

# Qwik Connect

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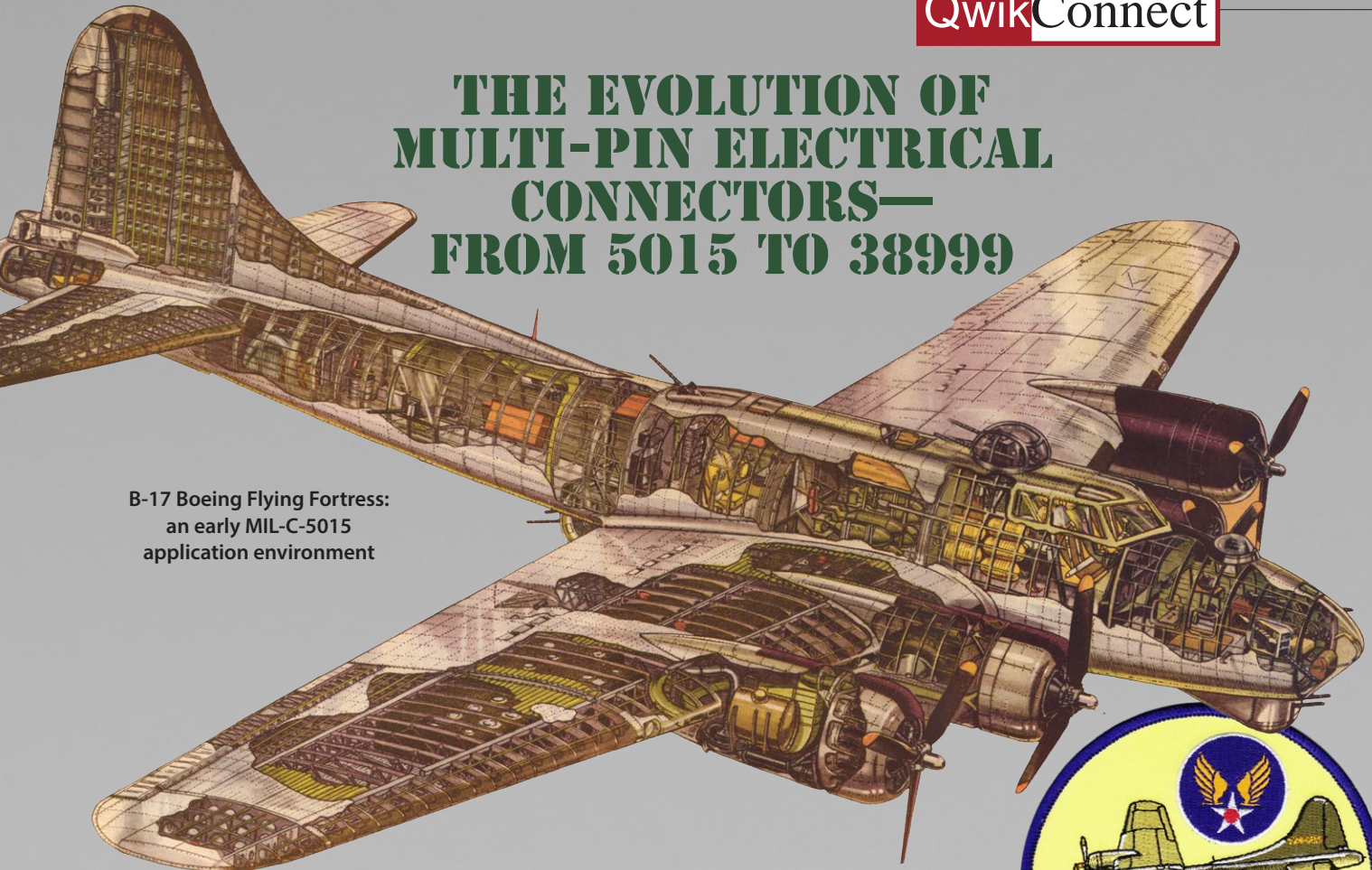
*In This Issue:*

 **SuperNine<sup>®</sup>**

**Advanced Performance MIL-DTL-38999  
Series III Style Connectors**

 **Glencair<sup>®</sup>**

# THE EVOLUTION OF MULTI-PIN ELECTRICAL CONNECTORS— FROM 5015 TO 38999



B-17 Boeing Flying Fortress:  
an early MIL-C-5015  
application environment



The evolution of multi-pin circular electrical connectors used in harsh environmental conditions such as military aerospace began with the MIL-DTL-5015—formerly known as MIL-C-5015—employed in US and NATO military systems since the 1950s. This connector family, perhaps due to the simplicity of its design and its wide range of power and signal contact arrangements, became a universal standard. Originally outfitted with a threaded mating interface, solder cup wire terminations and displacement rubber contact retention, this standard density connector has been used in applications as diverse as geophysical exploration and combat fighter jets for well over 60 years.

Today the venerable 5015 provides reliable electrical and mechanical capabilities for equipment where durability and low cost is important. But due to its size, weight and lack of next-step design features (such as multi-key polarization and support for smaller contact sizes), incorporation of the 5015 into new application designs is now limited to fields such as mass transit and industrial robotics.



MIL-DTL-5015  
Threaded



VG95324  
Reverse-Bayonet



MIL-DTL-28840  
Shipboard



MIL-C-22992  
Threaded



Circular connectors can be grouped into standard, miniature and subminiature families. These groupings reflect the relative package density, and supported wire / contact sizes of popular series, as well as the technical evolution of connectors over the past 70 years. The standard group includes the venerable 5015, 22992 and the 28840 shipboard connector. Miniature circulars include the 26482 and 83723 (see opposite page). 38999s are the only significant subminiature circular connector. The series was originally released in October of 1966.

The next step in the evolution of multi-pin connector performance occurred with the introduction of the MIL-C-26482, a lighter weight, higher-density cylindrical connector that accommodated smaller wires and contacts up to #20 AWG. The MIL-C-26482 Series II was available with crimp contacts, EMI/RFI grounding and improved environmental sealing. Compared to the 5015, these slightly higher-density "miniature" cylindrical connectors were more suited for military and commercial applications that were themselves evolving with expanded communications and avionic technologies. Rear-release crimp contacts, for example, allowed for easier termination and repair than solder cups and a wider range of shell styles and mountings translated to greater flexibility in interconnect system design. The evolution to smaller crimp-contact connectors was also necessary due to increased sophistication in electronic systems—away from individually-wired point-to-point production breaks to more modular platforms that utilized sealed box technologies.

motivation. New avionics technology and a more sophisticated "systems" approach to interconnect design, as well as increased utilization of printed circuit boards with direct connector mountings was an additional motivating factor.

PC tail versions of D38999 allowed designers to mount their boards directly to box I/O connectors. As electronic system designs became more complex, so did the interconnect requirements. For example, the need for improved reliability of PC board solder joints led to innovations with standoffs, dual flanges, threaded standoffs and so on. Performance requirements also changed due to higher shock applications, more sensitive micro-electronics, increased susceptibility to electromagnetic interference and lightning strike, advancing signal speeds and data transmission rates.

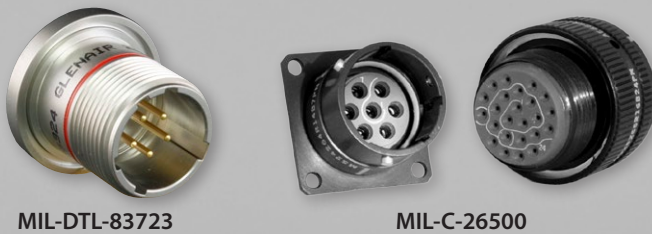
Offered in four mating styles (low profile and scoop-proof bayonet, triple-start and breech-lock) the D38999 answered virtually every requirement of the 1970s era military and commercial aerospace industries, for both general duty and severe applications including:

- Smaller size, higher density contact arrangements (as small as #22 AWG)
- Superior environmental resistance due to improved grommets and diaphragm contact seals
- Improved mating—especially in the triple-start Series III—including anti-vibration and shock ratcheted coupling
- Hybrid contact arrangements supporting both standard and high-density power and signal requirements
- Controlled accessory interface with metric threads
- Broader range of conductive and non-conductive finishes
- Five key/keyway polarization



MIL-DTL-26482  
Series I

MIL-DTL-26482  
Series II



MIL-DTL-83723

MIL-C-26500

Miniature connectors, including both crimp and solder versions of MIL-C-26482, were introduced to accommodate smaller wire sizes down to #20 gage and address requirements for better sealed and shielded interconnects integrated into modular electronic box-based systems

## MIL-DTL-38999

The MIL-C-5015 and the MIL-C-26482, together with numerous derivative and off-shoot connectors, basically ruled the electrical wire interconnect system until the 1970s, when the sub-miniature MIL-DTL-38999 was introduced in a major move to upgrade the versatility and performance of separable connectors used in military aerospace applications. Like the evolution to the 26482, reduced package size and increased contact density down to size #22 gage was a primary



Series I  
Scoop-Proof  
Bayonet



Series II  
Low-Profile Bayonet



Series III  
Triple-Start



Series IV  
Breech Lock

The MIL-DTL-38999 series was originally released in October of 1966. Subsequent releases introduced threaded and breech-lock connectors (Revision G, December 1977). The first QPL was awarded in 1981 and composite-class Series III (Revision J) was introduced in April of 1990.



**F-35**  
**Joint Strike**  
**Fighter: a modern**  
**MIL-DTL-38999**  
**application**  
**environment**

Interestingly, with the exception of the composite thermoplastic versions of the D38999 Series III introduced in the early '90s, the ongoing development of the multi-pin cylindrical essentially came to a halt with the broad standardization that came with the sub-miniature MIL-DTL-38999. And certainly this connector series, with its precision machined shells, robust sealing technologies, wider range of available backshells and accessories has done the job when it came to that generation's aircraft and ground-based technologies.

**FAST-FORWARD TO 2014**

But here we are in 2014. And while ultra-miniature interconnect innovations such as the Glenair Series 80 Mighty Mouse have certainly done a job for today's generation of space vehicles, drones, tactical robots, and composite aircraft, there is still no more ubiquitous connector in service than the MIL-DTL-38999. Despite the proliferation of high-speed data protocols, in-flight entertainment systems, space-grade interconnect applications, small-form-factor unmanned vehicle requirements and more, the same basic 38999 connector—with its proven performance from over 40 years of service—is still the unquestioned standard of many industries.

But that doesn't mean the evolution of the technology has completely stood still. Glenair, among others, has continued to develop commercial derivatives of this military standard connector series to meet the evolving needs of OEM aircraft and equipment manufacturers—plus the multitude of non-aerospace customers and applications that have selected the D38999 as their go-to high-performance connector.

Shielded contact technology such as Quadrax and El Ochito®, for example, did not exist—nor did the high-speed data networks that require their advanced performance—when the connector series was originally developed in the 70s.



**El Ochito™**      **Opto-Electronic**      **Quadrax**  
**Ethernet contact**      **transceiver contacts**      **high-speed shielded**

Other requirements, such as integrated EMI filtering, were extremely rare in the avionics platforms of 70s era aircraft. Not so today. And as OEM technology has advanced (ref: Joint Strike Fighter, 787 Dreamliner, MQ Predator, etc.) the need for advanced versions of D38999 interconnects has likewise advanced. Higher processing speeds to handle the complex signal intelligence and networked warfare, to cite just one example, requires connector technology capable of handling higher data rates and surviving in increasingly harsh

application environments. But often these evolutions fall into the realm of custom and bespoke solutions: sole source, non-catalog offerings with big minimum orders, attached NRE costs, and long-lead times. The technology has been available, but in business models at the polar extreme of “commercial-off-the-shelf.”

## **INTRODUCING: GLENAIR SERIES 23 SUPERNINE®**

This then was the background for the development of SuperNine®, the Glenair advanced MIL-DTL-38999 Series III derivative connector with better-than-QPL performance. Glenair distilled four decades of custom, one-off development work to create a connector series that perfectly matches the high expectations and requirements of today’s military aircraft, commercial aircraft and other industries. From advanced product features to the best availability of any 38999 supplier, Glenair SuperNine® has evolved the 1970s era 38999 into a high-performance interconnect solution with advanced sealing, EMC compatibility, rugged durability and versatility.

Today’s EWIS engineers and designers want interconnect technologies that face SWaP—size, weight, and power consumption—head-on. Manned and unmanned aircraft designers want solutions that aggressively address material choices and its direct relationship to aircraft all-up-weights and payload. System designers demand better mechanical solutions to connector-to-PC board mounting, easier and faster shield termination, improved corrosion resistance, and more.

The Series 23 SuperNine® advanced performance connector series speaks specifically to these requirements. SuperNine® rolls up many of the technology advances Glenair has for years pioneered in our environmental, hermetic, and filter connectors into a comprehensive high-performance connector series. SuperNine® combines advanced plating, sealing and other high-performance features including:

- 1500 mating cycle advanced durability contacts
- Integrated EMI shield banding porch
- High-durability anti-vibration coupling
- IP68 (mated condition) sealing
- Tight-tolerance composite shell fiber-optics
- Multiple COTS PC tail shell configurations
- Crimp contact hermetics
- Corrosion-resistant finishes and coupling nut design

SuperNine® is intermateable with all industry-standard D38999 solutions and accommodates Glenair’s broad range of connector designator “H” backshells, protective covers, shrink boots and lightweight composite accessories.

This issue of QwikConnect highlights the most important features and advantages of the Glenair SuperNine. Complete

data sheets are supplied for each class of connector in the series—from our advanced performance environmental to our other COTS solutions including high-speed, hermetic, EMI/EMP filter, fiber optic, ruggedized field RJ45 and USB and more. These advanced connector solutions are all available now from Glenair with the best lead times and customer service available in the interconnect industry, including same-day delivery on hundreds of popular part numbers.



## **SUPERNINE® SPACE-GRADE CONNECTORS**

**SuperNine® environmental series connectors may be specified to undergo bakeout and thermal vacuum outgas processing IAW MIL-DTL-38999 Class G**

### **Note on Outgassing**

Space flight equipment requires low-outgassing components in order to prevent degradation to optics and other sensitive instruments. The space industry has adopted a standardized test procedure, ASTM E595, to evaluate outgassing properties. The MIL-DTL-38999 specification Class G also details specific TVM and CVCM values. In Glenair’s 186T process, for example, connectors and connector materials are heated to 175° C at a vacuum of  $5 \times 10^{-6}$  torr for 48 hours. Items under test are then weighed to calculate the Total Mass Loss (TML), which may not exceed 1.0% of the total initial mass. A collector plate is used to determine the Collected Volatile Condensable Material (CVCM), which may not exceed 0.1% of the total original specimen mass. Glenair is able to offer both NASA as well as D38999 Class G bakeout processes which assure all materials comply with their respective standards.

### **Note on Connector Material and Finish Options**

Some types of metals are prohibited for space flight. “Cadmium, zinc, pure tin chemically coated cadmium or zinc, or silver shall not be used as a connector or contact finish” (NASA EEE-INST-002 Instructions for EEE Parts Selection, Screening, Qualification, and Derating). NASA recommends electroless nickel or gold finish on connector shells and gold finish for contacts.

# PRESENT-DAY AND FUTURE APPLICATIONS DEMAND INCREASINGLY HIGH-PERFORMANCE INTERCONNECT SOLUTIONS

## SuperNine®

Perfectly positioned to meet the electrical and fiber optic interconnect system requirements of today's most demanding applications.

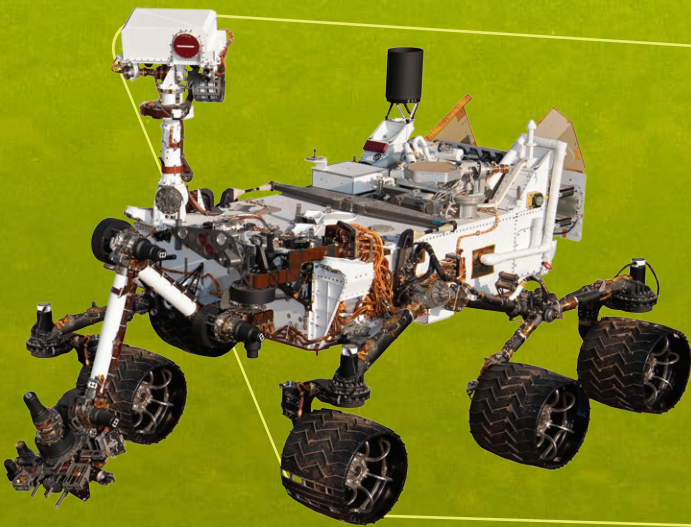
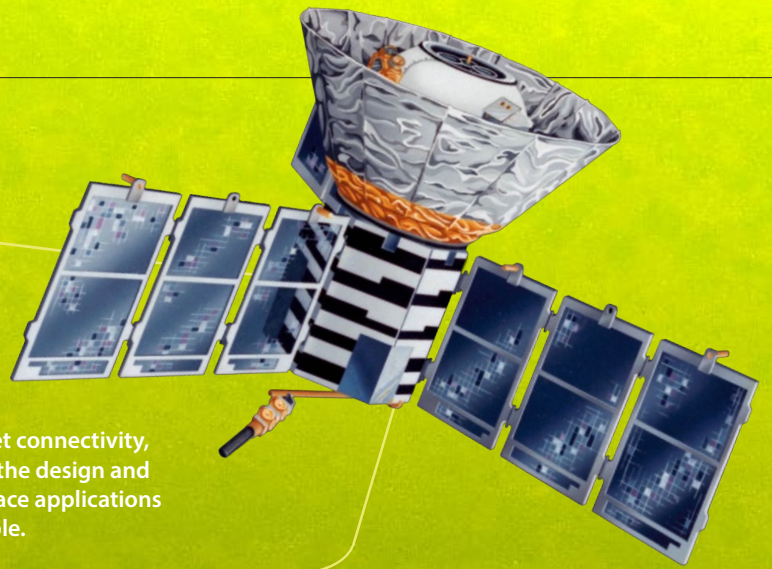


**THE LATEST GENERATION OF UNMANNED VEHICLES** demands strict attention to the size, weight and power attributes of interconnect wiring and cabling. Whether radio signal controlled or satellite controlled, drone systems require extremely robust EMI/RFI shielding. Equipped with C band line-of-sight and KU band satellite data links, as well as targeting systems, color cameras, variable-aperture daylight cameras, infrared electro-optical sensors and numerous other surveillance-related payloads, the modern military drone demands extremely high-levels of reliability and performance in its electronic systems. Hostile environment requirements such as high-altitude immersion, weapons vibration and shock, and corrosion resistance also place new demands on interconnect component performance.



**IN-FLIGHT ENTERTAINMENT SYSTEMS** have a long history dating back to the live singers and piano bars on dirigibles such as the Hindenburg. Modern IFE systems, with their personal TVs, real-time interactive flight maps, games, audio, video, internet connectivity, and even passenger-to-passenger data communications obviously place significant demands on electrical and optical interconnect infrastructure. Miles of wire, the potential for voltage leaks and arcing introduce new complexity and safety concerns in the electrical interconnect wire systems serving passenger IFE. System demands for data throughput and speed require incorporation of special-purpose contacts, protocols, and even electro-optical wire media.

**FIXED, MOBILE, AND SCIENTIFIC RESEARCH SATELLITES** incorporate a demanding array of communication, navigation, and remote sensing equipment. Extremely high bandwidth and data speed requirements for voice, video, and other forms of imaging place heavy demands on both electronics and interconnect cabling. Digital cameras, satellite radio, internet connectivity, not to mention the diverse needs of military applications, make the design and specification of connector technology for satellites and other space applications one of the most challenging application environments imaginable.



**ROBOTIC ROVERS SUCH AS THE MARS CURIOSITY** represent a new and challenging benchmark for connectors, cables, and other interconnect technology. The NASA Mars Science Laboratory mission to investigate climate, geology, microbial life, habitability and other aspects of Mars was an unprecedented hurdle for interconnect system designers. Extremes in temperature—from  $-127^{\circ}$  to  $+40^{\circ}\text{C}$ — exposure to intense forms of radiation, and the extremes of vibration and shock during deployment are just three of the unique challenges faced by *Curiosity*. On board power systems and payloads—including radioisotope thermoelectric generators, cameras, chemical sensors, environmental monitoring systems, x-ray spectrometers, gas chromatographs and more—constituted an extremely complex and zero-fault-tolerant application environment.



**THE BOEING 787 DREAMLINER** is an 80% composite-by-volume aircraft, with an all-electric architecture. 787 designers replaced bleed and hydraulic power sources with electrically-powered compressors and pumps, completely eliminating pneumatics and hydraulics from engine starters, brakes, and other systems. Additional electrical technology such as electrothermal heater mats for wing ice protection, fly-by-wire control systems, LCD avionic displays, AFDX Ethernet networking are additional reasons why interconnect system design for 787-class commercial aircraft requires new and innovative interconnect technology. Reliability and performance, ease-of-assembly, durability, as well as unprecedented demands for high-speed data throughput and electrical power management make this system the most unique and challenging in all of commercial aviation.



## SERIES OVERVIEW

# SuperNine®

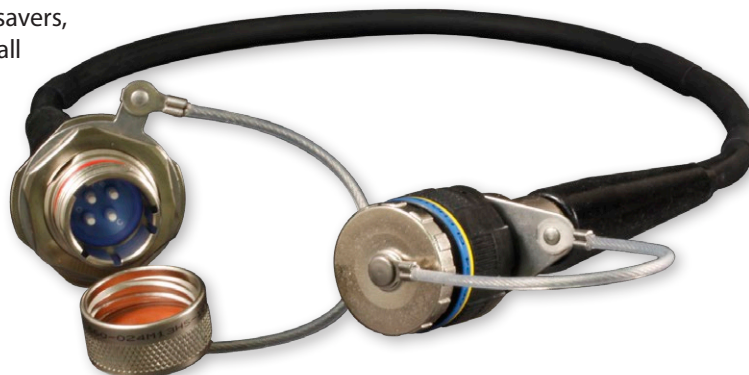


## The advanced-performance D38999 Series III connector

SuperNine® is the industry's most complete and advanced D38999 Series III type connector family. From standard environmental-class connectors with improved durability and ease-of-use, to EMI/EMP filter connectors with innovative flange and PC tail termination configurations, SuperNine® offers military and commercial aerospace customers that have standardized on Series III technology the opportunity to improve interconnect system performance and resolve a wide range of persistent electrical, environmental, and mechanical performance problems—all with catalog connector solutions backed by Glenair's high-availability business model.

SuperNine® delivers improved durability, sealing, cost-of-ownership, ease of shield termination, a broader range of PC tail configurations, environmental and hermetic bulkhead feed-throughs, connector savers, off-the-shelf EMI/EMP filter connectors and more—all supported with Glenair's well-established reputation for service, support, and fast turnaround.

**Glenair SuperNine® connectors in action:**  
in this example, a pair of our advanced fiber optic interconnects cabled-up in a turnkey, environmentally sealed point-to-point jumper



### THE SUPERNINE® TECHNOLOGY PROMISE

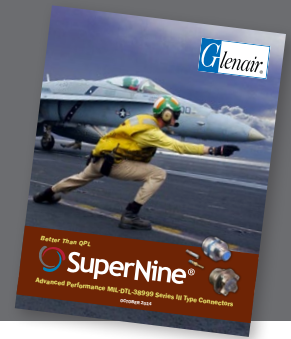
- **Across-the-board improvements in mating-cycle and contact durability**
- **Advanced ease-of-use features such as integrated band porches and PC-Tail standoffs**
- **Advanced-performance improvements in every connector class—from filters to fiber optics**

SERIES 23

**SuperNine®**

## MIL-DTL-38999 Series III Type Series Overview

Now Available:  
SuperNine® Advanced  
Performance  
MIL-DTL-38999 Series III  
Catalog

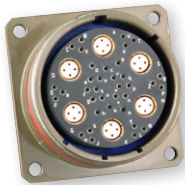


### SuperNine® Environmental I/O, Cable and PCB Connectors



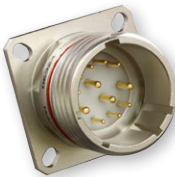
- Plug connectors with available nickel Teflon plating and banding porch
- Complete range of crimp receptacles with high-durability contacts
- Five different designs of printed circuit board connector standoffs
- IP68 level sealing in the mated condition
- High-durability, corrosion-resistant vibration and shock coupler

### SuperNine® High-Speed Connectors



- Full range of hybrid insert arrangements incorporating size #22D signal contacts, plus size #12 and #8 keyed shielded contacts
- El Ochito®: One full 1G/10G Ethernet channel per standard size #8 cavity
- Supported applications: 10/100/1G/10G BASE-T Ethernet, analog/digital video, 1553 databus and general RF or differential data transmission
- Turnkey Quadrax and El Ochito® solutions—from contacts to connectors, wire and termination hardware

### SuperNine® High-Pressure Hermetic Connectors



- Glass-to-metal seal hermetics with sealing up to  $1 \times 10^{-10}$  cc/sec
- DSCC qualified and derivative solutions with advanced mounting features
- Pressure resistance to 32,000+ psi
- Stainless steel, titanium, Kovar® and Inconel® shell material options
- Bulkhead feed-through and hull penetrator versions

### SuperNine® Ruggedized RJ45 and USB Connectors



- Insert-to-shell grounding for superior EMC continuity and shielding
- Superior environmental sealing to IP67 compared to COTS solutions
- Advanced vibration and mechanical shock tolerance
- Full range of offerings for Cat6a Ethernet: Jacks, Plugs, PC tail and crimp
- High-temperature rated  $-40^{\circ}$  to  $+125^{\circ}\text{C}$

### SuperNine® EMI/EMP Filter Connectors



- Planar, multilayer ceramic capacitive filters with and without TVS diodes
- C, L-C, C-L, and Pi filter electrical configurations
- Special high operating temperature solutions
- Industry's broadest range of capacitance: from 10 to 1,000,000 pF
- Fast and reliable in-house manufacturing of all elements and processes

### SuperNine® Fiber Optic Connectors



- Ultra-lightweight composite thermoplastic connector solution
- Qualified size #16 MIL-PRF-29504 pin-socket precision ceramic termini
- Ultra-tight tolerance shell and cavity for precise axial alignment
- Ultra-low insertion loss values for both singlemode and multimode
- Insert arrangements from 2 to 37 ways

**MIL-DTL-38999 Series III Type**  
**Advanced mechanical features**

The Series 23 SuperNine® advanced performance connector series rolls up many of the technology advances Glenair has pioneered in our environmental, hermetic, and filter connectors into a comprehensive high-performance connector series. SuperNine® is intermateable with all industry-standard D38999 solutions and accommodates Glenair’s broad range of connector designator “H” backshells, protective covers, shrink boots and lightweight composite accessories. SuperNine® combines innovative mechanical design and materials selection (see next page) resulting in the industry’s best performing aerospace-ready connector series.

**IMPROVED DURABILITY AND MECHANICAL PERFORMANCE**



Tight Tolerance Ultra-Low-dB Loss Fiber Optics



1500 Mating Cycle Coupling Nut and Contacts

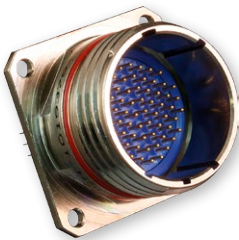


Heavy Duty Integrated Ground Spring Attachment



Available Sav-Con® Connector Saver Go-Between

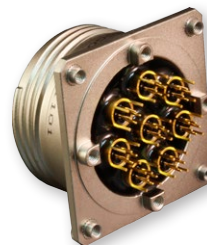
**IMPROVED EASE-OF-USE AND VERSATILITY**



High-density contact arrangements



Integrated Shield Termination Band Porch



Diverse Range of PC Tail Stand-Offs



Available Bulk Head Feed-Thrus

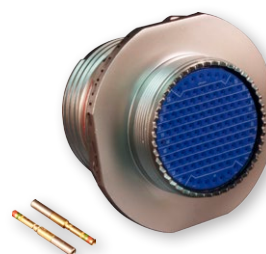
**EXPANDED FUNCTIONALITY**



Zero Extraction Force Designs



Metal Ground Plane Inserts



Hermetic with Crimp Contacts



Quick-Disconnect Lanyard-Release Assemblies

**RoHS COMPLIANT FINISH OPTIONS**



**Electroless Nickel**

Cost	\$	\$	\$	\$	\$
Conductivity	+	+	+	+	+
Corrosion Resistance	⌚	⌚	⌚	⌚	⌚

-65 to +200°C  
Glenair Code **ME**



**Black Zinc Nickel**

Cost	\$	\$	\$	\$	\$
Conductivity	+	+	+	+	+
Corrosion Resistance	⌚	⌚	⌚	⌚	⌚

-65 to +175°C  
Glenair Code **ZR**



**Nickel-PTFE**

Cost	\$	\$	\$	\$	\$
Conductivity	+	+	+	+	+
Corrosion Resistance	⌚	⌚	⌚	⌚	⌚

-65 to +175°C  
Glenair Code **MT, ZM**



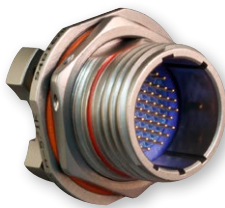
**Stainless Steel**

Cost	\$	\$	\$	\$	\$
Conductivity	+	+	+	+	+
Corrosion Resistance	⌚	⌚	⌚	⌚	⌚

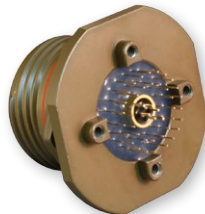
-65 to +200°C  
Glenair Code **Z1, ZL**



**IMPROVED MATERIAL SELECTION AND PERFORMANCE**



1000 Hour Nickel-Teflon Plating Option



High-Performance Space-Grade Epoxy Potting Compound

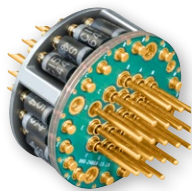


High-performance EMI ground spring attachment



Space-Grade Certified Materials

**MIL-DTL-38999 TYPE SPECIAL CLASS DERIVATIVES**



EMI/RFI Filters



RJ45 and USB Solutions



Fiber Optic



Hermetic

Mechanical Performance Feature	D38999 Sr. III	SuperNine®
Threaded Triple-Start Coupling Design	Yes	Yes
Nine Shell Sizes, Range 9 – 25	Yes	Yes
Scoop-Proof Shell Design	Yes	Yes
Full Mate Visual Indicator	Yes	Yes
Integrated Contact Retention System	Yes	Yes
Interfacial and Grommet Seals	Yes	Yes
Fully Shielded	Yes	Yes
Lightning Strike	Yes	Yes
Shell-to-Shell Bottoming	Yes	Yes
Threaded/Toothed Accessory Interface	Yes	Yes
Full Range of Assembly Tools	Yes	Yes

Connector Class	D38999 Sr. III	SuperNine®
Environmental	Yes	Yes
Space-Grade	Yes	Yes
Hermetic	Yes	Yes
EMI Filter	No	Yes
High Durability	No	Yes
ESD	Yes	Yes
Bulkhead Feed-Thru	No	Yes
Sav-Con® Connector Saver	No	Yes

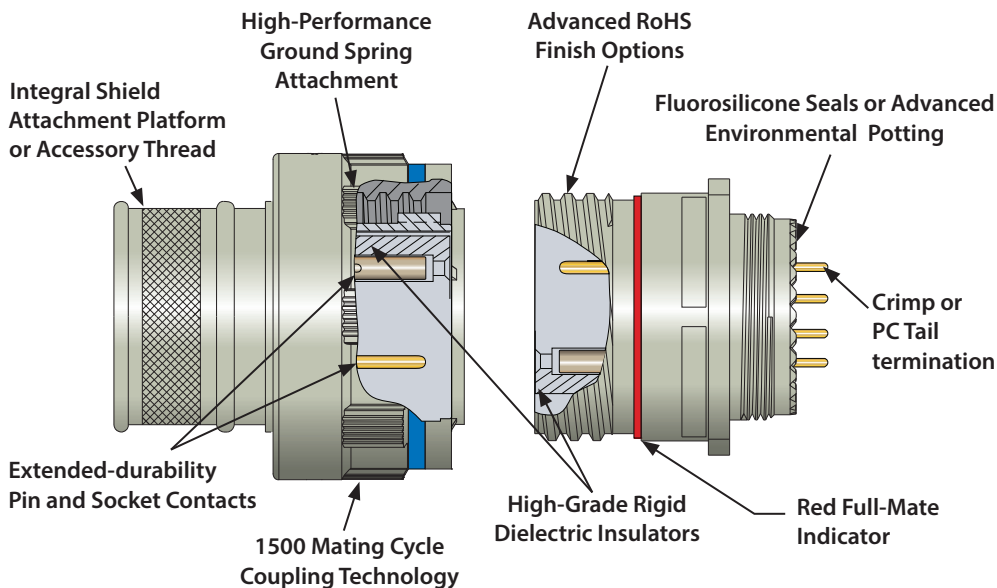


# ENVIRONMENTAL CLASS

# SuperNine®

The environmental class of the Glenair Series 23 SuperNine® includes IP68 (mated condition) MIL-DTL-38999, Series III crimp plug and receptacles for cable and I/O applications, plus the interconnect industry's most advanced range of PCB termination receptacles, connector savers and bulkhead feed-thrus. High performance features include extended durability contacts, integrated banding capability, high-density insert arrangements, and more. Rugged ratcheted coupling technology delivers reliable vibration and shock performance. Insert arrangements are in accordance with MIL-STD-1560 and include special high-density layouts.

- Integrated band porch
- Extended-durability contacts, finish and coupling nut: 1500 cycles
- Standard plus high-density contact arrangements
- Integrated EMI/RFI ground spring
- Extensive line of PC tail configurations with superior sealing
- Advanced RoHS compliant finish solutions
- IP68 in mated condition (10 meters, two hours)
- Available transition zone piston seal versions



850-006 and 850-007 Extended-duty socket and pin crimp contacts

# High Performance Environmental Class Connectors

Improved durability, sealing, and ease-of-use



## CRIMP CONTACT TERMINATION



Extended-Durability Plug with Band Porch and 1500 Mating Cycle Contacts



Extended-Durability Plug with Accessory Threads

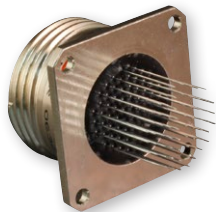


High-Density Plugs and Receptacles in All Mounting Styles



Piston Seal Submersible Series

## EXTENDED RANGE OF PC TAIL RECEPTACLE STYLES



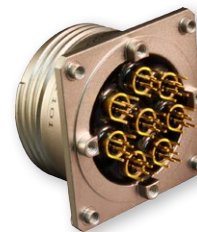
Flush Flange



Stepped Contacts



Short Standoff



Threaded Standoff



Dual Flange

## SPACE-GRADE SOLUTIONS



NASA and Class G Screening



Zero-Extraction Force Satellite Deployment Interconnect



Blind-Mate Rack-and-Panel



Hold-Down Release Mechanism with SuperNine Interconnect Interface

## SPECIAL PURPOSE DERIVATIVES



Environmental Bulkhead Feed-Thru



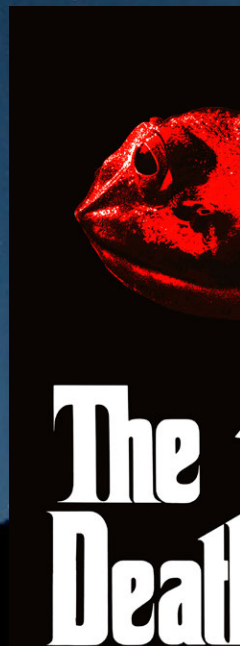
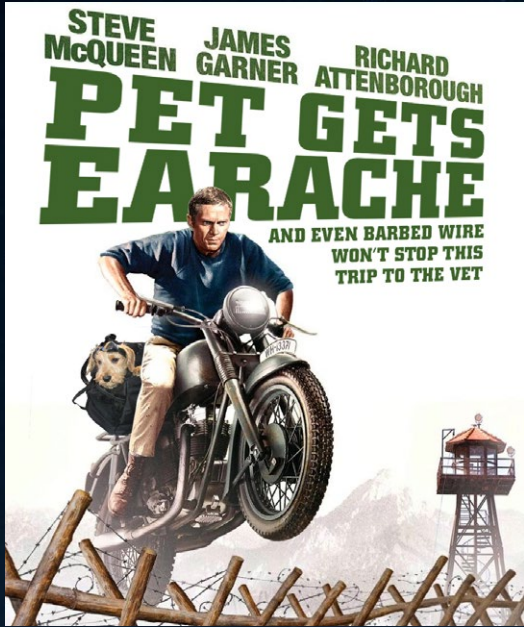
High-Reliability Connector Savers

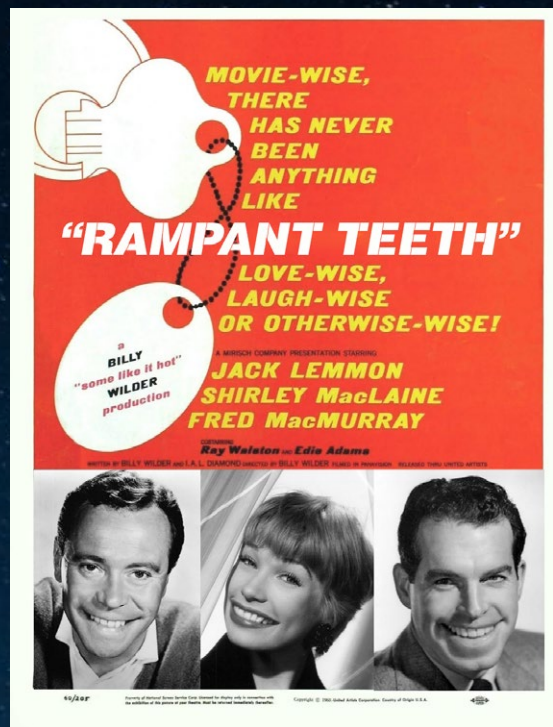


Quick-Disconnect Lanyard-Release Assemblies



# MOVIE TITLE ANAGRAM PUZZLE





Answers Posted  
November 14th  
[www.glenair.com/qwikconnect](http://www.glenair.com/qwikconnect)



HIGH-SPEED CLASS

# SuperNine®

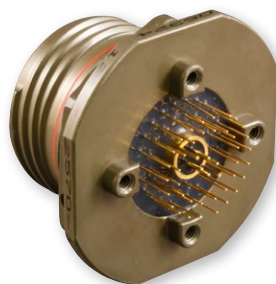
## Mil-Aero Ethernet, Video, and High-Speed Data Solutions

Leverage the proven environmental,  
mechanical, and EMC performance of D38999  
for all your high-speed data requirements

- **High availability:** full range of in-stock technology—from contacts to cables to high-performance connector shells
- **Available El Ochito® contact technology:** one full 1G/10G Ethernet channel per standard size #8 cavity
- **Supported applications:** 10/100/1G/10G BASE-T Ethernet, analog/digital video, 1553 databus, IEEE 1394, Fibre Channel and general RF or differential data transmission



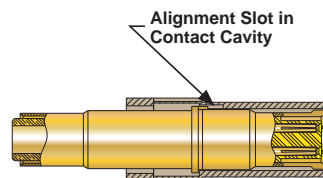
High-speed crimp 233-217 Plug featuring SuperNine® 1500 mating-cycle ratcheted coupling technology and El Ochito® 1G/10G Ethernet contacts



233-218 Jam-Nut Receptacle with hybrid signal and Quadrax contacts, PC tail termination and threaded standoffs for reliable connector-to-board attachment

### About Keyed Contacts:

Glenair SuperNine® high-speed connector size #8 contact cavities are equipped with internal alignment slots. Quadrax and El Ochito® contacts have a corresponding alignment key to properly orient the contact within the contact cavity.



# High speed connectors for Ethernet, Video and High-Speed Data Applications

Featuring El Ochito® 10G Ethernet-ready contacts

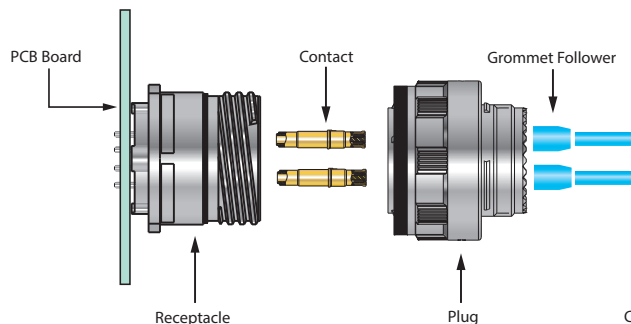


## SUPERNINE® HIGH-SPEED CONTACT ARRANGEMENTS AND SUPPORTED CONTACTS

Size 8 Contact Quick Reference Guide						
Available Contacts (ordered separately)		Glenair P/N	Contact Size	Accommodates AWG Size	Wire Size	Application Notes
	Coax (per M39029/59 & /60)	Pin: 809-114 Socket: 809-116	16	#16 - #20	RG174, RG316, RG179	Analog Radio Frequency or Microwave Applications
		Pin: 809-118 Socket: 809-120	12	#12 - #14	RG174, RG316, RG179	
		Pin: 852-007 Socket: 852-006	8	#22 - #28	M17/95-RG180	
	Differential Twinax	Pin: 853-014 Socket: 853-013	8	#22 - #28	M17/176-00002	1553 Databus/ Differential Signal
	El Ochito®	Pin: 858-003 Socket: 858-004	8	#22 - #28	963-003-26	1G/10G Base-T Ethernet
	Quadrax	Pin: 854-001 Socket: 854-002	8	#22 - #28	963-019/020/021	10/100Base-T Ethernet
	Triax/ Concentric Twinax	Pin: 853-003 Socket: 853-004	8	#22 - #28	M17/176-00002	1553 Databus

High Speed Contact Arrangement						
Shell Size	Number of Contacts					Shell Size - Insert Arr.
	#22	#20	#16	#12	#8	
09					1	09G05
11				2	1	11-01
17					2	17-22
17C					2	17C-75
19					4	19-04
21					4	21-75
23					5	23-05
23					6	23-06
25					8	25-08

High Speed Combo Contact Arrangement						
Shell Size	Number of Contacts					Shell Size - Insert Arr.
	#22	#20	#16	#12	#8	
17		26	2			17-02
17		29	1			17-22
17		37	2			17-60
19		23	20			19-17
19	14				4	19-18
25	9				8	25-07
25	36				6	25-17
25		10	13	4		25-20
25		20	12			25-26
25	2	3	11	16	3	25-41
25	22	3	11	2	3	25-46



Arrangements accept Size #8 Quadrax, differential and El Ochito® contacts with alignment keys plus conventional (non-keyed) coax, triax and concentric twinax





HERMETIC CLASS

# SuperNine<sup>®</sup> Glass-Sealed Connectors



Resolve gas, moisture and particle ingress problems with SuperNine<sup>®</sup> advanced-performance glass-sealed hermetic connectors

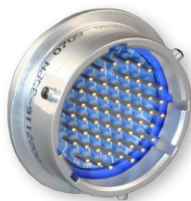
## VITREOUS GLASS TECHNOLOGY ADVANTAGES

- Superior pressure resistance to 32,000+ PSI
- Higher resistance to extreme operating temperatures to 260°+ C
- Superior mechanical strength
- No material breakdown or aging over time
- Helium leak rate <math>1 \times 10^{-7}</math> cc/sec to <math>1 \times 10^{-10}</math>

## MIL-DTL-38999 QPL AND COMMERCIAL PIN AND SOCKET HERMETICS



Scoop-proof  
3 Point Bayonet Coupling



Low-profile  
3 Point Bayonet Coupling

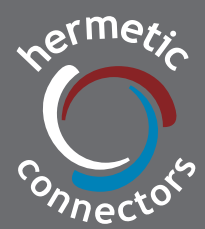


Scoop-proof  
Triple Start, Self-Locking



Scoop-proof  
Breech Lock

# MIL-DTL-38999 AND OTHER Glass-Sealed Hermetic Connectors



Superior pressure and temperature resistance

## GEOPHYSICAL AND OFFSHORE CONFIGURATIONS



GeoMarine® Double-Start Hermetic Connector



Hermetic Power Connector



Single-Way Tool Joint HTHP Hermetic Connector



Hermetic Probe Connector



Hermetic Bulkhead Penetrator

## HIGH-SPEED/SHIELDED DESIGNS



Triax Hermetic



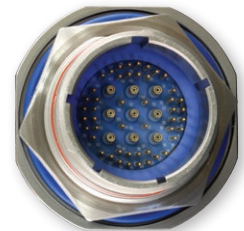
Hybrid Coax/Signal Hermetic



Quadrax Hermetic



MT Ribbon Fiber Optic Hermetic

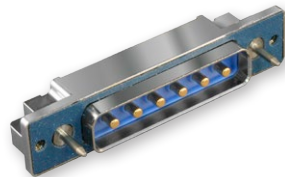


Hybrid Coax/Signal Hermetic

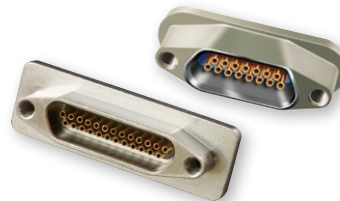
## RECTANGULAR PACKAGES



MIL-DTL-24308 QPL Hermetic



Series 79 Micro-Crimp Hermetic



MIL-DTL-83513 Type Micro-D Hermetics



Sealed Panel-Mount Micro-D Hermetic

## CIRCULAR GLASS-SEALED HERMETIC CONNECTORS AVAILABLE WITH ACCELERATED LEAD TIMES



MIL-DTL-26482



MIL-DTL-83723



MIL-DTL-38999 (QPL)



MIL-DTL-5015



Series 80 Mighty Mouse



## RUGGED RJ45/USB CLASS

# SuperNine®

## IP68 Sealed Solutions

SuperNine® MIL-DTL-38999 type RJ45 and USB connectors with IP68 sealing (mated condition), robust insert-to-shell grounding, and a complete range of wire, cable, and circuit board terminations

- Superior sealing—IP67 unmated—for complete system protection against water, sand and dust
- Highly durable RJ45 design, including enhanced operating temperature, increased life-cycle, and rugged vibration and shock performance
- Shielded/grounded coupler designs in both receptacle and plug connectors
- Crimp, solder-cup, PC tail, and Quadrax contact/wire termination options
- RJ45 plug and/or jack interface options available in Cat 5e or Cat 6a
- Intermateable with other MIL-DTL-38999 type RJ45 field-duty connectors



MIL-DTL-38999 Series III type with sealed RJ45



MIL-DTL-38999 Series III type with USB jack and jumper



High-capacity, high-speed USB data stick

MIL-DTL-38999 SERIES III TYPE

# Ruggedized RJ45 and USB Connectors

The field RJ45 and USB solution with superior sealing, grounding, and wire termination



## SUPERNINE® RJ45 AND USB PRODUCT SELECTION GUIDE



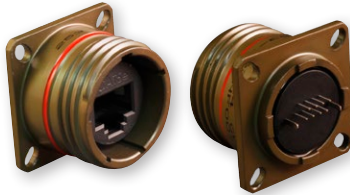
233-300

MIL-DTL-38999 Series III Type Connector/Adapter with RJ45 Jack/Jack or Plug/Plug Couplers



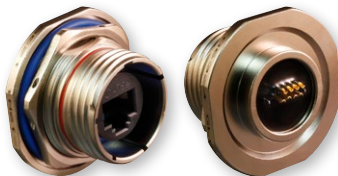
233-301

MIL-DTL-38999 Series III Type Connectors with RJ45 Jack or Plug to Rear Crimp Contact Termination



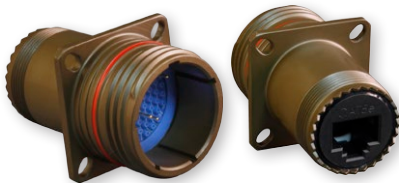
233-302

MIL-DTL-38999 Series III Type Connectors with RJ45 Jack to PC Tail Termination



233-303

MIL-DTL-38999 Series III Type Connectors with RJ45 Jack to Rear Solder Cup Termination



233-304

MIL-DTL-38999 Series III Type Connectors with Pin or Socket Contacts to RJ45 Jack or Plug Interface



233-305

MIL-DTL-38999 Series III Type Connectors with Pin or Socket Quadrax to RJ45 Jack or Plug



233-330

MIL-DTL-38999 Series III Type Feedthrough Receptacle with RJ45 Jack to Jack Coupler



## EMI/EMP FILTER CLASS

# SuperNine®

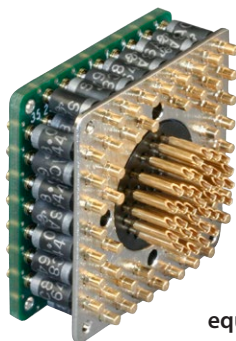
## Filter Connectors



The SuperNine® EMI/EMP filter class includes a full range of plug-and-play solutions for use in EMC/EMP management of electronic systems and interconnect cabling. All connectors are designed in accordance with applicable connector specifications, and are designed to mate with plugs with the same insert configuration and opposite contact gender. Planar filter arrays and TVS diodes may be integrated into both standard catalog as well as build-to-order configurations. Glenair's state-of-the-art diode burn-in process tests leaded and surface mount diodes with leakage current monitored throughout the entire test procedure ensuring field reliability.

- Planar, multilayer ceramic capacitive filters, with and without transient voltage suppression diodes
- C and Pi electrical configurations
- PC tail, crimp or solder cup termination
- 35 – 240,000 pF capacitance
- Fast and reliable diode burn-in and test services
- Turnkey in-house manufacturing of all filter connector elements and processes

Table I: Capacitor Array Code / Capacitance Range		
Class	Pi - Circuit (pF)	C - Circuit (pF)
X	160,000 - 240,000	80,000 - 120,000
Y	80,000 - 120,000	40,000 - 60,000
Z	60,000 - 90,000	30,000 - 45,000
A	38,000 - 56,000	19,000 - 28,000
B	32,000 - 45,000	16,000 - 22,500
C	18,000 - 33,000	9,000 - 16,500
D	8,000 - 12,000	4,000 - 6,000
E	3,300 - 5,000	1,650 - 2,500
F	800 - 1,300	400 - 650
G	400 - 600	200 - 300
J	70-120	35-60



MIL-DTL-38999 Series III Type EMI/EMP solutions: from commercial-off-the-shelf crimp receptacles to unique form-factor EMP diode-equipped designs.

# MIL-DTL-38999 SERIES III TYPE EMI/EMP Filter connectors

Fast, reliable in-house manufacturing plus  
diode burn-in and testing



## MIL-DTL-38999 SERIES III TYPE STANDARD PACKAGING



Crimp Contact  
Filter Receptacles



Printed Circuit Board  
Filter Receptacles

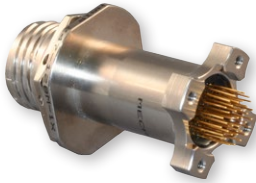


Square Flange and Jam-Nut  
Filter Receptacles



Crimp Contact  
Filtered Plugs

## MIL-DTL-38999 SERIES III TYPE UNIQUE AND SPECIAL PURPOSE EMI/EMP FILTER CONNECTORS



Extended-Shell  
PC-Tail Cylindrical with  
Threaded Standoff



Special-Purpose  
Filter Connector Cable  
Adapter



Side-Car  
EMP Design

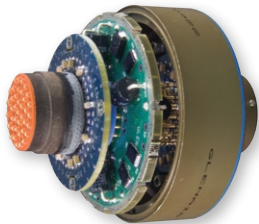


MIL-STD-1760 Insert  
Arrangements



In-Line TVS  
Adapter

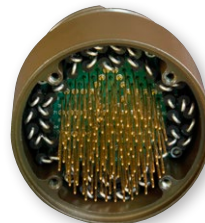
## MIL-DTL-38999 SERIES III TYPE EMP TRANSIENT VOLTAGE SUPPRESSION DIODE-EQUIPPED



EMP Diode-Equipped Connector  
with Oversized Shell



MIL-DTL-38999 Series III Type  
EMP connector



Reduced-Package-Size  
EMI/EMP Cylindrical



MIL-DTL-38999 Series III Type  
EMP Plug with Rectangular Housing

## THE INDUSTRY'S MOST COMPREHENSIVE AND COMPLIANT FILTER SERVICE

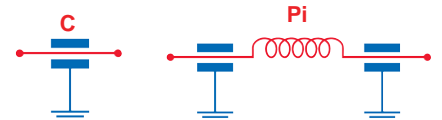
Requirement Compliance:
MIL-STD-449D: RF Spectrum
MIL-STD-461E: EMI Susceptibility
MIL-STD-1310G: Shipboard EMC
MIL-STD-1512: Electroexplosive Subsystems
MIL-STD-1541A: EMC for Space Systems
MIL-STD-1795A: Aerospace Lightning Protection
MIL-STD-1857: Grounding, Bonding and Shielding
MIL-STD-1542B: EMC and Grounding for Space Systems
EN 61000-4-2, 3, 4, 5, 6, 8: EM, RF and Power
RTCA/DO-160 Sec 22: Pin/Cable Level and Waveform

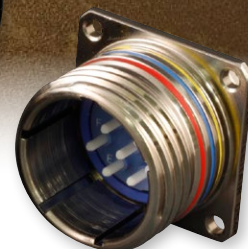
Connector Series:	
38999	83513
Series I, II, III, IV	5015
26482	Sr. 80 Mighty Mouse
83723	Sr. 79 Micro-Crimp
28840	Sr. ITS Reverse-Bayonet
24308	Sr. 28 HiPer-D
ARINC 600	Sr. 970 PowerTrip

Line Types:	
CAN BUS	TTL
ARINC 429	Analog Sensors
RS 232	Thermocouple Wires
RS 422	USB
RS 485	Ethernet

### Filter Types

**C** Single capacitor with low self inductance  
**Pi** Dual capacitors with a single inductive element positioned between.





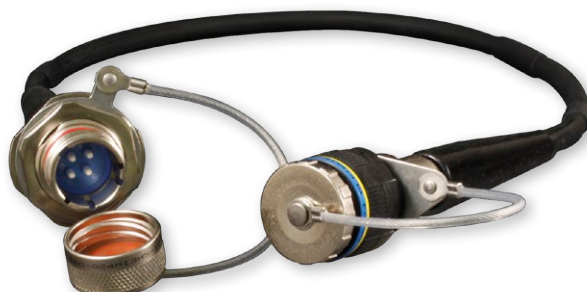
MIL-DTL-38999 Series III type plug and square flange wall-mount receptacle

FIBER OPTIC CLASS

# SuperNine®

## MIL-DTL-38999 Type Fiber optic connection system connection

The high performance fiber optic interconnect system successfully deployed in hundreds of commercial and military aerospace and other applications—from F-16 upgrade systems to the revolutionary F-35 Joint Strike Fighter



Terminated and tested point-to-point and multibranch D38999 type fiber optic cable assemblies

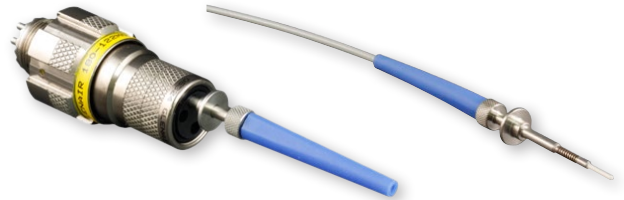
- MIL-DTL-38999 type tight tolerance fiber optic connectors
- Composite, aluminum and stainless steel shells available
- Qualified size #16 MIL-PRF-29504 precision ceramic termini
- Singlemode and multimode fiber, from 9/125 to 1000 microns
- Ultra-low insertion loss values, <.50dB typical
- From 2 to 37 Termini
- Plug and In-Line, Jam Nut and Square Flange Receptacles
- Patented MIL-DTL-38999 fiber optic test probes and adapters

# MIL-DTL-38999 FIBER OPTIC TYPE Advanced Fiber Optic Connection System

Tight-tolerance manufacturing  
and superior optical performance



MIL-DTL-38999 type fiber optic connection system termination, inspection, test, and cleaning tools are available now from Glenair. We also offer comprehensive F/O training services for assembly and maintenance technicians.



Glenair optical fiber test probes and connector adapters provide accurate and repeatable testing of MIL-DTL-38999 F/O assemblies

Glenair M29504/4 and /5 QPL termini are in stock and ready for immediate, same-day shipment



A complete range of metal and composite backshells and protective covers is available



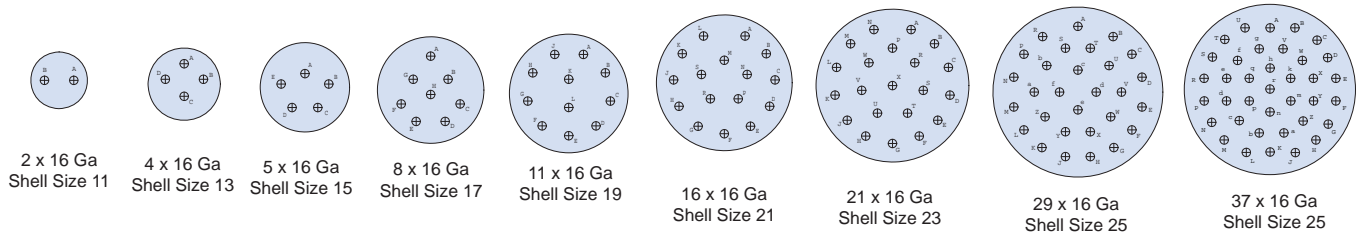
Available Glenair Fiber Optic termination, inspection, and testing training programs for MIL-DTL-38999 and 29504/4 and /5 technologies

MIL-PRF-29504/04 and /05 Fiber Optic Termini Performance Data	
Test Type	Performance Requirement
Operating Temperature	-55°C to +165°C (dependent on epoxy and cable)
Temperature Cycling	-65°C to +175°C
Thermal Shock	-55°C to +150°C, 5 cycles
Temperature Life	+150°C for 1,000 hours
Random Vibration	20-2,000 Hz, 42.2 g's
Shock (Half-sine Pulse)	300 g Peak Load
Mechanical Shock	MIL-S-901, Grade A, Type B, Class I
Mating Durability	500 cycles (cleaning after 100 matings)
Salt Spray	48 hours (Terminus only)
Cable Retention Force	22.0 lbs (dependent on cable construction)

D38999 Type Fiber Optic Connector Part Numbers	
Glenair Dwg. Number*	Product Description
181-001	#16 Socket Terminus
181-002	#16 Pin Terminus
181-048	#16 Dummy Terminus
180-091 (05)	In-Line Receptacle Connector
180-091 (06)	Plug Connector
180-091 (08)	Jam Nut Mount Receptacle Connector
180-091 (H7)	Square Flange Wall Mount Receptacle with Round Holes
180-091 (S7)	Square Flange Wall Mount Receptacle with Slotted Holes
180-091 (T7)	Square Flange Wall Mount Receptacle with Tapped Holes

\* See fiber optic catalog for complete part number information

## INSERT ARRANGEMENTS



Per MIL-STD-1560. Mating face of pin insert shown.



CONNECTOR SAVER CLASS

# SuperNine®

## Savers and Feed-Thrus

The smart solution for preventing contact damage and extending the service life of cable assemblies and mounted receptacles

Sav-Con® connector savers protect connectors that are mated and unmated frequently during manufacturing, test, check-out phases, and environmental test programs. They prevent costly repair or replacement by absorbing connect and disconnect abuse. Glenair Sav-Con® connector savers are available for both standard and high-density SuperNine® insert arrangements. Popular Sav-Con® part numbers, especially for N (normal) polarization are in-stock and ready for immediate, same-day shipment. Glenair also manufactures and supplies Sav-Con® connector savers and bulkhead feed-thrus for a complete range of MS circular and rectangular connectors.



Series changers and gender changers available in both Sav-Con® and bulkhead feed-thru configurations



- Full support for every SuperNine® insert arrangement and polarization
- Traditional plug-receptacle savers, as well as in-line versions and gender changers
- Available EMI/EMP filter savers and adapters
- Bulkhead feed-thrus for environmental, filter and hermetic applications
- Pin/pin, pin/socket, and socket/socket versions
- Optional locking mechanism (recommended for bayonet-style connectors)

# MIL-DTL-38999 SERIES III TYPE AND OTHER Sav-Con® Connector Savers and Bulkhead Feed-Thrus



## FULL RANGE OF MIL-DTL-38999 SERIES III CONFIGURATIONS



MIL-DTL-38999 Series III Type  
Plug/Receptacle Go-Between



MIL-DTL-38999 Series III Type  
Panel Mount Plug Saver



MIL-DTL-38999 Series III Type  
In-Line Go-Between

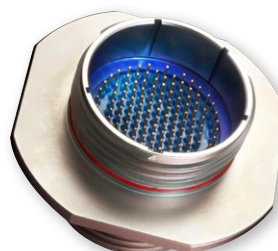


MIL-DTL-38999 Series III  
Type Filtered Adapter

## MIL-DTL-38999 SERIES III TYPE BULKHEAD FEED-THRUS



MIL-DTL-38999 Series III type  
Jam Nut and Square-Flange Bulkhead Feed-Thrus



Special Shielded Contact  
Bulkhead Feed-Thrus

## SAV-CON® SOLUTIONS FOR OTHER CONNECTOR SERIES



MIL-DTL-5015 Type



Series 80 Mighty Mouse



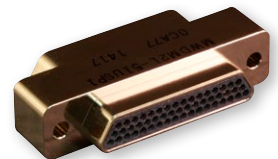
MIL-DTL-38999 Series II



5015 Power

Each Glenair Sav-Con® Connector Saver meets the military specification performance requirements of its mating connector. Glenair manufactures and supplies a Sav-Con® connector saver for every military standard connector currently in use including:

- MIL-DTL-26482 Series I and II
- MIL-DTL-28840
- MIL-DTL-38999 Series I, II and III
- MIL-DTL-83723
- LN 29729 (SJT)
- PATT 105 and PATT 602
- MIL-DTL-5015
- Series 801 and 805 Mighty Mouse
- M24308 D-Subminiature
- MIL-DTL-83513 Micro-D Subminiature
- Series 28 HiPer-D M24308 intermateable
- Series 79 Micro-Crimp



Circular and rectangular configurations are also available, including standard connector go-betweens, gender changers, and series changers

Comprehensive materials, plating, and polarization options available

## Rate Readiness

Manufacturing Readiness Level (“MRL”) measurements are used by US government agencies and some major companies to assess the maturity of a company’s manufacturing readiness and to identify possible risks and shortcomings associated with both products and processes. As immature manufacturing processes may lead to quality problems, delays and other potential problems, MRL’s attempt to determine proactively whether products entering key design and production phases will ultimately be reliable and available according to the known requirements of a program.

In many ways, the goals of a manufacturing (or rate) readiness review should be adequately answered by an operation’s track-record of quality and on-time delivery. A certified quality system, which is put in place to ensure both product and process quality, should also tell the story loud and clear without the need for discrete program-level audits. Glenair is certified to ISO 9001:2008 and AS9100:2009 Rev C, and both of these industry standard systems are specifically geared to ferret out problems before they lead to quality problems, cost over-runs or delays. I say should, because despite the industry’s best efforts to standardize on recognized systems such as AS9100 as a window into a company’s inner workings, many of our customers continue to expend significant resources conducting independent MRL’s and other types of audits to address the specific metrics of their individual business and programs.

Now don’t get me wrong, we are always willing to dance to our customer’s tune. And it is a great source of satisfaction and pride for us at Glenair that our systems and processes are so well managed that we invariably pass these reviews with flying colors. But yes, they are woefully time-consuming. And I frequently bump into key members of our team caught up in the paperwork of an audit who would rather be designing, building and shipping parts.

So this message is for the Glenair team. We have built ourselves a mighty machine. We have all the materials, resources, equipment, space, people and processes to do all the work our customers demand—from one piece to 100,000; from same day delivery to not even one day early; and from commercial-off-the-shelf to custom one-of-a-kind. More to the point, we have all the operational processes in place to do the work consistently and reliably with no attitudinal constraints when it comes to expending more resources when and where they are needed.

So be of good cheer. Think of a rate readiness review as our chance to show our stuff. And who knows, we might even discover a thing or two we could do better along the way. And that is always an outcome we welcome and embrace.



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