

Qwik Connect

GLENAIR • JULY 2017 • VO NUMBER 3

SERIOUS Interconnect Cable CAPABILITIES

Glenair®

Mario Trevino,
Glenair Complex Cable Group

SERIOUS Interconnect Cable CAPABILITIES

Military, aerospace, and harsh-environment industrial interconnect applications require EWIS cabling of a caliber not generally found on consumer-grade applications such as desktop computers or automobiles. In fact, the typical interconnect cable assembly made for high performance applications—from fighter jets to dismounted soldier systems—has little in common with their more pedestrian cousins in the consumer product arena including better shielding from electromagnetic interference, higher levels of environmental sealing and superior all-around mechanical performance.

Lightweight Mighty Mouse 806 SWAMP zone sensor/transducer interconnect cable assemblies



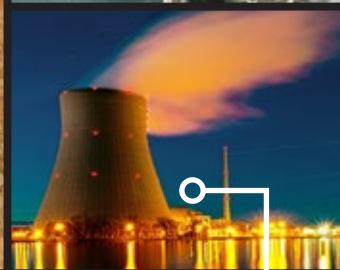
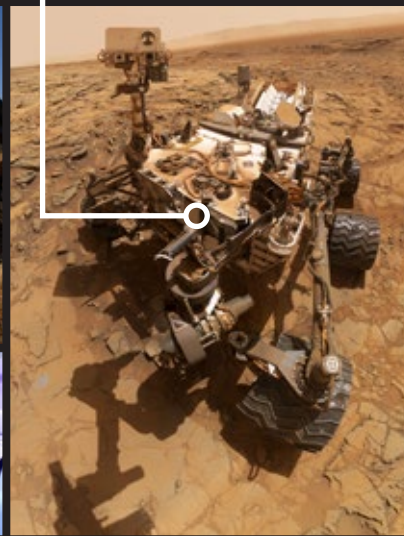
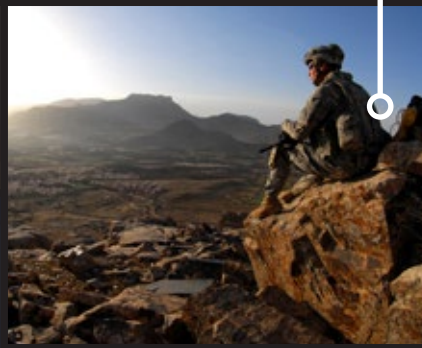
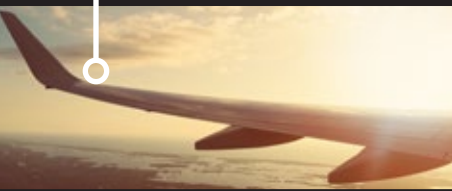
Lightweight, flexible, abrasion-resistant power and data cables for soldier C4ISR hubs



Miniaturized space-grade harness assemblies



High-temperature tolerant reusable wire-protection conduit assembly for space launch applications



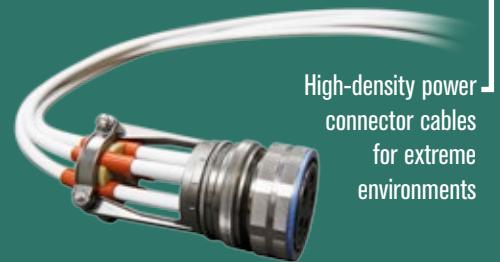
Multibranch overbraided Nomex® cable assemblies with overmolded connector junctions



High-speed fiber optic in-flight entertainment cable jumpers



High-density power connector cables for extreme environments



Glenair: Where Connector Manufacturing Meets Cable Harness Assembly

If there is one thing we understand well at Glenair, it's how to build interconnect assemblies for high-reliability systems. In fact, when it comes to protecting both electrical and optical media from mechanical stress, corrosion damage, lightning strike, physical abuse, nuclear, biological or chemical contamination and more, there is no more experienced cable operation in the business than Glenair. In large part this is due to our extensive interconnect component design

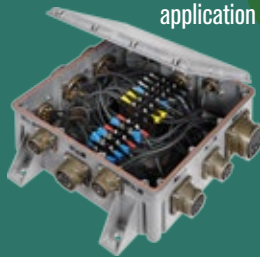
and manufacturing capabilities combined with our many years of experience in military grade and harsh environmental commercial cable harness fabrication.

This issue of *QwikConnect* presents a comprehensive overview of the interconnect environments, materials and design regimens that go into building high-reliability cable and conduit assemblies that meet even the most stringent electrical, mechanical and environmental performance requirements. The montage below illustrates the many application environments where Glenair interconnect cable assemblies have proven their value and performance since 1956.

Flight-proven cable assemblies dating back to Commander Ed White's Golden Umbilical Cable, first American space walk, 1965



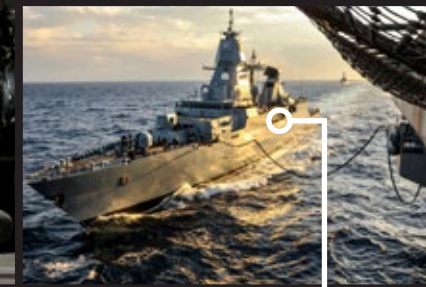
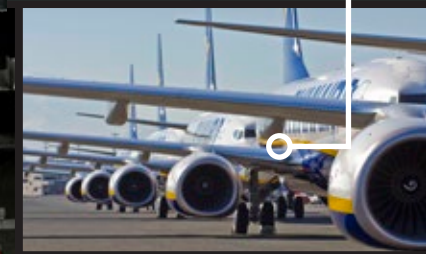
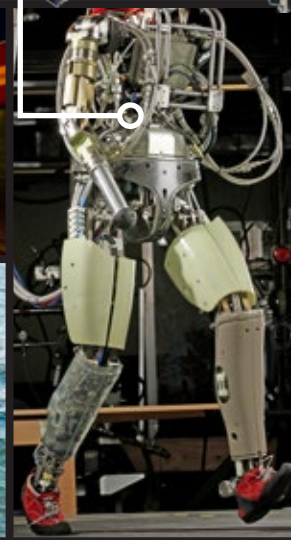
FADEC-caliber interconnect control box for rail engine application



Small form-factor, flexible multibranch harness assemblies



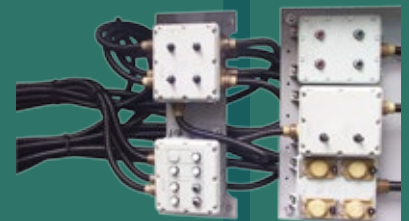
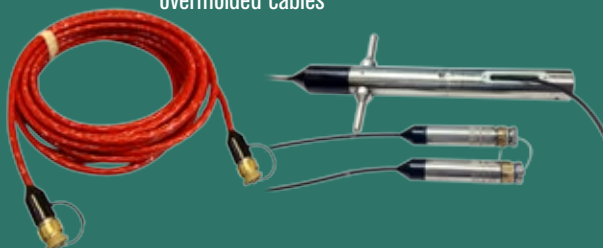
Aircraft wheel well / landing gear wired conduit assembly



Towed-array subsea streamers and overmolded cables

Corrosion-resistant wired conduit / composite junction box assembly for shipboard application

Golden Umbilical on display Smithsonian Air and Space Museum



SERIOUS Interconnect Cable CAPABILITIES

Environmental and Mechanical Stress Factors that Impact Cable Design

Application environment and user mechanics define the stress factors a cable or harness must endure. "Build to print" specifications typically spell out cable assembly sealing levels, mechanical durability, shielding levels as well as preferred materials and design. Glenair's cable/harness engineering team can also suggest design ideas, material types and fabrication processes that we know from experience best meet application needs in each specific environment. Careful attention to caustic chemicals and fuel types, UV exposure and mechanical

Small form-factor snap-lock, trigger-release helmet assembly with MouseBud™ spring-contact connectors



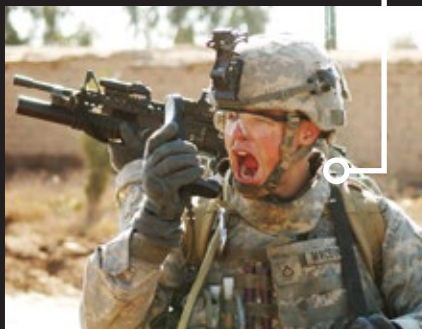
Soldier radio / C4ISR system power, voice, and data cables



Soldier-to-armored vehicle power / data interface cables and flex assemblies with SuperSeal™ field interconnects



Shallow water submersible and topside harsh-environment cable assemblies for geophysical applications



F-16 full immersion fuel tank cable assembly with molded bulkhead fittings



Ultra-lightweight, high-temperature PEEK wired conduit assembly, rail traction motor application



Turnkey in-house integrated flex assemblies



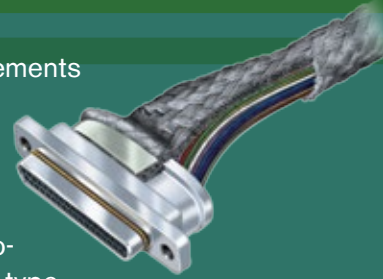
abrasion can significantly improve cable durability. Shielding material choices that resist windowing can improve electrical grounding throughout the life of the system. The judicious use of speciality fabrication processes, such as overmolding and the banding termination of shields, result in robust cable strain relief and reduced stress on wire junctions.

High-Speed Performance Requirements

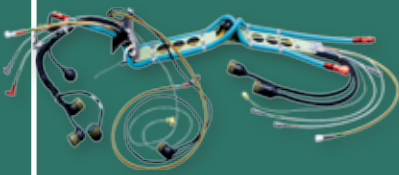
High-speed protocol specifications also dictate material and design decisions for wires, cables, connectors, shielding, and grounding. In specialty cable assemblies, such as RF, gigabit Ethernet and high-bandwidth fiber

optics, these many unique requirements demonstrably impact harness design and construction including length, shielding layers, and bend moment. Glenair is well known as the go-to supplier for assemblies of this type.

Our complete control of component part manufacture also allows us to offer accelerated lead times, improved quality control, and advantageous pricing on a complete range of assemblies incorporating advanced EMI/RFI filter, lightweight shielding and impedance-control technologies.



F/A-18 hybrid multibranch radar pantograph interconnect cable assembly



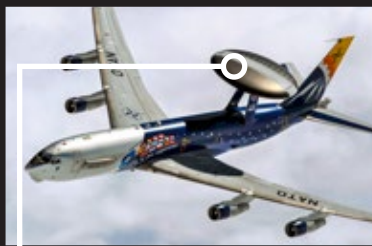
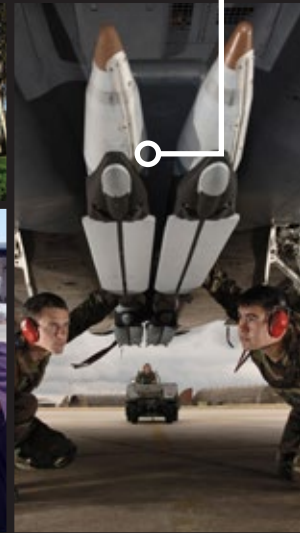
Certified laboratory and space-grade ECSS-E-ST-50-12C SpaceWire data transmission cable assemblies



Harsh-environment, field-deployable MIL-DTL-83526 type GFOCA spooled cable assemblies



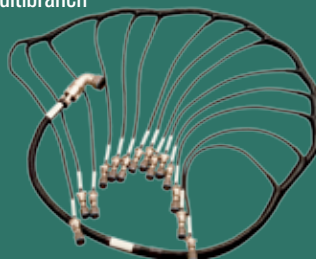
MIL-DTL-83513 Micro-D and MIL-DTL-32139 Nano missile telemetry cable assemblies



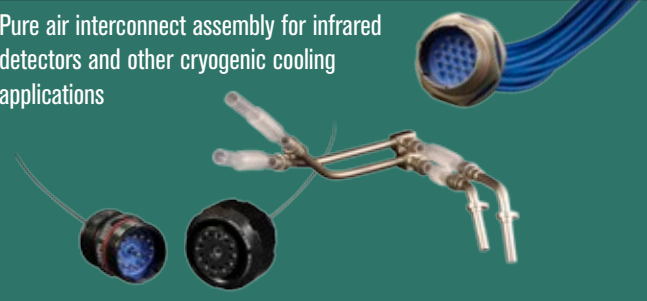
Buffer interface connector-equipped missile pylon assembly



Complex multibranch AWACS radar assembly



Pure air interconnect assembly for infrared detectors and other cryogenic cooling applications



Assemblies

Printed Circuit Board and Flex Circuit Interconnect Assemblies

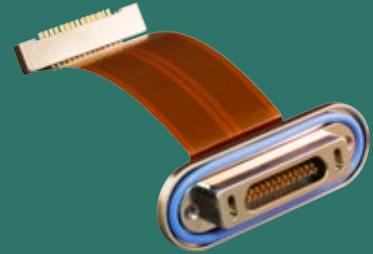
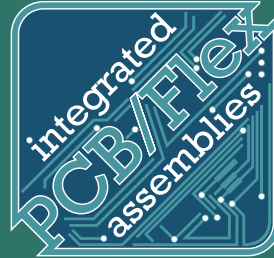
Electrical wire interconnect designers are increasingly turning to small form-factor flex circuitry to replace board-to-I/O wiring. Glenair offers turnkey PCB/Flex interconnect design and assembly. PCB/flex circuits offer unsurpassed size and weight reduction compared to cable bundles, especially in tight spaces with multi-branch routing. Flex circuitry offers outstanding mechanical performance, being able to withstand extreme vibration environments and capable of extended duty even through thousands of flexing cycles. Replacing complicated wire bundle assemblies with high-density flex assures faster, error-free assembly.

From concept drawings and fabrication data packages, to PCB/flex fabrication and assembly, we offer a complete solution. Termination to Glenair-manufactured printed circuit board connectors ensures high quality and technical performance to even the most challenging delivery requirements.

The ability to deliver connectorized flex and rigid flex assemblies is an important enabling technology contributing to our overall embedded subsystem electronics offering. We offer IPC Class III manufacturing for multiple panel sizes and panel thicknesses up to .5 inch. A broad variety of materials are available including Polyimide, FR-4, Rogers 4003, and Isola. Available surface finishes include ENIG, HASL, Ni/Au and more. Our PCB/Flex Interconnect team offers:

- Circuit design and generation of PCB/Flex fabrication data packages
- Full component-level documentation
- Top-level assembly drawings and BOM management
- 200+ certified PCB and cable assemblers
- IPC-6012 Class I, II, III, types 1-4; ISO 9001, AS9100
- ESD management
- NADCAP certification for special processes
- Tests such as DWV/IR, continuity, and others.
- Overmolding with multiple materials, including Hysol for PCB terminations

Point-to-Point Connectorized Flex and Rigid Flex Jumpers



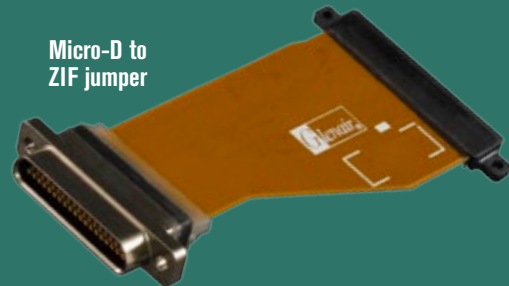
Harsh-environmental Micro-D to AlphaLink jumper



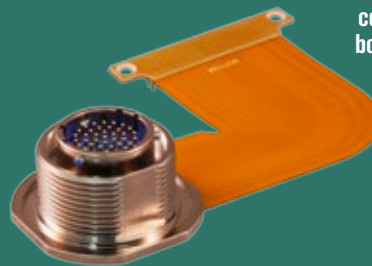
Low-profile Micro-D jumper



804 Mighty Mouse to Samtec surface mount jumper



Micro-D to ZIF jumper



Bayonet receptacle connector with direct board termination flex

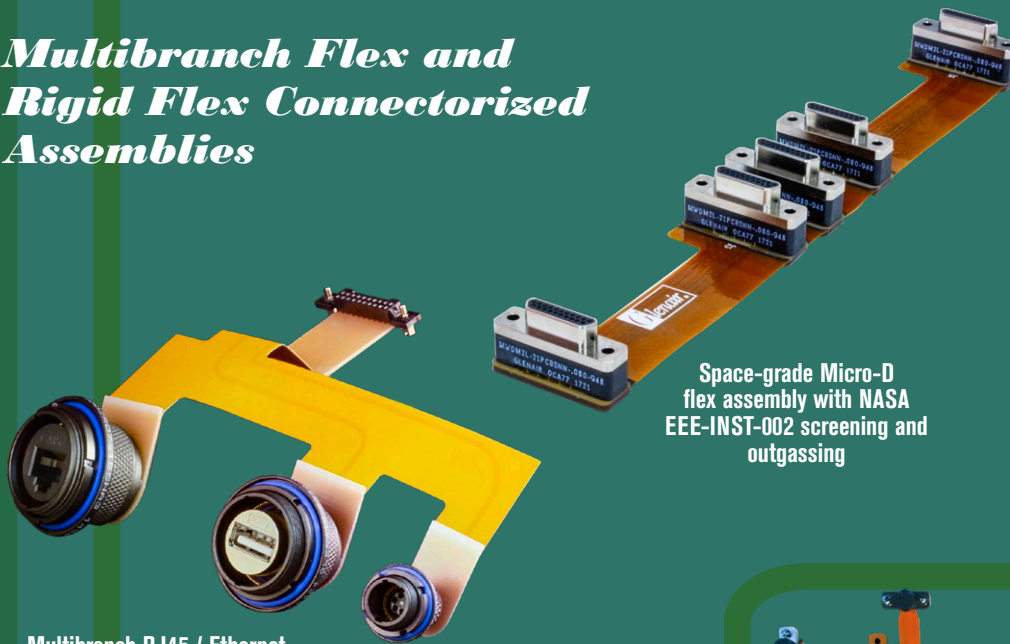


Series 23 SuperNine® to AlphaLink jumper

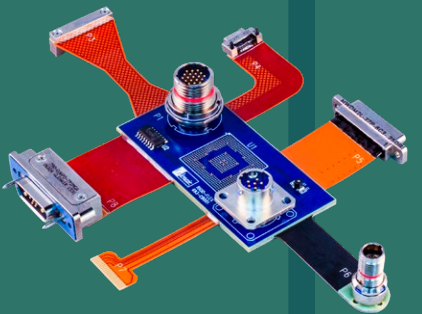


Our flex fabrication cell delivers IPC 6012 and 6013 Class III manufacturing and is managed under the same ISO 9001 and AS9100 certified quality system as the rest of the Glenair operation

Multibranch Flex and Rigid Flex Connectorized Assemblies



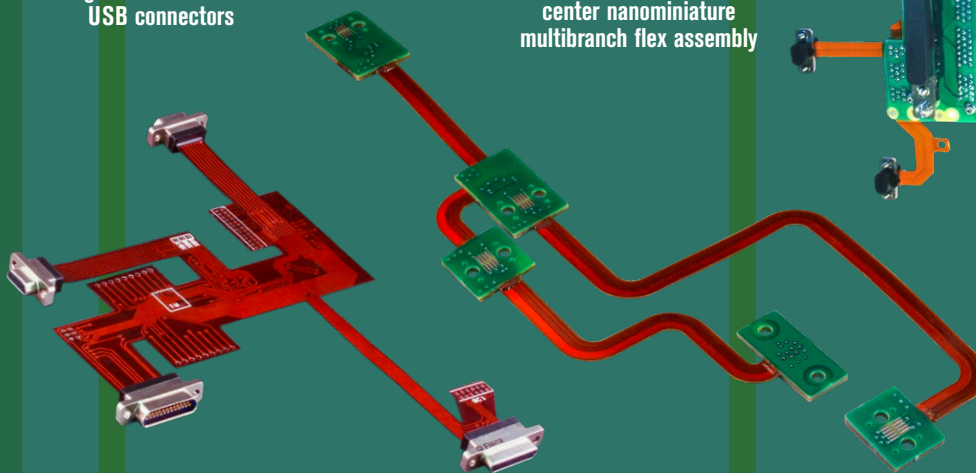
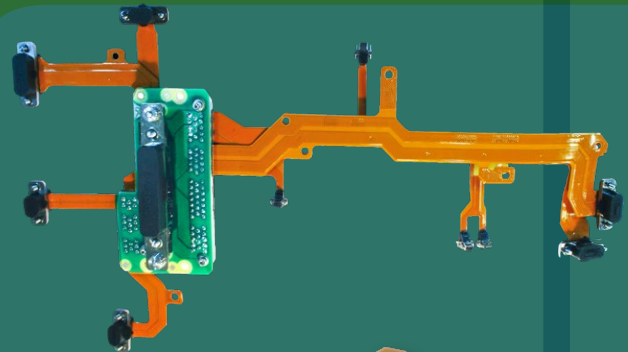
Space-grade Micro-D flex assembly with NASA EEE-INST-002 screening and outgassing



Multibranch factory demo rigid flex assembly highlighting the broad range of catalog board and mezzanine connectors available from Glenair

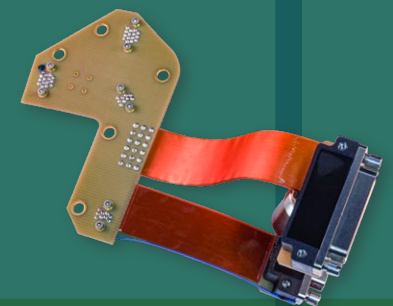
Multibranch RJ45 / Ethernet / USB Flex assembly. Glenair is the only manufacturer of catalog PCB-tail field RJ and USB connectors

High density .025" contact center nanominiature multibranch flex assembly



Micro-D subminiature multibranch flex assembly—a Glenair specialty.

Hybrid flex/rigid multibranch assembly ready for connector termination



Stacked Micro-D I/O connectors with flex jumper to rigid PCB assembly

FIBER OPTIC *Assemblies*

QwikConnect



Glenair manufactures every mission-critical fiber optic interconnect system and can integrate these fiber optic connectors, termini, backshell accessories, and cables into turnkey assemblies—terminated, tested, and ready for immediate use. Examples shown below range from inside-the-box pigtail assemblies to harsh environmental fiber optic cables, junction boxes, and integrated assemblies.



Environmental overmolded fiber optic cable assembly, MIL-DTL-38999 type with 29504/8 /9 QPL termini



Multi-way inside-the-box D38999-to-ST assembly



Turnkey catalog ASAP fiber optic cable assembly



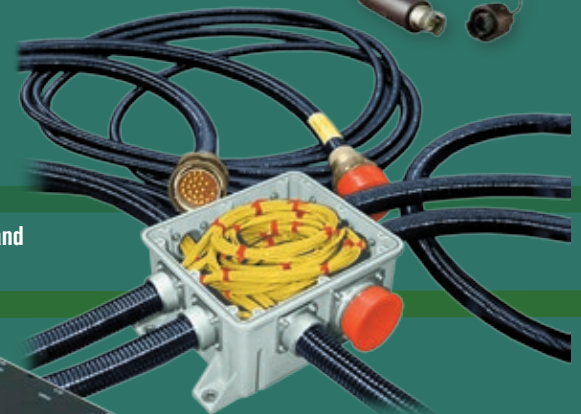
High-density non-environmental fiber optic assembly

Available cable reels and field-deployment technologies including man-packable units for both Glenair GFOCA and Eye-Beam® GMA fiber optic systems



Simple inside-the-box MIL-DTL-38999 type I/O connector to board

Fiber optic multibranch assembly with flexible conduit wire protection and integrated cable storage bay

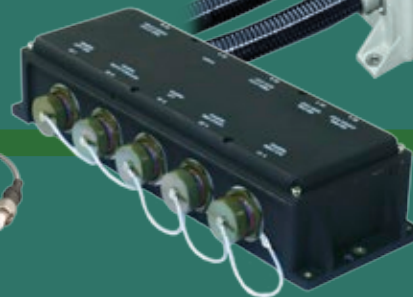


Demo assembly illustrating MT fiber optic board terminations

GFOCA I/O to board assembly with reinforcing overbraiding



High-speed video fiber optic switch and cable junction box assembly





Turnkey GFOCA fiber optic cable assembly

Fiber Optic Cable Assembly Application Checklist

Application Specifications

Working Environment

- Shipboard
- Airframe / Avionics
- Field Communications
- Space
- Missile Defense
- Other

Cable Installation

- Outdoor
- Indoor
- Internal-to-Equipment

Temperature Requirements

Operating:

- °C= _____ +°C= _____

Storage:

- °C= _____ +°C= _____

Optical Fiber Requirements

Singlemode

Number of fibers _____

Fiber Size

9/125 μm

Other

Test wavelength

1310 nm

1550 nm

Acceptable optical dB insertion loss

Less than 1.0 dB

Less than 1.5 dB

Acceptable optical return loss (backreflection)

Not applicable

_____ dB

Multimode

Number of fibers _____

Fiber Size

50/125 μm

62.5/125 μm

100/140 μm

Other

Test wavelength

850 nm

1300 nm

Acceptable optical dB insertion loss

Less than .5 dB

Less than 1.0 dB

Cable Harness Construction

Assembly Length Requirements

Less than 10 Meters

10 to 150 Meters

More than 150 Meters

Cable Type

Buffered

Simplex

Distribution

Breakout

Basic Harness/Assembly Description

Open Wire Harness

Repairable/Jacketed

Overmolded

Metal/Fabric Overbraided

Alternative Wire Protection Media

High Flexibility Convoluted Tubing

EMI/EMP Metal-Core Conduit

Molded Shrink Boots

Junction Box / Cable Bay

Level of Environmental Protection

Not Applicable

Moisture Resistance

Full Water Immersion

Caustic Fluid Resistance

Intense Atomic Radiation

Special Considerations

RoHS Compliant Materials

Extreme Temperature Tolerance

UL94-VO Flammability

UV Resistance

Field Repairability

Weight Reduction

Connector Types

Jam Nut or Flange or Square Plug

Pin Skt

Genderless

D38999 Series III Type

Glenair High Density

Series 80 Mighty Mouse

Eye-Beam™ GMA GLT

Glenair Front Release

MIL-PRF-64266 (NGCON)

GFOCA

MIL-PRF-28876

Termini Part No. _____

Dust Cover: Yes No

For inside-the-box assemblies indicate

B Connector type

ST Connector _____

FC Connector _____

SC Connector _____

SMA Connector _____

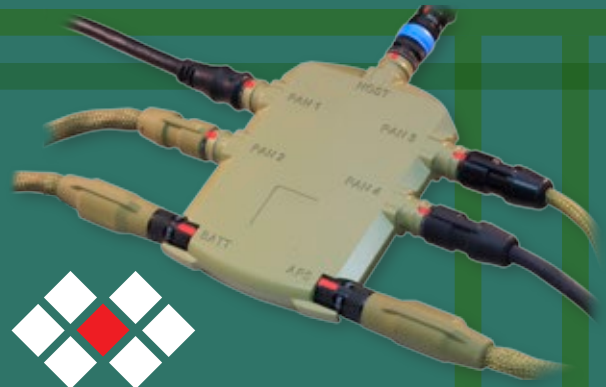
LC Connector _____

Other _____

GROUND SOLDIER *Assemblies*



Glenair STAR-PAN™ USB hub and power distribution interconnect systems are optimized with embedded power conditioning and charging electronics which allow the hub to utilize both primary battery power as well as scavenged power from direct current sources such as transport vehicles and alternative energy sources like kinetic and solar energy. Dedicated adapters and cabling for all charging functions as well as interconnect cabling for the broad range of soldier peripherals, radios, and computer EUDs are also supplied. Glenair STAR-PAN™ system cables utilize field-proven Mighty Mouse Series 804 connectors, and are optimized for durability, flexibility, and environmental sealing.



General-Purpose STAR-PAN™ System Cables



NETT Warrior (C1) Extension Cable 808-047



Host USB-A Cable 808-079



C4 Micro USB EUD Host Cable 808-046

STAR-PAN™ Peripheral Device Cables



TacROVER-e Cable 808-043



Radio Adapter Cable 808-080



USB 2.0 Adapter Cable 808-053



DAGR GPS/Navigation Cable 808-040



TacROVER-p ISR Receiver Cable 808-045



PLRF-15C/25C Laser Range Finder Cable 808-049

STAR-PAN™ Radio Data / Power Cables and Adapters



Microlight Radio Data Cable 808-044



PRC-117G Radio Data Cable 808-035



Harris Radio Adapter Cable 808-088



PRC-148 Radio Data Adapter 808-039



PRC-152A Radio Data Adapter 808-032



PRC-154 Rifleman Radio Data Adapter 808-051

***Small form-factor tactical soldier
interconnect cable assemblies
with Series 804 Mighty Mouse
quick-disconnect connectors***



**TACTICAL
INTERCONNECT
SOLUTIONS**

***Harsh Environment
Overmolded***



Overmolded breakout assembly featuring 100% Glenair content; a true turnkey solution

***Ultraflexible Fabric
Overbraid***



Non-environmental aircraft cable with integrated circuit breakout box and Mighty Mouse 804 push-pull connectors



Multibranch cable assembly with Glenair Mighty Mouse, HiPer-D M24308 and customer-supplied power connector



Heads-up display (HUD) cable with custom Series 804 Mighty Mouse and low-profile cable routing



Turnkey overmolded GPS cable assembly with integrated switch



Military jet jumper cable with user-serviceable backshells and fabric overbraid for mechanical protection



Environmental cable with Glenair Series 804 Mighty Mouse, Series 79, and RF Coax terminations

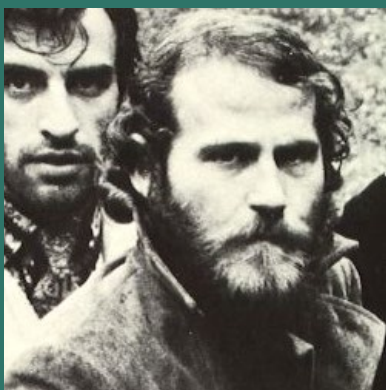
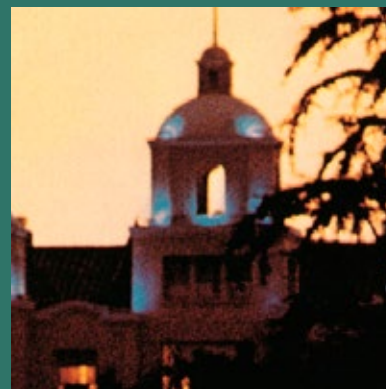
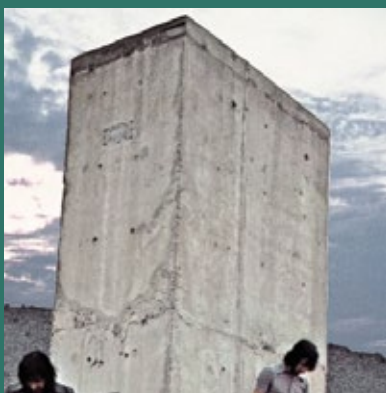


Hybrid Mighty Mouse and Micro-D aircraft pilot helmet cable assembly

TOP 25 CLASSIC POP ALBUMS *Of All Time?*

Hey, you can argue all you want... but these are our picks, and we're sticking with 'em. How many can you guess with just a postage stamp-sized piece of each original cover?

Answers posted August 15th: www.glenair.com/qwikconnect





OVERMOLDED *Assemblies*

Terminated, tested, overmolded, and ready for use, Glenair environmental cable assemblies may be supplied with MIL-M-24041 materials as well as other molding materials including Viton[®], Duraelectric[™], polyurethane, EPDM, Santoprene[™], polyamide and more. Fast turnaround and quality fabrication in overmolded cable assemblies depends on capital investment in tooling and injection molding equipment. Glenair operates the largest and most well-equipped overmolding shop in the high-reliability cable industry.

Advantages of Overmolding

- Waterproof sealing
- Robust mechanical protection
- Permanent protection of terminations
- Resistance to chemicals and fuels
- No induced cold flow stress
- Electrical isolation and insulation
- Reduced damage from wear
- Flexible routing/cable entry
- Repeatable assembly performance



Color-coded overmolded power and signal cable assembly



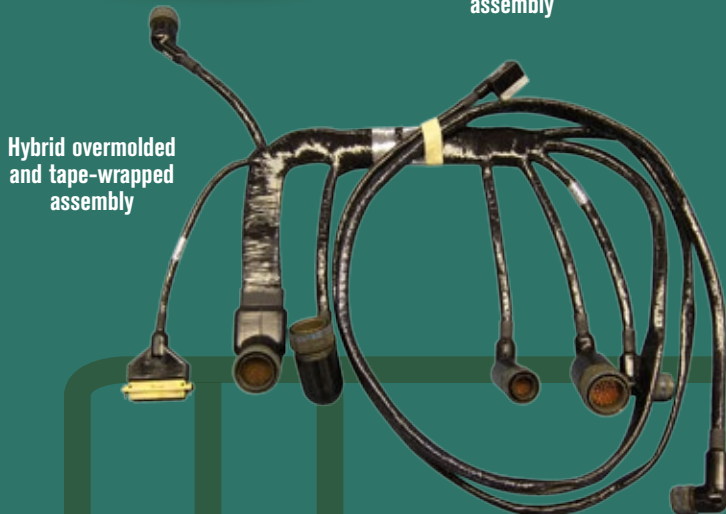
Overmolded TurboFlex[™] power and signal tank pylon assembly



Tight-tolerance multibranch fighter jet assembly



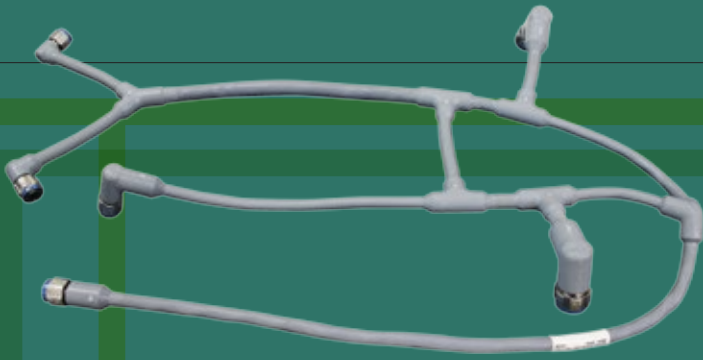
Repairable accordion boot-equipped assembly



Hybrid overmolded and tape-wrapped assembly



Overmolded point-to-point assembly with coil cord cabling



Commercial aircraft assembly with Duraelectric™ overmolding and Mighty Mouse connectors



Hybrid abrasion-resistant overbraided cable assembly with overmolded cable junctions

Overmolded Cable Assembly Application Checklist

Working Environment:

- Shipboard
- Airframe/Avionics
- Secure Communications
- C4ISR Soldier System
- Armored Vehicle
- Rail/Mass Transit
- Space
- Missile Defense
- Industrial
- Down Hole/Oil Patch
- Other

Basic Physical Description:

- Single-Ended
- Double-Ended
- Multi-Branch
- Overall Length _____
- Dimensional Tolerance
± _____ %

Electrical Wire Description:

- Number of Conductors _____
- Conductor Material/Finish _____
- Insulation Material _____
- Wire Gage(s) _____ AWG
- Wire Voltage Rating _____
- Twisted Pair
- Shielded Twisted Pair
- Coaxial

- Hybrid Optical/Electrical
- Multiple Conductor Cable
- Other

Optical Fiber Requirements:

- Number of F/O Lines _____
- Single-Mode
- Multi-Mode
- Acceptable Optical dB Loss
- < 1.0 dB
- < 1.5 dB

Environmental Requirements:

- Full Water Immersion
- Chemical/NBC Resistant
- Advanced Corrosion Protection
- IP67

Overall EMI/RFI Shield Requirements:

- Single Shield, Standard Coverage
- Double Shield, Maximum Coverage
- Other

Protective Jacketing Material:

- General Purpose Polyurethane
- Low-Smoke, Zero Hal Duraelectric™
- Chemically Resistant Viton
- High-Flexibility Neoprene
- Other

Style and Class of Connectors:

- MIL-STD Connector Series
- Industrial Power and Signal
- Fiber Optic
- Ultraminiature Circular
- Ultraminiature Rectangular
- Class of Mating Receptacle(s) _____

High-Speed Serial Data Applications:

- 10/100BASE-T
- 1000BASE-T
- USB 2.0
- IEEE 1394

Special Considerations:

- Space-Grade
- RoHS Compliant Materials
- Extreme Temperature Tolerance
- UL94-VO Flammability
- UV Resistance
- Crush/Abrasion Resistance

Identification Method:

- Heat Shrink Band
- Nylon Band
- Hot Stamp
- Other

Electrical Tests:

- Hi-Pot VAC
- Insulation Resistance

MARINE/SUBSEA *Assemblies*

QwikConnect

High pressure, up to 10K psi open-face deep water connectors, complex cables, and PBOF assemblies

All connectors and assemblies fully tested and qualified in-house in Glenair's state-of-the-art hydrostatic test lab.



SeaKing

Series 70 SeaKing™

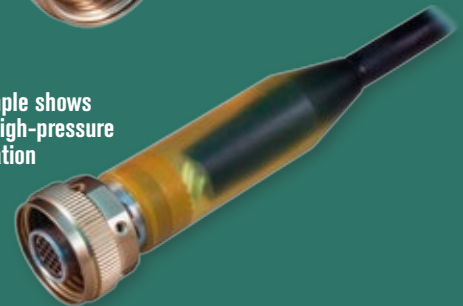
10K PSI / 700 Bar / 7000m open-face or mated, dual O-ring equipped, high-density, high-voltage, fiber optic and hybrid electrical/optical subsea connectors.

SeaKing is an innovative new connector series that eliminates a broad range of mechanical design weaknesses found in many of today's high-pressure subsea connector families. From its double O-ring seals and retractable engaging nut, to its multi-keyed mating interface, the SeaKing represents a bold new approach to subsea power and signal connectivity.



Series 70 SeaKing™ cable assemblies are available from the factory with special 10,000 psi overmolded cable-to-plug connector environmental sealing.

Transparent overmold test sample shows Glenair's harsh-environment, high-pressure cable overmolding and termination expertise (no voids, 360° material adhesion and cosmetic perfection)



Special high-speed application 10K psi overmolded 75 Ohm Coax hybrid assemblies



SeaKing™ PBOF hose attachment accessories feature adjustable hose routing/angle adjustment and 340° hose swivel action



Glenair's hydrostatic test lab control room: modular consoles provide for up to 8 pressure circuits, operating in manual or automated mode. Each circuit is capable of a maximum of 16.5K psi.



SuperG55 series cables undergoing qualification testing



Glenair's hydrostatic test lab accommodates pressure testing of discrete connectors as well as large multibranch assemblies



Series 22 Geo-Marine®

Geo-Marine® plugs are equipped with arctic coupling nuts—made from marine-grade naval bronze—with easy-to-grip castellated knurling and a powerful ratcheted anti-decoupling mechanism which guarantees reliable mating and demating performance in even the harshest environments. Supplied as discrete connectors—or more typically in build-to-print overmolded cable assemblies—the Series 22 Geo-Marine® has delivered reliable, proven performance in high-pressure subsea applications.



Geo-Marine catalog cordset



High pressure environmental and hermetically sealed cable for a field geophysical application



Marine-grade naval bronze interconnects in a ultra harsh-environment subsea cable assembly



SuperG55™

The SuperG55™ family of dry-mate deep sea-high pressure connectors is a revolutionary new design of the popular industry-standard used in countless ROV, underwater camera, diver communications, lights, pan and tilts, and other subsea applications.

Available in multiple shell sizes, the SuperG55™ is manufactured from 316L Stainless Steel with insert molded contact assemblies designed for pressure-sealed applications up to 10K psi mated and unmated. Intermateable and intermountable with other “55” series connectors, the Glenair solution introduces a long list of product innovations designed to improve performance and durability.

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SuperG55 right-angle overmolded high-pressure 10K psi sealed cable connector plug (CCP)



SuperG55 PBOF hose attachment accessories feature adjustable hose routing/angle adjustment and 340° hose swivel action



SuperG55 Factory-terminated overmolded high-pressure 10K psi sealed cable connector plug (CCP)

CONDUIT *Assemblies*

QwikConnect

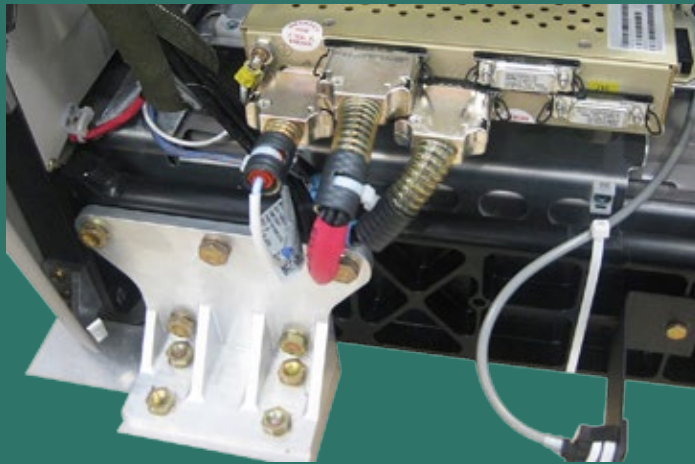
Turnkey Wired Conduit Interconnect Assemblies

Many of the conduit and convoluted tubing systems we fabricate at Glenair are assembled at our factory with tamper-proof crimp ring or solder terminations. User-assembled conduit components offer the convenience and flexibility of do-it-yourself field termination—especially valuable for prototyping of interconnect wire protection systems. But reduced size and weight factory terminated assemblies—from simple point-to-point to elaborate multibranch assemblies—offer the utmost in convenience, value, reliability and durability.

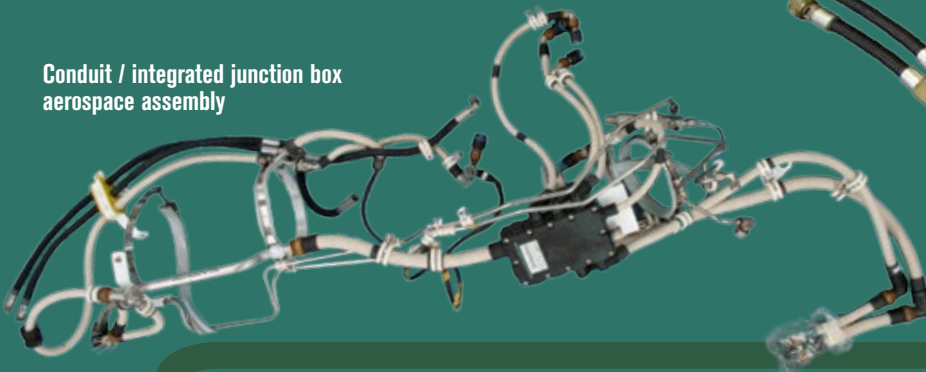
Labor-saving, ruggedized and lightweight

- Glenair can design, build, terminate—and even pre-wire—turnkey conduit wire routing solutions.
- Save space, weight, assembly time and labor cost.
- Certified factory assemblers and calibrated tooling for guaranteed performance.
- Simple point-to-point or complex multibranch.

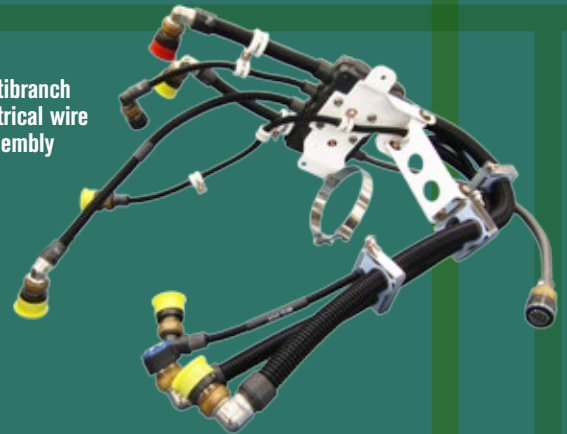
Glenair's expertise in wired conduit systems extends from simple point-to-point jumpers to complex multibranch assemblies (right) as well as turnkey integrated systems and LRUs with flexible conduit interconnect cabling.



Conduit / integrated junction box aerospace assembly



Complex multibranch fighter jet electrical wire conduit assembly

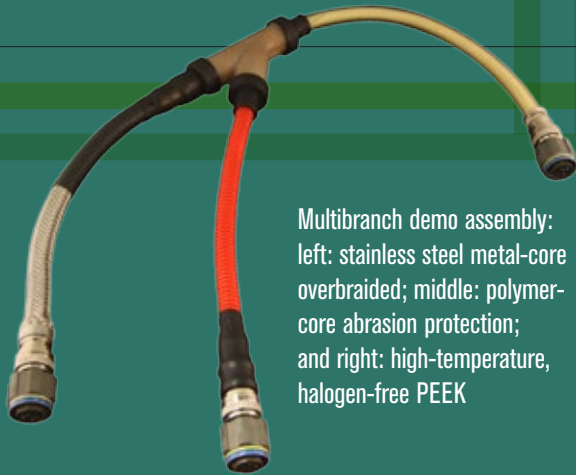


Lightweight, halogen-free rail industry wire conduit assembly

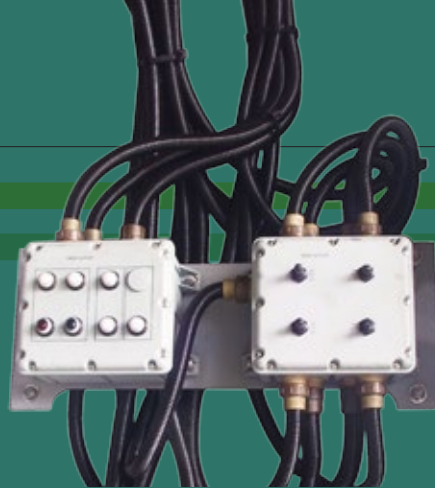


Crush-resistant commercial aerospace metal-core conduit assembly

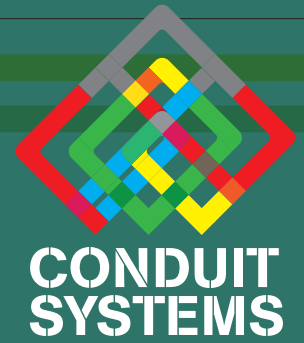




Multibranch demo assembly:
left: stainless steel metal-core overbraided; middle: polymer-core abrasion protection; and right: high-temperature, halogen-free PEEK



Turnkey integrated box assembly and wired polymer-core interconnect system with NAVSEA-qualified Navy junction boxes



Wired Conduit Assembly Application Checklist

Assembly Type

- Metal core
- Polymer core

Working Environment

- Shipboard
- Aircraft
- Secure Communications
- Ground Support
- Rail/Mass Transit
- Space
- Missile Defense
- Telecommunications
- Armored Vehicle
- Other _____

Assembly Length Requirements

- Less than 10 Meters
- 10 to 150 Meters
- More than 150 Meters

Special Requirements

- Weight Reduction
- Low Smoke/Zero Halogen
- UL94-V0 Flammability
- CBRN Resistance
- Field Repairability
- Size or Shape Restraints as Specified:

Level of Electromagnetic Protection

- Not Applicable
- db from _____ MHz/GHz
to _____ Mhz/GHz
- EMP
- TEMPEST
- Other; Required attenuation and frequency band:

Level of Environmental Protection

- Not Applicable (indoors)
- Moisture Proof
- Splash Proof
- Full Water Immersion
- Chemical/Caustic Fluid Resistance
- Extreme Corrosion Resistance

Mechanical Requirements

- Abrasion Resistance
- Crush Resistance
- Approx Strength: _____
- Flexibility
- Approx number of cycles: _____
- Tensile Strength
- Max. lbs. of pull: _____
- Temperature Tolerance:
Operating: - _____ °C
to + _____ °C

Storage: - _____ °C
to + _____ °C

Mechanical Durability

- Not Applicable
- Light Duty
- Medium Duty
- Heavy Duty

List the connectors used in this project:

List preferred jacketing, protective overbraiding or fabric sheathing materials such as neoprene, Dacron, AmberStrand®, ArmorLite™, and so on.

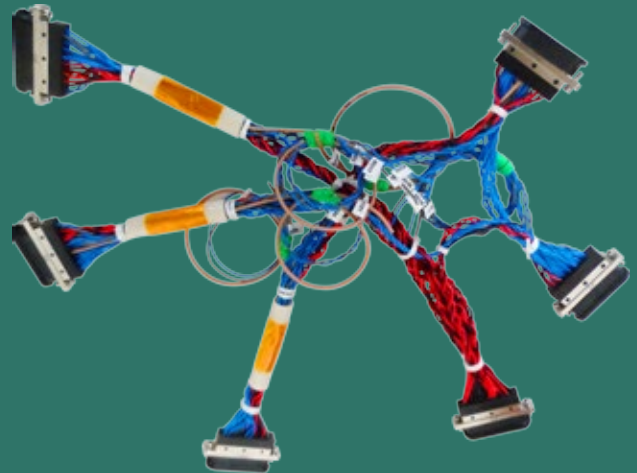
Marking/Labeling Requirements

RECTANGULAR *Assemblies*

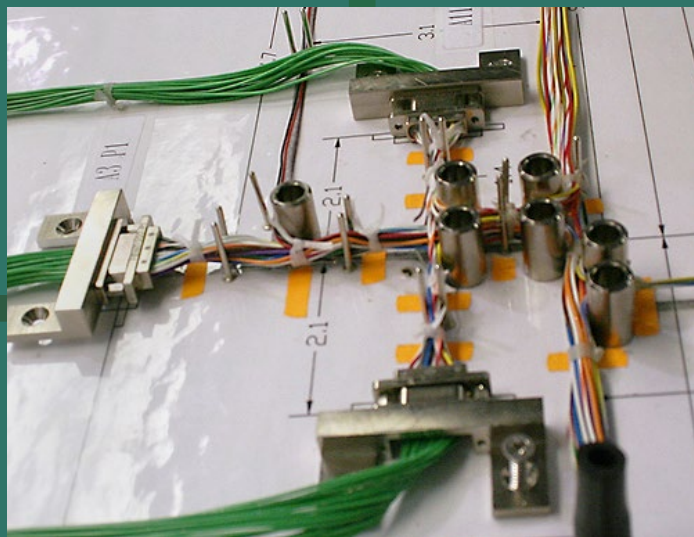
Rectangular connectors deliver optimized interconnection of circuits with higher-density and less wasted space compared to circulars. Efficient use of space goes hand-in-hand with contact density to enable rectangular shaped connectors to better fit into reduced size and weight applications. Because of their overall shorter length, lower shell profile and the fact that rectangulars do not need as much adjacent space for manual mating and de-mating, they are typically the connector of choice for low profile devices such as backplane and blade-type applications.

Glenair manufactures the complete range of rectangular connectors and connectorized interconnect assemblies from Nano and Microminiature to larger form-factor M24308 D-Subs and filtered ARINC 400 / 600.

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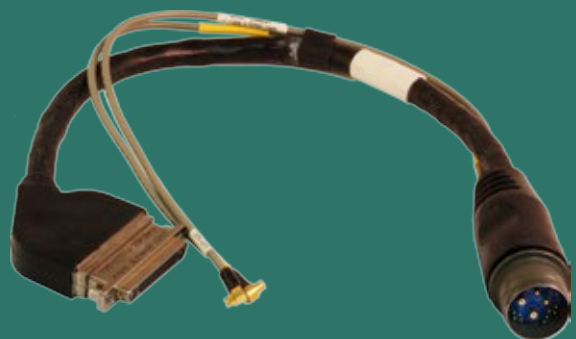
Open-loom Micro-D wire harness for an industrial robotic application



Precision tight-tolerance wiring board

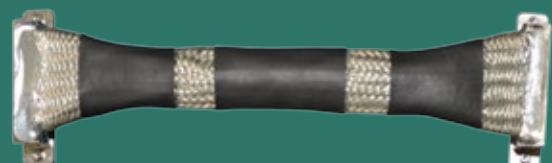
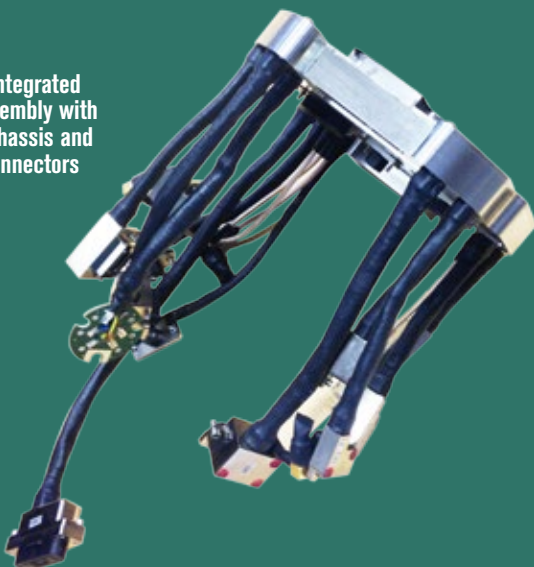


Hybrid Nano circular, D-Sub, and RF overmolded cable assembly



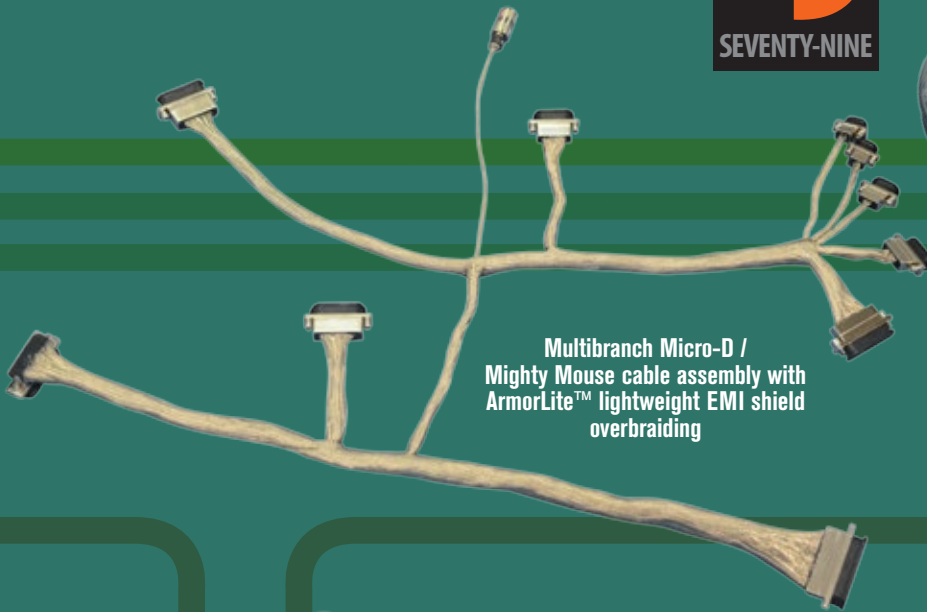
High-speed / RF cable assembly with overmolded Series 79 I/O connector and Mighty Mouse quick-disconnect cable connector

Complex integrated Micro-D assembly with machined chassis and custom connectors



Back-to-back shielded Micro-D assembly

***HiPer-D, Micro-D,
Nanominature, and
Series 79 Interconnect
Assemblies:
Factory-Terminated
and Ready for
Immediate Use***



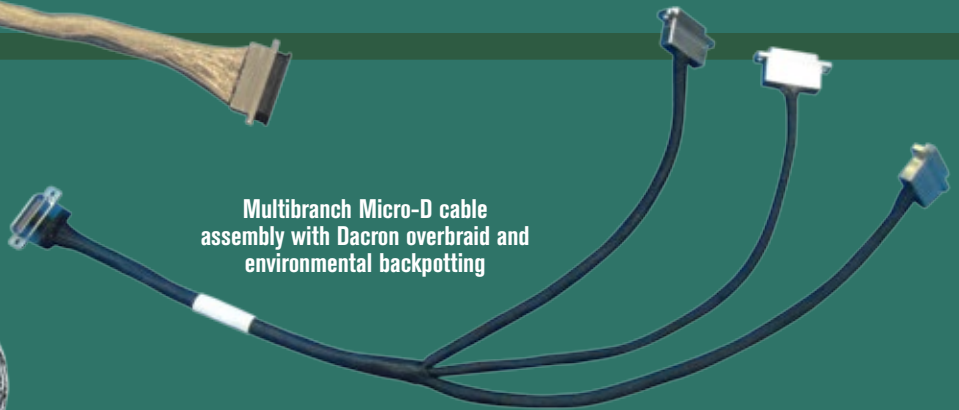
Multibranch Micro-D /
Mighty Mouse cable assembly with
ArmorLite™ lightweight EMI shield
overbraiding



Viton overmolded Micro-D to
Mighty Mouse cable assembly with
Series 77 Heat Shrink
3-1 transition



Repairable backshell-equipped Micro-D open loom
cable assembly with MIL-DTL-28840 circulars for a
US Navy application



Multibranch Micro-D cable
assembly with Dacron overbraid and
environmental backpotting



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

COMPLEX CABLE *Factory Highlights*

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Glenair's Complex Cable Group (CCG) has delivered creative engineering, high-quality workmanship, fast response, and on-time delivery to countless mission-critical interconnect customers for over 60 years. 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

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



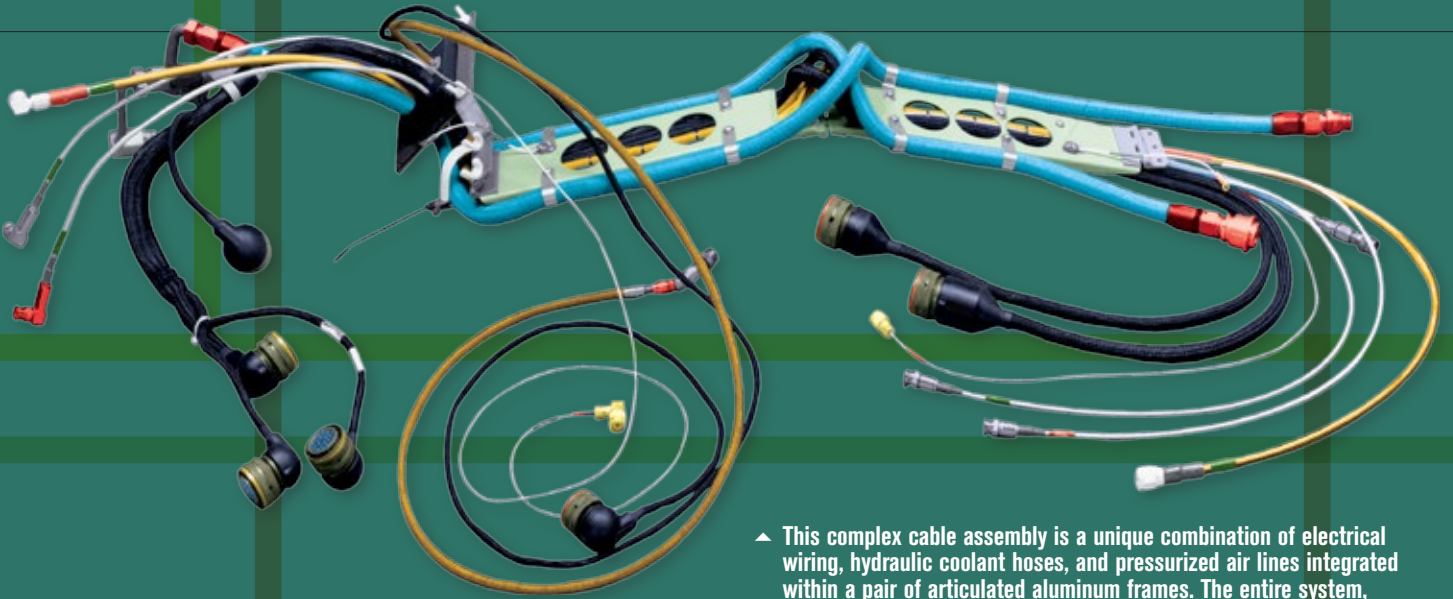
▶ Continuity testing standard on all cable circuits



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



▶ CCG manufacturing engineering team designs and builds custom jigs and fixtures



▲ This complex cable assembly is a unique combination of electrical wiring, hydraulic coolant hoses, and pressurized air lines integrated within a pair of articulated aluminum frames. The entire system, including coolant hoses, is assembled and tested according to customer specifications.



◀ Creative and practical: layout boards ensure final fit and function



◀ Skilled technicians produce made-to-measure multi-branch assemblies to exact dimensional tolerances

▶ Complete coverage of cable interstices in overbraided assemblies



If not, why not?

We like to keep things simple at Glenair. I was reminded of this the other day when an ISO quality auditor questioned me regarding customer satisfaction and quality. He was interested in how well we communicated our quality policy throughout our organization and whether or not we took adequate steps to *truly* evaluate customer satisfaction. My answer was that we use comprehensive PPM measurement instruments and are of course subject to intense scrutiny and feedback from our customers when it comes to on-time delivery, rejected parts and so on. Further, that we deliver important quality training on a regular basis and reiterate quality goals and objectives regularly in employee communications. Nailed it, right?

Some of you may know that our Glendale headquarters is located adjacent to The Disney Company's west coast Imagineering facility and that over the years we have had the occasion to interact closely with many of the people there. This question of measuring customer satisfaction—measuring it in a way that *truly* reveals how you are doing—reminds me of the unique approach followed by Walt Disney himself during the early years of Disneyland. Walt had a simple and effective way of determining customer satisfaction, as well as for determining where to focus his ongoing improvement efforts.

At the end of each day, a cheerful cast member with a clipboard would ask departing guests a few simple questions (I'm paraphrasing here, but the most important question in my mind went something like this):

- *Do you intend to recommend a trip to Disneyland to your friends, neighbors, co-workers, and others—and if not, why not?*

Walt believed a practical survey of this sort would provide all the information needed to determine whether or not they had a customer satisfaction problem. The "if not, why not" element of the question was of course critical. If the reasons were things like, "the lines were too long," or "the cast members were inattentive," or "the food was unappetizing," then *voila* he had a simple—and practical—road map for corrective action.

I think at times we all believe business must be more complex than that. That particularly in our industry, the range of questions and "if not, why not's" are more complicated than in Walt's day. But really, doesn't this one issue go straight to the heart of quality, performance, and customer satisfaction? In fact, what better way to gauge for yourself on an ongoing basis—no matter what your role is in the organization—whether your specific performance is meeting your customer's expectations? I can't say whether Walt's approach would have won any points with an ISO audit team. But I do hope it gives everyone on the Glenair team a glimpse into a powerful and effective way to *truly* measure customer satisfaction.

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