QwikConnect

GLENA 9 ▪ VOLUME 13 ▪ NUMBER 4

MS Backshell Wall Chart Inside!

Out of This World: Connector Accessory Lollapalooza!

Glenair®

Glenair Interconnect Solutions and...

THE RACE FOR SPACE

The Cold War between the Soviet Union and the Western powers led by the United States was in full vigor by the early 1950's. The formation of military coalitions, a budding nuclear arms race, secret espionage programs and aggressive economic and technological competition were pronounced expressions of the conflict. While much of the Cold War was played out in secret or in proxy wars, one facet of the war was extremely public: The Space Race. The early days of the race for space focused on the development of rocket technologies, or launch vehicles, capable of delivering large payloads into space. Sergey Korolyov and Kerim Kerimov were the principal architects of the Soviet program, while Wernher von Braun directed the United States effort.

Wernher von Braun (1912 – 1977) a German American rocket physicist and astronautics engineer, universally recognized to be the preeminent rocket engineer of the 20th century.

When the Soviet-built Sputnik I became the first successful man-made satellite in space, and the Russian dog "Laika" became the first living creature to experience low-earth orbit, the battle for space dominance was truly on. As reports of an ever successful Soviet space program accumulated, pressure mounted in the United States to define space exploration as a national priority.

The world's first manned space flight was undertaken on April 12, 1961, when cosmonaut Yuri Gagarin made one orbit around the Earth aboard the Vostok 1 spacecraft. The United States became the second nation to achieve manned spaceflight, with the suborbital flight of astronaut Alan Shepard aboard Freedom 7, as part of Project Mercury. National pride was a significant motivator driving the pace of launch vehicle and payload technology development. For those who experienced the race for space "live," the drama and excitement was palpable. And although Glenair never made the headlines, we were right there in the thick of the battle, producing an innovative range of interconnect products for the aircraft, missiles and the space industries.

Glenair History Lesson:

FROM SPACE-GRADE CABLES TO THE G1 CONNECTOR ADAPTER AND CLAMP

Glenair had its beginnings as a military-grade cable shop founded in Glendale, California in 1955. Pacific Automation Products, Inc. built complex, multi-conductor cables for ICBM missile and space launch vehicle applications. Located adjacent to a runway in Glendale's Grand Central Air Terminal, "PAPI" developed innovative methods to build jacketed cable assemblies longer than the then existing maximum of 250 feet. PAPI workers would lay out the multi-conductor cables, sometimes up to 1,000 feet in length, on the airport landing strip and

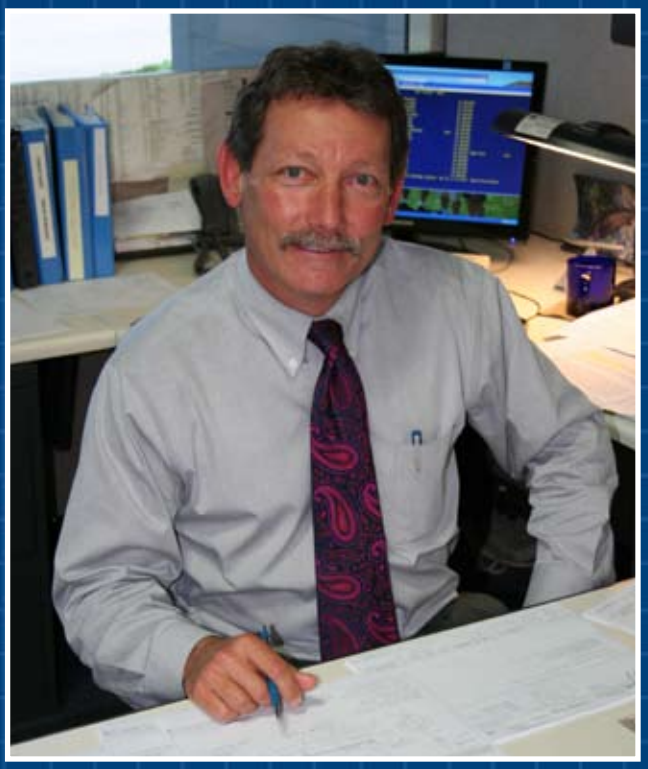
their new backshell enterprise as a separate entity to avoid potential conflicts with their erstwhile competitors. And so Glenair was born.

Located directly across the street from PAPI, Glenair took its name from the city of Glendale and the company's street address on Air Way. Glenair's first product, the G1 connector adapter and cable clamp, covered all the high reliability mil/aero connectors then in existence. And in case you are wondering, yes, we still produce and stock the G1 part. The rapid growth of the aerospace industry in Southern California meant Glenair's growing line of connector accessories was in high demand. And soon the success of the startup backshell business had far outstripped that of the original enterprise PAPI. And so, following a series of organizational changes, the parent company PAPI reversed roles to become the cable division of the now prospering start-up. 53 years later, Glenair is still in operation at 1211 Air Way in Glendale, California and we are still making cables, backshells—and a whole lot more—adjacent to the former runways of Grand Central.

Throughout the ensuing years, Glenair has continued its tradition of innovation with new wire protection, shield termination and other connector accessory solutions. We started with the simple idea that the industry needed standardized connector accessories to accommodate cable clamps, backshells and other hardware to fit the many specialized circular and rectangular connectors in use in high-reliability interconnect systems. This issue of *QwikConnect* is designed to give you a complete overview of these essential connector accessory products.

At Disney they say "it all started with a mouse." At Glenair it was an industry-standard cable clamp, the G1. From this humble beginning Glenair has evolved into one of the world's premier interconnection manufacturers with a dozen full-spectrum product lines designed to meet every high-reliability interconnect requirement. In the pages that follow we present a virtual cornucopia of useful information for the buyer and user of Glenair's "Out of This World" line of connector accessory products. For a free sample of any of our connector accessory products, please call the factory or contact your local Glenair Sales Group.

Engineering: A Matter of Facts



Greg Brown, Vice President, Engineering

Glenair is a component manufacturer and, as such, is rarely in complete control of the larger systems to which our parts contribute. Nonetheless, we know that small problems at the component level can have significant impact on system performance.

Whether from a mil-spec or a customer, specifications can sometimes be ambiguous or inadequate. That's why we've found it's never enough to just say that a design "meets the spec." Our consistent goal is that the component truly solves the customer's problem. By our reckoning, rigidly designing to spec is the surest pathway to unforeseen engineering failures.

Backshells at Work

The broad range of backshell types available today make it critical for interconnect engineers, and others tasked with the responsibility of specifying connector accessories to become adept at building backshell part numbers. For the most part, the process entails selecting options from the part number development trees.

But experience shows it is equally important to consider the working environment of the target application before completing the backshell selection process. There are many electrical, mechanical and environmental considerations which, when properly addressed, will ensure a long functional life for the interconnect system.

The *Backshell Selection Guide* on the following pages presents a step-by-step explanation of this process. But before we delve into the exciting details of backshell part number development it is worthwhile to digress for a moment and talk about cables and conduit.

Cable and Conduit Make-up

Some very basic questions in the backshell selection process cannot be answered without an understanding of the overall make-up of the wire and cable used in the assembly. Basic dimensional decisions on cable entry size (see Table I on the opposite page) cannot be specified without accurate descriptions and measurements of the cable or wire bundle. A basic analysis of the cable should include:

- Wire Numbers and Types: twisted shielded pairs, coaxial power, signal, fiber optic, etc.
- Shield Material Gauge, Number and Type: tin, nickel, silver plated copper wire, and so on.
- Jacket material properties.

In addition to standard cables, many customers prefer to use circuit protection products such as convoluted tubing and/or metal-core conduit. These products also employ backshell-like devices to assist in the routing of wires or connection to feed-through fittings and connectors. Conduit systems are intended for use in airframe applications, military vehicles, rail, shipboard and transportation systems that require performance attributes not supplied by cable.

The wire harnesses under the hood of your automobile, for example, are rarely enclosed in cable jacketing as the complexity of the routing and the sheer number of interconnected devices makes this an impractical choice. There are obviously many ways to protect wiring, and the choice of which product to use depends on the nature of the potential electromagnetic interference, environmental damage and physical abuse experienced by the assembly. Other factors, such as the ability to readily open the system for repair, add or subtract individual wires from the assembly, or reduce weight also come into play. While the following selection guide is clearly geared to cabled systems, Glenair also supplies an equally broad range of choices for conduit. See www.glenair.com for additional information.

The heart of every interconnect cable assembly is the multi-conductor cable. As early in the application development process as possible it is critical to document the wire gauges, core type, insulation/dielectric materials, media types (copper, aluminum or optical), shielding (individual conductor and overall), jacketing, and all other elements that contribute to the mechanical and dimensional properties of the cable. By the way, Glenair's cable shop can supply the cable, particularly for unusual or short run applications.

Backshell and Connector Accessory Glossary of Essential Terms

Adapter: Generic term for a threaded shell that facilitates the attachment of cable-clamps and other accessories to the back end of a cylindrical connector.

Angle/Profile: The straight, 45° or 90° configuration of a connector backshell. Allows system designers to specify the exact route a cable will take as it enters/exits the back end of the connector.

Backshell: Any one of thousands of end-bell shaped connector accessories that provide EMI shield termination, environmental sealing or other functions when attached to the back end of a connector.

Band Porch: The area on an EMI shield termination backshell where braided cable or wire shielding is terminated (attached) by means of a banding strip, crimp ring or other device.

Bent Tube: Manufacturing process used to fabricate angled parts. The smooth, full-radius bend is often specified for fiber optic media or other wire types with bend radius restrictions.

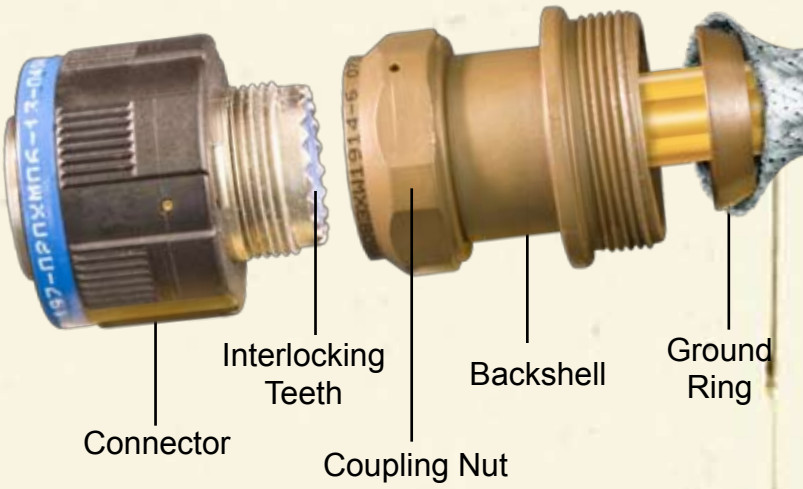
Connector Accessory: Generic term for the broad family of parts designed to improve the performance of connectors by providing cable strain-relief, environmental sealing, EMI shield termination and so on.

Coupling Nut: Threaded portion of the backshell that enables reliable attachment of the connector accessory to the back end of the connector. Various styles such as free-spinning and self-locking are specified depending on application requirements.

Cable Entry/Exit: In a correctly sized backshell, the OD of the cable will fit easily into the rear-end of the backshell but not be too loose as to limit the effectiveness of the cable clamp. In backshell part number development the cable entry/exit is generically referred to at the “dash number” and is selected from a table according to the diameter of the cable.

Crimp Ring: Malleable aluminum band, typically factory installed, used to terminate (attach) braided cable shielding to a backshell.

Cable Clamp: Simple strain-relief device, typically made up of saddle-bars and fasteners, used to prevent wires and cables from being pulled from the backend of a connector.



Cut and Welded: manufacturing process used to fabricate angled backshells, when a tooled (die-cast) equivalent does not exist.

Commercial: Term used to refer to connector accessories (or other interconnect components) that are built to non-mil-spec specifications. Typically commercial backshells are preferred when a particular feature is not available in the applicable mil-spec.

Connector Designator: Alphabetic code used in connector accessory part number development used to indicate the series of connector the part is designed to fit.

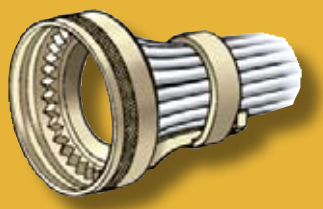
Backshell-to-Connector Coupling

Glenair offers four different coupling styles to meet every application requirement:

Direct Coupling

Direct couplers thread directly onto the connector by rotating the entire part. A separate toothed follower provides backshell-to-connector grounding.

Rotatable Coupling



Rotatable designs utilize a free-spinning, toothed coupling nut for easier installation.

Self-Locking, Rotatable Coupling

Rotatable Self-Lockers add a ratcheted detent "clicker" to prevent de-coupling due to extreme vibration and shock.

Positive-Lock, Non-Detent Coupling

Glenair Mod Code -445 ("NESTOR") coupling mechanism corresponds to AS85049 style "N" non-detent, rotatable coupling with spring-loaded interface.

Backshell Selection Guide

The design and development of today's broad range of connector accessories took over 50 years to complete, and the number of types and styles is truly extraordinary. Glenair's Circular Connector Accessories catalog, for example, presents 24 different categories of backshells and other accessories. The D-Subminiature portion of our new Rectangular Accessories catalog features over 30 different styles of backshells for use with popular rack and panel connectors. Glenair also produces dozens of different composite and fiber-optic backshell designs, not to mention thousands of Mil-Spec configurations. Perhaps the most revealing figure is the 70,000 part numbers—mostly connector accessories—now available in our Same-Day Inventory. The staggering number of backshell types available today makes it all the more important for interconnect engineers, and others tasked with the responsibility of specifying connector accessories, to become expert at the art of backshell selection. Here are the basics:

Step One: Determine Accessory Functionality and Performance Requirements

The first step in successful backshell selection is proper product application: In other words, what exactly is the accessory supposed to do, and what are the conditions in which it must accomplish its job? It's not enough, for example, to know that the accessory must provide strain-relief. It's critical to also understand the working environment—the high heat of an engine compartment, for example—before moving forward in the selection process. And the more complex the application, the more detailed the questions need to become, lest some important functionality or performance requirement be forgotten.

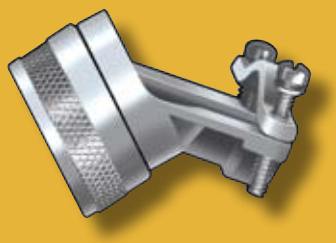
The following questions will reveal the most critical functional and performance requirements for the accessory, and help a knowledgeable engineer make the best design, material and plating selections:

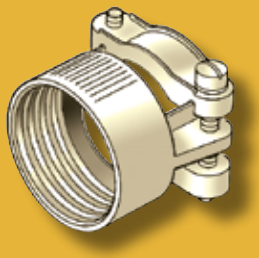
(1) *What is the intended working environment of the interconnect system—shipboard, space, airframe, ground support and so on?*

Strain-Reliefs

Typical Mil/Aero cable assemblies often have over a hundred wires terminated to a single connector. Preventing the wires from pulling on the contacts and damaging the termination is critical, and is usually accomplished with a strain-relief clamp or shrink-boot that isolates the pulling strain applied to the cable. Strain relief on electrical connectors can be accomplished in other ways, such as with a wire service loop that allows the wire to move between the clamping device and the contact without over-stressing the termination. But the basic method of clamping the wire bundle or cable jacket with saddle bars is the most common method of protecting contact terminations.

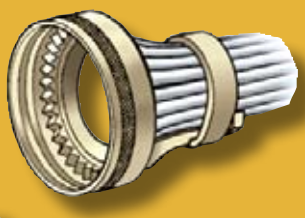
- ***Straight and Angled Strain Reliefs***

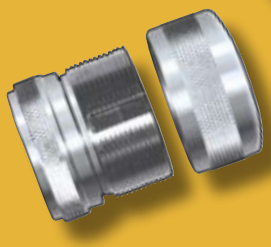




- ***Light, Medium and Heavy-Duty Saddle Bars***

- ***Qwik-Ty®***





- ***QwikClamp®***

- ***Series 77 "Full Nelson" Shrink-Boots***

interface geometries were also standardized and came under the control of a number of military specifications, principally MIL-C-85049. This meant it was no longer necessary for accessory makers to consider both the connector type, shell size *as well as* manufacturer in order to correctly mate their accessories to a given family of connectors.

Today, interconnect system designers simply need to identify the correct part number for the chosen connector and match it to an alphabetic interface designator to select accessories which correctly fit the part. Tables listing all the major connector-to-accessory interface designators used by Glenair can be found in the Backshell Interface Standards table in the general information section of the Circular Connector Accessories catalog.

While the interface designators take much of the guess work out of the process, it is still important to evaluate the chosen connector in terms of application performance requirements. And if necessary, to work with Glenair engineering to suggest an alternative connector for the application.

Step Three: Determine Cable Make-up

Several key questions in backshell selection cannot be answered without a solid understanding of the overall make-up of the cable and harness on which the accessory will be used. Basic dimensional elements, for example the diameter of the backshell cable entry, cannot be specified without accurate OD measurements of the cable or wire bundle in hand.

As mentioned, the make-up of the cable and the selection of strain-relief, environmental protection or shield termination technologies go hand-in-hand. At the risk of waxing pedantic, it has been our experience that significant problems, such as an unanticipated susceptibility to EMI in the electronic equipment serviced by the cable, are much less costly to resolve when tackled at this stage of the design process. Imagine the difficulty of re-engineering a printed circuit board or a re-building a complex interconnect cable because you failed to optimize cable shielding and grounding back when it was easier to accomplish.

Many EMI filter connector customers, for example, find themselves in this situation after

(4) Select the Basic Part Code: *This code fine-tunes your selection within the product series. For example, for Series 39 EMI/RFI Cable Sealing Backshells, your Basic Part Code selection could tell the factory what style of shield termination technology you prefer.*

(5) Select the Finish Symbol: *This symbol, selected from tables right there on the catalog page, or in some cases from a larger table elsewhere in the book, tells the factory what surface finish or plating should be applied to the product.*

(6) Select the Shell Size: *This of course is simply the matching of the accessory shell size to that of the chosen connector. Use the Backshell Interface Dimensions table found in the catalogs to find the part number code for your choice.*

(7) Select the Cable Diameter: *Referred to most commonly as just the "dash number" this piece of the part number specifies the minimum and maximum size of cable the rear end of the accessory can accept. Dash number selection tables are generally found right there on the page or on an immediately adjacent page.*

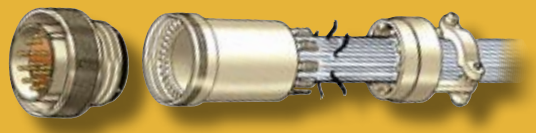
(8) Select the Strain Relief Style: *Most accessories that are able to accept cable clamps or saddle bars offer a range of style choices. The selection is usually based on the level or duty of strain-relief that is required, and design drawings of applicable options are featured right there on the catalog page.*

(9) Select the Environmental Sealing: *When different levels of environmental sealing are available, the choices are presented right there on the page. Full immersion protection is accomplished by capturing the cable grommet and follower within a cylindrical socket. Moisture proof designs merely force the cable grommet seal against a conical ferrule.*

(10) Select Unique Options: *Other available options, such as drain holes, wire attachment lengths, special material designators, and so on, are tacked on to the end of the part number. These options are generally explained right there on the page.*

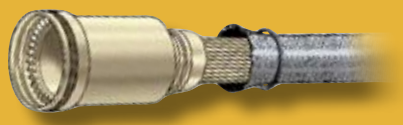
EMI/RFI Backshell Designs

Glenair TAG® Ring Backshells



Glenair TAG® Ring Backshells offer a unique and reliable method of terminating individual wire shields.

Raychem Tinel-Lock® Terminators

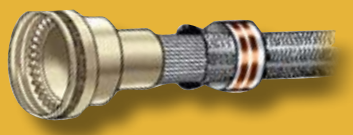


Glenair offers the Raychem Tinel-Lock® termination method. Applied heat causes the alloy ring to contract, clamping the shield to the backshell.

Band-It® Termination System

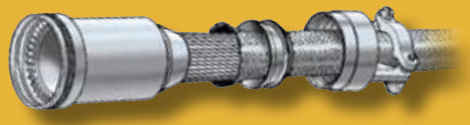
The unique low profile and smooth inside diameter of the *Band-It®* steel clamping band virtually eliminates EMI leakage paths, providing reliable and repairable shield terminations.

Crimp Ring Termination System



Crimp ring terminations provide an efficient approach to terminating overall cable and harness screens. Individually sized bands are required for each adapter and shield combination.

Conical Ring Style Backshells



Glenair EMI/RFI conical ring backshells provide reliable individual and overall shield termination by securing the shield under pressure between a conically shaped backshell and ground ring.

Seven Innovations From the Space Race that Led to Products We Use Everyday!

1. Smoke Detectors From Space!

Smoke detector technology was originally developed for the Skylab space station to warn crew members of toxic gas accumulation. Now, these "smoke detectors from space" eerily reminiscent of flying saucers, are routinely used by amateur film makers (in tin-foil hats) to create phony images of UFO's and frightening alien invasions.

2. New Help for Obsessive Compulsive Scientists

Foggy goggles can be hazardous, especially when mixing caustic chemicals! But thanks to NASA—which developed an anti-fogging solution to keep spacecraft windows cloudless during takeoff and reentry—even the most obsessive compulsive scientist on Earth can now work for hours on end in attractive, non-fogging goggles. Just imagine the worry-free hours they'll enjoy uninterrupted by the maddening desire to wipe away annoying condensation.

3. Infrared Technology Bolsters Health Care

When NASA created its innovative infrared-sensing thermometers for use in detecting elusive heat signatures in space, who would have guessed the technology wou help bolster health care cost-cutti efforts! Now incorporated in patie friendly ear-thermometers —that even the youngest toddlers can use—the infrared technology will save countless health-care dollars patients learn to self-diagnose and without the help of costly medical

New Glenair Backshell and Connector Accessory Innovations

Composite Swing-Arm with Keyed Banding Insert

This version of the popular Swing-Arm Strain-Relief Clamp features a banding insert that makes termination of EMI shielding a snap! In assembly, the strain-relief portion of the clamp is run-up and staged out of the way on the cable. This allows the user to complete the termination of the braided shielding to the special insert banding device with relative ease—unconstrained by the limited working-room usually afforded by combined strain-relief/shield termination devices. The toothed insert device and the clamp are then drawn together and the assembly is threaded to the connector, creating a tight, reliable ground path. See Series 627-142 in the Glenair *Composite Accessories* catalog for more information. Free sample available on request.

StarShield "Zero Length" Individual Shield Termination Backshell

The Glenair Series 470-013 StarShield "Zero Length" Individual Shield Termination Backshell offers optimal grounding of EMI/EMP braided shielding. The unique StarShield configuration completely eliminates "standing antenna" problems common with pigtail shield termination systems. The backshell utilizes familiar solder sleeve technology for fast and reliable termination of shielding—even with dissimilar wire types and gauges. The internal configuration of the StarShield features a tapered split-ring that fits snuggly into the conically machined backshell. Tightening the coupling nut in place effects 360° grounding of all conductive surfaces. Standard configurations of the StarShield Backshell include banding and shrink-boot versions. Free sample available on request.

TAG-Ring/Qwik-Ty Feed-Through Fitting

Feed-through fittings are an important but often overlooked component in Glenair's "No-Gaps" product line. Used for non-connectorized wire and cable routing, our feed-through fittings are available in metal and composite versions with a wide range of environmental, EMC and strain-relief features. The example shown is a Series 407-038 TAGRing® feed-through, perfect for individual wire shield termination. We offer similar feed-throughs with a banding platform, constant-force EMI shield spring, or a shrink-boot groove. Free sample available on request.

SERIES 77

FULL NELSON

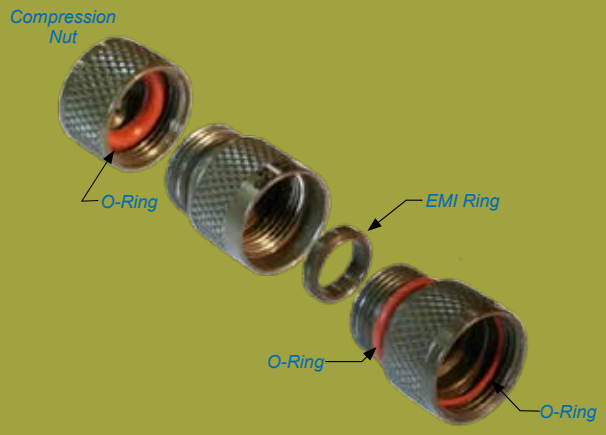
Heat Shrink Boots

Outstanding Environmental and Mechanical Protection

"Think he'll ever break that hold? Nope. He's got him in a Full Nelson!"

Shrink boots provide mechanical and environmental protection to connector-to-cable transitions. Specially formulated polymers are injection-molded, then heated and expanded. The shape-memory property of the material allows it to return to its original shape when heated with a hot air gun. Optional adhesive coatings on the inside of the boot provide a watertight, high-strength bond to the cable jacket and the connector or adapter. Glenair has just launched a major foray into the shrink-boot market with a comprehensive catalog of parts and materials. Most important, we are putting all our Series 77 products into stock for immediate same-day shipment.

Series 80 "Mighty Mouse" Backshells



Glenair Series 80 "Mighty Mouse" connectors are now supported with an expanded range of both rear-end backshells and well as dustcaps, o-rings, flange gaskets, nut rings and more! The Glenair "no gaps" model has been applied to this popular ultra-miniature connector series and the result is a comprehensive range of accessory solutions for all standard requirements, including EMI shield termination, shrink-boot attachment, environmental sealing, strain-relief and so on.

M85049/75 and Glenair Commercial Potting Boots

Not exactly a new product, but there is so much confusion in the marketplace on where to get these items we thought we would give them a plug here. Available in straight and 90° configuations in plastic or aluminum, these simple rear-end accessories provide an easy and convenient receptacle for wire sealing potting material. Ask for Glenair series 307-037 thread-on metal potting boot rings or the M85049/75 plastic snap-on version.

Glenair Backshell Plating Code and Mil-Spec Connector Finish Code Cross-Reference

MIL-DTL-38999 Series I and II Finish Code	Material, Finish	Recommended Glenair Accessory Code
A	Aluminum, Cadmium Plated, Clear Chromate	LF
B	Aluminum, Cadmium Plated, Olive Drab	NF
C	Aluminum, Anodize, Hardcoat	G
E	Stainless Steel, Passivated	Z1
F	Aluminum, Electroless Nickel Plated	M
N	Stainless Steel, Electrodeposited Nickel (Hermetic)	ZL
P	Aluminum, Pure Dense Aluminum (AlumiPlate℠)	AL
R	Aluminum, Electroless Nickel	ME
T	Aluminum, Nickel-PTFE	MT
U	Aluminum, Cadmium Plated, Clear Chromate	LF
X	Aluminum, Cadmium Plated, Olive Drab	NF
Z	Aluminum, Zinc-Nickel, Black	ZR

MIL-DTL-38999 Series III and IV Class Code	Material, Finish	Recommended Glenair Accessory Code
C	Aluminum, Anodize, Hardcoat	G
F	Aluminum, Electroless Nickel	M
G	Aluminum, Electroless Nickel	M
H	Stainless Steel, Passivated	Z1
J	Composite, Cadmium Plated, Olive Drab	XW
K	Stainless Steel, Passivated	Z1
L	Stainless Steel, Electrodeposited Nickel	ZL
M	Composite, Electroless Nickel Plated	XM
N	Stainless Steel, Electrodeposited Nickel (Hermetic)	ZL
P	Aluminum, Pure Dense Aluminum (AlumiPlate℠)	AL
R	Aluminum, Electroless Nickel	ME
S	Stainless Steel, Electrodeposited Nickel	ZL
T	Aluminum, Nickel-PTFE	MT
W	Aluminum, Cadmium Plated, Olive Drab	NF
X	Aluminum, Cadmium Plated, Olive Drab	NF
Y	Stainless Steel, Passivated	Z1
Z	Aluminum, Zinc-Nickel, Black	ZR

Toolin' Around Glenair...

Glenair is *the* connector accessory and EMI shield termination tool-maker for the interconnect industry. Here is an overview of the tools we produce that make backshell-to-connector assembly a breeze!

Nobody can grasp the ins-and-outs of interconnect tool design and manufacturing without a full understanding of cable harness assembly. At Glenair, we not only manufacture the connectors, backshells, cables and enclosures which go into interconnect cable systems, we run a top-flight cable assembly service of our own. And we've drawn on this extensive experience to design and build a complete family of specialized backshell assembly tools for most Mil-Standard circular connectors, as well as connector wrenches, mini-strap wrenches, universal connector holding tools and braid termination tools for production use and field maintenance.

Glenair's selection of circular backshell assembly wrenches include round wrenches in all standard sizes that are designed to be employed with Glenair's hand-held or bench-mounted torque wrenches. The round design assures even distribution of pressure around the backshell, thereby preventing false tightening and distortion problems. A hex design for Glenair composite coupling applications is also offered. Strap wrenches, soft-jaw pliers and connector wrenches for a full range of connector-to-backshell assembly applications are available.

The backshell tightening tools which make up our core tool offering provide a full 360° gripping surface on the backshell coupling nuts. These essential tools minimize the possibility of coupling nut distortion and false tightening problems which can be caused by soft-jaw pliers or strap wrenches. For composite backshell coupling nuts it is essential to use only our 600-091 (aluminum) or 600-157 (stainless steel) series tools and to tighten the coupling nut to the prescribed torque values. When used with the appropriate connector holder and a torque, our backshell assembly tools provide the user with reliable and repeatable assembly performance.

Glenair Connector Accessory Manufacturing Process Guided Tour

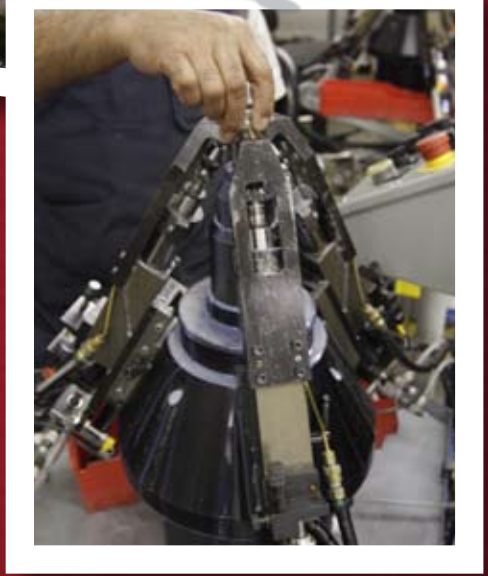
Glenair's manufacturing capability is unique in the interconnect industry. Carefully planned vertical integration gives us unparalleled control over the most important parts of every manufacturing process. From machining of raw bar stock to plating of connector accessory shells, Glenair performs the work.

Primary manufacturing processes convert raw materials into a useful form and shape that typically requires additional operations and processes for completion. Machining is a generic term for removing material from a work piece to form a useful shape. This material removal can be accomplished by rotating the cutting tool as it bites into a stationary work piece, or by rotating a work piece and moving it into a stationary cutting tool. The most common machining centers are lathes and mills.

Rod (or round bar) is used for circular shapes such as connector and backshell bodies, coupling nuts, and protective covers. Tube is commonly used for rings and ferrules. Hex bar is a good source for jam nuts. Square bar is used to produce flanged connector bodies and dummy stowage receptacles.

The vast majority of our machined aluminum is Alloy 6061. With its excellent anti-corrosion properties, good acceptance of applied coatings, ability to accept welds and brazing, and light weight relative to other metals, it's ideal for many components used in interconnect systems. We also use large quantities of 300 series corrosion resistant steel which, with passivation, can withstand up to 2000 hours salt spray, making it one of the most resilient materials available for high-reliability connectors and accessories.

Transfer molding, like compression molding, is a process where the amount of molding material (usually a thermoset plastic) is measured and inserted before the molding takes place. Molding material is preheated and loaded into a chamber known as the pot. A plunger is then used to force the material from the pot through channels known as a sprue and runner system into the mold cavities. The mold remains closed as the material is inserted and is opened to release the part from the sprue and runner. The mold walls are heated to a temperature above the melting point of the mold material; this allows a faster flow of material through the cavities. The mold remains closed until the curing reaction within the material is complete. Ejector pins are usually incorporated into the design of the molding tool and are used to push the part from the mold once it has hardened. Many Glenair seals, grommets and glands are made in our transfer molding machines.



Almost every metal and thermoplastic part requires a finish treatment. Through electrical or chemical processes, metals or chemicals are deposited on part surfaces to provide conductivity, corrosion protection and coloration.

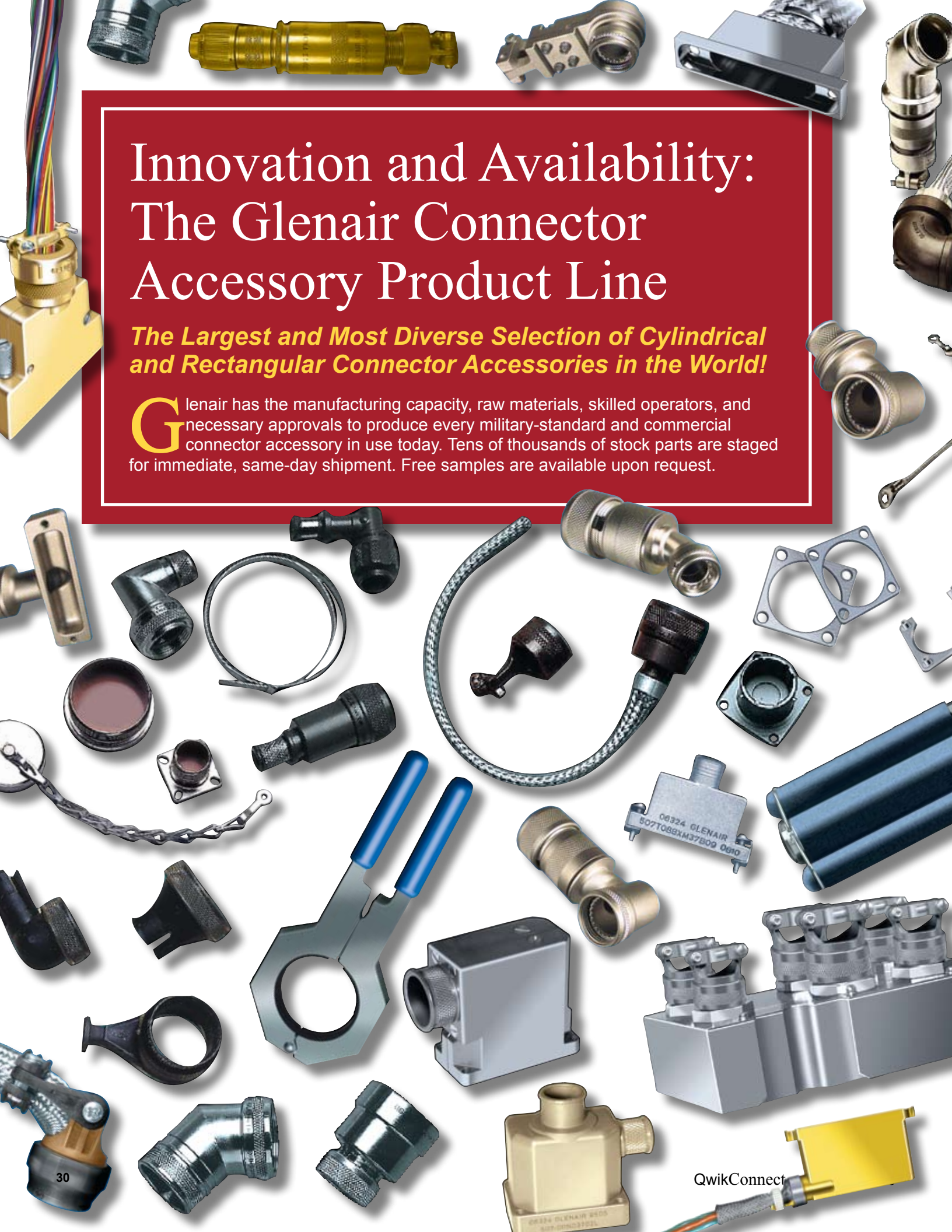
Mil-Specs and other specifications callfor permanent part number marking on every part sold by Glenair. One of the most efficient ways to produce this marking is the VideoJet that sprays on ink using a dot-matrix. Part numbering can include a Mil-Spec number, the Glenair cross reference number, the CAGE code and the manufacturing date code.

Many of Glenair's backshells and coupling nuts require secondary operations such as precision-drilled wire holes. The Glenair-designed "Rocket," drills all needed holes simultaneously. Other secondary operations include the removal of rough or sharp edges, the attachment or "crunching" of coupling nuts, and so on.

Innovation and Availability: The Glenair Connector Accessory Product Line

The Largest and Most Diverse Selection of Cylindrical and Rectangular Connector Accessories in the World!

Glenair has the manufacturing capacity, raw materials, skilled operators, and necessary approvals to produce every military-standard and commercial connector accessory in use today. Tens of thousands of stock parts are staged for immediate, same-day shipment. Free samples are available upon request.



How Not To Succeed

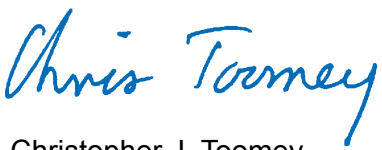
There is a humorous story of a rustic who said, “I wish I knew where I was going to die, and then I’d never go there.” You may laugh, but in fact this fellow was on to something. Many clever people use the practice of “inversion” (looking at things from back to front) to gain a better understanding of difficult subjects. The mathematician Jacobi always counseled his students to “invert, always invert” when faced with a difficult piece of algebra.

I first came across this “inversion” approach in a speech Charlie Munger delivered in 1986 to the Harvard School here in Los Angeles. In his talk he explained that he was unable to tell the students how to be happy, but he had a sure-fire recipe they could follow if they wanted to be miserable. Charlie’s recipe for misery in life went something like this:

First, be unreliable. Do not faithfully do what you have promised to do. Second, stubbornly learn everything you can in life from your own experience, minimizing at all times valuable opportunities to learn from the mistakes and successes of others. Third, when faced with a reversal in life, go down and stay down. Do not get back on that horse! And finally, never follow the advice of the rustic. Never bother to contemplate the places in life that will cause you harm and never avoid the behaviors that will surely take you there.

Successful businessmen are often asked by young people how to succeed in business. Better that they would ask how to fail. Answers like these might really open their eyes: Be unethical and untrustworthy; Put the customer at the bottom of your list of priorities; Remain inflexible when faced with changing business circumstances; Focus on driving cost out of your business rather than on improving customer service; Aggressively leverage and overextend your financial affairs; Adopt a short-term, rather than long term, business perspective.

I’m sure you can think of other “guaranteed prescriptions for business failure” to add to this list. But isn’t it interesting how practical and direct the inversion method makes this discussion? By the way, when Munger concluded his talk to the students at Harvard School he gave them one last piece of sage advice, “gentlemen, may each of you rise by spending each day of a long life aiming low.” I think in our business the equivalent advice would be: please spend every day ignoring your customers and never, ever deliver the level of quality and service you would wish to receive yourself.



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