In This Issue:

SuperNine®
Advanced Performance MIL-DTL-38999 Series III Style Connectors
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.

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.

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 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 ratched 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

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.
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 subminiature 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.

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—not did the high-speed data networks that require their advanced performance—when the connector series was originally developed in the 70s.

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.

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.

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 X 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

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-aperature 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.
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°C to +40°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.

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.
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
SERIES 23

SuperNine® MIL-DTL-38999 Series III Type

Series Overview

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° to +125°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
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
MIL-DTL-38999 Series III Type
Advanced material performance

RoHS COMPLIANT FINISH OPTIONS

Electroless Nickel
- Cost
- Conductivity
- Corrosion Resistance
- Temperature Range: -65 to +200°C
- Glenair Code: ME

Black Zinc Nickel
- Cost
- Conductivity
- Corrosion Resistance
- Temperature Range: -65 to +175°C
- Glenair Code: ZR

Nickel-PTFE
- Cost
- Conductivity
- Corrosion Resistance
- Temperature Range: -65 to +175°C
- Glenair Code: MT, ZM

Stainless Steel
- Cost
- Conductivity
- Corrosion Resistance
- Temperature Range: -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

<table>
<thead>
<tr>
<th>Mechanical Performance Feature</th>
<th>D38999 Sr. III</th>
<th>SuperNine®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threaded Triple-Start Coupling Design</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Nine Shell Sizes, Range 9 – 25</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Scoop-Proof Shell Design</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Full Mate Visual Indicator</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Integrated Contact Retention System</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Interfacial and Grommet Seals</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Fully Shielded</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Lightning Strike</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Shell-to-Shell Bottoming</td>
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<td>Yes</td>
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<tr>
<td>Threaded/Toothed Accessory Interface</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Full Range of Assembly Tools</td>
<td>Yes</td>
<td>Yes</td>
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<table>
<thead>
<tr>
<th>Connector Class</th>
<th>D38999 Sr. III</th>
<th>SuperNine®</th>
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<tbody>
<tr>
<td>Environmental</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Space-Grade</td>
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<tr>
<td>Hermetic</td>
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<td>Yes</td>
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<tr>
<td>EMI Filter</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>High Durability</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>ESD</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bulkhead Feed-Thru</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Sav-Con® Connector Saver</td>
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<td>Yes</td>
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</table>
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
MIL-DTL-38999 SERIES III TYPE
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
Even our dogs are looking down on you.

White Snobs

Answers Posted
November 14th

www.glenair.com/qwikconnect
HIGH-SPEED CLASS

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

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.
# MIL-DTL-38999 SERIES III TYPE

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

<table>
<thead>
<tr>
<th>Available Contacts (ordered separately)</th>
<th>Glenair P/N</th>
<th>Contact Size</th>
<th>Accommodates AWG Size</th>
<th>Wire Size</th>
<th>Application Notes</th>
</tr>
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<tbody>
<tr>
<td>Coax (per M39029/59 &amp; /60)</td>
<td>Pin: 809-114 Socket: 809-116</td>
<td>16</td>
<td>#16 - #20</td>
<td>RG174, RG316, RG179</td>
<td>Analog Radio Frequency or Microwave Applications</td>
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<td></td>
<td>Pin: 809-118 Socket: 809-120</td>
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<td>#12 - #14</td>
<td>RG174, RG316, RG179</td>
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<tr>
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<td>Pin: 852-007 Socket: 852-006</td>
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<td>#22 - #28</td>
<td>M17/95-RG180</td>
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<tr>
<td>El Ochito*</td>
<td>Pin: 858-003 Socket: 858-004</td>
<td>8</td>
<td>#22 - #28</td>
<td>963-003-26</td>
<td>1G/10G Base-T Ethernet</td>
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<tr>
<td>Quadrax</td>
<td>Pin: 854-001 Socket: 854-002</td>
<td>8</td>
<td>#22 - #28</td>
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<td>#22 - #28</td>
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<td>1553 Databus</td>
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### High Speed Contact Arrangement

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<th>Shell Size</th>
<th>Number of Contacts</th>
<th>Shell Size - Insert Arr.</th>
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<tr>
<td>09</td>
<td>#22 1  #20 1  #16 1</td>
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<tr>
<td>11</td>
<td>#22 2  #12 1</td>
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<td>17</td>
<td>#22 2</td>
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<td>25</td>
<td>#22 8</td>
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### High Speed Combo Contact Arrangement

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<td>17</td>
<td>#22 17</td>
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</tbody>
</table>

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®

Glass-Sealed Connectors

Resolve gas, moisture and particle ingress problems with SuperNine® 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 <1X10⁻⁷ cc/sec to 1X10⁻¹⁰

MIL-DTL-38999 QPL AND COMMERCIAL PIN AND SOCKET HERMETICS
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/SHELDED 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
MIL-DTL-38999 Series III type with sealed RJ45

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

**Ruggedized RJ45 and USB Connectors**

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

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>233-300</td>
<td>MIL-DTL-38999 Series III Type Connector/Adapter with RJ45 Jack/Jack or Plug/Jack Couplers</td>
</tr>
<tr>
<td>233-301</td>
<td>MIL-DTL-38999 Series III Type Connectors with RJ45 Jack or Plug to Rear Crimp Contact Termination</td>
</tr>
<tr>
<td>233-302</td>
<td>MIL-DTL-38999 Series III Type Connectors with RJ45 Jack to PC Tail Termination</td>
</tr>
<tr>
<td>233-303</td>
<td>MIL-DTL-38999 Series III Type Connectors with RJ45 Jack to Rear Solder Cup Termination</td>
</tr>
<tr>
<td>233-304</td>
<td>MIL-DTL-38999 Series III Type Connectors with Pin or Socket Contacts to RJ45 Jack or Plug Interface</td>
</tr>
<tr>
<td>233-305</td>
<td>MIL-DTL-38999 Series III Type Connectors with Pin or Socket Quadrax to RJ45 Jack or Plug</td>
</tr>
<tr>
<td>233-330</td>
<td>MIL-DTL-38999 Series III Type Feedthrough Receptacle with RJ45 Jack to Jack Coupler</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Class</th>
<th>Pi - Circuit (pF)</th>
<th>C - Circuit (pF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>160,000 - 240,000</td>
<td>80,000 - 120,000</td>
</tr>
<tr>
<td>Y</td>
<td>80,000 - 120,000</td>
<td>40,000 - 60,000</td>
</tr>
<tr>
<td>Z</td>
<td>60,000 - 90,000</td>
<td>30,000 - 45,000</td>
</tr>
<tr>
<td>A</td>
<td>38,000 - 56,000</td>
<td>19,000 - 28,000</td>
</tr>
<tr>
<td>B</td>
<td>32,000 - 45,000</td>
<td>16,000 - 22,500</td>
</tr>
<tr>
<td>C</td>
<td>18,000 - 33,000</td>
<td>9,000 - 16,500</td>
</tr>
<tr>
<td>D</td>
<td>8,000 - 12,000</td>
<td>4,000 - 6,000</td>
</tr>
<tr>
<td>E</td>
<td>3,300 - 5,000</td>
<td>1,650 - 2,500</td>
</tr>
<tr>
<td>F</td>
<td>800 - 1,300</td>
<td>400 - 650</td>
</tr>
<tr>
<td>G</td>
<td>400 - 600</td>
<td>200 - 300</td>
</tr>
<tr>
<td>J</td>
<td>70-120</td>
<td>35-60</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Requirement Compliance:</th>
<th>Connector Series:</th>
<th>Line Types:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL-STD-449D: RF Spectrum</td>
<td>38999</td>
<td>CAN BUS</td>
</tr>
<tr>
<td>MIL-STD-461E: EMI Susceptibility</td>
<td>Series I, II, III, IV</td>
<td>ARINC 429</td>
</tr>
<tr>
<td>MIL-STD-1310G: Shipboard EMC</td>
<td>83513</td>
<td>Analog Sensors</td>
</tr>
<tr>
<td>MIL-STD-1512: Electroexplosive Subsystems</td>
<td>26482</td>
<td>RS 232</td>
</tr>
<tr>
<td>MIL-STD-1541A: EMC for Space Systems</td>
<td>83723</td>
<td>Thermocouple Wires</td>
</tr>
<tr>
<td>MIL-STD-1795A: Aerospace Lightning Protection</td>
<td>28840</td>
<td>RS 422</td>
</tr>
<tr>
<td>MIL-STD-1857: Grounding, Bonding and Shielding</td>
<td>24308</td>
<td>USB</td>
</tr>
<tr>
<td>MIL-STD-1542B: EMC and Grounding for Space Systems</td>
<td>ARINC 600</td>
<td>RS 485</td>
</tr>
<tr>
<td>EN 61000-4-2, 3, 4, 5, 6, 8: EM, RF and Power</td>
<td>Sr. 79 Micro-Crimp</td>
<td>Ethernet</td>
</tr>
<tr>
<td>RTCA/DO-160 Sec 22: Pin/Cable Level and Waveform</td>
<td>Sr. ITS Reverse-Bayonet</td>
<td>Rs. 28 HiPer-D</td>
</tr>
<tr>
<td></td>
<td>Sr. 970 PowerTrip</td>
<td></td>
</tr>
</tbody>
</table>

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

- 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

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

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

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

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

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### MIL-PRF-29504/04 and /05 Fiber Optic Termini Performance Data

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Performance Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-55°C to +165°C (dependent on epoxy and cable)</td>
</tr>
<tr>
<td>Temperature Cycling</td>
<td>-65°C to +172°C</td>
</tr>
<tr>
<td>Thermal Shock</td>
<td>-55°C to +150°C, 5 cycles</td>
</tr>
<tr>
<td>Temperature Life</td>
<td>+150°C for 1,000 hours</td>
</tr>
<tr>
<td>Random Vibration</td>
<td>20-2,000 Hz, 42.2 g’s</td>
</tr>
<tr>
<td>Shock (Half-sine Pulse)</td>
<td>300 g Peak Load</td>
</tr>
<tr>
<td>Mechanical Shock</td>
<td>MIL-S-901, Grade A, Type B, Class I</td>
</tr>
<tr>
<td>Mating Durability</td>
<td>500 cycles (cleaning after 100 matings)</td>
</tr>
<tr>
<td>Salt Spray</td>
<td>48 hours (Terminus only)</td>
</tr>
<tr>
<td>Cable Retention Force</td>
<td>22.0 lbs (dependent on cable construction)</td>
</tr>
</tbody>
</table>

### D38999 Type Fiber Optic Connector Part Numbers

<table>
<thead>
<tr>
<th>Glenair Dwg. Number*</th>
<th>Product Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>181-001</td>
<td>#16 Socket Terminus</td>
</tr>
<tr>
<td>181-002</td>
<td>#16 Pin Terminus</td>
</tr>
<tr>
<td>181-048</td>
<td>#16 Dummy Terminus</td>
</tr>
<tr>
<td>180-091 (05)</td>
<td>In-Line Receptacle Connector</td>
</tr>
<tr>
<td>180-091 (06)</td>
<td>Plug Connector</td>
</tr>
<tr>
<td>180-091 (08)</td>
<td>Jam Nut Mount Receptacle Connector</td>
</tr>
<tr>
<td>180-091 (H7)</td>
<td>Square Flange Wall Mount Receptacle with Round Holes</td>
</tr>
<tr>
<td>180-091 (S7)</td>
<td>Square Flange Wall Mount Receptacle with Slotted Holes</td>
</tr>
<tr>
<td>180-091 (T7)</td>
<td>Square Flange Wall Mount Receptacle with Tapped Holes</td>
</tr>
</tbody>
</table>

* See fiber optic catalog for complete part number information

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### INSERT ARRANGEMENTS

- 2 x 16 Ga Shell Size 11
- 4 x 16 Ga Shell Size 13
- 5 x 16 Ga Shell Size 15
- 8 x 16 Ga Shell Size 17
- 11 x 16 Ga Shell Size 19
- 16 x 16 Ga Shell Size 21
- 21 x 16 Ga Shell Size 23
- 29 x 16 Ga Shell Size 25
- 37 x 16 Ga Shell Size 25

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.

- 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 AS9110:2009 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 AS9110 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.

Chris Toomey