

Qwik Connect

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Glencair®

Turnkey
**FACTORY TERMINATED CONDUIT ASSEMBLIES
FOR MISSION-CRITICAL APPLICATIONS**

Conduit is an outstanding alternative to jacketed cables, especially for prototype assemblies, systems with extreme flexibility and physical protection requirements, and when field repair or system expansion is anticipated. Polymer tubing versions are lightweight, durable, highly flexible, and available in a broad range of material choices. Metal-core versions offer crush resistance and high-levels of EMI shielding. Connector-to-conduit backshells, transition fittings and special adapters are available in factory assembled and user installable styles. Conduit offers outstanding EMI, mechanical and environmental protection for interconnect wiring including,

- Easy on-site installation and repair
- Superior crush protection and resistance to projectile damage
- Reliable E and H field EMI shielding
- Superior flexibility compared to jacketed cables
- Superior durability and aging protection from heat, chemicals, and fluids.

Glenair is unique in the industry because we produce all our conduit component elements in-house, including extruded polymer tubing, braided EMI shielding, formed metal-core conduit, and machined, die-cast and injection molded backshells, adapters and fittings. In addition, we offer turnkey (wired and unwired) conduit assemblies made from both Mil-qualified and Glenair commercial-off-the-shelf components.

WHY CHOOSE CONDUIT INSTEAD OF A STANDARD CABLE ASSEMBLY?

1 Ease of Installation, Use and Repair

- Factory terminated point-to-point and multi-branch assemblies deliver exceptional value and convenience.
- Conduit can also be cut to length on-site and fitted with Glenair user-installable adapters and transitions.
- Conduit systems allow easy post-assembly access to wires for repairs, whether in the field or in the factory.
- For prototypes and mockups where wire routing lengths cannot be exactly determined before installation, the convenience of conduit as a wire protection solution is unmatched.
- Conduit systems are expandable, making it easy to add or remove wires as needed.



2 Advanced EMI Protection

- Metal-Core conduit provides optimal EMI/RFI shielding across all frequencies—H and E fields, TEMPEST and lightning strike.
- The continuously-wound and solder-sealed tubing completely encloses wire media—eliminating EMI susceptibility and emissions.
- Optional metallic or lightweight composite braided shielding provides an additional pathway to ground for EMI.



3 Environmental and Mechanical Performance

- Conduit is extremely flexible and offers wire routing versatility and environmental-sealing durability in repetitive flex applications
- Conduit delivers crush protection, abrasion protection, and high pull or tensile strength.
- Heat-resistant conduit materials, such as PFA, function in extreme temperatures from -95° to 500°F.
- High performance polymer materials are resistant to gamma radiation, ozone, fluids, fungus, and decontamination agents.
- Low smoke, zero halogen, low toxicity materials, such as PEEK, meet stringent environmental requirements.



All Glenair conduit systems—from our turnkey factory assemblies to our innovative do-it-yourself components—are designed and manufactured with a simple goal: make the products easy-to-install and tough enough to perform durably and reliably for the life of the application. This issue of *QwikConnect* highlights the broad range of solutions we bring to this alternative method of wire media protection. For additional information and specification assistance please see our new *High-Performance Conduit Systems* catalog.



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 multi-branch assemblies—offer the utmost in convenience, value, reliability and durability.

FACTORY TERMINATED CONDUIT AND CONVOLUTED TUBING ASSEMBLIES

Labor-saving, ruggedized and lightweight

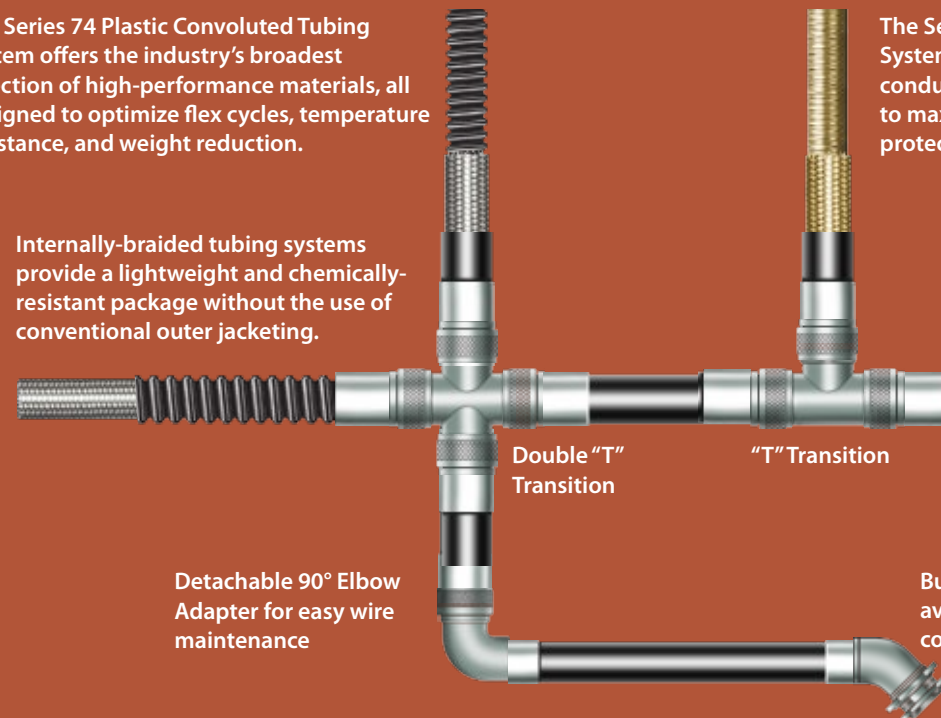
- Glenair can design, build, terminate—and even pre-wire—turnkey conduit wire routing solutions.
- Save space, weight, assembly time and labor cost.
- Certified factory assemblers and calibrated tooling for guaranteed performance.
- Simple point-to-point or complex multi-branch.



The Series 74 Plastic Convoluted Tubing System offers the industry's broadest selection of high-performance materials, all designed to optimize flex cycles, temperature resistance, and weight reduction.

The Series 75 Metal-Core Conduit System offers a wide range of flexible conduit core materials, all designed to maximize crush resistance and EMI protection.

Internally-braided tubing systems provide a lightweight and chemically-resistant package without the use of conventional outer jacketing.



Double "T" Transition

"T" Transition

Detachable 90° Elbow Adapter for easy wire maintenance

Bulkhead Feed-Thru Fittings are available in Straight, 45°, and 90° configurations.

Straight, 45° and 90° retractable connector backshells facilitate large-gauge contact termination and insertion.

Circular straight, 45° and 90° Conduit-to-Connector backshells are available for all common circular connector series.

Add strain relief and enhanced mechanical protection to Series 74 and 75 assemblies with Band-In-A-Can Backshells in Straight, 45° and 90° configurations.

Double "Y" Transition

Lazy "Y" Transition



H code teeth

Transitions and adapters are available in a number of configurations, depending on series and system. Versions with H code teeth (shown) for either direct attachment to MIL-DTL-38999 connectors, or to additional lengths of conduit, accommodate self-locking coupling nuts for anti-decoupling and easy clocking of backshells and fittings.

Glenair offers a variety of elastomeric jacketing materials. Our UV resistant and temperature tolerant Duralectric™ jacketing is available in several colors including black, OSHA Safety Orange, MIL-PRF-24758A Haze Gray, and Fed Std #3446 Desert Tan.

Rectangular Conduit-to-Connector Backshells for MIL-DTL-24308, MIL-DTL-83513 Micro-D, Glenair HiPer-D and Series 79 Micro-Crimp connectors are available in Straight, 45°, and 90° configurations.

Turnkey

SERIES 74 POLYMER-CORE CONVOLUTED TUBING ASSEMBLIES

TERMINATED, TESTED, AND READY FOR IMMEDIATE USE



Featured assembly made from lightweight, halogen-free PEEK tubing.

The first choice in the design of a flexible conduit assembly is the selection of the core tubing material—either lightweight polymer or flexible metal-core. The following pages describe the material choices and performance attributes of Glenair Series 74 High Performance polymer plastic convoluted tubing systems. Wire protection assemblies built around this core material offer exceptional durability and flexibility at the lightest possible weight. Polymer materials range from high-temperature Teflon® solutions to ultra-lightweight and halogen free PEEK. Because core materials are extruded in a helical configuration, many of the backshells, fittings and adapters are extremely easy to assembly—essentially threading onto the tubing in the same manner you would mate other thread-equipped components.

Environmental requirements are well managed in polymer tubing systems and include basic mechanical sealing against fluids through the use of glands, o-rings and jacketing as well as material resistance to solvents, cleaning compounds and fuels. When equipped with conductive internal or external braided shielding, the systems may be effectively employed in EMI/RFI shielded applications.

Lightweight, durable and flexible

- Wide range of tubing materials
- High-temperature tolerance
- Low-Smoke, Zero Halogen PEEK material available
- Braid options for superior EMI protection
- Ideal for expandable systems or prototypes
- Harsh chemical environment resistant
- Used in landing gear, aerospace and lightweight fiber optic applications
- Available in sizes from 3/16 to 2 inch (ID)



Series 74 Convoluted Tubing, Braided Shielding, and Jacketing Options

The Series 74 Convoluted Tubing System is a flexible and durable alternative to standard jacketed cable. System design begins with your selection of core Teflon® materials such as ETFE, FEP, PFA or PTFE, or halogen-free PEEK. Core materials may be outfitted with braided shielding and jacketing options to address specific mechanical, electrical (EMI), and environmental protection requirements. See the *High-Performance Conduit Systems* catalog for more information.

 <p>Part Number 120-100</p>	<p>Outstanding mechanical wire protection and lubricity for non-environmental and non-EMI/RFI applications</p> <p>Helical plastic convoluted tubing, available in a choice of 5 materials. Choose standard black or clear color.</p>
 <p>Part Number 120-108</p>	<p>Low-Smoke, Zero-Halogen PEEK Tubing</p> <p>Polyetheretherketone is the only halogen-free plastic tubing material supplied by Glenair. It is extremely light weight and crush resistant.</p>
 <p>Part Number 121-101</p>	<p>Adds EMI/RFI braided shielding for use in non-environmental applications</p> <p>Helical plastic convoluted tubing, available in a choice of 5 materials, with a single braided shield for EMI/RFI protection.</p>
 <p>Part Number 121-102</p>	<p>Adds a second layer of high dB EMI/RFI shielding for use in non-environmental applications</p> <p>Helical plastic convoluted tubing, available in a choice of 5 materials, with double braided shield for high frequency shielding applications.</p>
 <p>Part Number 121-100</p>	<p>A jacketed configuration with one EMI/RFI shield for use in environmental applications</p> <p>Helical plastic convoluted tubing, available in a choice of 5 materials, with braided shielding for EMI/RFI protection and a ruggedized jacket for environmental protection.</p>
 <p>Part Number 121-103</p>	<p>Double-braided and jacketed configuration for environmental and high dB EMI/RFI shielding protection</p> <p>Helical plastic convoluted tubing, available in a choice of 5 materials with double shielding and jacket for optimum EMI/RFI protection and environmental sealing.</p>
 <p>Part Number 123-100</p>	<p>For environmental applications without EMI shielding requirements</p> <p>Helical convoluted tubing in choice of 5 materials with a ruggedized jacket for environmental protection.</p>
 <p>Part Number 121-195</p>	<p>Internal braid configuration for harsh chemical environment applications, with EMI/RFI shielding</p> <p>Chemical- and UV-resistant plastic conduit tubing with internal braid for weight-savings and harsh-environment EMI/RFI protection.</p>

Convoluted Tubing Material Choices		
E	ETFE	Highest tensile strength and lubricity. Combines mechanical toughness with outstanding chemical, dielectric and thermal properties, improved radiation resistance. This is our standard material for a reason: ETFE delivers the best performance and best value in high-performance polymer resins.
F	FEP	Economical with relatively high thermal stability, excellent dielectric properties. Unaffected by virtually all solvents and chemicals, good adhesion resistance.
P	PFA	Outstanding lubricity and resistance to corrosives, -95°F to 500°F temperature rating. Melt-extruded for better cold flow and long-term sealing than PTFE; more economical.
T	PTFE	Outstanding resistance to corrosives, -95°F to 500°F temperature rating. Somewhat better folding endurance than PFA. However, this paste-extruded Teflon® material is more difficult to process and so costs more than PFA with virtually equal performance.
K	PEEK	Low-smoke, zero-halogen with high strength and superior crush resistance. Lightest weight of all the tubing polymers, but also the highest material cost.

Convoluted Tubing Material Properties					
Material Property	Perfluoroalkoxy (PFA)	Fluorinated Ethylene Propylene (FEP)	Ethylene Tetrafluoroethylene (ETFE)	Polytetrafluoroethylene (PTFE)	Polyether Ketone (PEEK)
Service Temperature	-95°F/500°F (-71°C/260°C)	-95°F/400°F (-71°C/204°C)	-65°F/310°F (-54°C/154°C)	-95°F/500°F (-71°C/260°C)	-76°F/392°F (-60°C/200°C)
Tensile Strength	3,000 PSI (20,684 KP)	2,500 PSI (17,237 KP)	5,000 PSI (34,474 KP)	2,500 PSI (17,237 KP)	7,000 PSI (48,300 KP)
Elongation	250%	200%	100%	175%	100%
Specific Gravity	2.15	2.15	1.70	2.15	1.26
Heat Aging	2000 Hrs.@ 525°F (274°C)	2000 Hrs.@ 430°F (221°C)	2000 Hrs.@ 350°F (177°C)	2000 Hrs. @ 525°F (274°C)	2,000 Hrs. @ 464°F (240°C)
Dielectric Strength	12,000V	12,000V	12,000V	12,000V	12,000V
Volume Resistivity	1018	1018	1016	1018	1016
Water Absorption	0.03%	0.01%	0.02%	0.01%	0.03%
Solvent Resistance	No swelling, stickiness or weight change				
Flammability	Non-burning				
Fungus Resistance	Does not support fungus growth				

Convoluted Tubing Color Options		
B	Standard Black	Standard for all Series 74 convoluted tubing materials
C	Clear (Natural)	Available for all Series 74 convoluted tubing materials
Consult factory for additional color options		

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PFA Versus PTFE Properties Comparison: Choosing the Right Teflon® Fluoropolymer Resin



Summary and Analysis

Understanding the performance characteristics of available material types is an essential first step in specifying the correct convoluted tubing for your interconnect application. But two of DuPont's most popular materials, Teflon® PFA and Teflon® PTFE are so close in most major performance areas that selection is more often an issue of price, rather than performance.

Both materials show outstanding chemical properties for resistance to corrosive agents, nonsolubility, and nonflammability. Both are virtually identical in terms of their electrical properties for dielectric, dissipation, and surface resistivity. Even in critical melting point (service temperature) ratings, both materials have identical properties. In fact, it is only in three areas, cold flow, folding endurance and cost that these virtually identical fluoropolymer resins differ significantly.

Because PFA is melt extruded, it exhibits better cold flow values than PTFE, which translates to better long-term sealing and reduced loosening of fittings. In terms of cost, PFA convoluted tubing is typically the better performer, as the melt extruded product is less costly to fabricate and can be produced in any length, effectively eliminating the scrap associated with PTFE.

PFA vs. PTFE Comparison Table		
Property	PFA 350	PTFE
Service Temperature	-95°F/500°F -71°C/260°C	-95°F/500°F -71°C/260°C
Thermal Conductivity	.25 W/MK	.19 W/MK
Tensile Strength	4,000 PSI (20,684 KP)	3,600 PSI (17,237 KP)
Specific Gravity	2.12 - 2.17	2.13 - 2.25
Hardness	55	55
Cold Flow	>2% 6.9 MPa (1,000 PSI) @25°C (73°F) at 1,000 hrs.	>10% 6.9 MPa (1,000 PSI) @25°C (73°F) at 1,000 hrs.
Flexural Modulus	590 - 625 MPa 85,000 - 90,000 PSI	345 - 620 MPa 50,000 - 90,000 PSI
MIT Folding Endurance	5 x 105	1 x 106
Chemical Properties	inert	Inert
Electrical Resistivity	>1018 OHM/CM	>1018 OHM/CM
Water Absorption	<.03%	<.01%

Series 74 High-Performance Helical Convoluted Tubing: Braided Shield and Jacket Options and Material Properties

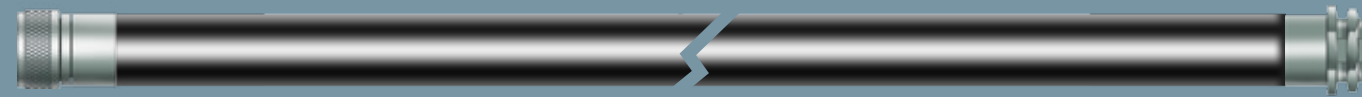
EMI/RFI Braided Shielding and Non-Metallic (Fabric) Overbraids		
T	Tin/Copper	150°C temperature rating, 125 lbs. tensile strength, 96 hr. salt spray corrosion resistance
C	Stainless Steel	Highest tensile strength (225 lbs.), highest temperature—1093°C+
N	Nickel/Copper	200°C temperature rated, 150 lbs. tensile strength, 500 hrs. salt spray corrosion resistance
S	SnCuFe	Tin plated iron/copper
L	ArmorLite™	Microfilament metal-clad ultra lightweight stainless steel braid
D	Dacron	Yarn with excellent abrasion resistance, good chemical resistance, non-conductive
M	Nomex	-55°C to 260°C temperature range - will not melt, excellent chemical resistance, non-conductive
E	AmberStrand® 100%	Expandable, flexible, high-strength conductive metal-clad composite thermoplastic
F	AmberStrand® 75%/25%	75% Expandable, flexible, high-strength conductive metal-clad composite thermoplastic combined with 25% nickel-plated 36AWG copper wire for additional strength

Jacketing Options		
N	Neoprene	Tough, durable polychloroprene for mechanical and environmental protection
H	Hypalon®	Light weight with broad temperature range
E	EPDM	Better resistance to Ketones
V	Viton	Heaviest material with best resistance to oil and gasoline
B	Duraelectric, Black	Weatherproof, halogen free, flame resistant, functional to 260°C
G	Duraelectric, Gray	Qualified to US Navy MIL-PRF-24758A, Fed Std 595B #26270 Haze Gray color
TN	Duraelectric, Desert Tan	Duraelectric in Fed Std #3446 Desert Tan color
O	Duraelectric, Orange	OSHA Safety Orange to mark energized electrical cables

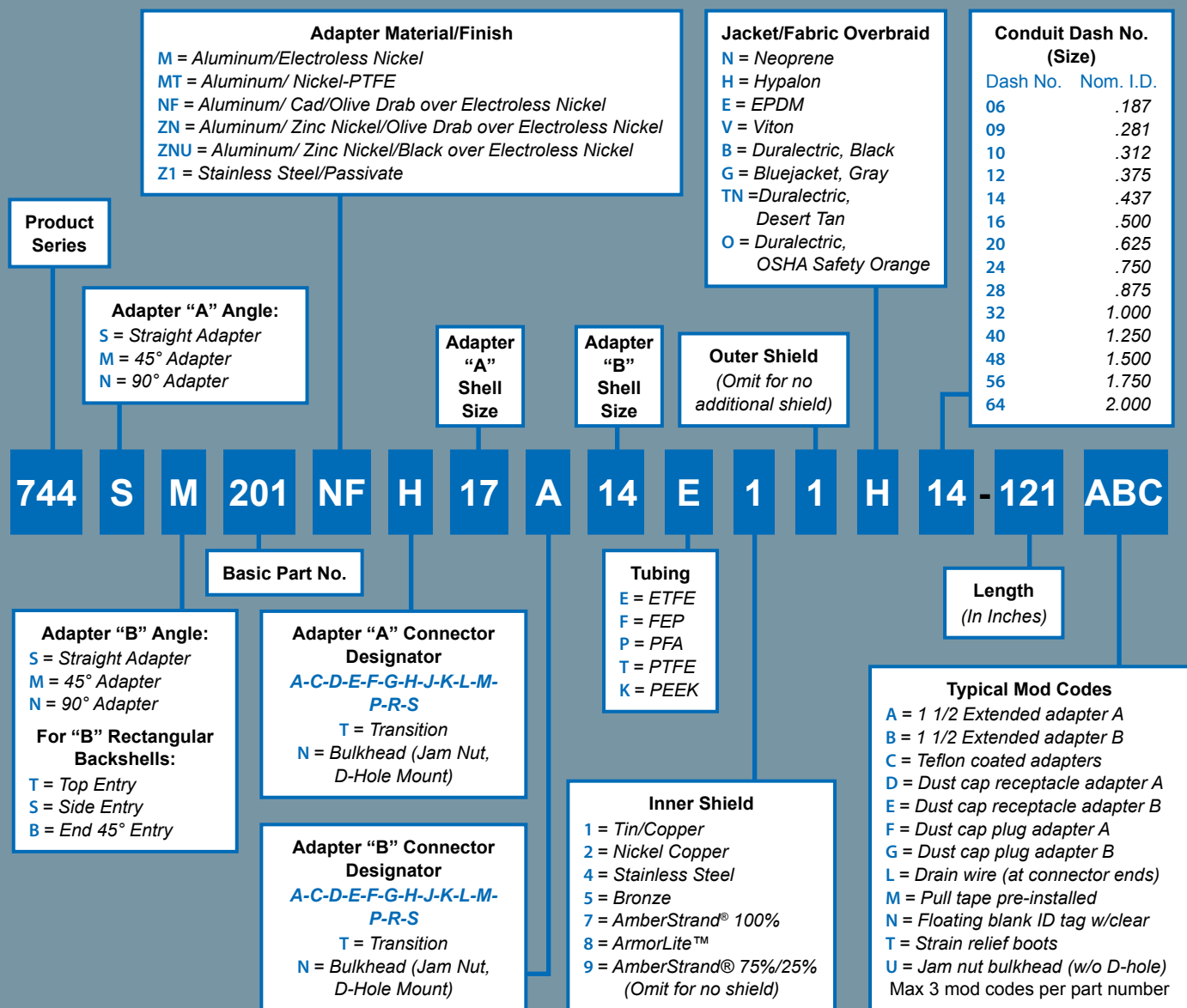
Jacketing Material Properties and Chemical Resistance					
Material Property	EPDM (Ethylene Propylene Diene Monomer)	Hypalon (Chlorosulfonated Polyethylene)	Neoprene (Polychloroprene)	Viton (Fluoroelastomer)	Duraelectric
Temperature Range	-60°F to +300°F (-51°C to +149°C)	-60°F to +300°F (-51°C to +149°C)	-60°F to +250°F (-51°C to +121°C)	-40°F to +392°F (-40°C to +200°C)	-94°F to +392°F (-70°C to +200°C)
Specific Gravity	1.26	1.18	1.25	1.80	1.22
Weight: Lbs./Cubic Inch	.045	.043	.045	.055	.045
Abrasion Resistance	Excellent	Excellent	Excellent	Excellent	Good
Wear Resistance	Good	Good	Good	Good	Good
Flame Resistance	Good	Good	Good	Good	Excellent
Sunlight Resistance	Good	Excellent	Excellent	Excellent	Excellent
Chemical Resistance					
Aliphatic Hydrocarbons	Good	Good	Good	Excellent	Excellent
Aromatic Hydrocarbons	Good	Fair	Fair	Excellent	Excellent
Ketones, Etc.	Good	Poor	Poor	Poor	Excellent
Oil & Gasoline	Good	Good	Good	Excellent	Excellent

How-To-Order: Factory Terminated Series 74 Convoluted Tubing Assembly

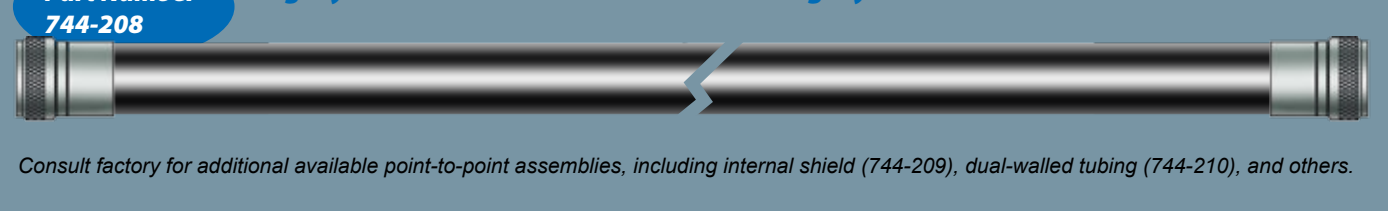
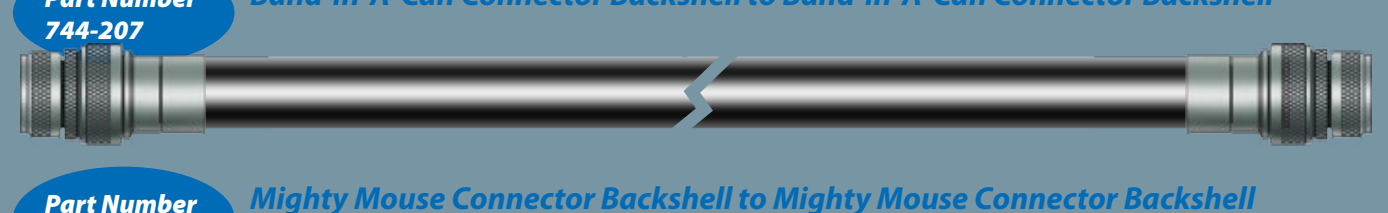
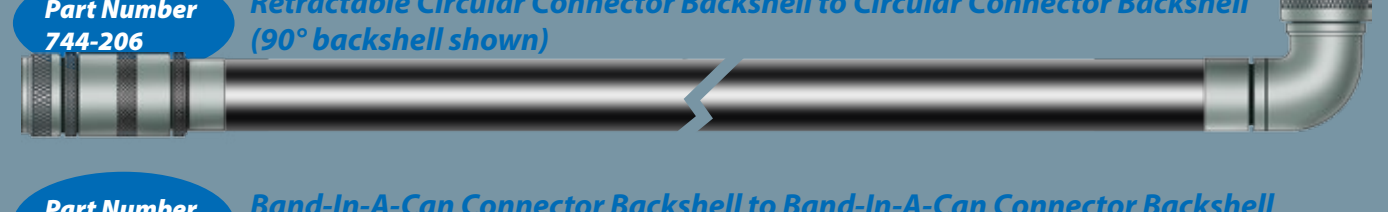
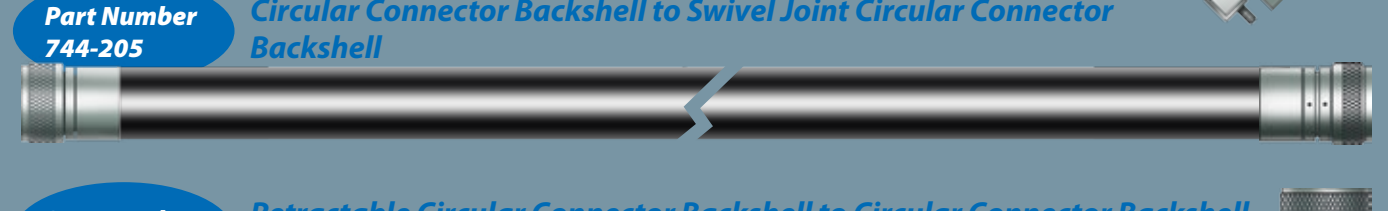
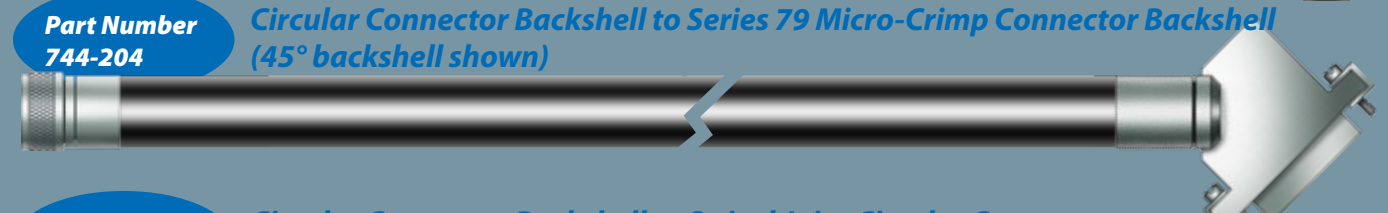
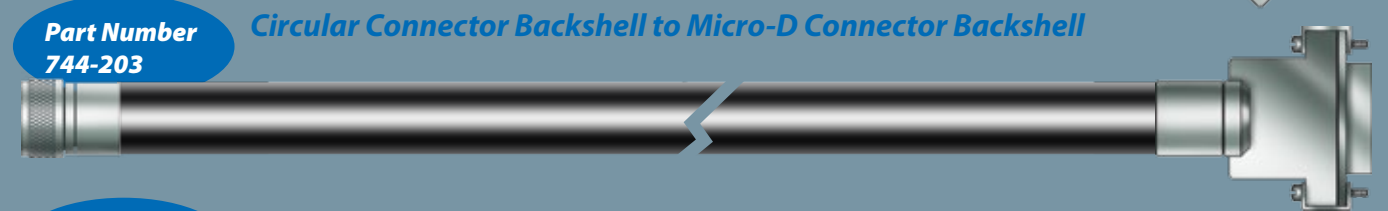
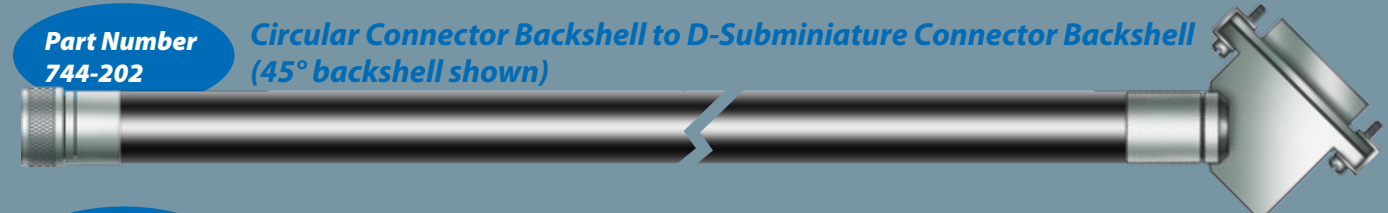
Use the order tree below to develop part numbers for the full range of Series 74 System point-to-point factory terminated assemblies. Diagrams of basic Series 74 point-to-point assemblies are shown on the facing page.



How To Order



Consult factory for individual tubing assembly sales drawings .



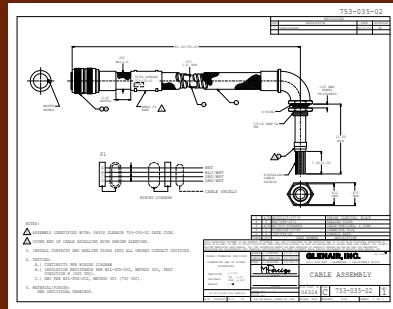
Consult factory for additional available point-to-point assemblies, including internal shield (744-209), dual-walled tubing (744-210), and others.



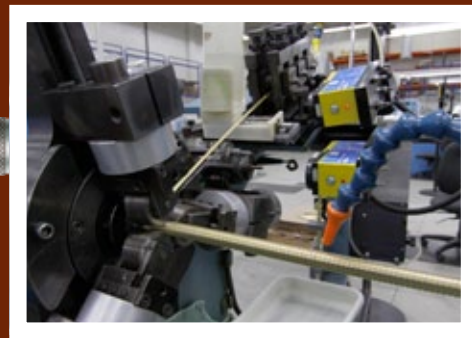
Howzit Made @ Glenair?

THE ULTIMATE CONDUIT FACTORY

STEP 1 The process begins with an approved customer drawing. In most cases, a first article assembly is manufactured prior to production.



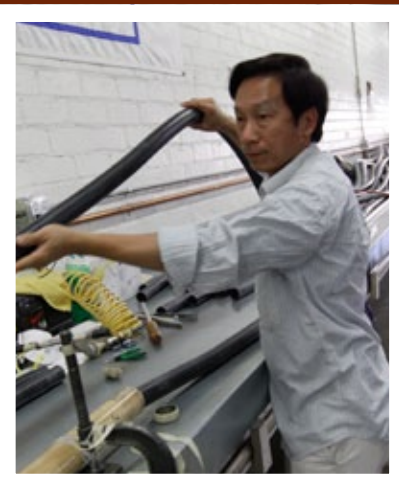
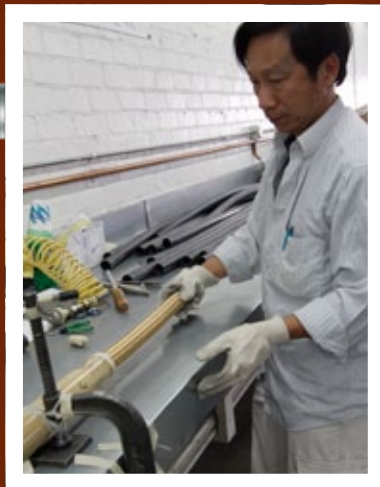
STEP 2 Metal-core conduit and polymer-core tubing are fabricated in-house on specialized Glenair-designed equipment.



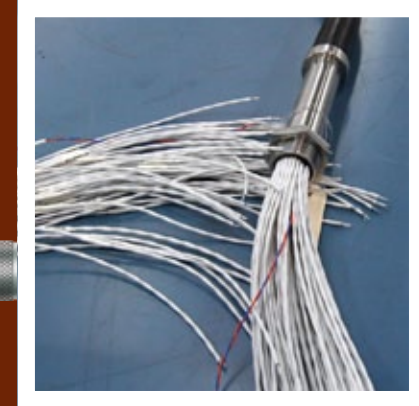
STEP 3 EMI/RFI applications typically utilize conductive braided shielding which is applied directly over the metal or polymer core.



STEPS 4 AND 5 The installation of environmental jacketing is accomplished with the help of a special pneumatic fixture that temporarily inflates long, continuous lengths of jacketing. Here we see the technician inserting the braided conduit into the fixture, releasing the air pressure, and removing the jacketed assembly.

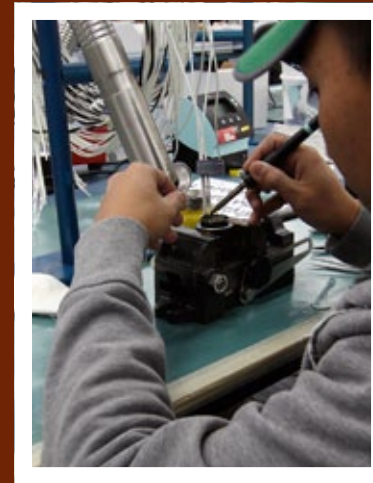


STEP 8 Several techniques are available for the termination or attachment of fittings to the conduit core. This picture illustrates the crimp termination process.



STEP 9 When called for by the job, terminated assemblies may be populated with wires...

STEP 7 Most component parts are plated for corrosion protection and conductivity. Notable exceptions include brass and nickel-iron.



STEP 10 ...and outfitted with crimp or solder contact connectors.

STEP 11 Every wired conduit assembly is subjected to a battery of tests prior to final inspection and packaging.



STEP 12 Glenair supplies and ships wired, terminated, and tested conduit assemblies worldwide. We offer the fastest turnaround on quotes and assemblies in the industry.

STEP 6 Meanwhile, the backshells, transitions and adapters called out on the drawing's bill of materials are fabricated in Glenair's CNC machine shop.



Turnkey

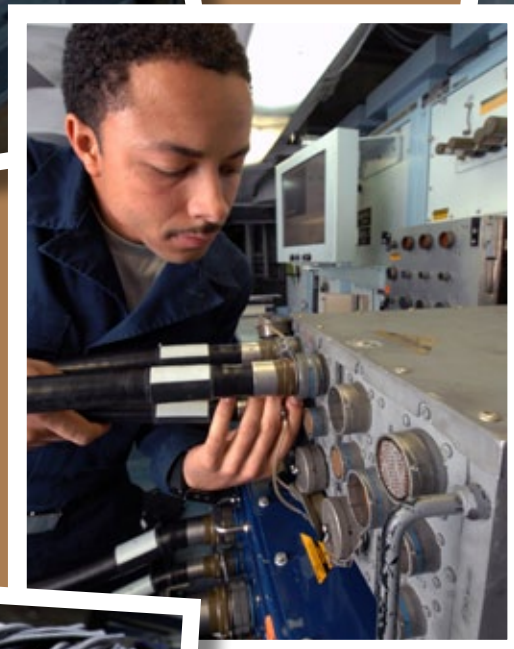
QwikConnect

SERIES 75 FLEXIBLE METAL-CORE CONDUIT ASSEMBLIES

FOR RUGGED EMI/RFI APPLICATIONS

Different conduit types and constructions provide different levels of strength, durability, weight, crush resistance, flexibility and so on. The lightweight Series 74 Polymer Plastic tubing presented on the previous pages is primarily used in applications requiring moderate strength and crush resistance. Glenair Series 75 flexible Metal Core conduit is typically selected in applications that require maximum mechanical strength.

Environmental requirements, including sealing to submersion levels, are met with or without the addition of appropriate jacketing and environmental backshells. EMI/RFI shielding is accomplished through the use of metal and/or plated composite plastic braiding materials. Series 75 metal-core conduit is supplied in three standard material types: brass, stainless steel, and nickel-iron.

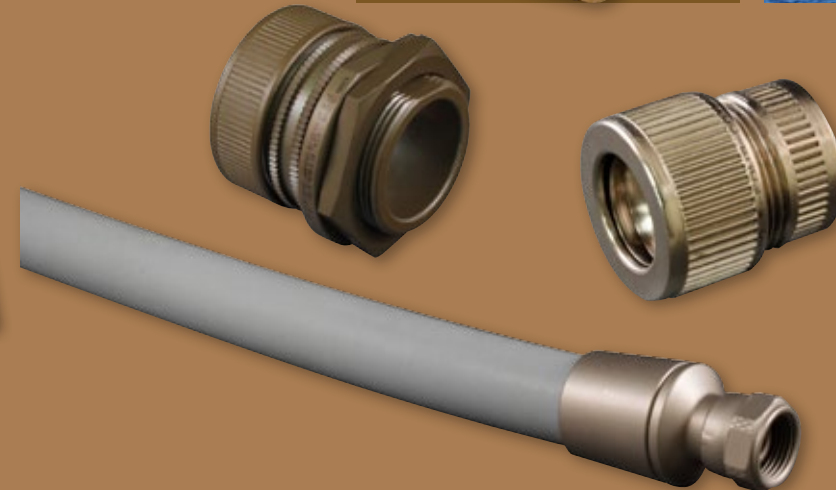


Featured application illustrates reliability and dependability of conduit wire protection systems in naval applications.




Crush-proof EMI protection

- Continuous solder seal for optimum EMI/EMP protection
- Superior crush resistance
- Used by the U.S. Navy in harsh-environment topside shipboard applications
- Metallic braid provides tensile (pull) strength
- Used in tanks, heavy machinery, airframes and submarines



Series 75 Flexible Metal-Core Conduit Tubing, Braided Shielding, and Jacketing Options

The Series 75 flexible metal-core conduit system is a helically wound, continuous solder metal conduit known for its flexibility, durability and hermeticity compared to standard jacketed cable. System design begins with your selection of core material, either brass, nickel-iron, or stainless steel. Core materials may be outfitted with braided shielding and jacketing to address specific mechanical, electrical (EMI), and environmental protection requirements. See the *High-Performance Conduit Systems* catalog for ordering information.

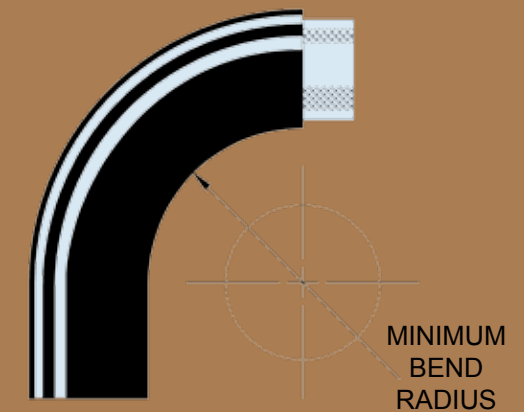
 <p>Part Number 750-190</p>	<p>Superior EMI protection and crush-proof strength for static, non-environmental applications</p> <p>Highly flexible crush-proof metal conduit, available in Nickel-Iron, Brass, or SST.</p>
 <p>Part Number 750-191</p>	<p>Adds braided shielding for additional tensile strength (for non-environmental applications)</p> <p>Flexible metal-core conduit tubing with numerous braided shielding options, for additional tensile strength and effective grounding of electromagnetic interference.</p>
 <p>Part Number 750-192</p>	<p>Adds a jacket for environmental protection</p> <p>Flexible metal-core conduit tubing with braided shielding plus a ruggedized jacket for environmental protection against contaminants and moisture.</p>
 <p>Part Number 750-193</p>	<p>Adds a second braided shield for high dB EMI/RFI shielding (for non-environmental applications)</p> <p>Flexible metal-core conduit tubing with double braided shield for high frequency EMI/RFI shielding requirements.</p>
 <p>Part Number 750-194</p>	<p>A jacketed, double-braided configuration for combined environmental and EMI/RFI applications with high dB shielding requirements</p> <p>Flexible metal-core conduit tubing with double braided shield and jacket for optimum EMI/RFI protection, strength and environmental sealing.</p>
 <p>Part Number 750-195</p>	<p>Triple-braided conduit for predictable and reliable grounding of surface-borne/high frequency electromagnetic interference</p> <p>Flexible metal-core conduit tubing with triple braided shield for optimal tensile strength and enhanced high frequency EMI/RFI protection.</p>
 <p>Part Number 750-196</p>	<p>Triple-braided and jacketed conduit for maximum EMI shielding in environmental applications</p> <p>Flexible metal-core conduit tubing with triple braided shield and jacket for enhanced high-frequency EMI/RFI protection, strength and environmental sealing.</p>

Conduit Material Choices, Material Properties, and Military Specifications			
Glenair Code	Material	Properties	Applicable Military Specifications
B	Brass, Per A-A-52440 Type I, Grade B	Optimal EMI shielding performance when combined with bronze overbraid.	IAW A-A-52440 (Covering shielded, electrical, flexible, metal conduit for use as protection of wiring in military vehicles from mechanical injury and, when properly installed and grounded, to prevent radiation that may cause interference with radio and other electronic equipment.)
C	Stainless Steel AISI 316	Specified for high-temperature, corrosion, and crush resistance. Nominal shielding value. Typically braided with stainless steel braid for additional pull strength and durability.	MIL-C-13909 (Superseded by IAW-A-A-52440 above) MIL-PRF-24758 (Covering the performance requirements for weatherproof flexible conduit systems for use primarily in exposed areas on U.S. Navy ships, to shield against electromagnetic (EM) radiation from own-ship transmitters and emissions external to the ship, electromagnetic pulse (EMP) events, and to minimize corrosion while being field repairable to reduce maintenance.)
N	Nickel Iron Alloy Type 4 ANSI/ASTM-A-753	80% Nickel, 20% Iron. Optimal low-frequency shielding material. Typically braided with stainless steel braid for additional pull strength and durability.	MIL-DTL-28840 (Covering Connectors, Electrical, Circular, Threaded, High Shock, High Density, Shipboard, Metal Conduit, for EMI Shielding)

Conduit Resistance and (O.D.) Conduit Pull Force				
Dash No.	Nominal I.D.	Percent Crush	Pull Force	
			Pounds	Newtons
08	.250 (6.4)	2.6	250	1112
12	.375 (9.5)	2.8	500	2224
16	.500 (12.7)	4.7	600	2669
20	.625 (15.9)	4.4	650	2891
24	.750 (19.1)	5.7	700	3114
32	1.000 (25.4)	5.0	750	3336
40	1.250 (31.8)	3.6	1500	6672
48	1.500 (38.1)	3.0	2000	8896
56	1.750 (44.5)	3.0	2000	8896
64	2.000 (50.8)	3.0	2000	8896
80	2.500 (63.5)	3.0	2000	8896
96	3.000 (76.2)	3.0	2000	8896

Crush resistance values are expressed as a "percent crush" with a force of 480 pounds (2138 Nm) applied to brass conduit with bronze braid and Neoprene jacket using a 4 inch width compression plate. The "percent crush" for double- and triple-braided conduit configurations are less due to additional braided coverings.

Pull-force values listed indicate the axial load at which the conduit braid separated at a point between the conduit end-fittings. No separation of the terminated end-fittings occurred at these force levels. Double- and triple-braided conduit configurations have a higher pull force due to additional braided coverings. (Note: These values are for factory installed fittings.)



Minimum Bend Radius: Brass conduit, single braid, neoprene jacket			
Dash No.	A Dia	B Dia Max	Minimum Bend Radius
08	.250 (6.4)	.625 (15.9)	1.750 (44.5)
12	.375 (9.5)	.750 (19.1)	2.000 (50.8)
16	.500 (12.7)	.875 (22.2)	2.500 (63.5)
20	.625 (15.9)	1.000 (25.4)	3.000 (76.2)
24	.750 (19.1)	1.141 (29.0)	3.750 (95.3)
32	1.000 (25.4)	1.500 (38.1)	5.000 (127.0)
40	1.250 (31.8)	1.750 (44.5)	6.250 (158.8)
48	1.500 (38.1)	2.000 (50.8)	7.750 (196.9)
56	1.750 (44.5)	2.250 (57.2)	8.500 (215.9)
64	2.000 (50.8)	2.531 (64.3)	10.000 (254.6)
80	2.500 (63.5)	3.031 (77.0)	12.500 (317.5)
96	3.000 (76.2)	3.560 (90.4)	15.000 (381.0)

Braided Shield Options

B	Bronze	Phosphorous bronze
T	Tin/Copper	150°C temperature rating, 125 lbs. tensile strength, 96 hr. salt spray corrosion resistance
C	Stainless Steel	Highest tensile strength (225 lbs.), highest temperature—up to 260°C
N	Nickel/Copper	200°C temperature rated, 150 lbs. tensile strength, 500 hrs. salt spray corrosion resistance
S	SnCuFe	Tin plated iron/copper
L	ArmorLite™	Ultra lightweight stainless steel braid
D	Dacron	Yarn with excellent abrasion resistance, good chemical resistance, non-conductive
M	Nomex	-55°C to 260°C temperature range - will not melt, excellent chemical resistance, non-conductive
E	AmberStrand® 100%	Expandable, flexible, high-strength conductive metal-clad composite thermoplastic
F	AmberStrand® 75%/25%	75% Expandable, flexible, high-strength conductive metal-clad composite thermoplastic combined with 25% nickel-plated 36AWG copper wire for additional strength

Jacketing Options

N	Neoprene	Tough, durable polychloroprene for mechanical and environmental protection
H	Hypalon®	Light weight with broad temperature range
E	EPDM	Better resistance to Ketones
V	Viton	Heaviest material with best resistance to oil and gasoline
B	Duraelectric, Black	Weatherproof, halogen free, flame resistant, functional to 260°C
G	Duraelectric, Gray	Qualified to US Navy MIL-PRF-24758A, Fed Std 595B #26270 Haze Gray color
TN	Duraelectric, Desert Tan	Duraelectric in Fed Std #3446 Desert Tan color
O	Duraelectric, Orange	OSHA Safety Orange to mark energized electrical cables

Jacketing Material Properties and Chemical Resistance

Material Property	EPDM (Ethylene Propylene Diene Monomer)	Hypalon (Chlorosulfonated Polyethylene)	Neoprene (Polychloroprene)	Viton (Fluoroelastomer)	Duraelectric
Temperature Range	-60°F to +300°F (-51°C to +149°C)	-60°F to +300°F (-51°C to +149°C)	-60°F to +250°F (-51°C to +121°C)	-40°F to +392°F (-40°C to +200°C)	-94°F to +392°F (-70°C to +200°C)
Specific Gravity	1.26	1.18	1.25	1.80	1.22
Weight: Lbs./Cubic Inch	.045	.043	.045	.055	.045
Abrasion Resistance	Excellent	Excellent	Excellent	Excellent	Good
Wear Resistance	Good	Good	Good	Good	Good
Flame Resistance	Good	Good	Good	Good	Excellent
Sunlight Resistance	Good	Excellent	Excellent	Excellent	Excellent
Chemical Resistance					
Aliphatic Hydrocarbons	Good	Good	Good	Excellent	Excellent
Aromatic Hydrocarbons	Good	Fair	Fair	Excellent	Excellent
Ketones, Etc.	Good	Poor	Poor	Poor	Excellent
Oil & Gasoline	Good	Good	Good	Excellent	Excellent

Convoluting Tubing and Conduit System Application Checklist

Originator Contact Information

Name and Title _____
 Company Name/Division _____
 Street Address _____
 City and State/Province _____
 Country and Postal Code/Zip _____
 Telephone _____ Fax _____ Email _____

Assembly Type

- Factory Terminated
- Do-It-Yourself

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: _____

Temperature Tolerance:

Operating: - _____ °C to + _____ °C

Storage: - _____ °C to + _____ °C

Mechanical Durability

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

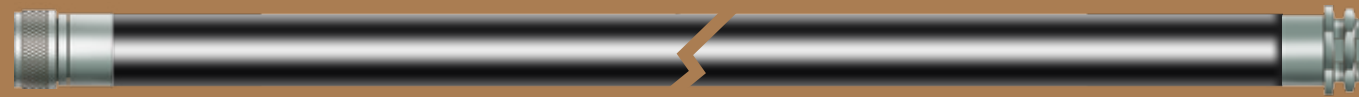
List the connectors used in this project: _____

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

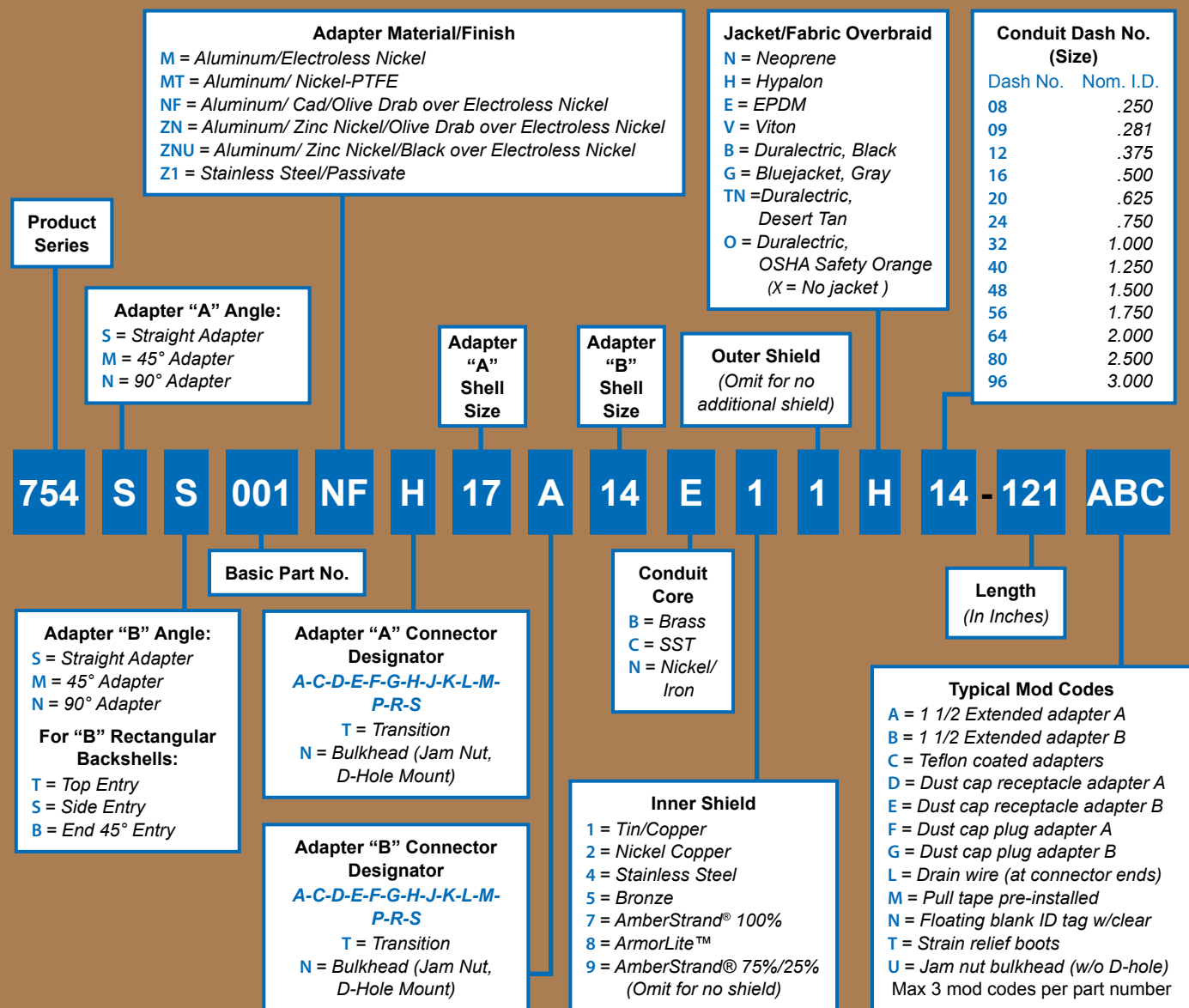
Marking/Labeling Requirements

How-To-Order: Factory Terminated Series 75 Metal-Core Assembly

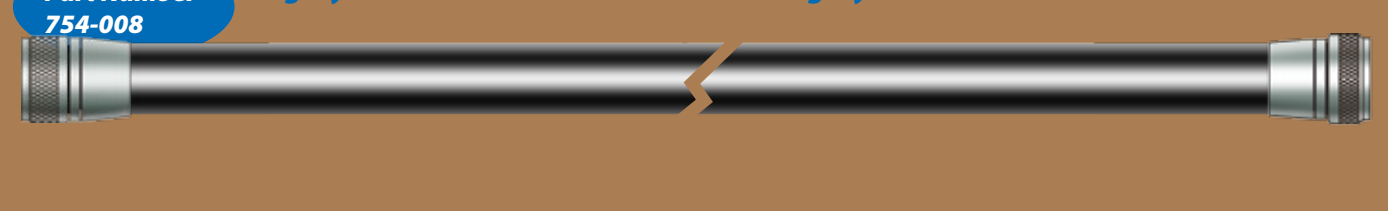
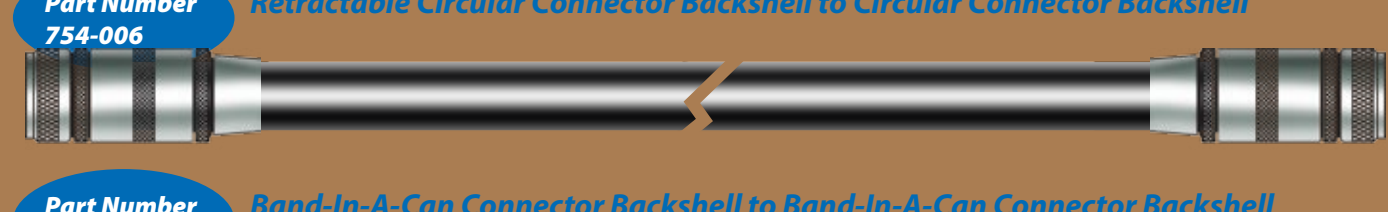
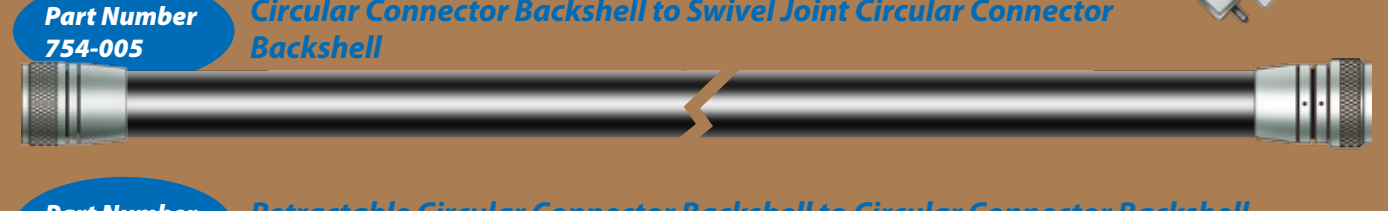
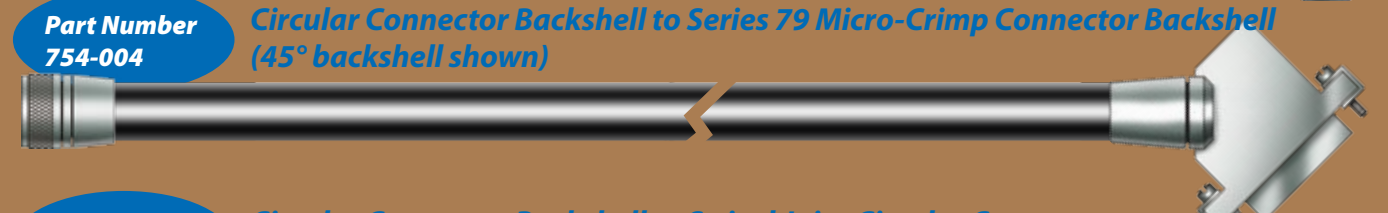
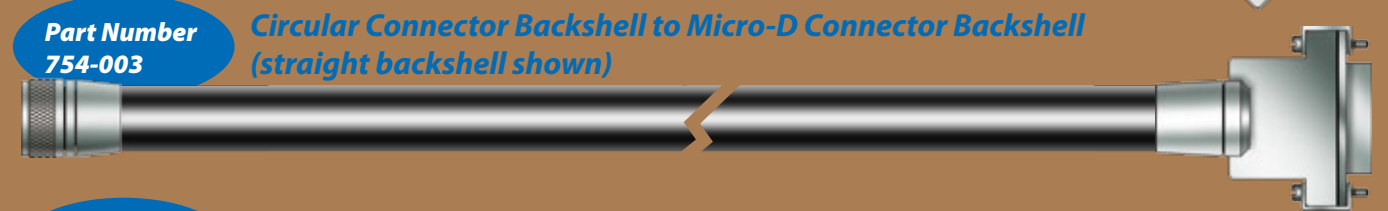
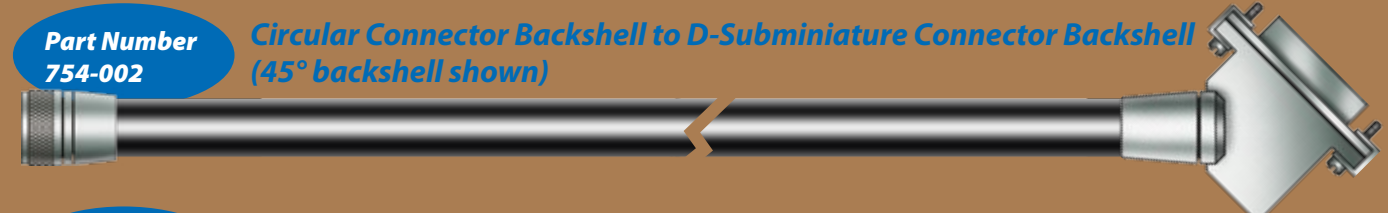
Use the order tree below to develop part numbers for the full range of Series 75 System point-to-point factory terminated assemblies. Diagrams of basic Series 75 point-to-point assemblies are shown on the facing page.



How To Order



Consult factory for individual tubing assembly sales drawings.



Do-it-yourself conduit, conduit-to-connector backshells and other fittings allow users the flexibility to build prototype wire protection systems with ease and convenience. Do-it-yourself solutions are also employed when final cable/wire run lengths cannot be determined prior to installation; such is often the case in Navy ships, submarines, and communication shelter and bunker applications. Glenair offers a number of different do-it-yourself system technologies, each designed for particular performance requirements such as weight reduction, ease of assembly, durability, or to satisfy a particular military specification.

DO-IT-YOURSELF BACKSHELLS, ADAPTERS AND TRANSITIONS

Flexible, Repairable, Expandable

- A range of fitting types, all designed for convenient user installation
- Easy to assemble and repair
- Excellent choice for topside shipboard applications
- Best for prototype systems
- For interconnect systems that require periodic expansion or maintenance



Three fitting design types are available for user termination and assembly of Series 74 convoluted thermoplastic tubing systems



713-355
Convoluted tubing to connector backshell shown.

Hat Trick: Compact, Versatile "3-in-1" Design

Glenair's unique and versatile "Hat Trick" conduit system features cleverly designed fittings that provide three key functions—conduit attachment, shield termination and boot attachment—in one easy-to-use compact fitting. These do-it-yourself fittings are equipped with a threaded inner shell, banding porch and shrink boot groove as well as a self-locking coupling nut. Helical Series 74 convoluted tubing threads directly into the shell cavity for easy attachment without restricting the conduit's inner diameter. Available in composite plastic and aluminum versions. Banding is fast and reliable with Glenair Band-Master™ ATS bands. Add a shrink boot for IP66 environmental sealing.

Lightweight Composite Hummer-Nut Fittings

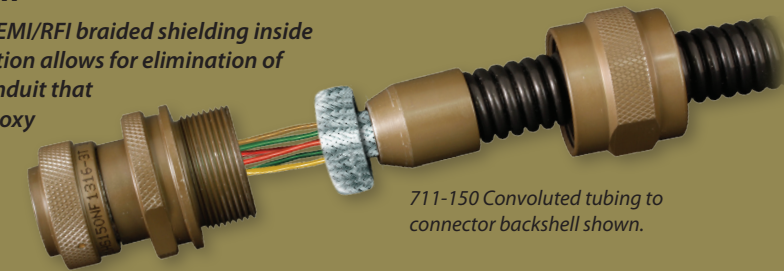
Lightweight, corrosion-resistant composite fittings provide quick and easy assembly of conduit systems with a lamp-base thread design. Designed with anti-decoupling feature and available environmental gland seal, composite fittings are the best choice for high-vibration environments where weight savings and corrosion resistance are a design requirement.



712-419 Convoluted tubing to connector backshell shown.

The Harsh-Environment Internal Braid Solution

These special-purpose, do-it-yourself fittings are fabricated with EMI/RFI braided shielding inside the chemical- and UV-resistant convoluted tubing. This configuration allows for elimination of outer jacketing materials, providing a lightweight and flexible conduit that resists fuels, oils, solvents, and other harsh chemicals. Use with epoxy adhesive lined elastomer shrink boots for environmental sealing. Internal braid fittings provide easy termination of single or double layers of shielding.



711-150 Convoluted tubing to connector backshell shown.



712-277
Convoluted tubing to connector backshell shown.

Heavy-Duty, Environmental System

These heavy duty EMI/RFI conduit backshells, fittings and adapters are ideally suited for conventional conduit wire protection applications. These heavy-duty user installable fittings are equipped with individual joints for EMI and environmental sealing, are designed for use with shielded conduit, and feature easy-to-assemble ground ring shield termination. The heavy duty series includes its own family of Y and T transition fittings, in stock for immediate same-day shipment.

Three fitting design types are available for user termination and assembly of Series 75 metal-core conduit systems



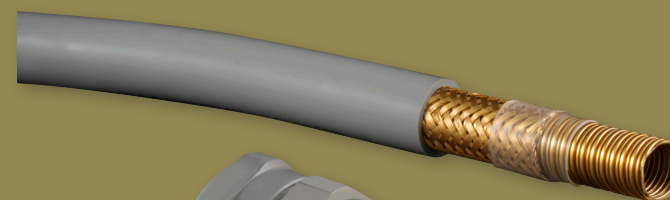
712-832 Convoluted tubing to connector backshell shown.

RP Plus: Lightweight, Compact, with Secure EMI Termination with Self-Locking Coupling Nut

Glenair's lightest, most compact fitting design for metal-core conduit is based on the Navy RP2000 fitting series and utilizes integrated split ring inserts for secure EMI shield termination, with or without jacketing on the conduit. RP Plus fittings are intermateable with selected 24758 Mil-spec end-fittings, and can be ordered with optional shrink boots for environmental sealing when terminating conduit with an outer jacket.

Heavy-Duty Environmental System: Metal

Glenair is a full-spectrum supplier of qualified MIL-PRF-24758 fittings. We bring the same rugged reliability and heavy duty performance to all of our MIL-PRF-24758 style commercial fittings. These topside, durable fittings feature individual termination of conduit, braiding and jacketing layers for maximum EMI performance and environmental sealing.



712-843
Conduit to connector backshell shown.

Heavy-Duty Environmental System: Composite

The same reliable, ruggedized performance of our M24758 QPL products in a unique hybrid configuration: Heavy-duty metal connectors with lightweight, corrosion resistant composite "Haze Gray" fittings provide a durable weight saving solution.



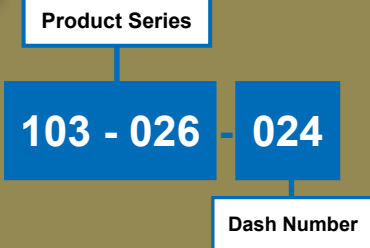
712-836 Conduit to bulkhead fitting shown.

AmberStrand®

103-026 and -027 AmberStrand® EMI/RFI Microfilament Metal-Clad Composite Braided Shielding



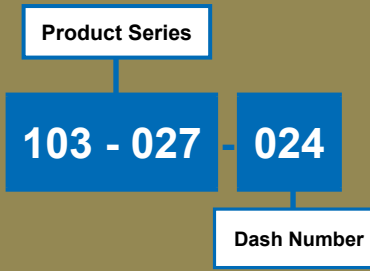
100% AmberStrand®



103-026 100% Composite AmberStrand®			
Part No.	Inner Diameter	Ref. Wire Bundle Range	Approximate Grams Per Foot
103-026-001	.031 (.8)	.016 (.4)	.4
		.047 (1.2)	
103-026-002	.062 (1.6)	.040 (1.0)	.6
		.075 (1.9)	
103-026-004	.125 (3.2)	.093 (2.4)	1.0
		.140 (3.5)	
103-026-008	.250 (6.4)	.125 (3.2)	1.8
		.312 (7.9)	
103-026-012	.375 (9.5)	.325 (8.2)	2.3
		.437 (11.1)	
103-026-016	.500 (12.7)	.375 (9.5)	3.7
		.560 (14.2)	
103-026-020	.625 (15.9)	.375 (9.5)	4.4
		.700 (17.8)	
103-026-024	.750 (19.1)	.500 (12.7)	5.2
		.830 (21.1)	
103-026-032	1.000 (25.4)	.780 (19.8)	8.0
		1.100 (27.94)	
103-026-040	1.250 (31.8)	.938 (23.8)	10.0
		1.312 (33.3)	
103-026-048	1.500 (38.1)	1.187 (30.1)	15.2
		1.590 (40.37)	
103-026-064	2.000 (50.8)	1.312 (33.3)	22.0
		2.090 (53.08)	



75%/25% AmberStrand®/
Nickel Copper



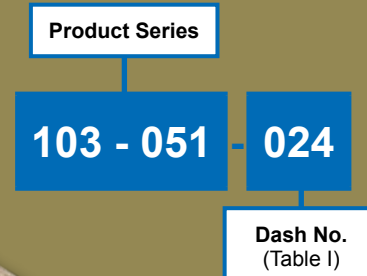
103-027 75%/25% Blended Composite AmberStrand®/Nickel Copper			
Part No.	Inner Diameter	Ref. Wire Bundle Range	Approximate Grams Per Foot
103-027-001	.031 (.8)	.016 (.4)	.6
		.047 (1.2)	
103-027-002	.062 (1.6)	.040 (1.0)	.9
		.075 (1.9)	
103-027-004	.125 (3.2)	.093 (2.4)	1.5
		.140 (3.5)	
103-027-008	.250 (6.4)	.125 (3.2)	2.4
		.312 (7.9)	
103-027-012	.375 (9.5)	.250 (6.4)	3.9
		.437 (11.1)	
103-027-016	.500 (12.7)	.375 (9.5)	6.0
		.550 (13.9)	
103-027-020	.625 (15.9)	.375 (9.5)	6.4
		.700 (17.8)	
103-027-024	.750 (19.1)	.500 (12.7)	7.2
		.830 (21.1)	
103-027-032	1.000 (25.4)	.780 (19.8)	11.0
		1.100 (27.94)	
103-027-040	1.250 (31.8)	.938 (23.8)	15.0
		1.312 (33.3)	
103-027-048	1.500 (38.1)	1.187 (30.1)	25.2
		1.590 (40.37)	
103-027-064	2.000 (50.8)	1.312 (33.3)	32.0
		2.090 (53.08)	

103-051 ArmorLite™ Lightweight EMI/RFI Microfilament Metal-Clad Stainless Steel Braided Shielding

ARMORLITE™



100% ArmorLite™

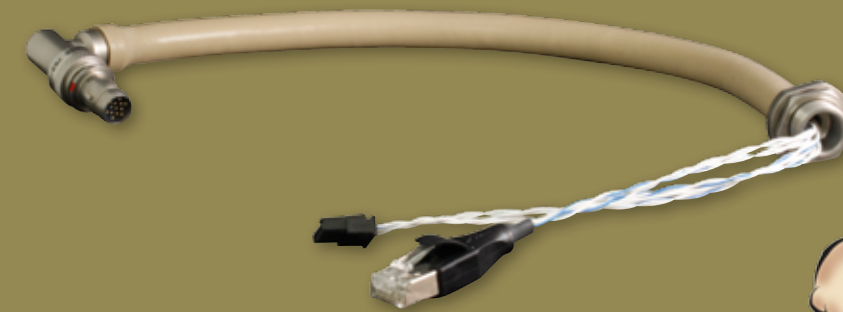


103-051 ArmorLite™			
Part Number	Inner Diameter	Ref. Wire Bundle Range	Approximate Grams Per Foot
103-051-001	.031 (0.8)	.016 (0.4)	.5
		.047 (1.2)	
103-051-002	.062 (1.6)	.040 (1.0)	1.15
		.075 (1.9)	
103-051-004	.125 (3.2)	.093 (2.4)	1.5
		.140 (3.5)	
103-051-008	.250 (6.4)	.125 (3.2)	2.2
		.312 (7.9)	
103-051-012	.375 (9.5)	.250 (6.4)	2.9
		.406 (10.3)	
103-051-016	.500 (12.7)	.375 (9.5)	4.4
		.560 (14.2)	
103-051-020	.625 (15.9)	.375 (9.5)	4.8
		.700 (17.8)	
103-051-024	.750 (19.1)	.500 (12.7)	5.8
		.800 (20.3)	
103-051-032	1.000 (25.4)	.780 (19.8)	11.5
		1.100 (27.9)	
103-051-040	1.250 (31.8)	.938 (23.8)	14.0
		1.312 (33.3)	
103-051-048	1.500 (38.1)	1.187 (30.1)	17.3
		1.590 (40.4)	
103-051-064	2.000 (50.8)	1.312 (33.3)	22.8
		2.090 (53.1)	

Specify length on purchase order.
No minimums!

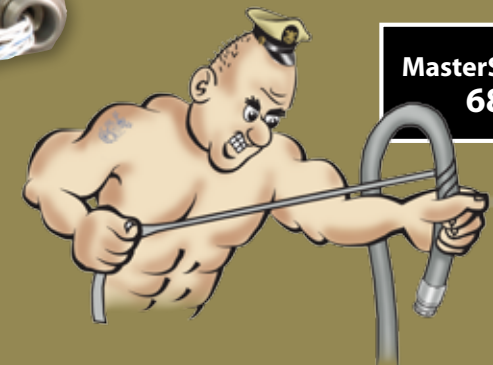
Duralectric™ Maximum Flexibility Waterproof Jacketing

Most wire and cable specifiers have simple expectations, such as jacketing materials that don't break down over time, requiring expensive replacement long before the lifetime of the ship, plane or vehicle is reached. They also want jacketing that can withstand exposure to high heat, extreme UV radiation, demanding weather conditions and caustic chemicals and fluids. Highly-flexible **Duralectric™** Jacketing delivers on these expectations—and a whole lot more. Ask for it by name for your next cable or conduit application.



Duralectric™ Jacketing (shown here in a desert tan conduit application) is the perfect way to protect and seal interconnect systems in commercial and military vehicles, aircraft, robots and other high-performance applications. Available in four standard colors: black (B), grey (G), desert tan (TN) and Orange (O).

Duralectric™ MasterSeal sealing tape is designed for temporary repair of cable and conduit. MasterSeal effectively stops water incursion until a permanent repair can be made.



MasterSeal PART NO. **687-758**

Marvin T. Borden, Glenair Founder

I'm sad to report the death of Glenair Founder Marvin Borden on November 26, 2011. Born May 3, 1925, in Long Beach, California, Marv was the third child of Thomas and Lura Borden. Following his mother's death at age 35, Marv was raised mostly by his grandparents at their citrus farm in Corona, California, while his father found work in Long Beach to support the family.

As a youngster in the Great Depression, Marv knew the meaning of hard work. He worked the family grove, sold newspapers, and took jobs in a meat packing house and a service station. He developed his mechanical aptitude by converting Model T's and Model A's into stripped down "snazzy" roadsters he drove along the back roads of rural Corona.

Fast forward to the mid-fifties, and Marv was plant manager for a cable house called Pacific Automation Products. Adjacent to the Grand Central Airport in Glendale, California, PAP could jacket 250 foot cables because that's how long their hangar building was. When they finally got a job for a 1,000 foot cable, they had to move the operation outside to the Airport runway. Marv enjoyed sharing stories of trying to blow on black neoprene jacket on that black asphalt runway—the heat was so extreme, the jacketing would "pop like a balloon" when inflated to pull the large diameter 36-conductor cable through it.

Part of the cabling business was to put connectors on the ends. The managers at PAP noticed each connector company supplied its own cable clamp—and that was all it did, clamp the cable for strain relief. If you had a braid shielded cable, what did you do with the shielding? So, PAP started having backshells made to accommodate shielding and thought they could sell them to other cable houses. But competitors would not come to PAP to buy these new backshells, so Marv and the four other key managers ponied up \$600 each to start a backshell company across the street from PAP. Thus Glenair was created in 1956 as a supplier of mil-quality backshells and connector accessories.

Marv took on many roles at Glenair over the decades: President, Chief Executive Officer, Chairman of the Board of Directors and finally becoming Vice Chairman after retiring from daily duties in 1994. We were so pleased to have Marv visit Glenair weekly until only recently, and he attended the Board meeting just two months ago.

Marv was truly a gentleman who always looked for the good in people. Quick-witted and humorous, he was a joy to be around. Marv's private, quiet, generosity benefitted so many individuals and families. He embodied the values that Glenair codified as our Guiding Principles. We will miss his wisdom and gentle guidance.

Chris Toomey



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