65 to +175°C		Glenair's standard black zinc-nickel finish over composite.
Z1	Stainless Steel	Passivate	SAE AMS 2700	500	Conductive	-65 to +200°C	✓	Glenair's standard passivated stainless steel.
Z16	Aluminum	Electroless Nickel	AMS-C-26074 Class 4 Grade B	48	Conductive	-65 to +200°C	✓	Standard matte electroless nickel for space applications
Z2	Aluminum	Gold	MIL-DTL-45204 Class 1 over electroless nickel	48	Conductive	-65 to +200°C	✓	Glenair's standard gold plating for space programs.
ZC	Stainless Steel	Zinc-Cobalt, Black	ASTM-B840, Grade 6		Conductive	-65 to +175°C		Glenair's standard zinc-cobalt over stainless steel.
ZCR	Stainless Steel	Zinc-Cobalt, Black	ASTM-B840, Grade 6		Conductive	-65 to +175°C	✓	RoHS version of ZC.
ZL	Stainless Steel	Electrodeposited Nickel	SAE-AMS-QQ-N-290 Class 2 Grade F	500	Conductive	-65 to +200°C	✓	Glenair's preferred nickel-plated stainless steel.
ZM	Stainless Steel	Electroless Nickel	AMS-C-26074 Class 1 Grade A		Conductive	-65 to +200°C	✓	Used on hermetic connectors. Use ZM for other applications.
ZMT	Stainless Steel	Nickel-PTFE	SAE AMS2454	1000	Conductive	-65 to +175°C	✓	Glenair's new 1000 Hour Grey over stainless steel.
ZN	Aluminum	Zinc-Nickel, Olive Drab	ASTM B841 Grade 5 over electroless nickel	500	Conductive	-65 to +175°C		Glenair's standard olive drab zinc-nickel finish.
ZNU	Aluminum	Zinc-Nickel, Black	ASTM B841 Grade 5 over electroless nickel	500	Conductive	-65 to +175°C		Glenair's standard black zinc-nickel finish.
ZU	Stainless Steel	Cadmium, Black	SAE-AMS-QQ-P-416 Type II Class 2	500	Conductive	-65 to +175°C		Glenair's standard black cadmium over stainless steel.
ZW	Stainless Steel	Cadmium, Olive Drab	SAE-AMS-QQ-P-416 Type II Class 2 over electroless nickel	500	Conductive	-65 to +175°C		Glenair's standard olive drab cadmium over stainless steel.
ZR	Aluminum	Zinc-Nickel, Black	ASTM B841 Grade 5 over electroless nickel	500	Conductive	-65 to +175°C	✓	Glenair's RoHS compliant black zinc-nickel

Glenair Connector Plating Code and Mil-Spec Connector Finish Code Cross-Reference

MIL-DTL-38999 Series I and II Finish Code	Material, Finish	Recommended Glenair Plating Code
A	Aluminum, Cadmium Plated, Clear Chromate	LF
B	Aluminum, Cadmium Plated, Olive Drab	NF
C	Aluminum, Anodize, Hardcoat	G2
E	Stainless Steel, Passivated	Z1
F	Aluminum, Electroless Nickel Plated	M
N	Stainless Steel, Electrodeposited Nickel (Hermetic)	P
P	Aluminum, Pure Dense Aluminum (AlumiPlate^{SM})	AL
R	Aluminum, Electroless Nickel	MA
T	Aluminum, Nickel-PTFE	MT
U	Aluminum, Cadmium Plated, Clear Chromate	LF
X	Aluminum, Cadmium Plated, Olive Drab	NF
Z	Aluminum, Black Zinc-Nickel	ZR

MIL-DTL-38999 Series III and IV Class Code	Material, Finish	Recommended Glenair Plating Code
C	Aluminum, Anodize, Hardcoat	G2
F	Aluminum, Electroless Nickel	M
G	Aluminum, Electroless Nickel	M
H	Stainless Steel, Passivated	Z1
J	Composite, Cadmium Plated, Olive Drab	XW
K	Stainless Steel, Passivated	Z1
L	Stainless Steel, Electrodeposited Nickel	ZL
M	Composite, Electroless Nickel Plated	XM
P	Aluminum, Pure Dense Aluminum (AlumiPlate^{SM})	AL
R	Aluminum, Electroless Nickel	MA
S	Stainless Steel, Electrodeposited Nickel	ZL
T	Aluminum, Nickel-PTFE	MT
W	Aluminum, Cadmium Plated, Olive Drab	NF
X	Aluminum, Cadmium Plated, Olive Drab	NF
Z	Aluminum, Black Zinc-Nickel	ZR

MIL-DTL-28840 Finish Code	Material, Finish	Recommended Glenair Plating Code
A	Aluminum, Cadmium Olive Drab over Nickel	NF
B	Stainless Steel, Cadmium-Black over Nickel	ZU
L	Aluminum, Nickel PTFE	MT
S	Aluminum, Zinc Nickel, Non-Reflective	ZR

SAE AS50151 Class Code	Material, Finish	Recommended Glenair Accessory Code
A, B, C, D, E, DJ, F, P, R, W	Aluminum, Cadmium Plated, Olive Drab	NF
H, K	Stainless Steel, Electroless Nickel	ZM
L,U	Aluminum, Electroless Nickel	M

MIL-DTL-26482	Material, Finish	Recommended Glenair Accessory Code
Series I	Aluminum, Cadmium Plated, Olive Drab	NF
Series 2 Class L	Electroless Nickel	M
Series 2 Class W	Aluminum, Cadmium Plated, Olive Drab	NF

AS85049 Finish Code	Material, Finish	Recommended Glenair Accessory Code
A	Aluminum, Black Anodize	C
B	Stainless Steel, Cadmium Plated, Black	ZU
G	Aluminum, Electroless Nickel Plated (Space)	M
J	Composite, Cadmium Plated, Olive Drab	XW
L	Composite, Cadmium Plated, Olive Drab(1)	XX
M	Composite, Electroless Nickel Plated	XM
N	Aluminum, Electroless Nickel Plated	M
P	Aluminum, Cadmium Plated, Olive Drab(1)	NFP
W	Aluminum, Cadmium Plated, Olive Drab	NF
T	Composite, Unplated	XO

(1) Selective plated with polysulfide barrier

MIL-DTL-38999 Series III Performance Specifications

Scoop Proof, Triple Start, Self-Locking, Threaded Coupling Connector

<table>
<tr><th>REQUIREMENT</th><th>PERFORMANCE SPECIFICATIONS</th></tr>
<tr><td>Test Voltage (Dielectric Withstanding Voltage)</td><td>Wired, assembled, unmated connectors withstand the following:
<table>
<tr><th rowspan="2">Altitude</th><th colspan="4">Test Voltages, ac rms, 60 Hz</th></tr>
<tr><th>Service Rating M</th><th>Service Rating N</th><th>Service Rating I</th><th>Service Rating II</th></tr>
<tr><td>Sea level</td><td>1300</td><td>1000</td><td>1800</td><td>2300</td></tr>
<tr><td>50,000 ft</td><td>550</td><td>400</td><td>600</td><td>800</td></tr>
<tr><td>70,000 ft</td><td>350</td><td>260</td><td>400</td><td>500</td></tr>
<tr><td>100,000 ft</td><td>200</td><td>260</td><td>200</td><td>200</td></tr>
</table></td></tr>
<tr><td>Insulation Resistance</td><td>Unmated connectors shall be tested as specified in test method EIA-364-21 5000 megohms min. at 25° C</td></tr>
<tr><td>Supported Wire Size</td><td><table>
<tr><th>Contact Size</th><th>Wire Gauge</th></tr>
<tr><td>22D</td><td>#22 - #28</td></tr>
<tr><td>20</td><td>#20 - #24</td></tr>
<tr><td>16</td><td>#16 - #20</td></tr>
<tr><td>12</td><td>#12 - #14</td></tr>
<tr><td>10</td><td>#10 - #12</td></tr>
</table></td></tr>
<tr><td>EMI Shielding</td><td>Effective over a range of 100 MHz to 10 GHz with a minimum 50dB effectiveness at 10 GHz, IAW test method EIA-364-10
<table>
<tr><th>Frequency MHz</th><th>Series III</th></tr>
<tr><td>100</td><td>90</td></tr>
<tr><td>200</td><td>88</td></tr>
<tr><td>300</td><td>88</td></tr>
<tr><td>400</td><td>87</td></tr>
<tr><td>800</td><td>85</td></tr>
<tr><td>1,000</td><td>85</td></tr>
<tr><td>1,500</td><td>76</td></tr>
<tr><td>2,000</td><td>70</td></tr>
<tr><td>3,000</td><td>69</td></tr>
<tr><td>4,000</td><td>68</td></tr>
<tr><td>6,000</td><td>66</td></tr>
<tr><td>10,000</td><td>65</td></tr>
</table></td></tr>
</table>

MIL-DTL-38999 Series III Performance Specifications

Scoop Proof, Triple Start, Self-Locking, Threaded Coupling Connector

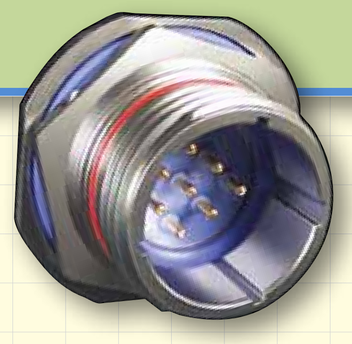
<table>
<tr><th>REQUIREMENT</th><th>PERFORMANCE SPECIFICATIONS</th></tr>
<tr><td>Thermal Shock</td><td>After cycling the connector between -65° C and +175° C, it will meet all applicable electrical and mechanical requirements.</td></tr>
<tr><td>Physical Shock</td><td>No loosening of parts, cracking or other deleterious results hindering further part operation after 300 G's in each of 3 mutually perpendicular planes.</td></tr>
<tr><td>Fluid Compatibility</td><td>Designed to function in all fluids encountered in any modern military or aerospace environment.</td></tr>
<tr><td>Fluid Immersion</td><td>Connector samples shall be tested IAW test procedure EIA-364-10 (One sample per fluid). Following fluid immersion cycles, the connectors shall be tested for coupling torque and DWV per MIL-DTL-38999 within 3 hours.
<table>
<tr><th>Test Condition</th><th>Fluid</th></tr>
<tr><td>A</td><td>Hydraulic Fluid, per MIL-H-5606</td></tr>
<tr><td>B</td><td>Turbine Fluid, grade JP-8, per MIL-DTL-83133 (NATO Type 34)</td></tr>
<tr><td>C</td><td>Lubricating oil, per MIL-L-7808</td></tr>
<tr><td>D</td><td>Lubricating Oil, per MIL-PRF-23699</td></tr>
<tr><td>E</td><td>Defrosting Fluid, per MIL-A-8243</td></tr>
<tr><td>F</td><td>Cleaning Compound, per MIL-PRF-87937 type I alkaline base</td></tr>
<tr><td>G</td><td>Gasoline, per ASTM-D-4814</td></tr>
<tr><td>H</td><td>Gasohol, per A-A-52530</td></tr>
<tr><td>I</td><td>One part Isopropyl Alcohol, per TT-I-735, grade A or B: and 3 parts Mineral Spirits, per A-A-2904, type II, grade A or P-D-680, type I, by volume</td></tr>
<tr><td>J</td><td>Deleted</td></tr>
<tr><td>K</td><td>Coolant dielectric fluid, synthetic silicate ester base MIL-PRF-47220 (Coolanol 25) or equivalent</td></tr>
<tr><td>L</td><td>Deleted</td></tr>
<tr><td>Z</td><td>As specified in the referencing document</td></tr>
</table></td></tr>
<tr><td>High Impact Shock</td><td>Mated connectors, wired with MIL-C-915/60 or /63 cable and equipped with straight environmentally sealed backshells, withstand high impact shockper MIL-S-901.</td></tr>
<tr><td>Vibration</td><td>There shall be no electrical discontinuity and there shall be no disengagement of the mated connectors, backing off of the coupling mechanism, evidence of cracking, breaking, or loosening of parts.</td></tr>
</table>

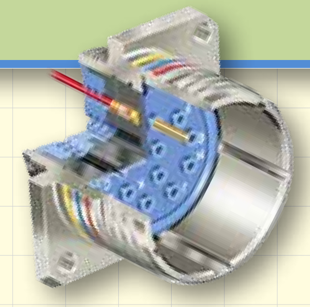
MIL-DTL-38999 Series III Performance Specifications

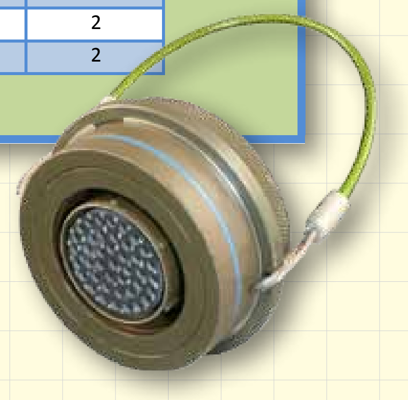
Scoop Proof, Triple Start, Self-Locking, Threaded Coupling Connector

REQUIREMENT	PERFORMANCE SPECIFICATIONS
Fungus	Materials used in the construction of these connectors shall be fungus inert per certification method 508.6 of MIL-STD-810.
Corrosion	When tested in accordance with EIA-364-26, meets appropriate electrical and mechanical requirements and shows no exposure of base metal after 500 hours of salt spray.
Durability	No electrical or mechanical defects after 500 cycles of engagement and disengagement.
Insert retention	Unmating connectors shall retain their proper location in the shell and there shall be no evidence of cracking, breaking, separation from the shell, or loosening of parts.
Contact Retention	The axial displacement of the contact shall not exceed .012 inch (0.30 mm). No damage to contacts or inserts shall result.
EMI Ground Spring Forces	The forces necessary to engage and separate EMI plugs with receptacle shells shall be within the values specified in the table shown below:

Shell Size	Axial Force for Series III			
	Maximum pounds	Minimum Newtons	Maximum pounds	Minimum Newtons
8/9	25	111	0.5	2
10/11	25	111	0.5	2
12/13	30	133	0.5	2
14/15	30	133	0.5	2
16/17	35	156	0.5	2
18/19	35	156	0.5	2
20/21	35	156	0.5	2
22/23	35	156	0.5	2
24/25	35	156	0.5	2







MIL-DTL-38999 Series III Contact Specifications

AS39029 Crimp and Hermetic Pin and Socket Contacts

REQUIREMENT	PERFORMANCE SPECIFICATIONS

Current Rating

Contact Size	Maximum Amps	
	Crimp	Hermetic
22D	5	3
20	7.5	5
16	13	10
12	23	17
10	33	24

Contact millivolt Drop

Contact Size	Maximum Millivolt Drop	
	Crimp	Hermetic
22D	73	85
20	55	60
16	49	85
12	42	82
10	33	72

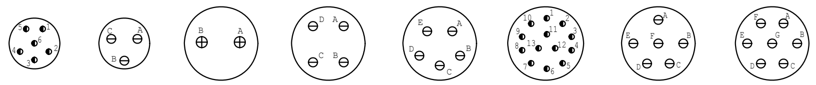
Contact Resistance at 25°C

Class	Contact Size	Wire Size	Test Amperes	Millivolt Drop Maximum	
				Initial	After
H, N and Y	12	12	17	85	100
	16	16	10	85	100
	20	20	5	60	75
	22D	22	3	85	95

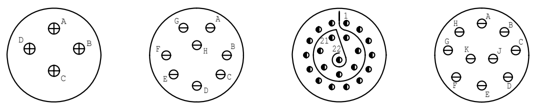
MIL-DTL-38999 CONTACT MATERIALS AND SPECIFICATIONS

Component	Material	Notes
Pin Contact	Copper alloy, 50 micro inches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate per SAE AMS-QQ-N-290.	Approved for Space Flight
Pin Contact, Hermetic	Nickel-iron alloy per ASTM F30 9Alloy 52), 50 micro inches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate pet SAE-AMS-QQ-N-290 Class 2, 50-100 micro inches.	Ferromagnetic Material
Socket Contact	Copper alloy, 50 micro inches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate per SAE AMS-QQ-N-290.	Approved for Space Flight
Socket Contact Hood	Stainless Steel, passivated per AMS2700.	Approved for Space Flight

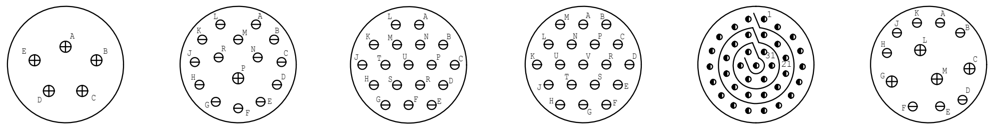
MIL-DTL-38999 Series I, II, III, and IV Connectors Insert Arrangements (IAW MIL-STD-1560)



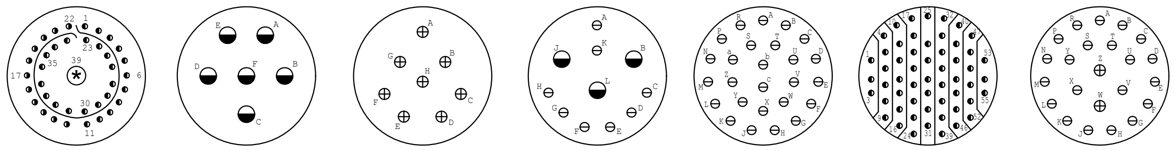
Series I	9-35	9-98	11-2	11-4	11-5	11-35	11-98	11-99
Series II	8-35	8-98	10-2	10-4	10-5	10-35	10-98	10-99
Series III	A35	A98	B2	B4	B5	B35	B98	B99
Series IV	---	---	---	---	B5	B35	B98	B99



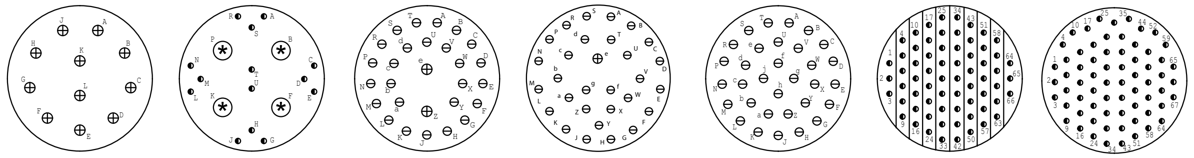
Series I	13-4	13-8	13-35	13-98
Series II	12-4	12-8	12-35	12-98
Series III	C4	C8	C35	C98
Series IV	C4	---	C35	C98



Series I	15-5	15-15	15-18	15-19	15-35	15-97
Series II	14-5	14-15	14-18	14-19	14-35	14-97
Series III	D5	D15	D18	D19	D35	D97
Series IV	D5	---	D18	D19	D35	D97



Series I	17-2	17-6	17-8	17-11	17-26	17-35	17-99
Series II	16-2	16-6	16-8	16-11	16-26	16-35	16-99
Series III	E2	E6	E8	E11	E26	E35	E99
Series IV	E2	E6	E8	E11	E26	E35	---

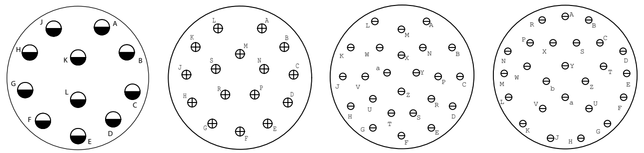


Series I	19-11	19-18	19-28	19-30	19-32	19-35	19-45
Series II	18-11	18-18	18-28	18-30	18-32	18-35	18-45
Series III	F11	F18	F28	F30	F32	F35	F45
Series IV	F11	F18	---	---	F32	F35	---

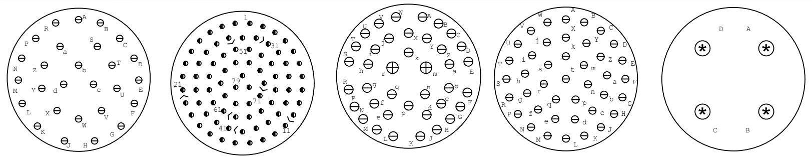
Contact Size Key

○	◎	◒	⊕	⊖	•
8	10	12	16	20	22D

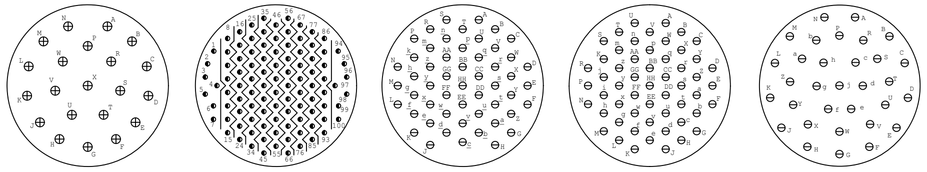
⊛ *Size 8 Contacts NOTE*: The SAE-AS39029/90 and 91 size 8 coaxial data bus contacts are not fully compatible with this insert arrangement and will require the use of a separate boot to seal properly and reduce the splaying of the contact.



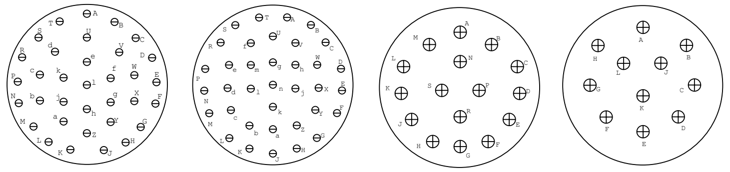
Series I	21-11	21-16	21-24	21-25
Series II	20-11	20-16	20-24	20-25
Series III, IV	G11, G11	G16, G16	G24, G24	G25, ---



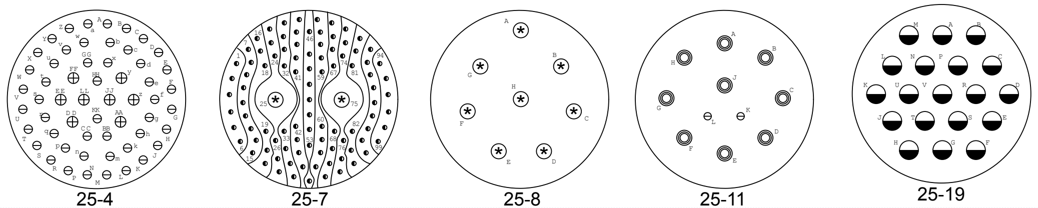
Series I	21-27	21-35	21-39	21-41	21-75
Series II	20-27	20-35	20-39	20-41	20-75
Series III, IV	G27, ---	G35, G35	G39, ---	G41, G41	G75, G75



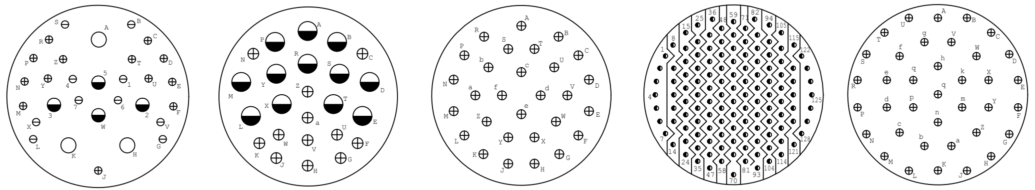
Series I	23-21	23-35	23-53	23-55	23-32
Series II	22-21	22-35	22-53	22-55	22-32
Series III, IV	H21, H21	H35, H35	H53, ---	H55, H55	H32, ---



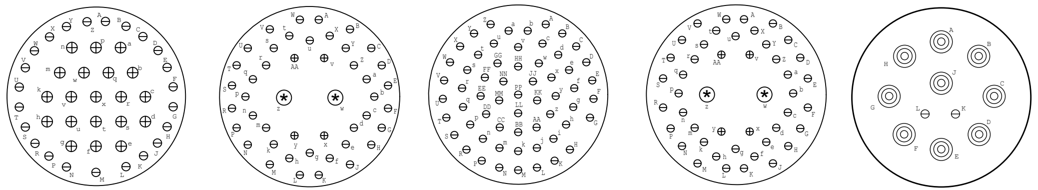
Series I	23-34	23-36	23-97	23-99
Series II	22-34	22-36	22-97	22-99
Series III, IV	H34, ---	H36, ---	H97, ---	H99, ---



Series I	25-4	25-7	25-8	25-11	25-19
Series II	24-4	24-7	24-8	24-11	24-19
Series III, IV	J4, J4	J7, J7	J8, J8	J11, J11	J19, J19



Series I	25-20	25-24	25-29	25-35	25-37
Series II	24-20	24-24	24-29	24-35	24-37
Series III, IV	J20, J20	J24, J24	J29, J29	J35, J35	J37, J37



Series I	25-43	25-46	25-61	25-90	J-11
Series II	24-43	24-46	24-61	24-90	***(Series IV Only)***
Series III, IV	J43, J43	J46, J46	J61, J61	J90, J90	

MIL-DTL-38999 Series I, II, III, and IV Connectors Layouts and Pin Counts

Shell Size and Insert Arrangements				Number of Pins							
Series I	**Series II**	**Series III**	**Service Rating**	**22D**	**20**	**16**	**12**	**12 coax**	**12 twinax**	**8 coax**	**8 twinax**
9-35	8-35	A35	M	6							
9-98	8-98	A98	I		3						
11-2	10-2	B2	I			2					
11-4	10-4	B4	I		4						
11-5	10-5	B5	I		5						
11-35	10-35	B35	M	13							
11-98	10-98	B98	I		6						
11-99	10-99	B99	I		7						
13-4	12-4	C4	I			4					
13-8	12-8	C8	I		8						
13-35	12-35	C35	M	22							
13-98	12-98	C98	I		10						
15-5	14-5	D5	II			5					
15-15	14-15	D15	I		14	1					
15-18	14-18	D18	I		18						
15-19	14-19	D19	I		19						
15-35	14-35	D35	M	37							
15-97	14-97	D97	I		8	4					
17-2	16-2	E2	M	38							1
17-6	16-6	E6	I				6				
17-8	16-8	E8	II			8					
17-11	16-11	E11	N		8			1	2		
17-26	16-26	E26	I		26						
17-35	16-35	E35	M	55							
17-99	16-99	E99	I		21	2					
19-11	18-11	F11	II			11					
19-18	18-18	F18	M	14							4
19-28	18-28	F28	I		26	2					
19-30	18-30	F30	I		29	1					
19-32	18-32	F32	I		32						
19-35	18-35	F35	M	66							
19-45	18-45	F45	M	67							
21-11	20-11	G11	I				11				
21-16	20-16	G16	II			16					
21-24	20-24	G24	I		24						
21-25	20-25	G25	I		25						
21-27	20-27	G27	I		27						
21-35	20-35	G35	M	79							
21-39	20-39	G39	I		37	2					
21-41	20-41	G41	I		41						

Shell Size and Insert Arrangements				Number of Pins							
Series I	**Series II**	**Series III**	**Service Rating**	**22D**	**20**	**16**	**12**	**12 coax**	**12 twinax**	**8 coax**	**8 twinax**
21-75	20-75	G75	M								4
23-21	22-21	H21	II			21					
23-32	22-32	H32	I		32						
23-34	22-34	H34	I		34						
23-35	22-35	H35	M	100							
23-36	22-36	H36	I		36						
23-53	22-53	H53	I		53						
23-55	22-55	H55	I		55						
23-97	22-97	H97	I			16					
23-99	22-99	H99	II			11					
25-4	24-4	J4	I		48	8					
25-7	24-7	J7	M	97							2
25-8	24-8	J8	M								8
25-11	24-11	J11	N			2		9			
25-19	24-19	J19	I				19				
25-24	24-24	J24	I			12	12				
25-29	24-29	J29	I			29					
25-35	24-35	J35	M	128							
25-43	24-43	J43	I		23	20					
25-46	24-46	J46	I		40	4				2	
25-61	24-61	J61	I		61						
25-90	24-90	J90	I		40	4					2

Shell Size / Insert Arrangements	Number of Pins				
Series IV	**22D**	**20**	**16**	**12**	**10**
B5		5			
B35	13				
B98		6			
B99		7			
C4			4		
C35	22				
C98		10			
D5			5		
D18		18			
D19	37	19			
D35					
D97		8	4		
E6				6	
E8			8		
E26		26			
E35	55				
F11			11		

Shell Size / Insert Arrangements	Number of Pins				
Series IV	**22D**	**20**	**16**	**12**	**10**
G41		41			
H21			21		
H35	100				
H55		55			
J4		48	8		
J11		2			9
J19				19	
J24			12	12	
J29			29		
J35	128				
J43		23	20		
J61		61			
F32		32			
F35	66				
G11				11	
G16			16		
G35	79				

Outlook

Every Day is a Winding Road

We sometimes joke that our industry moves at a glacial pace—especially considering how old some of the Mil-Spec products are that still get spec'd in on new interconnect designs. But despite the many "static" markers revealing how slow and steady our industry can be, there are far more indicators that we exist in a "dynamic" business environment. The concept of dynamic versus static is an interesting one to explore. For example, we have braiding rigs on our factory floor that so exactly accomplish the work they were designed for that the equipment has seen little or no change in over 50 years. On the other hand we have new and advanced CNC machining centers and robotic assembly equipment that has dynamically improved the productivity and safety of our factory. The opportunity is always there for improvement. It just takes an appetite for innovation and change—a willingness to embrace the dynamic nature of the world—to move the operation forward.

A good historical example of resistance to change can be found in the rail industry, where the introduction of the automatic air brake made freight train operation safer and more efficient. Formerly, railway brakemen would move rapidly from car to car manually turning hand brakes—big wheels mounted high up on the sides of each rail car—to slow the train during a long descent. Automatic air brakes made this operation much safer and far more reliable—both for workers and the public. And yet years after air brakes had become a required standard on all freight trains, brakemen were still required by work rules and contracts to be present on every train—even though they no longer had a useful role to play in the operation of the train.

I suspect there are countless examples of this type, where business managers, government regulators, standards bodies and others have been more inclined to hold to a set of static rules than to interact with the world in a more dynamic fashion. But just imagine if everybody did this! If a ball club manager never adjusted his starting lineup, if a product manager never looked for ways to make existing solutions better, if a engineer never embraced technologies that improved the performance and reliability of an important system.

At Glenair we believe it is far better to go through life adhering to a set of core principles—all the while being open to adjustments and change—than it is to lay down rigid rules or "recipes" for how every circumstance in our business should be managed. *Every Day is a Winding Road*, or so goes the song. To me this means every day is guaranteed to be full of twists and turns, and that we are at our best when we remain as flexible and as open to new ways of doing things as we can in our ongoing pursuit of excellence and sustainability in every market we serve.

Chris Toomey

Christopher J. Toomey

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