



Glencair[®]

**SPACE-GRADE
INTERCONNECT
SOLUTIONS**

RELIABILITY · AVAILABILITY · PERFORMANCE



PROVEN FLIGHT HERITAGE

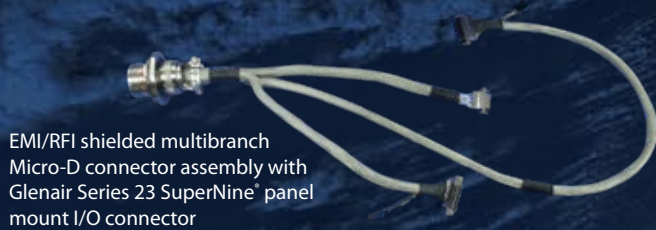
SPACE-GRADE SOLUTIONS

NASA · ESA · JAXA · Commercial



Complex space-grade cable assemblies (shown: Glenair-made "Golden Umbilical")

SPACE-GRADE WIRE HARNESS ASSEMBLIES



EMI/RFI shielded multibranch Micro-D connector assembly with Glenair Series 23 SuperNine® panel mount I/O connector



Multibranch Micro-D / Mighty Mouse cable assembly with ArmorLite™ lightweight EMI shield overbraiding

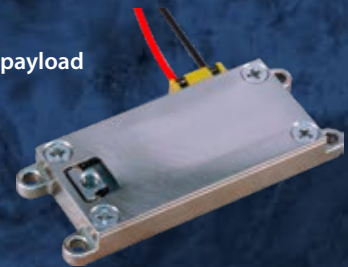
HD STACKER™



High-density (.0625" pitch) board-to-board stacking connector with solder-free press-fit (compliant pin) board mounting

HOLD-DOWN RELEASE MECHANISMS (HDRMS)

Light Duty
Up to 75 lb release payload



Medium Duty
Up to 1,000 lb release payload



Heavy Duty
Up to 20,000 lb release payload



LATCHING MICROSTRIPS™



Latching MicroStrips™: cable-to-cable and cable-to-board reduced size- and weight Micro-D TwistPin connectors

CERTIFIED ECSS-E-ST-50-12C SPACEWIRE CABLES



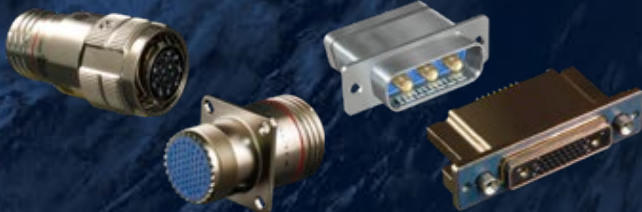
ESA, NASA, JAXA, and RKA approved SpaceWire cables for both laboratory test and space flight applications

FIBER OPTIC CONNECTORS, CABLES, AND PHOTONIC MEDIA CONVERSION



High-speed, high-bandwidth space-grade solutions

EMI/RFI FILTER CONNECTORS



MIL-DTL-38999 type, Series 80 Mighty Mouse, and other circulars

HiPer-D and Micro-Crimp filtered rectangulars

SPACE-GRADE 83513 MICRO-D AND 32139 NANO



ESA and NASA screened connectors and backshells available as discrete components or wired pigtail assemblies

SERIES 28 HIPER-D M24308 INTERMATEABLE



Qualified MIL-DTL-24308 Class K Space-Grade Hermetic, environmental, filter, Sav-Con's and cordsets

LIGHTWEIGHT MIGHTY MOUSE AND MICRO-CRIMP



Small, lightweight, high-density ideally suited for space programs

A proven product, ideal for guidepin and rack-and-panel applications

SAV-CON® CONNECTOR SAVERS



Available for every military and commercial circular and rectangular connector series

ULTRA-LIGHTWEIGHT CONDUIT AND BRAID



Factory-terminated and user-installable conduit systems

Weight-saving microfilament EMI braided shielding solutions

ASSISTED-RELEASE, AND LANYARD QUICK-DISCONNECTS




Blind mate D38999 type feedthrough with kick-off assist

Lanyard-release quick-disconnects

SPACE-QUALIFIED HERMETIC RECEPTACLES



Glass-to-metal and CODE RED encapsulant hermetic solutions for high-pressure / low-leakage space applications



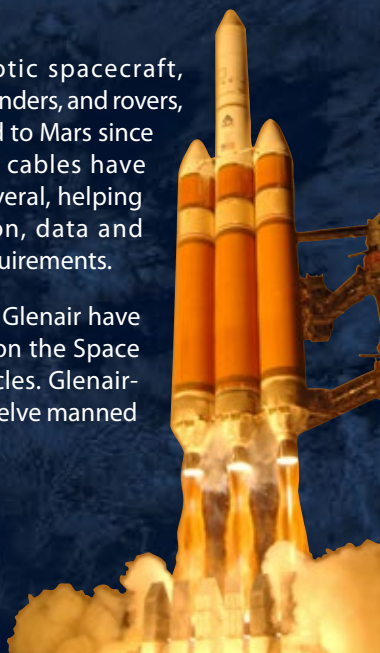
SPACE-GRADE Complex Cable Assemblies

We like to begin our presentation of Glenair's proven-performance space-grade products with the golden umbilical life support cable used by Commander Ed White in the first American space walk in 1965. This was a complex cable assembly with an exacting set of performance requirements. Even though this application is now over 50 years old, it still reflects Glenair's design and fabrication expertise and that we have been a go-to supplier for the space industry for almost 5 decades. Today we continue to fabricate high-performance cables for space, from rugged Viton® overmolded designs to ultra-lightweight SpaceWire jumpers for the high-speed space data transmission protocol. Other notable space cable applications include:



- Complex interconnect cable assemblies made by Glenair have also traveled to and from orbit dozens of times on the Space Shuttle, as well as numerous space-launch vehicles. Glenair-made interconnect harnesses also served on all twelve manned Gemini capsules.

- Dozens of robotic spacecraft, including orbiters, landers, and rovers, have been launched to Mars since the 1960s. Glenair cables have ridden along on several, helping to fulfill navigation, data and communication requirements.



Commander Ed White on the first American spacewalk, 1965 with Glenair-manufactured "Golden Umbilical" cable

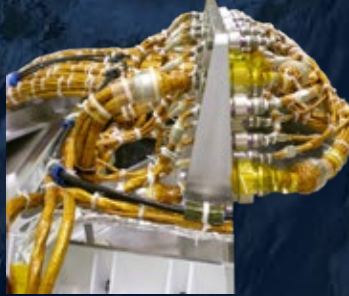
PROVEN PERFORMANCE IN SPACE

- The "Golden Umbilical" life-support cable
- JPL Mars probes (orbiters, landers, and the Curiosity rover)
- AIRS satellite
- Gravity Probe mission
- Space Shuttle
- Titan II launch vehicles
- SpaceWire (MIL-DTL-83513)

COMPLEX MULTIBRANCH AND OVERMOLDED CABLE ASSEMBLIES



Multibranch wire harness for a space lab application



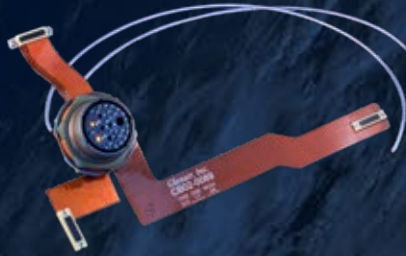
Complex Mighty Mouse cable harness for a Mars rover application



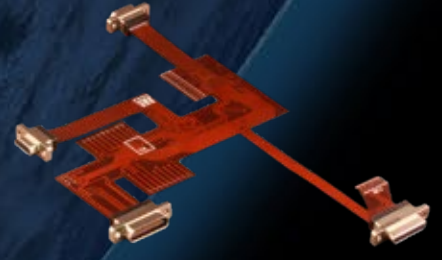
ESA and NASA screened Micro-D/Nano cable assembly



Space-grade Micro-D flex assembly with NASA EEE-INST-002 screening



Hybrid flex/rigid flex multibranch Micro-D flex assembly with discrete RF circuits



Micro-D subminiature multibranch flex assembly

TURNKEY FACTORY-TERMINATED CONDUIT ASSEMBLIES



Complex multibranch high altitude electrical wire conduit assembly

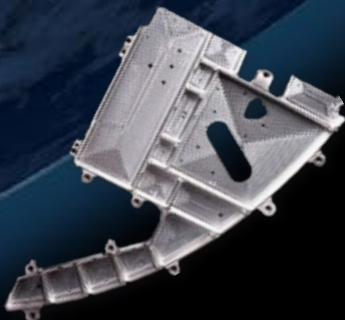


Lightweight, halogen-free wire conduit assembly



Crush-resistant aerospace metal-core conduit assembly

AEROSPACE-GRADE INTEGRATED SYSTEMS



+



=



Precision-machined, injection molded or stamped-and-formed boxes and structural members

Military-aerospace and space-grade multibranch interconnect cable assembly staff and facilities

Turnkey integrated system assemblies



SERIES 06 HDRM

Pyrotechnic-Free Space Mechanisms

High-reliability, non-explosive (split-spool) HDRMs, separation nuts, and pin pullers/pushers for dependable stowage and release of deployable space systems



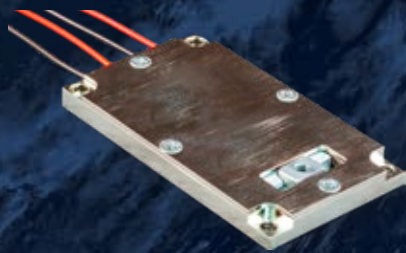
Glenair pyrotechnic-free release mechanisms offer quick release time, low shock, relatively low power input, and virtually no temperature sensitivity. HDRM Series includes separation nuts, pin pushers, and pin pullers—direct wired or connectorized—with a broad range of preload carrying capacity.

- Pyrotechnic-free alternative (low-shock fuse-wire) for single-event release of deployable space systems—electrical initiation up to 5 amps
- User-serviceable and refurbishable units
- Redundant or non-redundant actuation circuit
- Not susceptible to transient and noise (EMI/EMP/ESD/RFI) inputs
- Extended temperature ranges: -150°C to +150°C

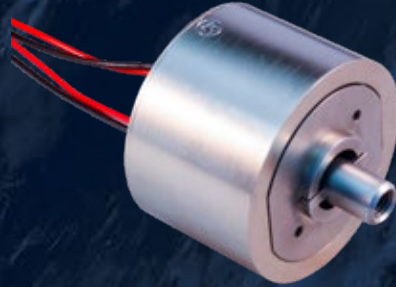
SERIES 06 HDRM
**Pyrotechnic-Free
 Space Mechanisms**
 Product selection guide



HDRM DUTY CLASSES



Light-Duty HDRM
 Redundant circuit,
 5 – 75 lb release preload



Medium-Duty HDRM
 Redundant circuit,
 300 – 2500 lb release preload

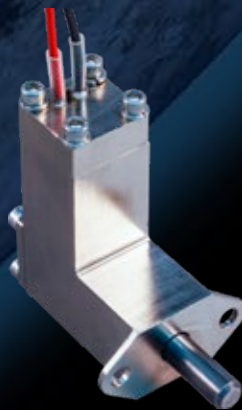


Heavy-Duty HDRM
 Redundant circuit,
 5000 – 20,000 lb release preload

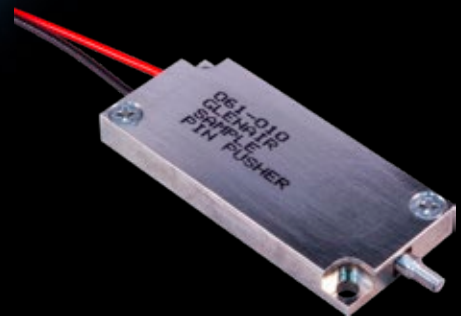
HDRM RELEASE TYPES



Separation nut



Pin puller



Pin pusher

DEPLOYMENT APPLICATIONS



Solar Arrays



Booms and Masts



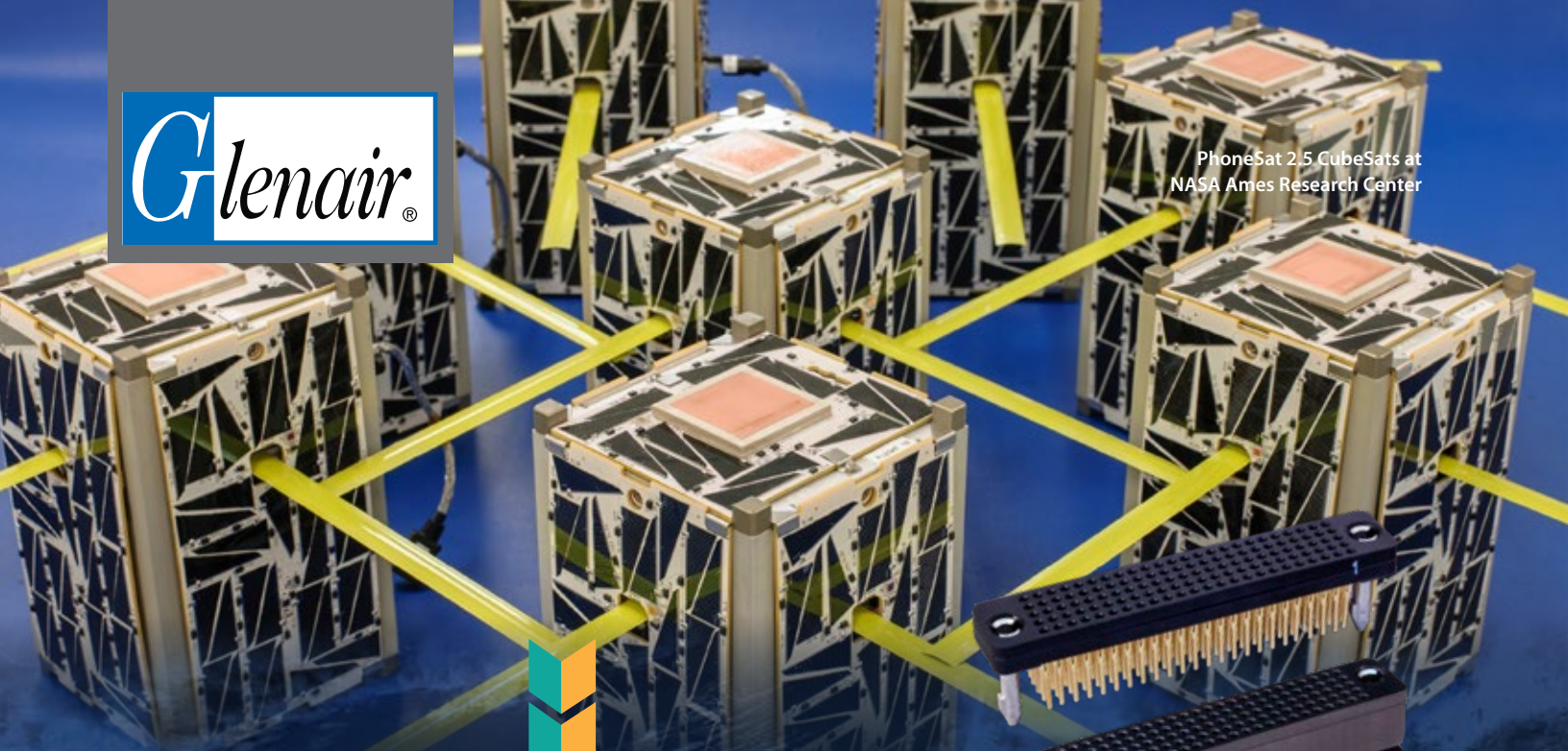
Antennas



Reflectors



PhoneSat 2.5 CubeSats at NASA Ames Research Center



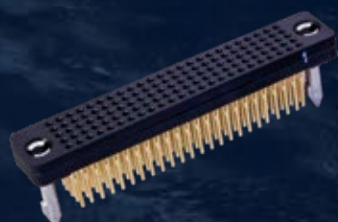
HD STACKER™

High-density, solder-free, PCIe-ready board-to-board stackable connectors

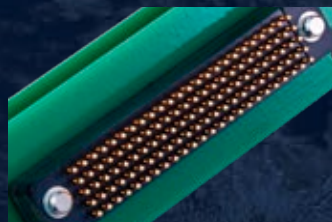
Mission-critical board-to-board connector applications demand fail-safe signal integrity as well as rugged and reliable harsh-environment performance. The HD Stacker™ brings Glenair innovation to stacking board-to-board connectors with several significant design improvements: Ultra high-density .0625" Chevron Contact System provides 55% more contacts per connector size, or a 31% size reduction for the same number of contacts as compared to current industry solutions. Polarized connector bodies and available polarized guide pins prevent accidental mismatching. The solder-free press-fit compliant pin contacts are removable, repairable, and available in custom lengths. HD Stacker™ connectors may also be ordered with pre-wired cable or flex jumper terminations. High-speed signal integrity test reports are available upon request. Choose HD Stacker™ for the ultimate in high-density, rugged board-to-board stackable connector performance.

- High-density .0625" pitch Chevron Contact System
- PCIe Rev 3 capable
- Signal integrity to 10.5Gb/sec.
- Polarized insulator and hardware options
- Solder free "eye of the needle" compliant tail for press fit installation
- High-temp PPS insulator meets NASA outgassing requirements
- Available wired / flex jumpers
- Available between-board spacers up to 1 inch

HD STACKER™ FOR MISSION-CRITICAL BOARD-TO-BOARD APPLICATIONS



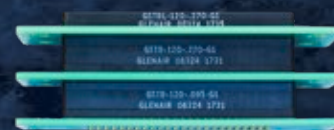
Solder-free press-fit (compliant pin) board mounting



.0625" pitch contact spacing: highest available density



Polarized shells and keyed guide pin hardware prevent mis-mating



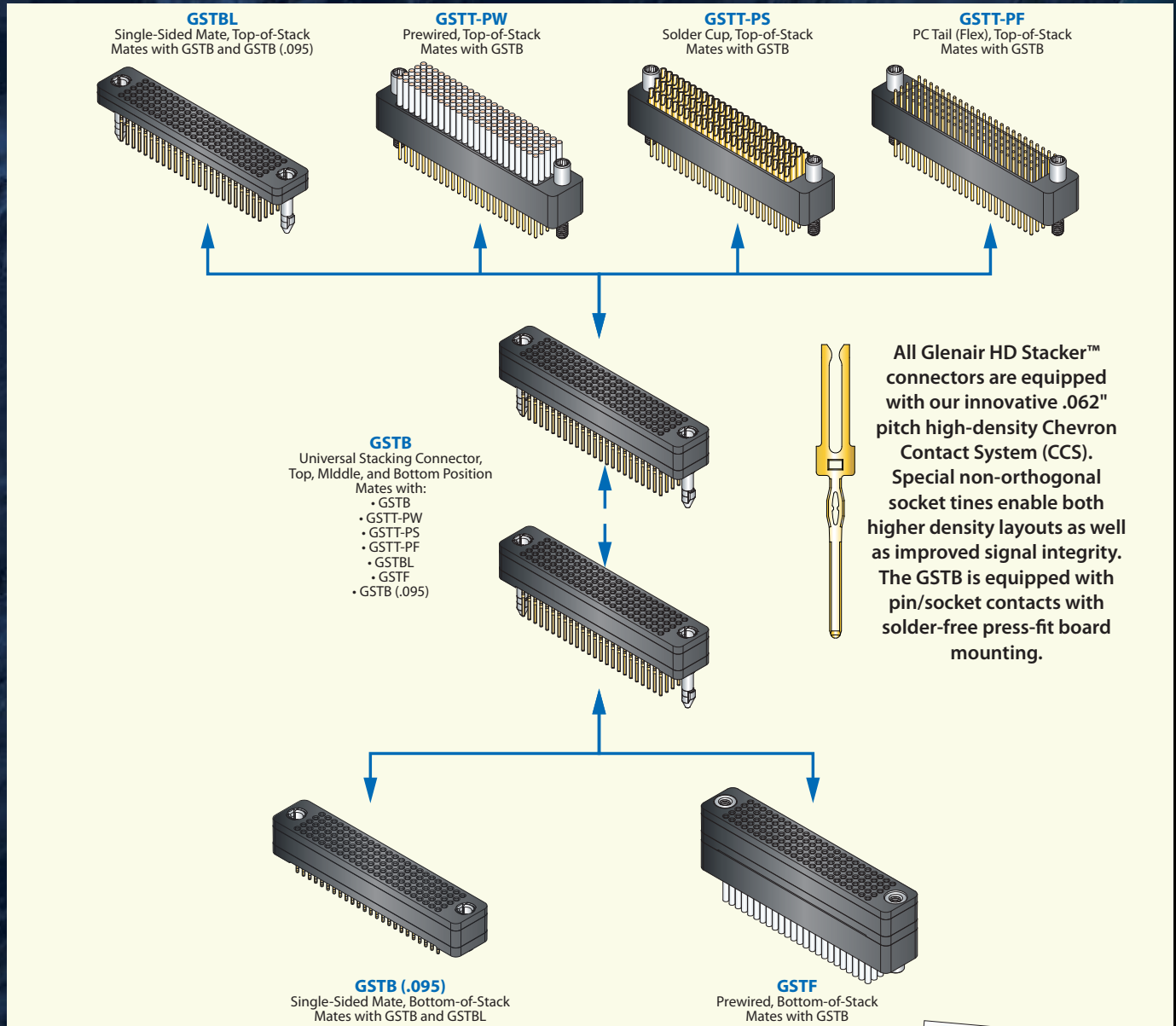
Controlled signal integrity for differential applications (PCIe Rev 3 capable)

.0625" PITCH COMPLIANT PIN High-Density Stacker™



Rugged board-to-board stackable connectors

HD STACKER™ POSITION AND MATING COMPATIBILITY GUIDE



QUALIFICATION TESTING / HIGH-SPEED PERFORMANCE

Stacker connectors were qualified in accordance with MIL-DTL-55302G testing for:

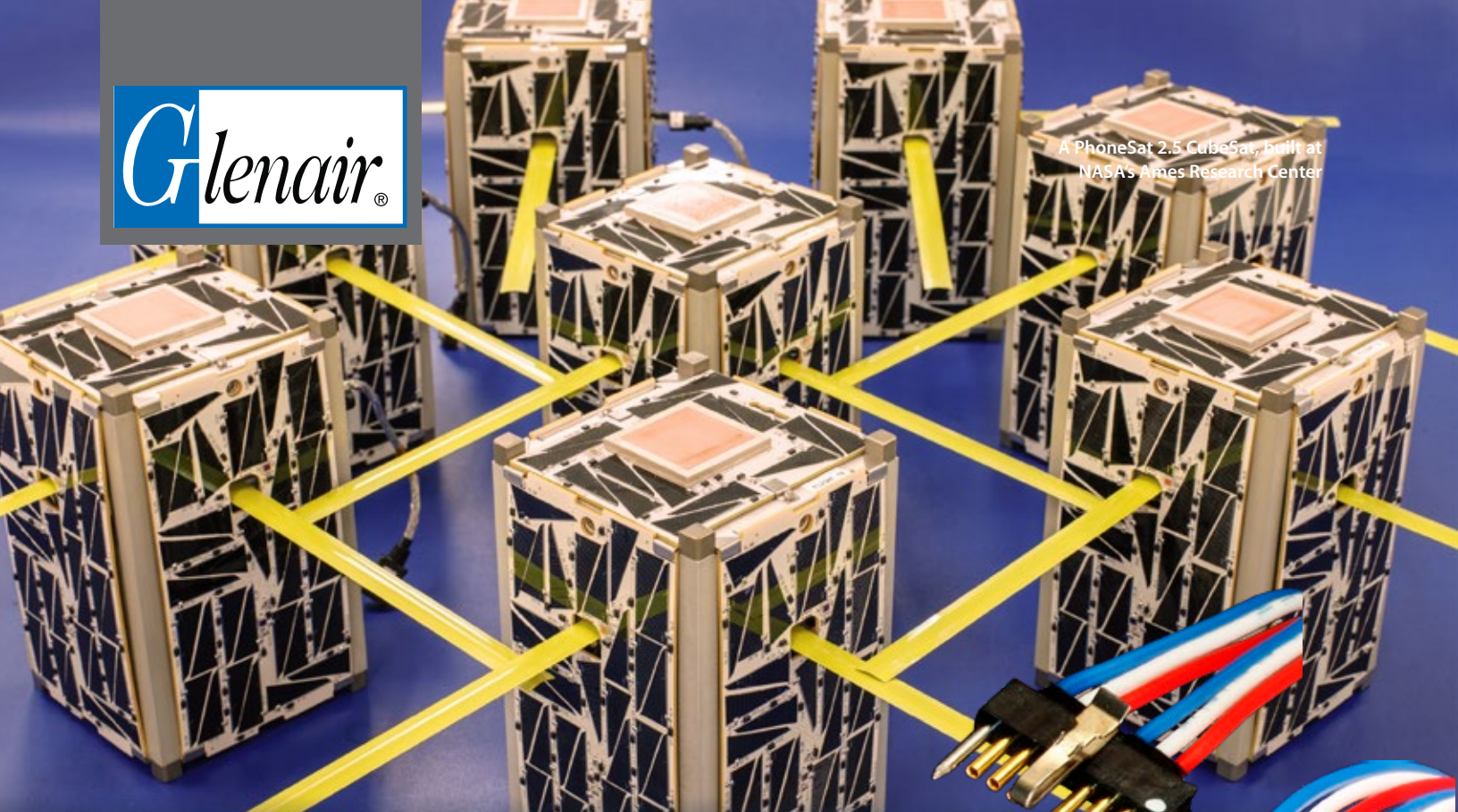
- Contact engagement/separation
- Contact retention
- DWV
- Electrical resistance
- Mechanical vibration and shock
- Insulation resistance
- Thermal shock
- Contact resistance
- Humidity

High-frequency electrical performance tests were performed for: Insertion loss, return loss, crosstalk, and time domain performance metrics including impedance and eye pattern. Complete test reports are available at www.Glenair.com/technical_information_test_reports





A PhoneSat 2.5 CubeSat, built at NASA's Ames Research Center



SERIES 171

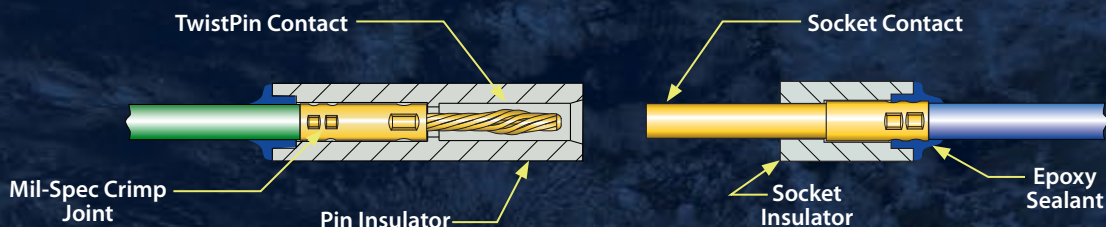
Latching MicroStrips™

TwistPin performance and durability in an economical, space-saving single row package

Series 171 MicroStrips™ are made for high-reliability wire-to-board and wire-to-wire applications. These high-density strip connectors are typically used in ruggedized 3 Amp signal applications, where higher-performance contacts, precision machined shells and space-grade dielectrics offer significant advantages compared to commercial-grade headers and jumpers. Glenair's rugged, high force TwistPin contact accepts up to #24 gage wire, the current rating is 3 Amps, the voltage rating is 600 Vac, and the temperature rating is -55C to +150C. The Series 171 Latching MicroStrip connector meets all applicable requirements of MIL-DTL-83513. Choose solder cup, pre-wired, or printed circuit board versions. A stainless steel latch provides secure coupling.

- High-reliability TwistPin contact system
- #24-30 AWG wire size
- .050" pitch contact spacing
- Solder cup, pre-wired or PCB header terminations
- 3 Amps, +150C, 600 Vac

LATCHING MICROSTRIP™ CROSS-SECTIONAL VIEW



SERIES 171

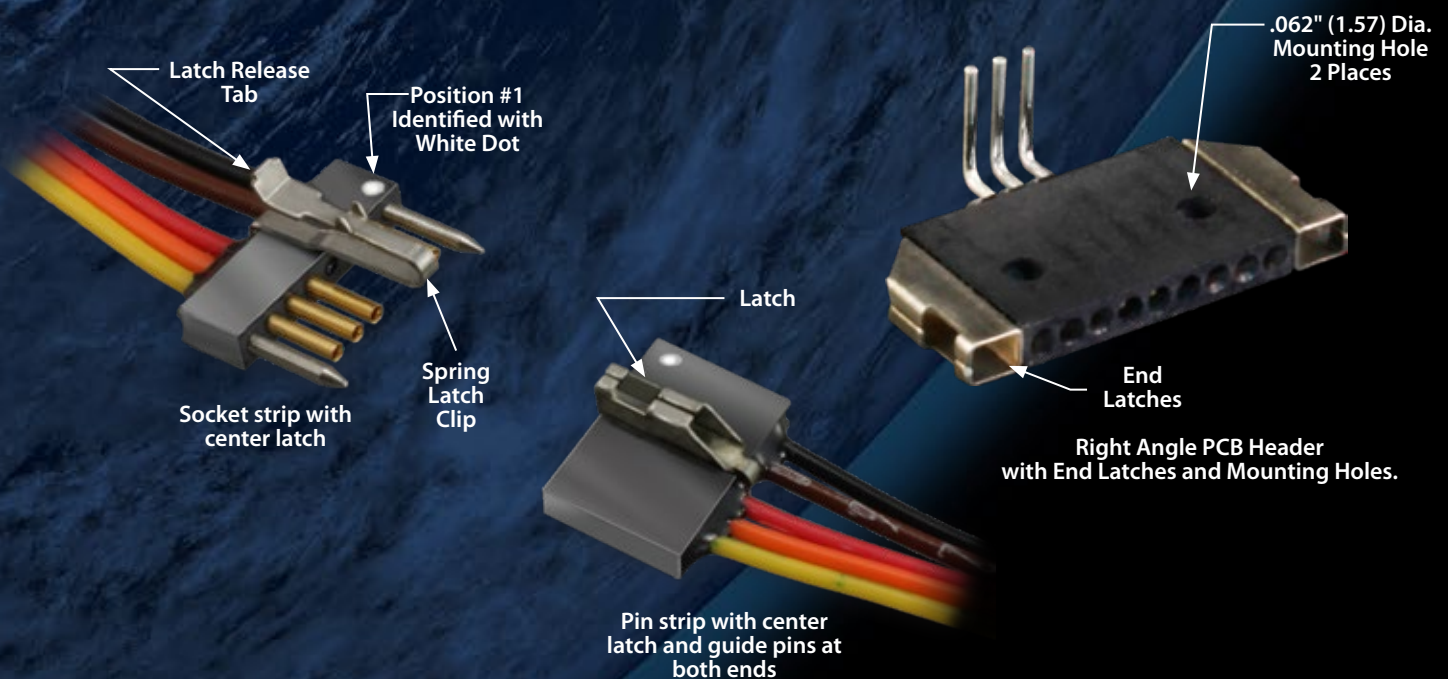
Latching MicroStrips™

Superior TwistPin contact performance



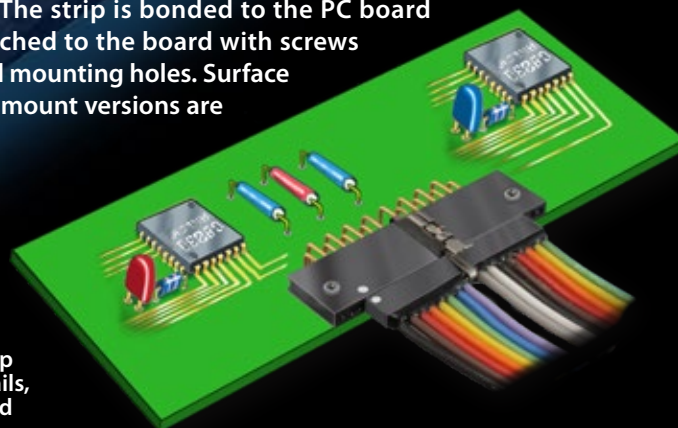
ABOUT SPRING LATCHES, GUIDE PINS AND MOUNTING HOLES

Optional stainless steel latch clips provide secure mating when subjected to shock and vibration. A single center latch is suitable for most applications. Dual end latches are also available. The spring latch is always installed on the socket strip. The latch receiver is installed on the pin strip. To unmate the connectors, simply press the release tab while pulling the connectors apart. MicroStrips™ are available with stainless steel guide pins. A single guide pin provides circuit polarization. A guide pin on each end helps to align connectors when mating and prevents damage to contacts. For most applications the preferred configuration is a single center latch with no guide pins. Mounting holes are now available. Attach strips to circuit boards with size 0-80 screws (customer-supplied).



ABOUT BOARD MOUNT STRIPS

Space customers typically use MicroStrips™ for high reliability board-to-wire I/O applications. The pin strip is usually configured with right angle thru-hole PC tails. The strip is bonded to the PC board with epoxy, or attached to the board with screws installed in optional mounting holes. Surface mount and vertical mount versions are also available.



Right angle pin strip with staggered PC tails, mounting holes and center latch

SINGLE ROW BACK-TO-BACK MICROSTRIPS



.050" pitch single row surface mount back-to-back microstrip



Physical layer SpaceWire router aboard the James Webb Space Telescope (NASA)

SpaceWire Cable Assemblies

Flight- and lab-grade SpaceWire qualified cable assemblies for IEEE 1355 space network node interconnection of routers, switches, recorders, transceivers, and other physical layer devices

The success of any space mission begins with reliable data transmission and Glenair SpaceWire cables, built to meet the strict standards set forth by ECSS-E-ST-50-12C make this a reality. Our SpaceWire cables offer bidirectional, high speed data transmission rates up to 400 Mbits/s while significantly reducing cross talk, skew, and signal attenuation. By incorporating a serial, point-to-point cable, with low voltage differential signaling (LVDS) reduced costs are realized through an easily integrated data transmission cable. These features allow SpaceWire cables to be incorporated across various satellite data transmission programs without the expense of costly design customization.

Glenair SpaceWire assemblies begin with a high performance cable built with expanded polytetrafluoroethylene (ePTFE) insulation. This material allows for low-loss transmission of LVDS signals, maximizing data-rates while allowing for the implementation of standard hardware protocols, thus eliminating the need for design customization and long lead time cable projects.

TYPICAL USES INCLUDE

- EGSE applications
- Radar sensor systems
- Hi-resolution camera equipment
- Sensor, mass-memory unit, and telemetry subsystem interconnections

APPROVED FOR USE BY:

- ESA
- NASA
- JAXA
- RKA

CONNECTOR/CABLE

- Laboratory and space-grade versions available
- Qualified MIL-DTL-83513 Micro-D connectors
- Gold-plated copper alloy TwistPin contacts
- Basic cable, 4 twisted pair cables and a ground
- Epoxy resin potting
- EMI banding backshell

PERFORMANCE

- 3 Amps
- Temperature tolerance -200° to 180° C
- 100 Ω impedance shielded signal pair
- Very low skew, signal attenuation and crosstalk
- 65dB minimum attenuation shielding effectiveness
- Low magnetic permeability IAW EIA-364-54

POINT-TO-POINT AND SINGLE-ENDED SpaceWire cable assemblies



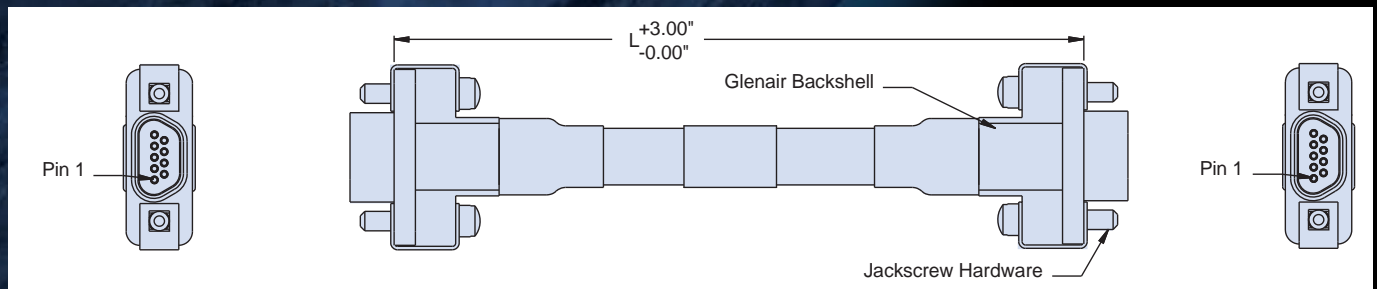
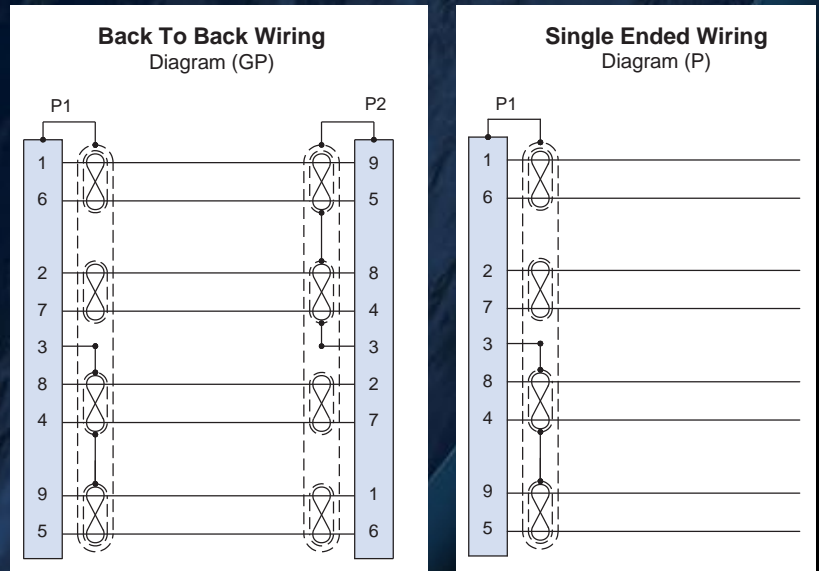
Technical specifications / how-to-order

NOTES:

1. Flight grade (cable Type F) assemblies to be screened IAW NASA EEE-INST-002, Table 2. Level 1 with 100% thermal vacuum outgassing (24 hours/+125°C/10⁻⁶ torr). Reference Glenair Mod Code 429C.
2. Operating temperature - 200°C to +180°C. Reference Glenair Mod Code 428.
3. Electrical performance:
Dielectric withstanding voltage: 600 VAC.
Insulation resistance: 5000 megohms @500 VDC.
4. Assembly to be identified with Glenair's name, Part Number, Cage Code and Date Code or ESCC Component Part Marking Standards.

MATERIALS/FINISH:

- Shells/backshells - aluminum alloy/electroless nickel.
- Insulators - high grade rigid dielectric/N.A.
- Contacts - copper alloy, gold plated.
- Hardware - stainless steel/passivated.



How To Order Spacewire

Sample Part Number	GSWM 2 L -9 GP -6 F B -16 S
Product Series	GSWM —Glenair Spacewire Micro-D
Shell Plating	2 —Electroless Nickel 5 —Gold
Insulator Material	L —LCP
Shell Size	-9
Connector Type	P —Single Ended Pin (Plug) GP —Pin (Plug) Connector Both Ends
Wire Gauge	-6 —26 AWG -8 —28 AWG -0 —30 AWG (30 AWG—Lab Only)
Cable Type	F —Flight Grade L —Lab Grade
Termination Option	B —Backshell
Cable Length In Inches	-16 = 16 inches (12 inches minimum)
Hardware	S —Male Slotted Jackscrew P —Female Jackpost



ESA's TV-4 Albert Einstein Automated Transfer Vehicle approaching the Zvezda Service Module of the ISS



FIBER OPTICS

High-performance fiber optic connectors, cables, termini, and assemblies

Glenair high performance fiber optic interconnect systems have been successfully deployed in hundreds of commercial and military aerospace applications

GLENAIR INNOVATIVE FIBER OPTIC CONNECTOR BACKSHELLS



Special-purpose fiber optic accessories, available exclusively from Glenair, optimize termini axial alignment and prevent bend radius damage

Glenair High Density GHD fiber optic connection system features integrated alignment sleeve retainers and #18 keyed and non-keyed termini types for singlemode and multimode F/O applications

ABOUT GLENAIR GHD

- Innovative #18 (1.25mm ferrule) front-release genderless termini accommodate 900 μ to 2.0mm jacketed fiber
- M85045/16 cable accommodation
- Composite, aluminum and stainless steel shells available
- Single keying for APC polish available
- Better optical performance than D38999 with nearly double the density
- Precision alignment sleeve retainer with integrated guide pins
- Piston O-ring sealing—submersible design

GLENAIR BUTT-JOINT FIBER OPTIC INTERCONNECT SOLUTIONS



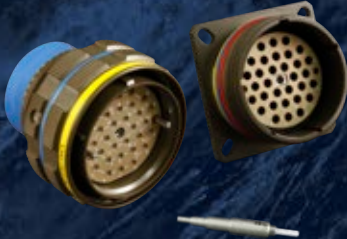
MIL-DTL-38999 type fiber optic



Glenair High Density (GHD) fiber optic



Glenair Front Release (GFR) fiber optic



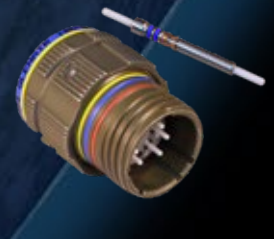
ARINC 801 type fiber optic



MT Ferrule 38999 type fiber optic



NGCON MIL-PRF-64266 fiber optics

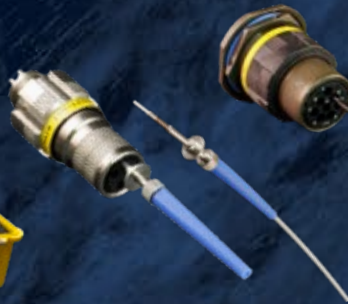


Fiber optic Sav-Con® connector savers

TOOL KITS AND TRAINING



Fiber Optic termination and maintenance kits



Fiber optic test probes and adapters



Dry-wipe fiber optic cleaning tools



On-site fiber optic technician certification training



TURNKEY FIBER OPTIC BREAKOUT CABLES AND RUGGEDIZED ASSEMBLIES



Glenair High Density (GHD) fiber optic assembly



Glenair hybrid optical/electrical assembly with ST transceiver/receiver terminations



Demo assembly illustrating MT fiber optic board terminations



Rugged MIL-DTL-38999 Series III fiber optic assembly

ESA astronaut Paolo Nespoli works with Anomalous Long Term Effects on Astronauts (ALTEA-Shield) equipment in the ISS



Photonic contacts and connectors

In-line fiber optic to copper media converter

RUGGEDIZED

Photonic Interconnect Solutions

Unlock the huge bandwidth of optical fiber and dramatically reduce the size and weight of transceiver hardware

Glenair leverages its extensive portfolio of military and aerospace interconnect products to bring you ruggedized Photonic solutions, converting signals between the electrical domain and the fiber domain. These Photonic products are designed for harsh military/aerospace system and subsystem environments and will operate reliably over very wide temperature ranges and high shock and vibration conditions; they have been optimized to minimize size, weight and power and offer electrical-to-fiber conversion for Ethernet, video, signal aggregation and high-speed digital signals. Glenair also offers integration of electronics or Photonics into rugged connector packages and cable assemblies per specific customer requirements. We offer rapid response in-house electrical/PCB design, and mechanical connector/backshell engineering from our vertically integrated factory.

ADVANTAGES OF GLENAIR PHOTONICS

- Reduced size, weight, and power consumption
- Leverages the virtues of fiber optics: EMI immunity, network security, increased transmission distance and high bandwidth
- High shock and vibration to support mil/aero applications
- Wide operating temperature range: -40°C to +85°C and beyond
- Designed IAW military and aviation requirements: ARINC 818, MIL-STD-883, MIL-STD-461, DO-160 and others
- Install Photonics in a fiber optic backbone for future requirement expandability without re-cabling



Small form-factor transceiver



Signal aggregation media converter



7-port Ethernet switch



DVI video media converter

SERIES 050 OVERVIEW

Ruggedized, Small Form-Factor Photonic Interconnect Solutions



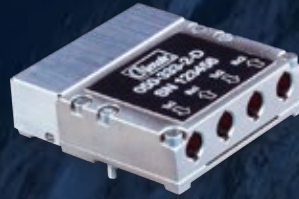
ONGOING EVOLUTIONS IN PHOTONIC TECHNOLOGY



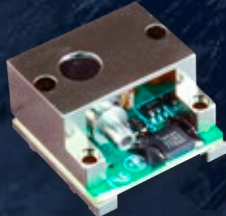
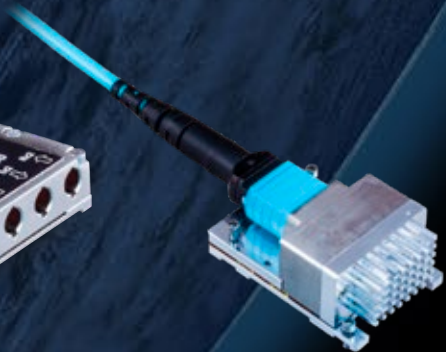
RF-over-fiber for SATCOM-based WiFi and IFE systems



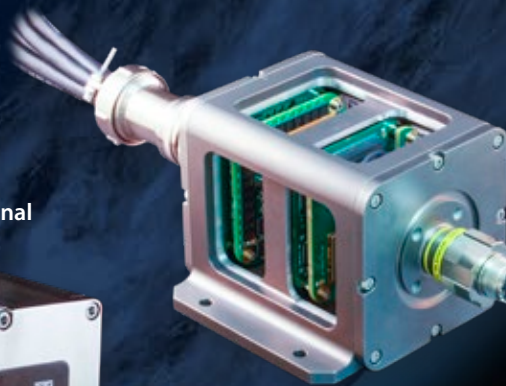
PCB-mount dual Transmitters, Receivers, and Transceivers



Parallel optical PCB-mount photonic converter with special heat-sink design



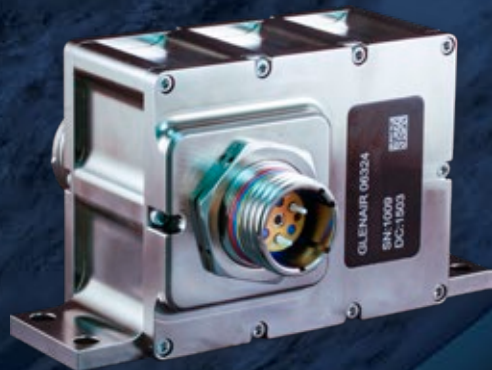
Small form-factor bi-directional PCB-mount transceivers



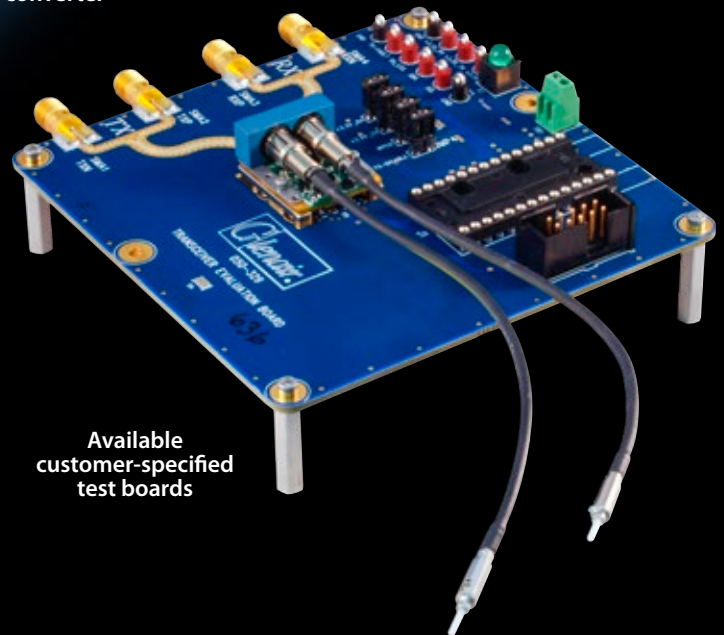
Cutaway shows Glenair ruggedized electronics in a signal aggregation media converter



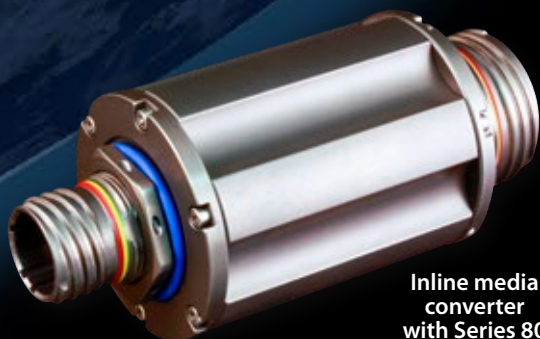
DVI copper-to-fiber media converter



Lightning-strike protected ARINC 801 F/O to D38999-type media converter



Available customer-specified test boards



Inline media converter with Series 80 Mighty Mouse and SuperNine connectors

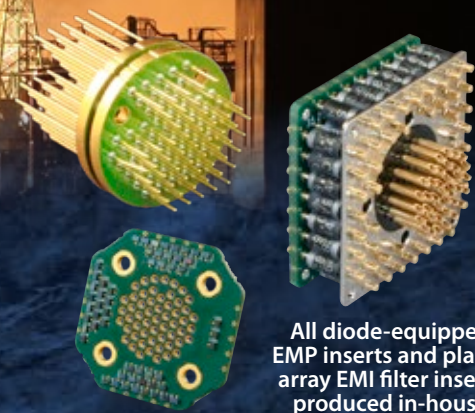
SERIES 240 EMI/EMP Filter Connectors

Glenair manufactures a full range of filter connectors 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.

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



ARINC 600 size 2 filter connector. Glenair also manufactures narrow-profile size 1 and double-wide size 3. All configurations are environmentally sealed for rugged airframe applications.



All diode-equipped EMP inserts and planar array EMI filter inserts produced in-house

- 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

SERIES 240 EMI/EMP Filter connectors

Innovative designs · total vertical integration



Extended-shell
PC-tail cylindrical with
threaded standoff



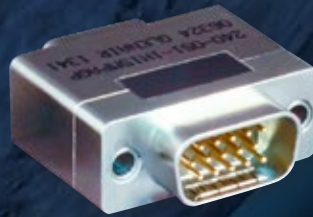
Special-purpose
filter connector cable
adapter



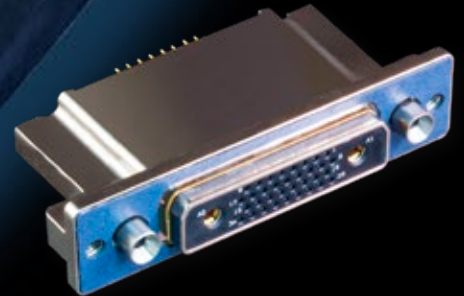
Series 80 Mighty Mouse
PC-tail filter receptacle



MIL-DTL-83513 type
micro-D filter connector



MIL-DTL-24308 type
D-sub filter connector



Series 79 Micro-Crimp
filter connector



MIL-STD-1760 filtered
umbilical connector



Filter plug with
crimp contacts



MIL-DTL-38999 series III type
EMP transient-voltage diode-
equipped connector



JAXA Kibo Laboratory module
from the International
Space Station



Certified SpaceWire cables for both
laboratory/test applications and
flight applications



SERIES MWDM Micro-D Connectors

- High density Micro TwistPin contacts set on .050" centers
- 9 to 130 contact arrangements
- Pigtail, PCB, solder cup, and flex terminations
- Single row, multi-row, low profile and high density insert arrangements
- QPL and commercial versions
- Same-day availability on all part numbers
- Qualified for use in ESA, NASA, JAXA applications



Standard



Hermetic



EMI Filter

TwistPin equipped MIL-DTL-83513 Micro-D connectors offer outstanding mating performance, durability and minimal contact resistance



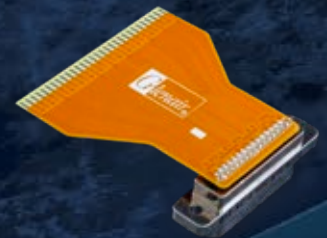
MasterLatch™



Surface Mount



Rear Panel Mount



Flex Circuit

MIL-DTL-83513 AND COMMERCIAL Micro-D Connectors



Mission-critical mating performance

Metal Shell Micro-D for Harnessing Applications

GRPM Solder Cup	GRPM Insulated Wire	GRPM Uninsulated Wire	MWDM Solder Cup	MWDM Insulated Wire	MWDM Back-To-Backs
Shielded Cable Assembly	MWDM Uninsulated Wire	GMDR Insulated Wire	GMDE Environmental	GSWM SpaceWire	GMLM MasterLatch

Micro-Ds for Printed Circuit Board

GRPM-CBS	GRPM-CBR	MWDM-BS	MWDM-BR
MWDM-CBR	MWDM-CBS	90° Surface Mount	GMR7580
GMR7590	GMR7580C	GMR7590C	Right Angle Filter



WellMaster™ 260



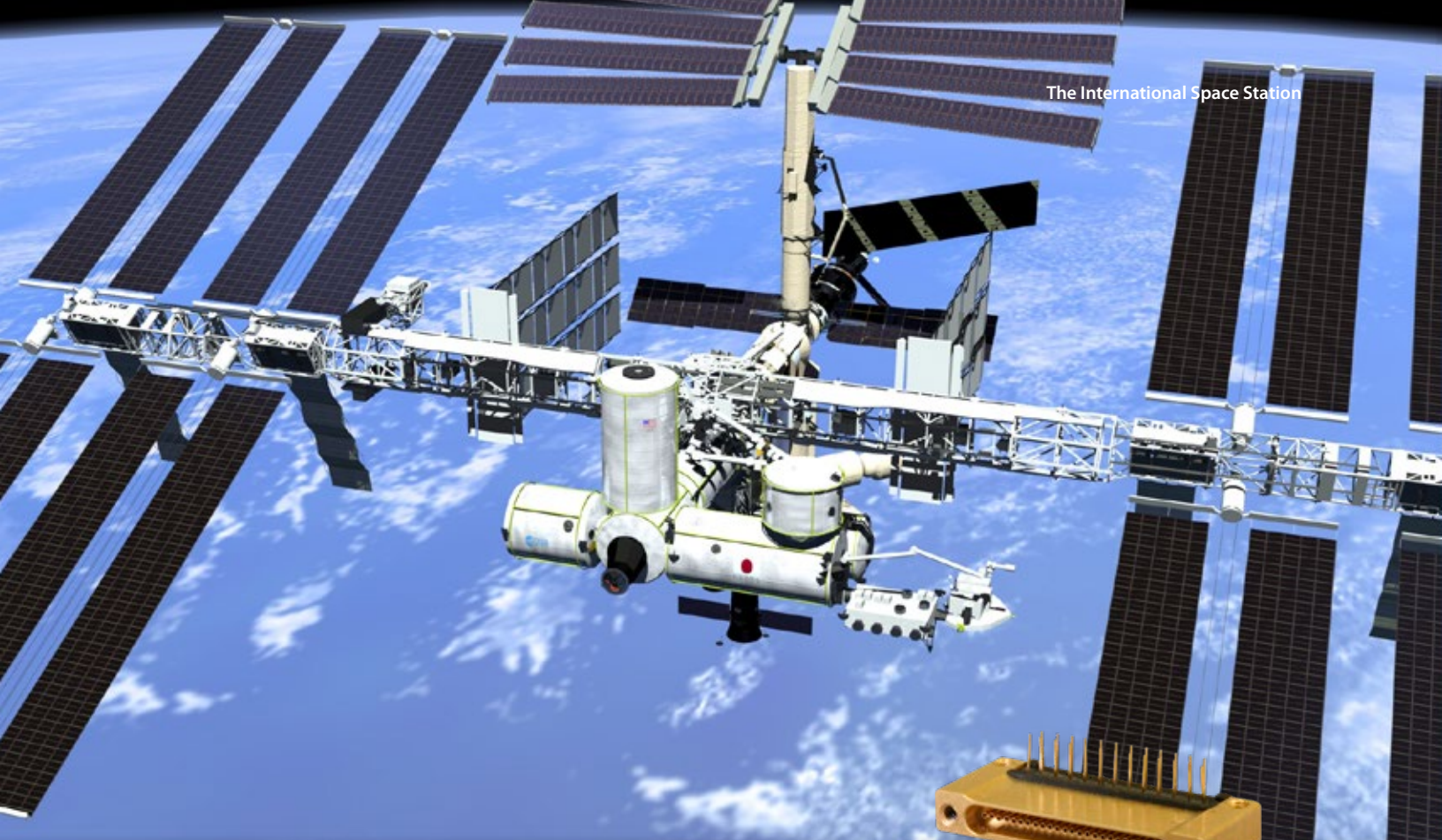
Sav-Con®



Latching MicroStrip



Low Profile



SERIES 89 Nanominiature Connectors

MIL-DTL-32139 qualified connectors for mission-critical board-to-wire applications—simply the smallest and lightest mil-spec connector in the business

- 1 Amp current rating
- .025 Inch (0.64 mm) contact spacing
- #30 And #32 gage wire accommodation
- Single and double row
- Metal shell, aluminum, titanium or stainless steel
- TwistPin contact system
- Gold alloy contact, unplated
- Thru-hole and surface-mount PCB versions

THE NANO TWISTPIN ADVANTAGE



Transverse cross-section of a TwistPin contact crimped to solid wire



- Gas-Tight Crimp Joint
- Better Shock and Vibration Performance
- Corrosion Proof Contact Alloy



SERIES 89 Nanominiature Connectors



The smallest and lightest
mil-spec connector

Series 89 Nanominiature Connector Performance Summary	
Contact Spacing	.025" (0.64mm) Contact Centers
Wire Accommodation	#30-#32 AWG
Current Rating	1 AMP Max
DWV	250 VAC RMS Sea Level
Insulation Resistance	5000 Megohms Minimum
Operating Temperature	-55° C. to +125° C.
Contact Resistance	71 Millivolt Drop Maximum
Shock, Vibration	100g's, 20 g's
Durability	200 Mating Cycles
Corrosion Resistance	48 Hours Salt Spray
Mating Force	5 Ounce Max, 0.4 Ounce Min

SERIES 89 NANOMINIATURE PRODUCT SELECTION GUIDE

Pre-Wired Single Row Connectors	Insulated Wire	Uninsulated Wire	Back-to-Back Cables		
Pre-Wired PCB Connectors	Thru-Hole Vertical	Thru-Hole 90°	SMT Vertical	SMT 90°	
Pre-Wired Double Row Connectors	Insulated Wire	Uninsulated Wire	Back-to-Back Cables		
Double Row PCB Connectors	Thru-Hole Vertical	Thru-Hole 90°	SMT Vertical	SMT 90°	SMT Straddler
Pre-Wired MIL-DTL-32139 Connectors	Single Row, Insulated Wire	Double Row, Insulated Wire			

How Small Are They?



D-Subminiature Connector

25 Contacts
on 0.109 Inch Spacing



Micro-D Connector

25 Contacts
on 0.050 Inch Spacing



Nano Connector

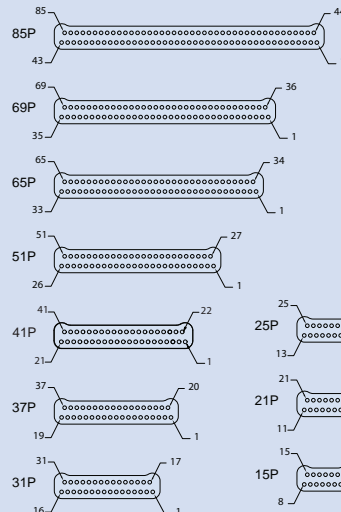
25 Contacts
on 0.025 Inch Spacing



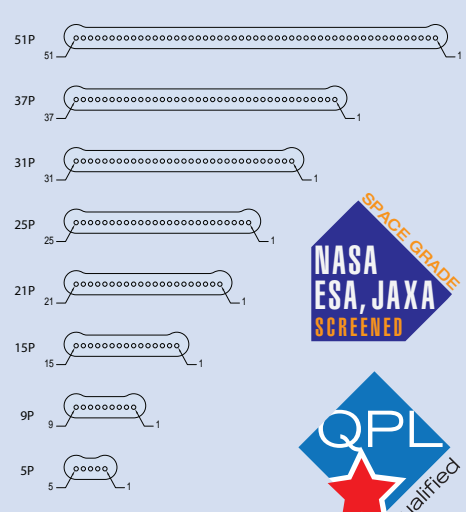
Also available: space-grade
Nano circulars

NANOMINIATURE CONTACT ARRANGEMENTS

Single Row Mating Face of Pin (Plug) Connector



Double Row Mating Face of Pin (Plug) Connector



JAXA Kounotori H2
Transfer Vehicle and the
Canadarm on the ISS

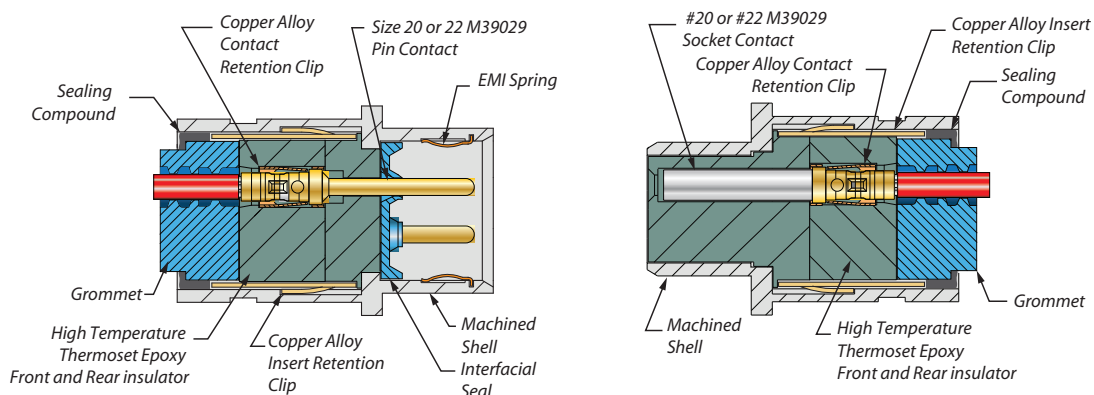
ADVANCED-PERFORMANCE HiPer-D Connectors

Space-grade M24308 intermateable

The HiPer-D connector is a M24308-type D-Subminiature connector with superior design features. Unlike standard M24308 connectors with stamped steel shells, the HiPer-D connector features a one-piece machined shell, 200°C continuous operating temperature rating and enhanced, mated shell EMI/RFI protection via an integrated ground spring. Aerospace grade fluorosilicone grommets and face seals (JAXA / NASA outgassing available) provide environmental protection. The HiPer-D is intermateable, intermountable and interchangeable with standard M24308 D-Sub connectors.

- Advanced temperature, vibration and EMC/ electrical performance
- 11 standard and 20 combo insert arrangements
- High temperature epoxy insulators
- Watertight sealing
- Rugged machined one-piece shell

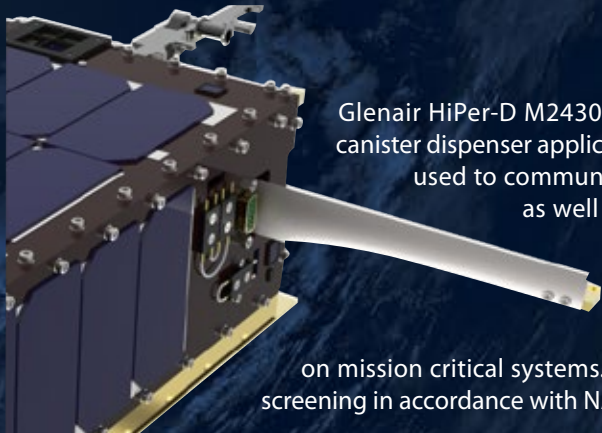
STANDARD AND HIGH DENSITY HiPer-D® - CUTAWAY



SERIES 28

HiPer-D Space Grade Connectors

Product features and specifications



Glenair HiPer-D M24308 D-sub connectors are ideally suited for CubeSat or NanoSat canister dispenser applications where rack and panel or connectorized wire assemblies are used to communicate with HDRMs, pin pullers, pin pushers, door status sensors, as well as system communications and testing prior to deployment of satellite equipment. Standardized usage of M24308 connectors on hardware interfaces simplifies interconnection and communication. Glenair HiPer-D space grade M24308 D-sub connectors eliminate potential interconnect electrical problems on mission critical systems. Connectors are supplied with NASA/ESA/JAXA outgassing and screening in accordance with NASA EEE-INST-0002.

HiPer-D High-Performance D-Sub vs. MIL-STD-24308		
Specification / Feature	M24308	HiPer-D
Temperature	-55°C to +125°C	-65°C to +200°C
Insulator	Thermoplastic	Thermoset Epoxy
Shell	Steel (Brass)	Aluminum (SST)
Voltage	1000 VAC	1000 VAC
Grounding	Dimples in shell (not in Mil-Spec)	Nickel-plated Copper Alloy EMI spring
Environmental	No	Yes
Vibration, sine	20 g	60 g
Vibration, random	N/A	43 g
Shock	50 g	300 g
Bolt-on backshells	No	Yes

HiPer-D M24308 Combo-Ds for power, signal, and RF applications

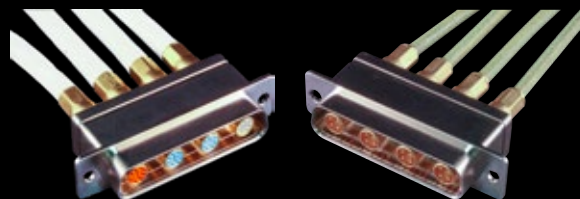
- Size #8 power and 50 ohm or 75 ohm RF contacts
- Mixed layouts with #8's and #20's
- 200°C continuous operating temperature
- 20 tooled layouts
- Crimp and PC tail terminations



High-Speed HiPer-D High-Performance M24308

Crimp contact non-environmental connectors with #8 contacts for high-speed data transmission

- One-piece rugged machined aluminum shell
- Two to five size 8 Coax, Twinax, Quadrax or Ochito contacts
- Common ground plane (no insulators)
- Available in straight and right angle PCB versions





Mars Curiosity rover self portrait. The MAHLI camera on Curiosity's robotic arm took multiple images that were stitched together into this selfie.



SERIES 80 MIGHTY MOUSE Reducing the Size and Weight of Electrical Wire Interconnect Systems

The industry standard ultraminiature interconnect—from low earth orbit to Mars



Mighty Mouse vs. 38999: less than half the size and weight.

- 8 coupling styles and 67 contact arrangements from 1 – 130 contacts
- MIL-DTL-38999 caliber performance
- Size #23, #22, #20, #20HD, #16, #12, #8 signal, power, fiber optic and shielded contacts
- Discrete connectors and turnkey cable assemblies
- Space-grade bakeout processing available

FULL RANGE OF SUPPORTED CONTACTS, 67 CONTACT ARRANGEMENTS



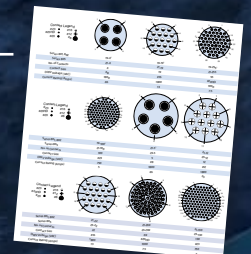
Signal

Power

Shielded

Fiber Optic

Pneumatic



67 arrangements, from 1–130 contacts

SERIES 80 ULTRAMINIATURE Mighty Mouse Connectors and Cables

Connector series overview



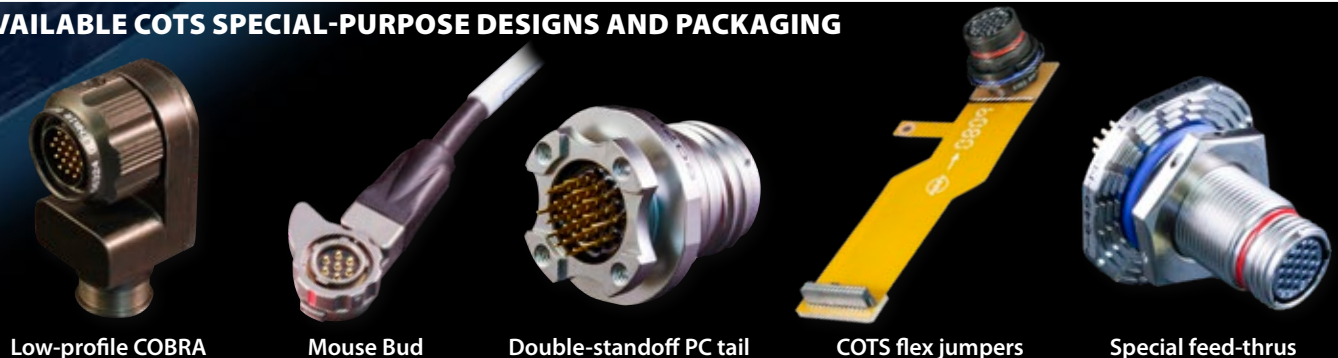
CHOOSE FROM 8 DIFFERENT COUPLING DESIGNS



AVAILABLE MIGHTY MOUSE CONNECTOR CLASSES



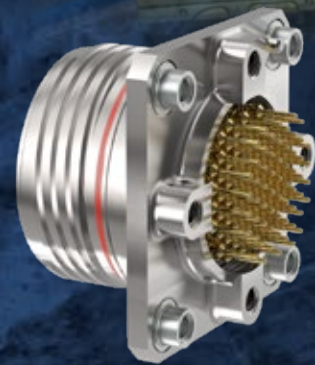
AVAILABLE COTS SPECIAL-PURPOSE DESIGNS AND PACKAGING





International Space Station Expedition 25 commander Doug Wheelock installed the Sabatier system to extract more water out of the ISS atmosphere

SPACE GRADE
NASA
ESA, JAXA
SCREENED



Series 806 Mil-Aero Connectors

Innovative design meets key performance benchmarks for harsh vibration, shock, and environmental settings—as well as high-altitude unpressurized zones with aggressive voltage ratings and altitude immersion standards

SAVE SIZE AND WEIGHT WITH SERIES 806 CONNECTORS

Series 806 Mil-Aero
Smallest Size
.500 In. Mating Threads
3 #20 Contacts or 7 #22
contacts



MIL-DTL-38999
Smallest Size
.625 In. Mating Threads
3 #20 Contacts or 6 #22
contacts

- Next-generation small form factor aerospace-grade circular connector
- Designed for general use in harsh application environments such as aircraft, industrial robotics and more
- Upgraded environmental, electrical and mechanical performance
- Integrated anti-decoupling technology
- Higher density 20HD and 22HD contact arrangements
- Glass hermetic, lightweight aluminum hermetic, and filtered versions
- +200° C temperature rating

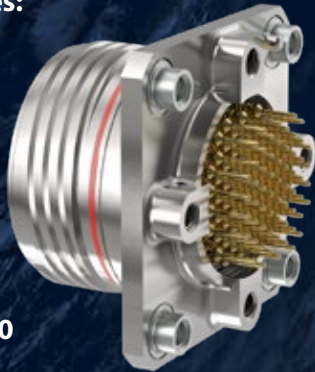
Series 806 Mil-Aero Ultraminature Circular Connectors

for harsh space applications IAW MIL-DTL-38999



SERIES 806 MIL-AERO FEATURES / SPECIFICATIONS

- **Supported wire sizes:**
#20HD contacts
20–24 AWG
#22HD contacts
22–28AWG
- **Dielectric withstanding voltage**
#20HD layouts:
1800 Vac
#22HD layouts: 1300 Vac
- **Reduced pitch triple-start modified anti-decoupling stub ACME mating threads**
- **“Triple ripple” wire sealing grommet (75,000 ft. rated)**
- **Integral Nano-Band shield termination platform**
- **EMI shielding effectiveness per D38999M para. 4.5.28 (65 dB min. leakage attenuation @ 10GHz)**
- **10,000 amp indirect lightning strike**
- **MIL-S-901 Grade A high impact shock**

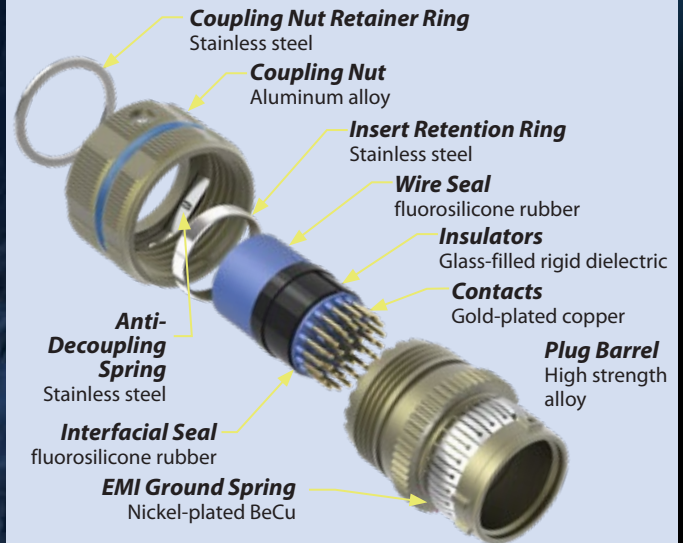


AVAILABLE LIGHTWEIGHT ALUMINUM “CODE RED” HERMETICS

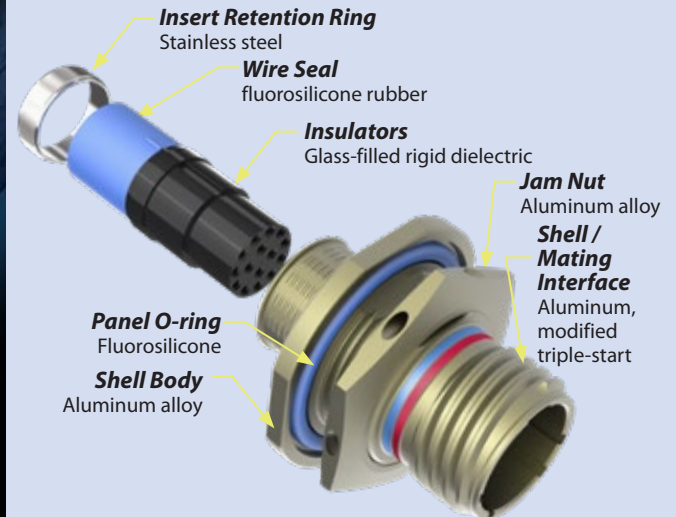
CODE RED is a lightweight encapsulant sealing and assembly process with 50% package-weight savings compared to glass-to-metal seal Kovar/stainless steel solutions. Non-outgassing CODE RED (IAW NASA/ESA) provides durable hermetic sealing with 1×10^{-7} leak rate performance. Gold-plated copper contacts deliver outstanding low-resistance current carrying capacity.



SERIES 806 MIL-AERO PLUG

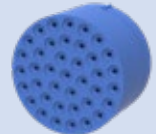
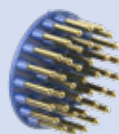


SERIES 806 MIL-AERO RECEPTACLE



SMALLER AND LIGHTER WITH EQUAL D38999 PERFORMANCE?

- | | | |
|--|--|--|
| High-Density Layouts
Twice as many contacts in a smaller package | “Top Hat” Insulator
High voltage rating, foolproof alignment | Triple Ripple Wire Seal
Reliable 75,000 ft. altitude immersion |
|--|--|--|



HIGH PERFORMANCE

Series 791

The next-generation ultraminiature rectangular connector for demanding aerospace applications

Sometimes the simplest ideas are the best ideas. The Series 791 is a simple idea. Let's create a brand new class of connector – the ultraminiature rectangular. Let's combine the versatility of the Series 790 Micro-D type connector with the rugged features of our popular HiPer-D M24308 type connector. Let's add a unique dual lobe shell and let's recess the pins to eliminate the possibility of scooping damage. Let's add high speed datalink capability.

Originally designed for NASA's Orion project, the 791 is qualified for manned space flight. The 791's small size and blind mate capability make it a perfect choice for 2U and 3U electronics modules. Applications include radars, weapons systems, comms gear, satellites, exoatmospheric vehicles, avionics, power distribution units, instrumentation, and everywhere else in need of a smaller, higher performance interconnect system.



Polarized / keyed shells prevent mis-mating and allow designers to specify identical layouts side-by-side without risk of circuit damage

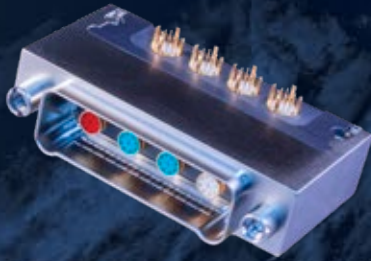
- Next-generation small form factor aerospace-grade rectangular connector
- Scoop-proof recessed pin contacts
- 37 arrangements, 12 shell sizes for the ultimate in versatility
- Rugged aluminum alloy dual lobe shell
- Environmental
- EMI shielded
- Blind mating

SERIES 791 MICRO-CRIMP

Next-generation ultraminiature rectangular for demanding aerospace applications

SPACE GRADE
NASA
ESA, JAXA
SCREENED

SERIES
791
SEVEN
NINETY-ONE



About The Series 791

The Series 791 is an aerospace-grade ultraminiature rectangular connector with EMI protection and environmental sealing. Originally developed for NASA's Orion capsule, The 791 is qualified for manned space flight and is ideal for radars, weapons systems and avionics gear.

The Series 791 is available either with crimp pins or with printed circuit terminals. Machined aluminum alloy shells feature dual lobes for polarization. Contact sizes range from size 8 to size 23 in 37 arrangements. Pin contacts are recessed to prevent scooping damage while mating. Crimp contacts conform to M39029 requirements and are rear release.

An optional ground spring reduces susceptibility to EMI problems. Fluorosilicone face seals and wire grommets prevent moisture and contamination. Panel mount versions are available with an O-ring, or for improved panel bonding, a metal spring.

Board mount versions include straight or right angle terminals. Right angle PCB connectors feature an aluminum shroud covering the terminals.

Hardware options include screwlocks, jackscrews or guide pins for blind mate applications.

Save Size and Weight with Series 791 Connectors

The Next Generation Ultraminiature Rectangular Connector for Demanding Aerospace and Defense Applications



M-17P17 with size 16 contacts

- Two to 102 contacts
- Coax, twinax, quadax and Ochito octaxial contacts
- Rugged aluminum shell with dual polarizing lobes



Shell size A – the smallest 791

- Integral band platform for direct attachment of cable braid
- -65°C to +150°C
- Panel mount versions with O-ring or EMI spring



- 37 contact arrangements
- Crimp-and-poke or epoxy-sealed board mount versions
- Scoop-proof recessed pins
- Size 23, 16, 12 and 8 contacts



- Straight and right angle printed circuit board mounting
- 12 shell sizes
- Guide pins for blind mate modules



- Contacts meet SAE AS39029 requirements
- Internal ground spring for EMI protection
- Approved for manned space flight

Glenair Sav-Con's protected the umbilical connectors on every Space Shuttle mission

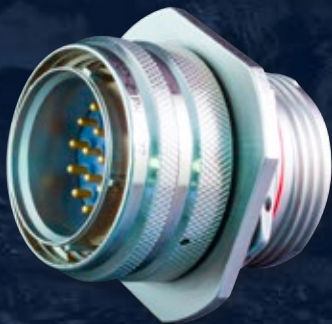
SAV-CON®

Connector Savers and Bulkhead Feed-Thrus

The smart solution for preventing contact damage and extending the service life of cable assemblies and box and panel-mount receptacles



- Sav-Con®s for every Military Standard connector—circular and rectangular
- Hundreds of successful space launch and space flight applications
- Glenair Sav-Con®s on board every Space Shuttle mission flown
- Bulkhead feed-thrus for environmental, filter and hermetic applications
- Pin/pin, pin/socket, and socket/socket versions
- Traditional plug-receptacle savers, as well as in-line versions and gender changers
- Available EMI/EMP filter savers and adapters
- Optional locking mechanism



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



circular and rectangular configurations available including hermetic and EMI/RFI filter configurations

HIGH-PERFORMANCE CONNECTOR GO-BETWEENS

Sav-Con® Connector Savers and Bulkhead Feed-Thrus



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
- Series 89 Nanominiature
- M24308 D-Subminiature
- MIL-DTL-83513 Micro-D Subminiature
- Series 28 HiPer-D M24308 intermateable
- Series 79 Micro-Crimp

Comprehensive materials, plating, and polarization options available

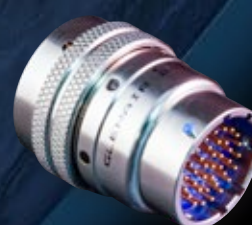
TRADITIONAL PLUG-RECEPTACLE SAV-CON® CONNECTOR SAVERS



MIL-DTL-38999 series III type



Series 89 Nanominiature rectangular

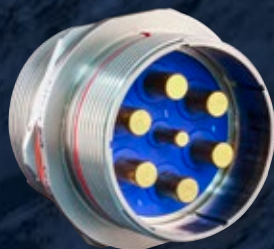


MIL-DTL-38999 series II bayonet-coupling saver



Series 80 Mighty Mouse Sav-Con®

BULKHEAD FEED-THRUS



Special high-voltage power bulkhead feed-thru



Special wide panel accommodation Mighty Mouse bulkhead feed-thru



MIL-DTL-5015 bulkhead feed-thru

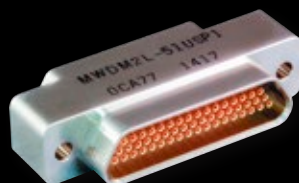


Special non-cadmium plating classes

SPECIAL-PURPOSE ADAPTERS AND SAVERS



EMI/RFI filter Sav-Con® adapter (D38999 Series III type shown)



Rectangular EMI/RFI filter Sav-Con adapter (MIL-DTL-83513 type shown)



Power distribution connector savers (MIL-D-5015 type shown)





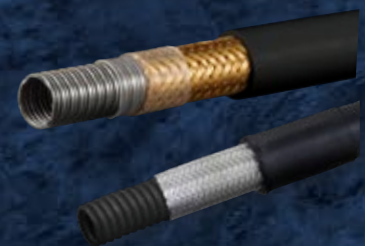
POLYMER AND METAL-CORE Conduit Systems

The flexible, lightweight alternative to standard jacketed cables

Conduit wire protection systems for space applications must be able to withstand extreme environments—from immersion in harsh chemicals, to temperature extremes and numerous flex cycles—without breakdown or failure. Glenair conduit systems are rigorously engineered to meet the exacting specifications of NASA, ESA and JAXA space programs, and have been successfully implemented in numerous space programs—from launch vehicles to the International Space Station and the Gravity Probe mission.

Lightweight, flexible polymer-core materials are available in a wide variety of materials to suit any application: Annular material choices include: Kynar, PVDF and G-FLEX Siletem, helical choices include ETFE, FEP, PFA, PTFE, and PEEK plus AS81914 /1 – 11 qualified materials and configurations.

Metal-core versions are specified for extreme crush resistance and optimal EMI shielding. The helically-wound metal conduit provides extremely high levels of EMI protection across all radiation fields and frequencies. Stainless steel versions are often specified for environments subject to the temperature extremes of space.

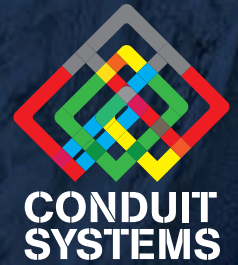


- **Hermetically sealed, flexible metal-core conduit for interconnect applications**
- **Lightweight, flexible helical and annular polymer-core materials and easy to install fittings, transitions and adapters**
- **Turnkey, factory-terminated assemblies for landing gear and other rugged aerospace applications**

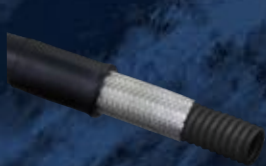
METAL AND POLYMER CORE

Conduit Systems

Turnkey factory-terminated assemblies
or user-installable systems



SERIES 72 CONVOLUTED TUBING PRODUCT SELECTION GUIDE



Convoluted Tubing



Factory Terminated Assemblies

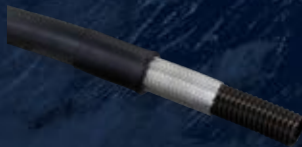


Sentry system



Easy-to-Install Guardian system

SERIES 74 CONVOLUTED TUBING PRODUCT SELECTION GUIDE



Helical Convoluted Tubing



Factory Terminated Assemblies

Swivel-joint circular connector backshell



Easy Assembly Hat Trick System



Super Durable Internal Braid System



Ultra Lightweight Composite Hummer Nut System

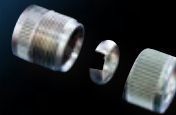
SERIES 75 METAL-CORE HELICALLY-WOUND CONDUIT PRODUCT SELECTION GUIDE



Metal-Core Helical-Wound Conduit



Turnkey Factory Terminated Assemblies



Low-Profile RP Plus System



Heavy-Duty Environmental Metal System



Heavy-Duty Hybrid Composite/Aluminum

Reduce package size, weight, and labor with turnkey factory assemblies

- Glenair can design, build, terminate—and even pre-wire—turnkey conduit wire routing solutions.
- Certified factory assemblers and calibrated tooling create better-performing systems.
- Simple point-to-point or complex multi-branch.



Delta II Lifts Off Carrying NPP,
a JPL CubeSat Experiment

AmberStrand® is ultra-lightweight microfilament metal clad EMI/RFI composite braiding. Glenair offers AmberStrand® users direct factory overbraiding services for point-to-point and multi-branch interconnect assemblies.

LIGHTWEIGHT

AmberStrand®

Composite metal-clad EMI/RFI expandable braided shielding

The smart way to reduce launch and flight weights in aerospace systems

For many applications, the cable shield is the most important element in controlling EMI. Unfortunately, metal shielding—especially when applied in multiple layers—can be extremely heavy. The opportunity to provide robust EMI shielding at a fraction of the weight is the principal advantage of composite thermoplastic EMI/RFI braid made from AmberStrand® material. Transfer impedance test reports demonstrate the effectiveness of the material compared to conventional metal solutions. So get smart! Reduce weight and save money with AmberStrand®

- Metal-clad EMI/RFI Shielding with a lightweight composite thermoplastic base material
- Highly conductive surface plating
- Reduce shielding weight up to 80% and more
- Reduce operation costs by permanently reducing launch and aircraft all-up weights
- Superior high frequency shielding compared to tinned and/or nickel plated copper
- Tensile strength: 590,000 psi (min)

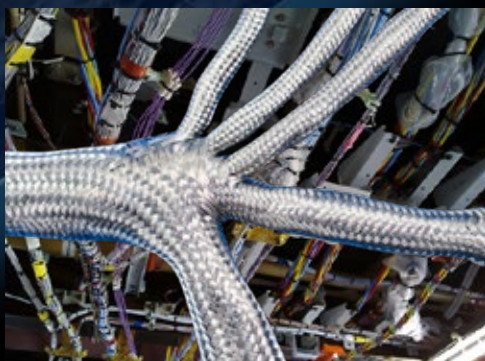
LIGHTWEIGHT, FLEXIBLE



AmberStrand® Composite Braid for EMI/RFI Shielding Applications

The lightest weight EMI/RFI braid in the industry

103-026 AmberStrand® 100% Lightweight Composite Thermoplastic Nickel Plated EMI/RFI Braid		
Tensile Strength	590,000 psi (min)	ATP196 MOD
Operating Temperature	-80°C to +220°C	85% shielding effectiveness, 1000 hrs
Specific Gravity	1.45% (max)	ISO 1183
Thermal Cycling	No adverse effects in visual inspection or resistance after 50 cycles	-65°C to +200°C In accordance with ANSI/EIA-364-75-1997
Lightning Current	Glenair qualification test report 040607AMB	In accordance with ANSI/EIA-364-75-1997
Surface Transfer Impedance	Glenair qualification test report 040607AMB	IEC 96.1 A.5.5.3 method 2
Vertical Flammability	Self-extinguishing ≤ 2 sec. Burn length 0.1 in. max - Dripping 0.0 sec	14CFR part 25.853 (A) AMDT25-116 Appendix F Part I (a) (1) (ii)
Fungus Resistance Testing	28 day incubation test: No fungus growth	Mil-Std 810F, Method 508.5
Mass Loss And CVCM	1.0% max mass loss; .10% max CVCM	ASTM E595
Flex Test 50,000 Cycles	No tearing or visible damage	90° to 120° bend
Salt Spray 500 hrs.	DC Resistance IAW AS85049 .5 milliohms; no visible evidence of base metal on braid	ASTM B 117-03 Sodium Chloride 5%
Salt Fog SO2	No damage or adverse effects	ASTM G 85 Annex 4 200 hrs.
JP-8 (Mil-T-83133) Military Jet Aircraft Fuel (70°C)	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)
Skydrol Military Jet Aircraft Fuel (90°C)	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)
Hydraulic Fluid Mil-H-5606 (70°C)	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)
Silicate Ester Based Coolanol 25R (70°C)	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)
Polyalphaolefin Mil-C-87252 (70°C)	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)
Lubricating Oil Mil-L-23699 8 hrs. @ 150°C, followed by 72 hrs. @ 65°C	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)
Isopropyl Alcohol 8 hrs. @ 50°C followed by 72 hrs. @ 65°C	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)
Cleaner Fluid Mil-C-85570 8 hrs. @ 23°C followed by 72 hrs. @ 65°C	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)
De-icer Fluid AMS-1432 8 hrs. @ 23°C followed by 72 hrs. @ 65°C	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)
Fire Extinguishing foam 8 hrs. @ 23°C followed by 72 hrs. @ 65°C	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)
R-134 Refrigerant 8 hrs. @ 23°C followed by 72 hrs. @ 65°C	No fraying, DC resistance within limits (AS85049 paragraph 4.6.3)	Mil-STD 810F Method 504 (Modified)



Up to 88% weight savings vs. NiCu

AmberStrand® 100% vs. nickel-coated copper			
Braid Dia.	AmberStrand® 100% 103-026	Nickel-Copper 100-003	% Weight Savings/ Foot
.062	.6	1.9	68%
.125	1.0	4.8	79%
.250	1.8	16.1	88%
.375	2.3	18.5	87%
.500	3.7	22.3	83%
.625	4.4	27.7	84%
.750	5.2	34.3	85%
1.000	8.0	35.0	77%

AmberStrand® 75% vs. nickel-coated copper			
Braid Dia.	AmberStrand® 75/25% NiCu 103-027	Nickel-Copper 100-003	% Weight Savings/ Foot
.062	.9	1.9	52%
.125	1.5	4.8	68%
.250	2.4	16.1	85%
.375	3.9	18.5	79%
.500	5.4	22.3	76%
.625	6.4	27.7	77%
.750	7.2	34.3	79%
1.000	11.0	35.0	69%

LIGHTWEIGHT

ARMORLITE™

Microfilament nickel-clad expandable stainless steel EMI/RFI braided shielding

Save weight and money every time you fly! All-Up-Weight (AUW) has met its match: ArmorLite™ microfilament stainless steel braid saves pounds compared to standard QQ-B-575/A-A-59569 EMI/RFI shielding. ArmorLite™ is an expandable, flexible, high-strength, conductive stainless steel microfilament braid material designed for use as EMI/RFI shielding in high-performance wire interconnect systems. The principal benefit of ArmorLite™ is its extreme light weight compared to conventional nickel/copper shielding. By way of comparison, 100 feet of 5/8 inch ArmorLite™ is more than four pounds lighter than standard 575 A-A-59569 shielding. Plus, ArmorLite™ offers superior temperature tolerance compared to other lightweight tubular braided shielding including microfilament composite technologies.

ArmorLite™ is an ultra-lightweight microfilament stainless steel EMI/RFI braided shielding. Available as tubular sleeving as well as direct factory overbraiding for point-to-point and multi-branch interconnect assemblies.

- Ultra-lightweight EMI/RFI braided sleeving for high-temperature applications -80°C to +260°C
- Microfilament stainless steel: 70% lighter than NiCu A-A-59569/QQB575
- Outstanding EMI/RFI shielding and conductivity
- Aerospace environment qualified
- Superior flexibility and “windowing” resistance: 90 to 95% optical coverage
- 70,000 psi (min.) tensile strength
- Best performing metallic braid during lightning tests (IAW ANSI/EIA-364-75-1997 Waveform 5B)

LIGHTWEIGHT, FLEXIBLE ArmorLite™ Microfilament Braid for EMI/RFI Shielding Applications



ARMORLITE™ AIRCRAFT UTILIZATION ANALYSIS COMPARED TO STANDARD A-A-59569 Ni/Cu BRAID



ArmorLite™ lightweight EMI/RFI braided shielding is ideally suited for weight reduction efforts in Electrical Wire Interconnect Systems



Length and Weight of NiCu Braid in Typical Commercial Aircraft			
Diameter (in)	Weight (Lb/ft)	Length (in)	weight (Lb)
0 - 0.25	0.02	12564.8	21.08
0.25 - 0.5	0.05	5259.3	21.17
0.5 - 0.75	0.07	1212.6	7.12
0.75 - 1.0	0.14	1437.4	16.88
1.0 - 1.5	0.18	467	7.05
Total weight			73.3

Weight Savings Using ArmorLite™ (Equivalent Lengths)				
Diameter (in)	Weight (Lb/ft)	Length (in)	Length in feet	weight (Lb)
0 - 0.25	.00507	12564.8	1047.07	5.309
0.25 - 0.5	.0097	5259.3	438.28	4.251
0.5 - 0.75	.0178	1212.6	101.05	1.737
0.75 - 1.0	.0256	1437.4	119.78	3.063
1.0 - 1.5	.0368	467	38.92	1.434
Total weight				15.794

Using ArmorLite™ in place of standard nickel-copper braid saves 54.6 pounds per system—up to 78% weight savings!

DESCRIPTION	REQUIREMENT	PROCEDURE	REPORT
Operating Temperature	-80°C to +260°C	(85% Shielding effectiveness 1000 hours)	ARM-103
Braid Resistivity test, Pre and Post	Test pre/post-5 cycles-minimal disparity per spec.	EIA-364-32D IAW AS85049	ARM-110/1
Surface Transfer Impedance	Glenair Qual. Test Plan ATP-194	Line injection IEC96-1 A.5.5.3 30KHz - 2.5 GHz mod	ARM-104
Shield Effectiveness Test, Pre and Post	Glenair Qual. Test Plan ATP-194	Line injection IEC96-1 A.5.5.3 30KHz - 2.5 GHz mod	ARM-104
Tensile/ Pull Strength	220 lbs. (min.). No anomalies within 8% - 10% of pre test for variable sizes	Glenair ATP- 183. 0 lbs. to 90 lbs, to 150 lbs, to 220lbs @ speed of 0.25 inches/min	ARM-105
Lightning Current Test	Glenair Qual. Test Plan 191/ DC resistance/ voltage criteria per DO-160F Level for 3 sizes up to 30Ka.	ANSI/EIA-364-75-1977 Wave Form 5B SAE/ARP5416 Section 6.3 Waveform 1, 3 (1, 10MHz) and 5A	ARM-110 ARM-112
Vertical Flammability	Self extinguishing ≤ 2 sec. Burn length 0.1 inch. max. Dripping 0.0 seconds.	14 CFR part 25.853 (a) AMdT25-116 Appendix F Part I (a) (1) (ii)	ARM-101
Mass Loss and Collected Volatile Condensable Materials	Total Mass Loss (TML) ≤1.0% Collected Volatile Condensable Matl.(CVCM) ≤.1%	ASTM E-595	ARM-102
Salt Spray Test	DC Resistance IAW AS85049 .5 milliohm. No evidence of base metal on braid	ASTM B117-09 Sodium Chloride 5% 500 Hrs	ARM-100
Vibration Resistance	EAI Test Report 33247. DO160 section 8 Cat. R Vib. Curves E1	DO-160F RTCA/DO-160F, Section 9, Fig. 8-4. Curve E1. - 3 sizes - 3 hours on each axis.	ARM-111
Thermal Shock Cycling test and Resistivity	No adverse effects in visual inspection or resistance after 50 cycles	EIA-364-32D, Table 3 Test condition V -75°C to +215°C	ARM-113
Abrasion and Plating test	DC Resistance IAW AS 85049. Glenair internal QTR-003	ATP 180 20 continuous @ 6 cycles/min. over 3 arms with .030 radiused edges	ARM-107
Fluid Immersion Test	Broad material compatibility	Customer/AS4373D method 601 Mod	ARM-106
Flex Test	2 Cycles: starting 0° over vertical ctr. line across to 180° cycle. Total cycles of 25633	Glenair ATP 179	ARM-112



Blind-Mate Connectors

Rack and Panel Sealed, Assisted Kick-off and Feed-Through Blind-Mate to D38999

Blind-mate, fixed and float-mount interconnects for non-ITAR commercial as well as military/defense applications

Application: Glenair Series 253 blind-mate connectors are designed for use in commercial rack-and-panel instrumentation applications, satellite deployment, scientific payloads, interstage, UAV, and munitions release, and more.

- Available in most symmetrical MIL-STD-1560 insert arrangements with contacts sizes from #23 to #8
- Selected materials offer low outgassing properties and high resistance to both corrosion and stress corrosion cracking
- NASA outgassing bake-out process available
- Designed to withstand the rigors of launch and flight—including shock, vibration, thermal vacuum, acceleration, and temperature extremes
- Standard accessory threads and teeth per MIL-DTL-38999 accommodate a wide range of backshell accessories
- Crimp-removable contacts standard. PC tails, dual-flange standoffs, hermetically sealed, and custom blind-mate configurations available



SPACE-GRADE BLIND MATE

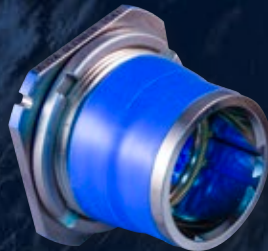


Float-mount and adjustable separation force connectors MIL-DTL-38999 Series III type, environmental, crimp contact

CRITICAL MECHANICAL FEATURES OF BLIND-MATE AND ADJUSTABLE SEPARATION FORCE (ZEF) CONNECTORS



Roll-off nose: allows for the smooth disconnection of blind mate plugs and receptacles.



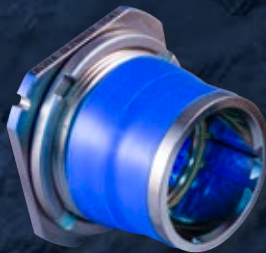
Float mounting: allows for coplanar movement of the receptacle during mating, preventing contact and shell damage.



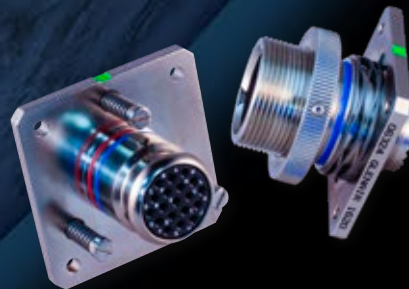
Misalignment accommodation: Radial, axial, and angular misalignment during mating is accounted for with integral wave springs.



Sealing: Misalignment accommodation makes environmental sealing difficult. The problem is solved with auxiliary external seals.



EMI shielding: Glenair incorporates ground springs in receptacle connectors and grounding fingers in special coupling nut-equipped plugs to optimize 360° shell-to-shell continuity.



Assisted separation force: Adjustable kick-off style with spring-loaded posts and an adjustment ring to calibrate separation force. A second style uses wave springs on the shell body.



Available non-ITAR environmental blind-mate and adjustable separation force solutions		
Basic Part No.	Description	Mates With
253-014	Fixed jam-nut mount plug with roll-on/roll-off nose and Accessory threads	253-015
253-015	Floating jam-nut mount receptacle with misalignment accommodation and optional sealing	253-014
253-016	Fixed wall mount plug with spring assist (zero separation force)	253-017
253-017	Floating wall mount receptacle with adjustable separation force and misalignment accommodation	253-016
253-018-07	Blind-mate feed-thru, jam-nut mount plug with B-side D38999 type receptacle mating interface and assisted kick-off (spring force)	253-019
253-018-G6	Blind-mate in-line feed-thru with B-side D38999 type plug mating interface and assisted kick-off (spring force)	253-019
253-019	Floating jam-nut mount receptacle with misalignment accommodation and optional sealing	253-018
253-031	Blind-mate jam-nut mount plug with kick-off spring and accessory threads	253-032
253-032	Floating jam-nut mount receptacle with misalignment accommodation	253-031
253-033	Float mount feed-thru, jam nut mount receptacle to 38999 type Series III plug mating interface	253-019
253-025	Locking circuit and test mate connector	253-016



Launch of a Japanese H-IIA rocket with the Global Precipitation Measurement (GPM) Core Observatory onboard, from the Tanegashima Space Center

SPACE-RATED

Lanyard-Release Quick-Disconnect Connectors

For mission-critical disengagement and release of launch and payload systems

Mil-standard 1760 lanyard-release connectors were originally developed for carriage stores management applications including weapons, pods, and drop tanks. Incorporating a common electrical interface as well as interfacing signals and pin and circuit assignments, lanyard-release connectors of this type are broadly employed for reliable, jam-free mating and disengagement. Space-rated versions of 1760 class cylindrical connectors take advantage of the technology's legacy in harsh-duty aircraft applications to ensure reliable and predictable performance in space. From fail-safe application in space station and space telescope deployment to rack-and-panel research equipment interconnection, these rugged axial-pull lanyard connectors deliver proven performance in accordance with all applicable NASA, ESA, and JAXA standards. Available in a wide range of connector packaging, from MIL-DTL-38999 SuperNine® to AS81703* and special small form-factor designs, these proven-performance interconnection devices may be equipped with standard signal or power contacts as well as shielded high-speed coax, twinax, and quadrax.



AS81703 space-grade lanyard release push pull mated pair with special order band and boot platform

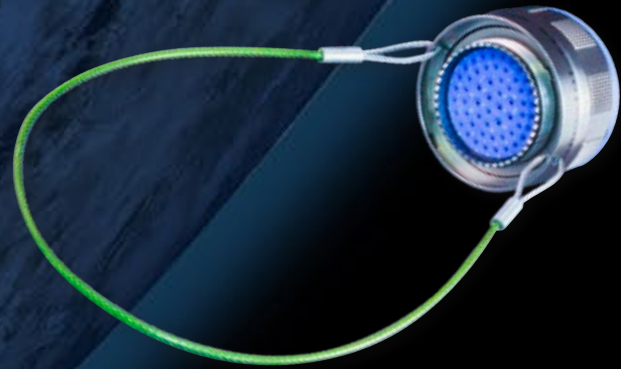
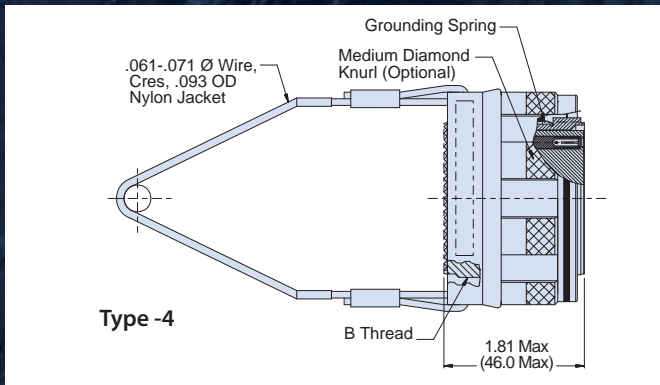
- Jam-free, push on/pull off technology
- Reliable fail-safe axial pull lanyard equipped coupling
- Instant disengagement for critical quick-release systems
- Manufactured IAW MIL-STD-1760
- Special umbilical buffers and go-betweens also available
- Blind-mate rack-and-panel versions available
- Qualified for military and space application
- Outgas processing IAW NASA, ESA and JAXA

SPACE-GRADE Lanyard-Release Quick-Disconnect Connectors



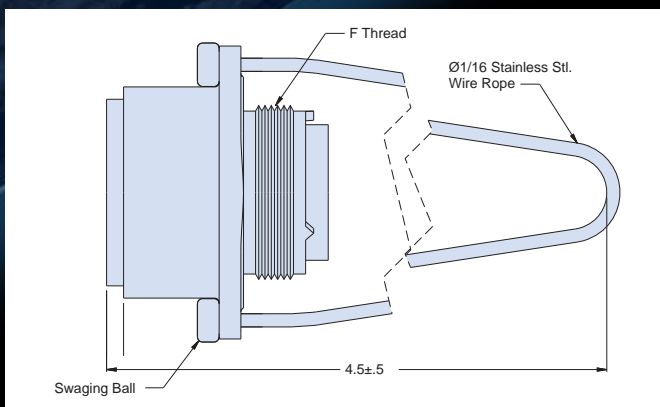
How To Order SuperNine® 233-216 MIL-DTL-38999 Type

Sample Part Number	233-216	-G6	ME	25-35	S	A	E	-4
Series / Basic Part No.	233-216 = Lanyard Release Plug							
Connector Style	G6 = Plug with EMI Spring							
Finish	ZL = Cres, Electrodeposited Nickel Z1 = Cres, Passivated ME = Al Alloy, Electroless Nickel							
Size and Arrangement	Per MIL-STD-1560 plus high density							
Contact Type	P = Pin S = Socket; 500 cycles							
Alternate Key Position	A, B, C, D, E, N = Normal (Per MIL-DTL-38999 Series III)							
Lanyard Length Code	See Lanyard Length Table							
Connector Type	4 = Type 4 (shown below, no accessory threads) 6 = Type 6 (not shown, includes accessory threads)							



How To Order 253-020 AS81703* Type Push-Pull Lanyard Release

Sample Part Number	253-020	-08	ME	25-35	S	N	812
Series / Basic Part No.	253-020 = AS81703 Type						
Connector Style	08 = Push-Pull Lanyard-Release Plug						
Finish	ZL = Cres, Electrodeposited Nickel Z1 = Cres, Passivated ME = Al Alloy, Electroless Nickel						
Size and Arrangement	Per AS81703						
Contact Type	P = Pin S = Socket						
Alternate Key Position	N, W, X, Y, B, C						
Lanyard Ring Mod Code	812 = Lanyard ring rotated 90° from master keyway Omit for standard ring						



*The MIL-C-81703 standard was superseded by SAE-AS81703 10-December 2010 per Navair



JAXA mission specialist Akihiko Hoshida
inside the Kibo module

Best-of-Class Hermetic Connector Design Capabilities

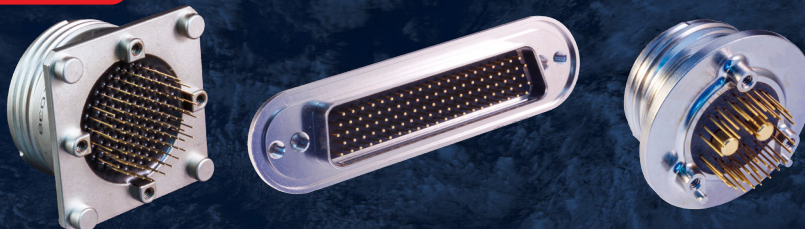
Resolve gas, moisture and particle ingress problems with advanced-performance glass- and encapsulant-sealed hermetic connectors

- 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 1×10^{-7} cc/sec to 1×10^{-10}

CODE RED

LIGHTWEIGHT HERMETIC SEALING

Lightweight hermetic encapsulant sealing solution with 1×10^{-7} leak rate performance. Available today in Mighty Mouse 806 Mil-Aero, M24308/9 D-Sub and D38999/23



Aluminum shell CODE RED hermetic connectors and copper contacts reduce weight and improve electrical performance compared to heavier-duty glass-to-metal seal hermetic solutions

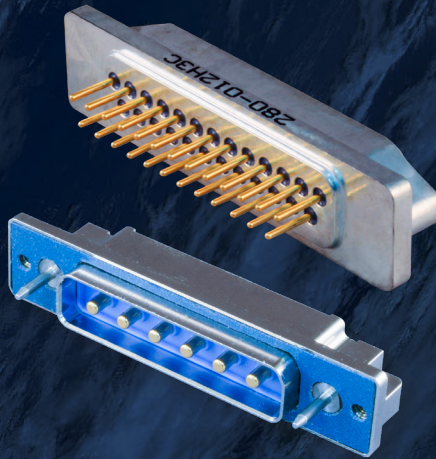
ADVANCED PERFORMANCE Glass-Sealed Hermetic Connectors



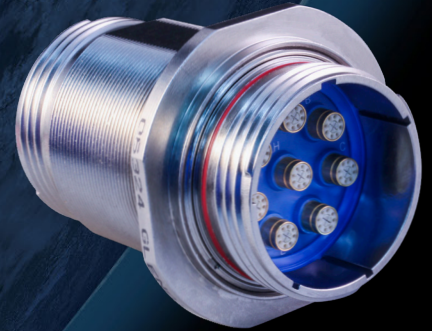
UNIQUE HERMETIC OFFERINGS AND CATALOG (COTS) SOLUTIONS



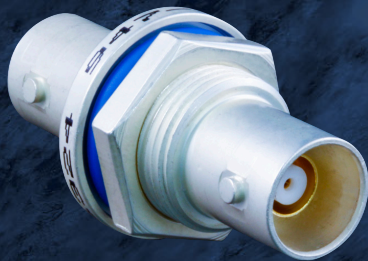
Coax, Triax, Quadrax and hybrid-contact layouts



Rectangular hermetics including Series 28 HiPer-D and Series 79



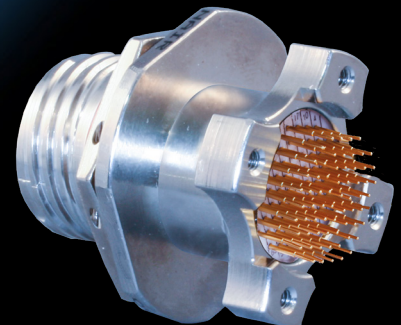
El Ocho high-speed octaxial contacts in a lightweight CODE-RED sealed bulkhead feed-thru



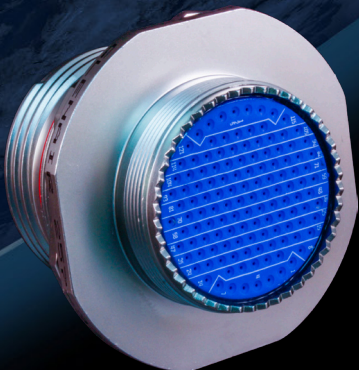
Triax hermetic



Hermetic Sav-Con Feed-thrus and Gender Changers



Dual-flange PC tail hermetic



Hermetic with crimp-removable contacts



Hermetic bulkhead penetrators



Hermetic receptacles with integrated band porch



LIGHTWEIGHT, LOW RESISTANCE

CODE RED

“Mission-Critical” hermetic sealing with better than 1×10^{-7} leak-rate performance

Hermetically-sealed interconnects used in vacuum or high-altitude applications prevent moisture and other contaminants from damaging sensitive electronic equipment. Glass-to-metal hermetic sealing has been the gold standard in the aerospace and petrochemical industries for decades due to the strength and long-term durability of the materials used. But glass-to-metal seal hermetics come with a big price tag in both weight and electrical resistance.

CODE RED is an innovative sealing encapsulant and application process—invented by Glenair—that provides durable hermetic sealing in a lightweight aluminum package. CODE RED allows for the use of conventional gold-plated copper alloy contacts, significantly improving electrical performance. CODE RED hermetic connectors are available now in Glenair SuperNine® (D38999 Series III type metal and composite), Series 80 Mighty Mouse, and M24308 D-Sub; and deliver reliable, life-of-system 1×10^{-7} max leak-rate hermetic sealing. Special non-magnetic (zero residual magnetism) versions are also available, consult factory.

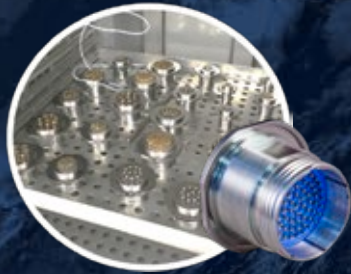
- Full hermetic sealing, better than 1×10^{-7} in a lightweight aluminum shell with low electrical resistance gold-plated copper contacts
- Meets NASA outgassing requirements, as well as aerospace temperature and corrosion resistance standards
- Operating temperature -65°C to $+200^{\circ}\text{C}$
- Available today in Mighty Mouse 806 Mil-Aero, M24308/9 D-Sub and D38999/23 glass-to-metal seal hermetics
- Significant weight savings—up to +50%
- Order-of-magnitude improvement in current carrying capacity and electrical resistance compared to Kovar/Inconel solutions

LIGHTWEIGHT, LOW RESISTANCE Code Red Hermetic Connectors



“Mission-Critical” hermetic sealing solution

CODE RED LIGHTWEIGHT HERMETIC CONNECTOR TESTING AND VALIDATION



Connectors utilizing CODE RED hermetic encapsulant sealing went through a grueling qualification test and validation process to prove material durability and hermeticity. Validation testing including 100 cycles of thermal shock IAW EIA-364-32 Test Condition A -65°C to +200°C while maintaining hermeticity followed by 1000 hours of thermal aging at 200°C. Additional tests included:

- DWV, DWV at altitude
- IR, IR at temperature
- Highly Accelerated Life Testing (HALT)
- Insert and contact retention
- Mating durability
- Random vibration at temperature IAW MIL-DTL-38999
- Hermetic seal at 30 psi

The entire qualification test cycle was repeated successfully a second time with new parts to validate complete reliability.

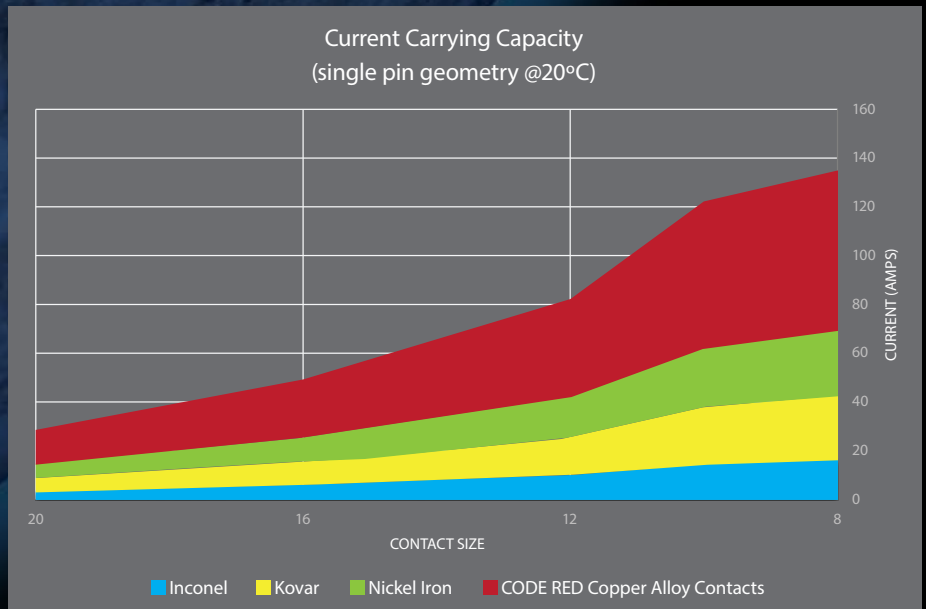
CODE RED USES PROVEN-PERFORMANCE CONNECTOR AND CONTACT MATERIALS

CODE RED Materials / Finish	
Sealing Adhesive	Proprietary Glenair compound
Contacts*	Gold-plated beryllium copper alloy per ASTM B 197 or equivalent
Insulator	Rigid plastic
Seals	Blended fluorosilicone/silicone elastomer
Receptacle Shell and Jam Nut*	Aluminum alloy 6061-T6 per ASTM B 221
Finish*	Electroless nickel per ASTM B 733

*zero residual magnetism materials also available

Graph illustrates Current Carrying Capacity of CODE RED copper alloy contacts compared to the Inconel, Kovar, and nickel iron contacts used in conventional glass-to-metal seal hermetics.

Percentage Weight Savings CODE RED vs. Glass-to-Metal MIL-DTL-38999 Sr. III	
Shell Size/Insert Arr.	Weight Reduction
9-35	52%
11-98	47%
13-35	47%
15-97	42%
19-32	40%
21-11	32%
23-21	28%
25-08	43%



APPLICATION NOTES: CODE RED is a viable drop-in solution for conventional glass-to-metal seal hermetic connectors with the following exceptions:

1. **Fuel Cells:** Although CODE RED exhibits outstanding resistance to caustic chemicals and fuels, its use in fuel tanks/fuel cell applications is not recommended.
2. **Cryogenics:** CODE RED has been tested and qualified to -65°C IAW MIL-DTL-38999
3. **Sustained High-Operating Temperatures:** CODE RED has been tested and qualified to +200°C IAW MIL-DTL-38999
4. **High Radiation:** Exposure to no more than 6 Megarads of radiation
5. **Deep Subsea:** CODE RED is ideally suited for aerospace and downhole applications that do not exceed 3 BAR (50 psi) atmospheric pressure differential.
6. **Space Life Support Systems:** Requires additional qualification testing not yet performed by Glenair.

Dr Chiaki Mukai is a cardiovascular surgeon and JAXA astronaut, the first Japanese woman in space

CIRCULAR AND RECTANGULAR Backshells and Connector Accessories

Corrosion resistance, weight reduction,
environmental durability and design innovation

Nowhere in the world does anyone manufacture and supply such a complete selection of backshell connector accessories—for space as well as all other mission-critical applications. In addition to traditional metal materials, Glenair also manufactures an extensive line of lightweight, corrosion-free composite thermoplastic interconnect components ideally suited for systems requiring electromagnetic compatibility, long-term durability and weight reduction.



The Glenair Qwik-Clamp connector accessory shown here is used on the International Space Station. This gold plated part is extremely resistant to space corrosion and radiation and is designed with all smooth surfaces to eliminate potential damage to space suits.



- High-performance connector accessories for every environmental, mechanical and electromagnetic shielding requirements
- Qualified to AS85049, SSQ 21635, 21636, 22698 and 22681 and other standards and specs
- EMI shield termination, cable strain relief, connector protective covers and more
- Lightweight composite versions
- QPL AS85049 backshells
- Tens of thousands of popular part numbers in inventory ready for same-day shipment

SPACE-GRADE INNOVATIONS
**Circular and rectangular
 backshells and connector accessories**



COMPOSITE DESIGN INNOVATION RADICALLY REDUCES INTERCONNECT SYSTEM WEIGHT



Band-in-a-Can
 composite backshell



Composite Swing-Arm with
 keyed drop-in banding insert

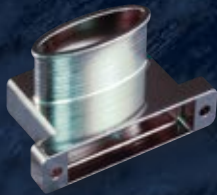


All-in-one booted
 "Piggyback" backshell



Isolated conductive
 ground path

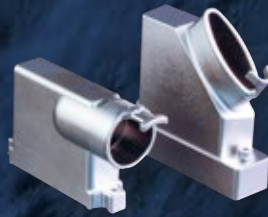
M24308 D-SUB SOLUTIONS: HIGH PERFORMANCE, RUGGEDIZED D-SUBMINIATURE PRODUCTS



D-subminiature 90°
 elliptical-entry backshell



Split-shell M24308
 composite backshell



Composite D-subminiature
 backshells



Flex-D Composite
 M24308 Backshell



M24308 EMI/RFI dual-
 entry backshell

BACKSHELL INNOVATION SHOWCASE



TAG-Ring/Qwik-Ty®
 Feed-Through Fitting



Spring-Loaded "Flop-Lid"
 Protective Cover



Special Space Grade
 Rectangular Backshell



Ultra Low-Profile
 Backshell



Series 437-001
 Backshell "Connector Saver"



Environmental
 Protective Covers



Mighty Mouse composite
 EMI/RFI banding backshell



High-Performance
 Banding Backshell

Reference Applications

Brief history of Glenair space-grade design-ins



**Atmospheric Infrared
Sounder (AIRS)**

Glenair-built cables provide signal and power interconnection on a broad range of space applications including The **Atmospheric Infrared Sounder (AIRS)** instrument aboard the Aqua Earth-observing satellite, JPL Mars Probes, the Space Shuttle, and the AIRS satellite. Several notable space applications include:

The **Gravity Probe**, confirmed two key predictions of Einstein's general theory of relativity in 2011 by monitoring the orientations of ultra-sensitive gyroscopes relative to a distant guide star. Glenair-built cables are on board.



Gravity Probe

Titan II space-launch vehicles, with Glenair-made interconnect harnesses, propelled all twelve manned Gemini capsules.

Hermetic connectors are ideal for high-pressure/low-leakage applications in air, sea and space environments. Made of stainless steel (CRES) with glass insulators fused to the connector shell, and suitable contacts meeting a leak rate of 1×10^{-6} cubic centimeters of Helium per second, these mounted receptacle connectors and bulkhead feed thru prevent gases from travelling through apertures or penetrations created for the routing of interconnect cabling. Glenair hermetics have protected a range of space programs including:

The **X-38** program implemented to design and build a spacecraft capable of flying itself and the Space Station crew back to Earth in an orbital emergency.

Pegasus rockets, the winged space booster vehicles used in an expendable launch system developed by private industry.



The X-38

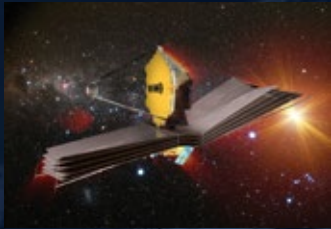
MetOp-A, Europe's polar-orbiting satellite dedicated to operational meteorology.

A well designed interconnect system will include a complement of grounding and shielding technologies to insure EMC. **EMI filter connectors** are an effective method to achieve electro-magnetic compatibility. Glenair is extremely well versed in supplying filter connector products optimized for use in space-grade applications, providing products compliant to EEE-INST-002, Table 2G, the recognized standard for space grade filters. Glenair MIL-DTL-38999, Series 80 Mighty Mouse, Series 28 HiPer-D, and Series 79 Micro-Crimp filter connectors are currently qualified and used by Ball Aerospace, Boeing Space, NASA/JPL, Orbital Sciences, Sierra Nevada Corp., and others. Notable Glenair Filtered connector space applications include:



MetOp-A

Skynet, for the United Kingdom Ministry of Defence, to provide strategic communication services to the three branches of the British Armed Forces and to NATO forces engaged on coalition tasks.



JWST

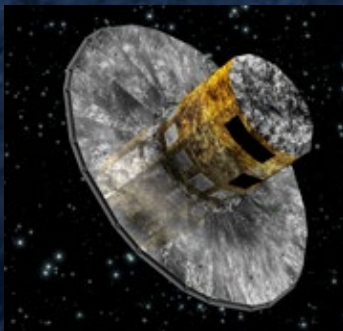
The **James Webb Space Telescope (JWST)** is a large, infrared-optimized space telescope. JWST is designed to find the first galaxies that formed in the early Universe, connecting the Big Bang to our own Milky Way Galaxy.

Micro-D connectors, including environmental, hermetics, filters, and flex assemblies are commonly used in space applications for their

high-performance and small size. The precision-machined shell of the Micro-D, with its robust mating retention forces, makes for an ideal connector for rocket and space vehicle applications that are subject to high levels of vibration and shock. The Micro-D is easily customized with package and mounting modification to fit virtually any integration challenge. A short list of Glenair Micro-D space applications would include the James Webb Space Telescope, SkyNet 5 military satellite, ALMA space telescope, JPL Mars Probe, Mars Curiosity Rover, AIRS satellite, and others. Several notable space applications that use Glenair Micro-D connectors include:

The **Herschel Space Observatory**, from the European Space Agency, made several scientific discoveries in its operational phase from 2009 – 2013, including a previously unknown and unexpected step in the star formation process, and the presence of molecular oxygen in space.

The European Space Agency also developed and built the **Gaia** satellite. Launched in 2013, its mission is to construct the largest and most precise map to date of the Milky Way. Its 2016 data release included positions and magnitudes for 1.1 billion stars



Gaia satellite

Cassini-Huygens was a joint NASA/ESA/ASI robotic spacecraft mission studying Saturn and its moons. Cassini executed several risky passes through Saturn's inner rings before completing its mission by burning up in atmospheric entry—but the data it returned will be analyzed for years to come.

CRIS is an advanced atmospheric sounding instrument aboard the United States Suomi National Polar Partnership (NPP) Polar-orbiting Operational Environmental Satellite. It produces high-resolution pressure, temperature, and moisture profiles from space, enabling more accurate predictions of severe weather events.

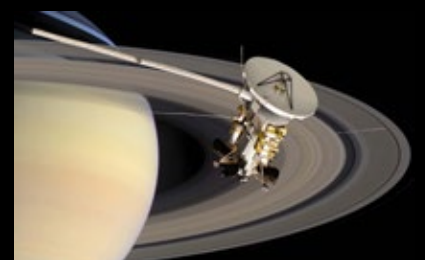
Glenair M32139 Class S Nanominiature connectors are DSCC approved for space programs. Glenair Nanominiature connectors, cable assemblies and flex circuit assemblies are currently in use on the several space-based telescopes,



Skynet



Herschel Space Observatory



Cassini-Huygens



CrIS NPOESS Satellite

including the **Large Synoptic Survey Telescope (LSST)**, **James Webb Space Telescope**, and others.

The **Series 79** connector is a Glenair original design. It features crimp, rear-release size #23 contacts on 0.075" spacing, as well as size #12 and #16 power and coaxial crimp contacts available in 29 insert arrangements for data and power transmission. The Series 79 Micro-Crimp is ideally suited for blind-mate rack and panel and/or module-to-chassis applications; and is currently qualified for use by Orion, Ball Aerospace, Honeywell Space, and LMCO Denver.

Glenair **Series 80 Mighty Mouse** connector and cable assemblies were developed as a smaller and lighter alternative to MIL-DTL-38999, offering virtually equal performance with up to 71% (weight) and 52% (size) savings for similar contact layouts. Mighty Mouse is well established in hundreds of safety-critical military, medical, industrial and geo-physical and space applications. Some space applications for this reduced form factor connector include:

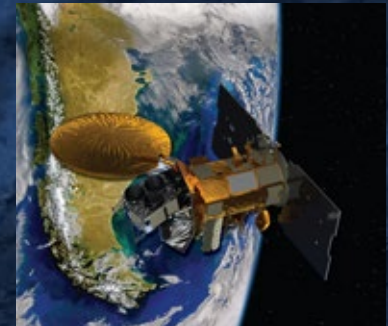
NASA's **Mars Exploration Rover (MER)** Mission, an ongoing robotic mission to explore the Martian surface and geology. The Opportunity rover is continuing her winter exploration of "Perseverance Valley" on the west rim of Endeavour Crater.



Mars Curiosity Rover's latest selfie, January 2019

The Mars Science Laboratory **Curiosity** landed in Mars' Gale Crater in 2012. This rover is over five times as heavy and carries over ten times the weight in scientific instruments as previous rovers. Within weeks, Curiosity discovered an ancient steambed where water once flowed, and evidence of a lake that could have supported microbial life in the distant past. Curiosity's original 2-year mission has been extended indefinitely, and it's still returning valuable data more than 5 years after landing.

Aquarius was a satellite mission to measure global Sea Surface Salinity. It provided the global view of salinity variability needed for climate studies.



Aquarius Satellite

Glenair **Sav-Con® Connector Savers** protect deliverable connectors subject to repeated mating and unmating cycles, especially from repetitive qualification test cycles. Sav-Con® Connector Savers prevent costly repair or replacement of cable plugs and receptacle connectors by absorbing connect and disconnect abuse and by reducing mating cycles during testing to the absolute minimum.

A virtual "Who's Who" of space programs use Glenair Sav-Cons including Boeing Satellite Systems, the Delta IV launch vehicle, Voyager, Galileo, Magellan, Cassini, and others—both during fabrication testing and in operation.

One of the most dramatic applications of our Sav-Con connectors is on the **Space Shuttle Orbiter** where they provided protection for the umbilical connectors from liftoff to touchdown on every mission.



A NASA LEO (Low Earth Orbit) Satellite

For many space applications, the cable shield is the most important element in controlling EMI and radiation damage. Unfortunately, metal shielding—especially when applied in multiple layers—can be extremely heavy. **AmberStrand** composite thermoplastic braid, and **ArmorLite** microfilament stainless steel braid provide robust EMI shielding at a fraction of the weight of

conventional shielding. Glenair lightweight braid technologies are currently qualified for use by EADS Astrium, Honeywell Space, Orbital Sciences, and Ball Aerospace. These unique products notably served on:

The **Cassini-Huygens** Program, an international science mission to the Saturnian system.

Mars Pathfinder, which delivered an instrumented lander and a free-ranging robotic rover to the surface of the red planet.



Ariane 5

The Glenair **Qwik-Clamp backshell** is used on the **International Space Station**. This gold plated part is extremely resistant to space corrosion and radiation and is designed with all smooth surfaces to eliminate potential damage to space suits.

Other circular backshell and connector accessory space applications include:

The European Space Agency's **Ariane 5**, which launches satellites and other craft into geostationary transfer orbit (GTO), medium and low Earth orbits, Sun-synchronous orbits (SSO) and Earth-escape trajectories

SEA Launch was a spacecraft launch service using a mobile sea platform for equatorial launches of commercial payloads.

As with circular backshells and accessories, Glenair has the rectangular interconnect world well covered. We supply everything from miniaturized backshells for Micro-D connectors to larger rack-and-panel connector accessories. Glenair rectangular accessories are used on dozens of space programs including the International Space Station, MetOps, Herschel Space Observatory, James Webb telescope, and others.

Recent / Notable Space-Grade Application Wins for Glenair

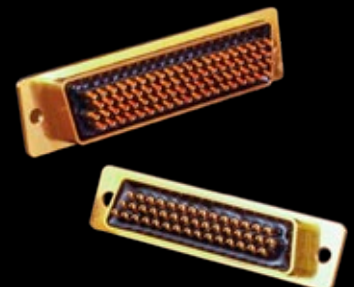
Glenair is the exclusive interconnect connector and cable supplier to the Sierra Nevada Dream Chaser reusable crewed suborbital and orbital space plane. The Dream Chaser electrical wire interconnect system incorporates Glenair Micro-D subminiature connectors, EMI filter connectors, flex circuitry, lightweight microfilament braid, metal and composite backshells, and other technologies.

The Glenair Series 28 HiPer-D High-Performance MIL-24308 Intermateable

Glenair's qualified MIL-DTL-24308 Class K space-grade hermetic, and our recently-introduced Series 28 HiPer-D connector series have become the go-to standard for mission-critical space applications and are now qualified for use by Ball Aerospace, LMCO Denver, Orbital Sciences, and others.



Space-grade Qwik-Clamp backshell designed for the International Space Station



Gold-plated space-grade Series 28 HiPer-D connectors

Glenair Factory Tour

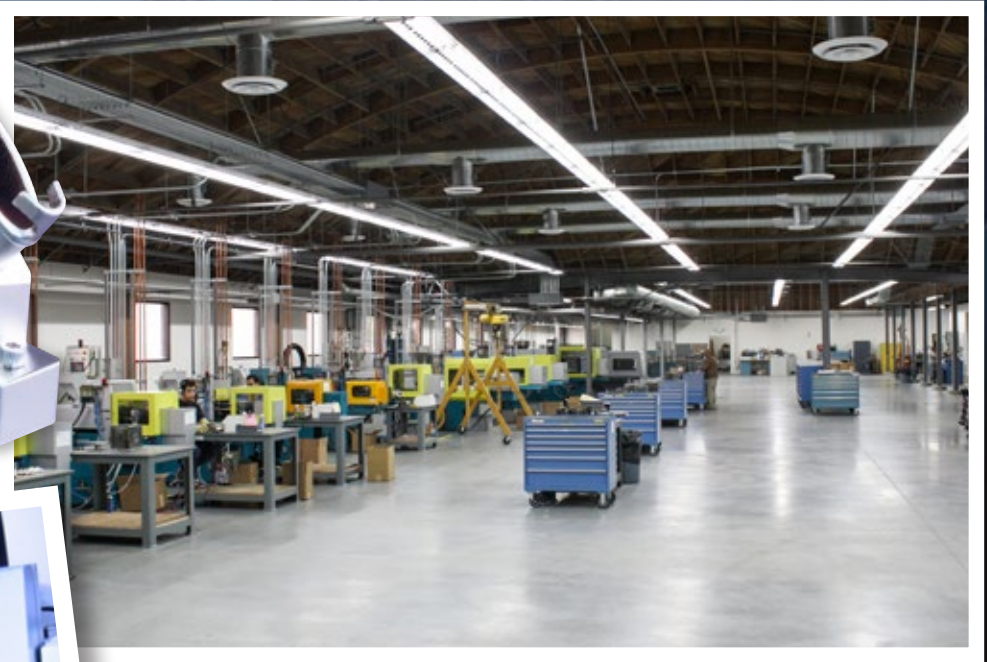
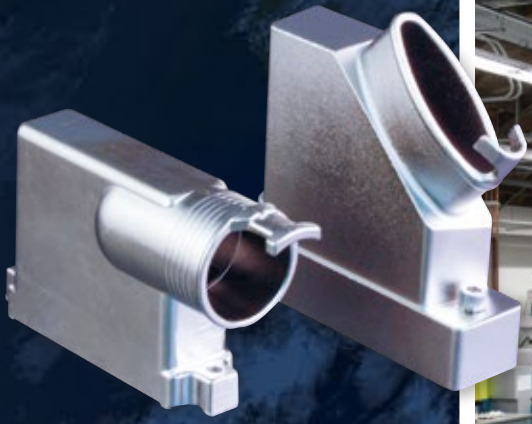
GLENDALE, CALIFORNIA

Complete vertical integration of manufacturing resources—at home in Southern California since 1956

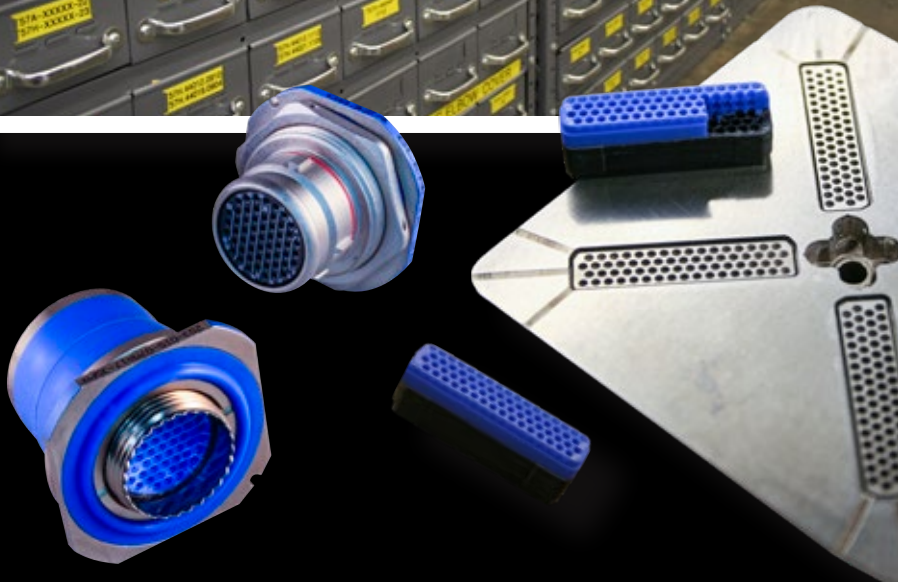


Glenair operates the largest precision machining facility in the high-performance interconnect industry, allowing us to support both small and large-volume interconnect requirements—from one piece to 100,000





Glenair's massive investment in composite thermoplastic injection molding capabilities—the largest in the high-reliability interconnect industry—includes machinery, tooling, and most importantly, professional operators



Glenair Factory Tour

Glenair's Complex Cable Group (CCG) has delivered creative engineering, high-quality workmanship, fast response, and on-time delivery to countless cable harness and ruggedized interconnect assembly customers for over 60 years—including countless space-grade and space flight applications. The operation—from cable design through fabrication, test, and delivery—is fully integrated into Glenair's Glendale campus, ISO 9001 and AS9100 quality system, and high-availability business model.



High-speed production overmolding



Multibranch assembly with lightweight ArmorLite™ microfilament EMI/RFI overbraid



Continuity testing standard on all cable circuits



Commander Ed White's "Golden Umbilical," with space-grade radiation shielding



Reliable Band-Master ATS® EMI/RFI shield termination technology used extensively throughout the shop



Glenair's engineering team in Glendale is augmented by regional teams worldwide, and we love to travel. Our place or yours? We work at our customers' convenience.



The Glenair Culture

COMMITTED TO QUALITY AND CUSTOMER SERVICE SINCE 1956

Glenair is proud of the quality and reliability we build into our broad range of mission-critical interconnect solutions—from discrete connectors to complex cable assemblies and embedded systems. Glenair is the biggest “made in the USA” interconnect supplier in the high-reliability industry, but we also operate factories in the UK, Italy, and Germany to serve the unique requirements of those markets. Glenair’s Worldwide Quality System is ISO 9001 and AS9100 certified and registered. We also hold many discrete product and operations certifications for specialty, high-performance markets including space, nuclear power, and rail. In addition to world-class quality, we are laser-focused on customer service and committed to being the easiest manufacturer in our industry to do business with. Here are just some of our key customer service principles:



Lightning-fast turnarounds on quotes and special orders

Huge same-day shipment inventory



Worldwide sales and technical support in every major market



Full-spectrum, “no gap” product lines



Generous NRE, RMA, and sample request policies



Abundant engineering and technical support

NO DOLLAR OR QUANTITY MINIMUMS.

No dollar or quantity minimums

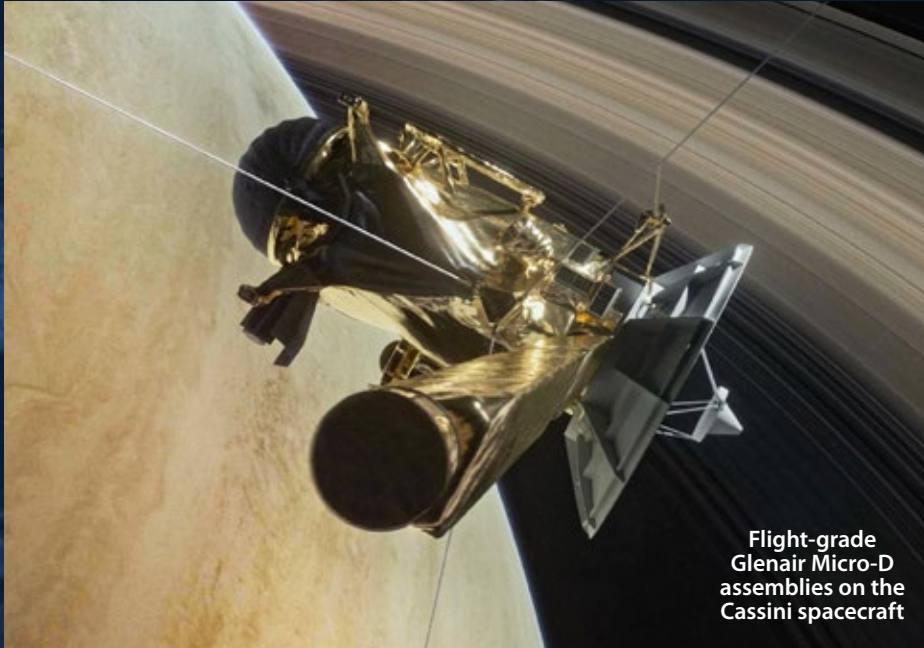


No attitudinal constraints when it comes to customer convenience and service

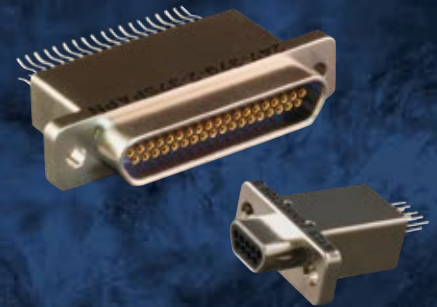
Glenair UK Factory Tour

MANSFIELD, ENGLAND

Mission-critical interconnect technologies for the UK and European markets with a special focus on micro and nanominiature flex assemblies



Flight-grade
Glenair Micro-D
assemblies on the
Cassini spacecraft



ESCC series Micro connectors for
ESA space and other UK and EU
markets

GLENAIR UK QUALITY STANDARDS AND APPROVALS

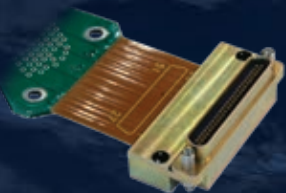
- ISO Class 8 Clean Room
IAW FED STD 209E class
100,000
- Quality Management
System certified
according to AS9100 and
ISO 9001
- Independent Test
Laboratory Certified to
ISO/IEC 17025 IECQ 01
and IECQ 03-6

Glenair UK is Glenair's Centre of Excellence for the design, build and qualification of its extensive Micro-D and Nano connector product portfolio for the European and global space market. Glenair UK have more than 30 years of experience in the manufacture of MIL-DTL-83513 Micro-D and MIL-DTL-32139 Nano compliant connectors.

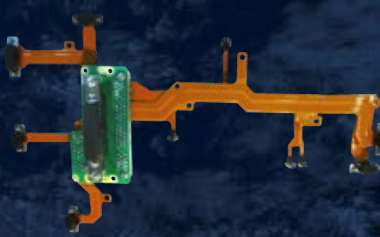
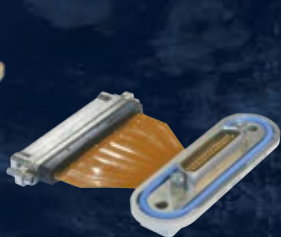
From standard flying-lead and PCB mount connectors to complex screened cable assemblies, Glenair production staff are trained and qualified to the exacting standards of IPC WHMA-A-620 and ESA soldering and crimping process standards: ECSS-Q-ST-70-08 & ECSS-Q-ST-70-26.

Certified to ISO/IEC 17025, Glenair's in-house independent test laboratory is capable of running all industry standard qualification programs for its space flight customers—from outgassing to full qualification programs (ESA and NASA).

MICRO AND NANOMINIATURE HARNESS AND FLEX ASSEMBLIES



Terminated and tested flexi and rigid flexi
point-to-point assemblies with Glenair Micro and
Nano interconnects



Complex multibranch flexi and rigid
flexi assembly with Glenair Micro and
Nano interconnects



Micro and Nano wired harnesses
and pigtailed

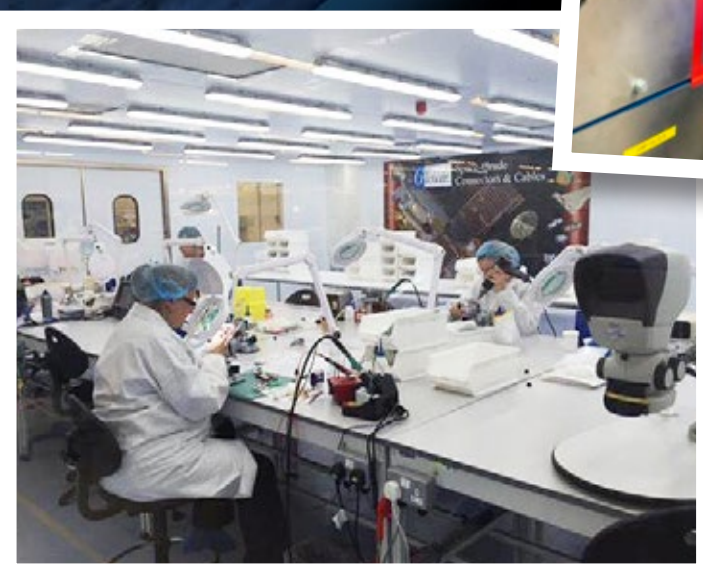


The Glenair Mansfield machine shop houses a full complement of CNC milling, turning, measurement, and mechanical inspection equipment

Micro-D and Nanominiature harnessing is completed in our AS9100 / ISO 9001 certified facility



The Glenair Mansfield clean room assembly area is used for fabrication of laser, space, and satellite assemblies IAW ISO Class 8 -100,000 PPM



Glenair UK operates an independently accredited BS9000:CECC:IECQ test lab for both internal as well as third-party product development / design verification and connector qualification

Glenair Factory Tour

BOLOGNA, ITALY

Glenair Italia serves harsh-environment military, nuclear, rail, and industrial markets with power, high-speed Ethernet, hazardous-zone interconnects and more.

SUPER ITS™ HIGH-PERFORMANCE REVERSE BAYONET



Higher temperature and ampacity rating with rigid insert and mechanical contact retention

HIGH VOLTAGE SOLUTIONS



15kV high-voltage connector series

HERMETIC CONNECTORS



UMBILICAL CONNECTORS



Umbilical interconnects, go-betweens, tilting buffers, and more

RUGGEDIZED ETHERNET CONNECTORS



Tested for compliance according to EN50173-1 standards for CAT5E and CAT7

MULTIPOLE POWER CONNECTORS



Pulse Width Modulation 3kV connector for AIRBUS



Ethernet Cat7A contacts



Ethernet Cat5 contacts



Coax contacts



Ethernet MVB - WBT contacts

Total vertical integration includes in-house contact fabrication and in-house injection molding



High-capacity CNC machining centers allow Glenair BLQ to provide lightning-fast turnaround on small and custom orders as well as large production runs, all with superior surface finishes and better part quality.



In-house test lab with capabilities for both high voltage as well as high speed signal product qualification



Glenair Italia hosts the most modern and comprehensive interconnect plating facility in Europe



FACTORY TOUR

Glenair Factory Tour

SALEM, GERMANY

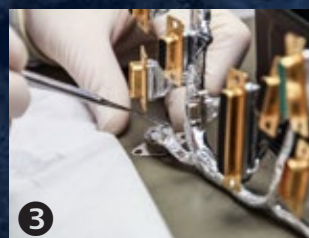
Space-grade interconnect harnesses and ESGE test rack systems for satellite applications—ESA certified



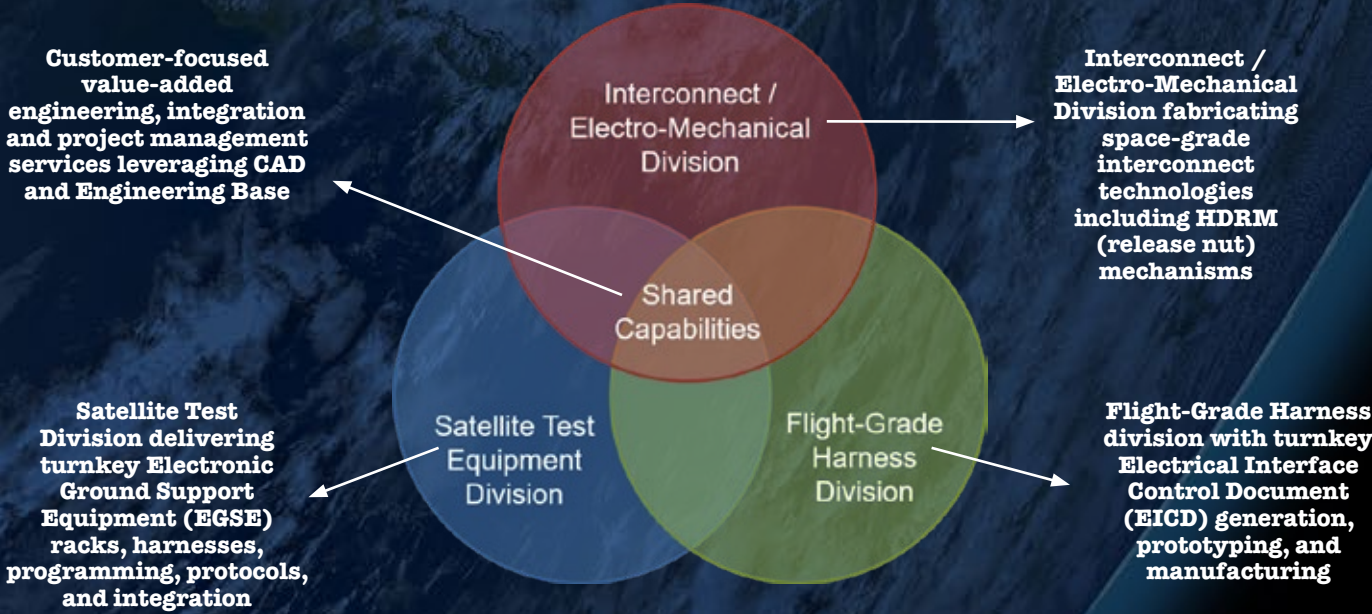
Glenair Space Systems: a mission-critical space-grade harness, test, production, and integration operation. ESA-certified assembly staff plus value-added Engineering Base and 3D SolidWorks design, prototyping, and clean-room facilities.

THE POWER OF GSS VALUE-ADDED ENGINEERING AND MANUFACTURING

A turnkey design and fabrication operation: from documentation (1), to prototype (2), to production (3), to integration (4).

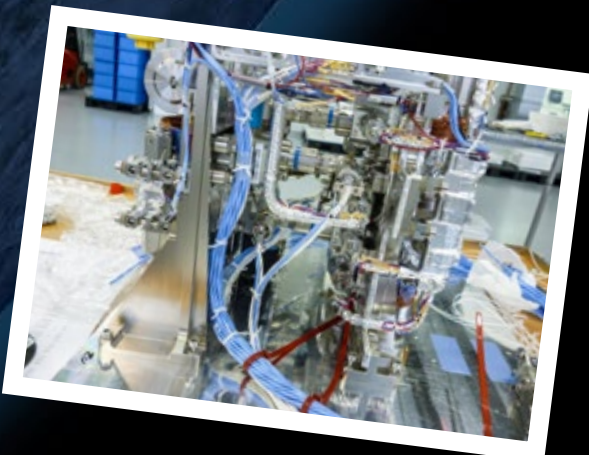


GLENAIR SPACE SYSTEMS CORE CAPABILITIES AND TECHNICAL TEAMS



GLENAIR SPACE SYSTEMS IN-HOUSE PRODUCTION AND ASSEMBLY CAPABILITIES

Glenair Space Systems is a growing operation with an over 600 m² production floor. The facility also features 300 m² ISO 8 and ISO 6 clean rooms, ISO 5 flow chamber (certified to ESD Standard 61340-5-1), a large precision machining center, and ample clean room accommodation for large mock-up and integration projects.



Integration of production harnesses— in-house or at customer facility



ESA-certified engineering and production staff



3D mockup design, fabrication, and harness integration including in-house generation of all engineering and production files using Engineering Base



Turnkey satellite test harnesses and Electronic Ground Support Equipment racks



MISSION-CRITICAL INTERCONNECT SOLUTIONS

Glenair, Inc.

1211 Air Way • Glendale, California • 91201-2497

Telephone: 818-247-6000 • Fax: 818-500-9912 • sales@glenair.com

www.Glenair.com

Glenair Power Products Group

20 Sterling Drive
Wallingford, CT
06492

Telephone:
203-741-1115
Facsimile:
203-741-0053
sales@glenair.com

Glenair UK Ltd

40 Lower Oakham Way
Oakham Business Park
Mansfield, Notts
NG18 5BY England

Telephone:
+44-1623-638100
Facsimile:
+44-1623-638111
sales@glenair.co.uk

Glenair Microway Systems

7000 North Lawndale Avenue
Lincolnwood, IL
60712

Telephone:
847-679-8833
Facsimile:
847-679-8849

Glenair Nordic AB

Gustav III : S Boulevard 46
SE-169 27 Solna
Sweden

Telephone:
+46-8-50550000
sales@glenair.se

Glenair GmbH

Schaberweg 28
61348 Bad Homburg
Germany

Telephone:
06172 / 68 16 0
Facsimile:
06172 / 68 16 90
info@glenair.de

Glenair Iberica

C/ La Vega, 16
45612 Velada
Spain

Telephone:
+34-925-89-29-88
Facsimile:
+34-925-89-29-87
sales@glenair.es

Glenair Italia S.p.A.

Via Del Lavoro, 7
40057 Quarto Inferiore –
Granarolo dell'Emilia
Bologna, Italy

Telephone:
+39-051-782811
Facsimile:
+39-051-782259
info@glenair.it

Glenair France SARL

7, Avenue Parmentier
Immeuble Central Parc #2
31200 Toulouse
France

Telephone:
+33-5-34-40-97-40
Facsimile:
+33-5-61-47-86-10
sales@glenair.fr

Glenair Korea

B-1304 Gunpo IT Valley
148 Gosan-Ro, Gunpo-Si
Kyunggi-Do, Korea
435-733

Telephone:
+82-31-8068-1090
Facsimile:
+82-31-8068-1092
sales@glenair.kr

