

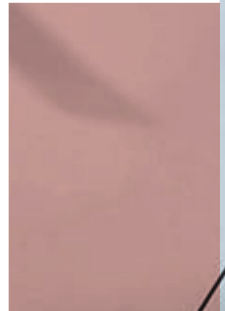
QwikConnect

GLENAIR ■ APRIL 2017 ■ VOLUME 21 ■ NUMBER 2



20 YEARS

SERIES 80
MIGHTY
MOUSE



1997-2017

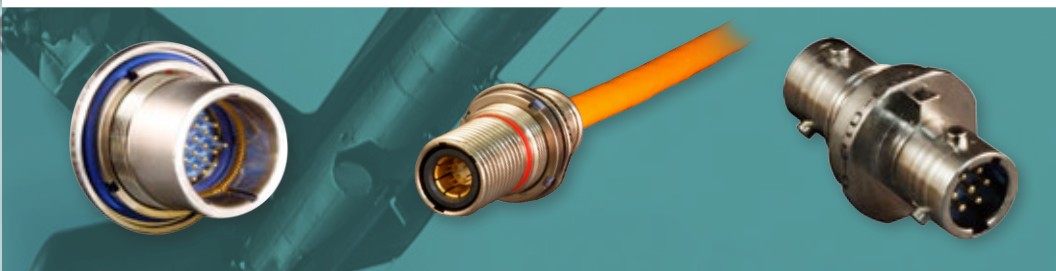
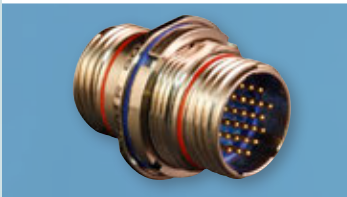
Glennair®



The industry standard for size and weight reduction in mission-critical electrical / optical interconnect systems

SERIES 80 MIGHTY MOUSE

Constant, relentless innovation





“I only hope that we don’t lose sight of one thing – that it was all started by a mouse.”

–Walt Disney

Glenair and the Walt Disney Company not only have neighboring facilities in Glendale, California, but both companies also have an affiliation with a cute little mouse. Disney of course has Mickey Mouse, and Glenair, its Mighty Mouse. This year marks the 20th anniversary of this “awesome performance, itty-bitty package” connector series. Glenair’s Mighty Mouse ultraminiature connectors are found on subsea robots, the Mars lander, and on just about everything in between. While we cannot claim that Glenair “was all started by a (mighty) mouse,” the connector has played a starring role in Glenair’s emergence as a top 10 interconnect manufacturer. For anyone in the military-aerospace industry who has been living in a cave for the last 20 years, a quick recap of the rationale behind the smaller and lighter Mighty Mouse will be a useful jumping off point for this “20 years in the making” interconnect success story.

The Series 80 Mighty Mouse represents the evolution of circular connector technology beyond the 38999 sub-miniature format to a new standard which is absolutely unmatched in today’s interconnect industry. Glenair is the unchallenged design and market leader for reduced package size and weight connectors of this type and style.

Mighty Mouse interconnect systems are so small and light that they are weighed in tenths of grams while still meeting the performance specifications of even the most mission-critical of applications. But the benefits of connector package-size reduction are not limited to the connector itself. Large form factor I/O-to-board connectors, such as the D38999 Series III, force an expansion of printed circuit board real estate, box enclosures, wires and cables, shielding and so on.

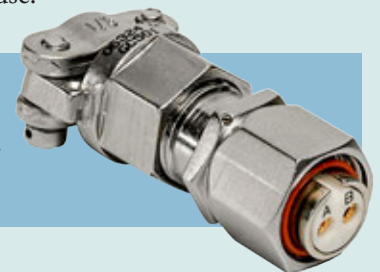
Obviously this is not a problem in every application. But with the lower power and signal voltage requirements of current-generation electronic systems, the opportunity has long been ripe to design systems with reduced-size circuits and connectors.



The origin of the Mighty Mouse

The Mighty Mouse story begins in 1997. The Glenair connector portfolio at the time was limited to connector savers, “oil patch” products, and a mixed bag of various specialty connectors. One of these specialty connectors led to the origin of the Mighty Mouse.

▶ Small form-factor jet engine connector that led to the first Mighty Mouse opportunity.



For over a decade, a special Glenair high-temperature connector had been used on jet engine accelerometers. The accelerometer manufacturer, pleased with Glenair’s service and support, agreed to give Glenair a shot at supplying a three pin connector already in use on another accelerometer. In 1997, Glenair created the first sales drawings for this ultraminiature three pin connector which featured size #23 contacts and a 5/16 inch coupling thread. These connectors deserve recognition as the earliest Mighty Mouse connectors.

◀ Accelerometer with three pin hermetic Mighty Mouse connector.



The original ▶ Mighty Mouse connector



JULY 2006.

A U.S. ARMY BASE IN NORTHWEST IRAQ



◀ Arrowhead challenge coin. Lockheed gave these coins to Glenair employees involved with the program.

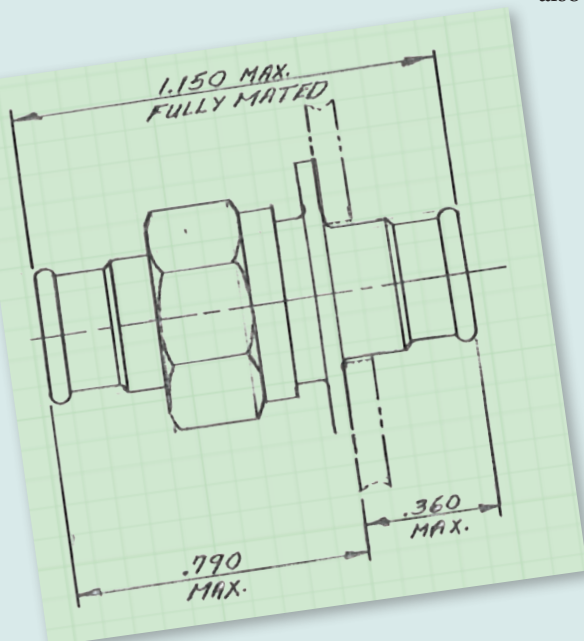
The roar of turbine engines filled the air as helicopters belonging to the 1-82 Attack/Recon Battalion lifted off in a cloud of sand and dust. For the first time in combat these AH-64D Apache attack helicopters were equipped with a new pair of electronic eyes- the M-TADS/PNVS, otherwise known as the Arrowhead system. The Arrowhead electro-optical targeting and vision system was a quantum leap in performance. The upgraded capability of Arrowhead enabled the Apache copters to perform their missions from a higher, safer altitude. But the enhanced capability meant stuffing a lot more electronics into the same envelope as the system it replaced. Traditional military-grade connectors were too big for consideration. Enter the Mighty Mouse. This miniaturized connector enabled Lockheed to minimize the Arrowhead electronics with no compromise in performance. The Arrowhead program was responsible for a long list of Mighty Mouse "firsts", but the Mighty Mouse story actually starts a couple of years before Arrowhead.

1998: The Mighty Mouse takes shape

The three pin accelerometer connector inspired Glenair to look for other customers and applications. In 1998 a satellite manufacturer wanted an ultra-small four pin crimp-and-poke connector as an alternative to factory-wired Micro-D connectors. Glenair proposed a four pin version of the original three pin Mighty Mouse. This connector, with a 3/8 inch mating thread, was similar to the original connector, except with one new feature, the integral band platform. This platform, compatible with Band-It shield termination bands, also accepted shrink

boots or cable overmolding. This feature eliminated the need for traditional backshells or cable clamps. Some Glenair employees were quick to point out that, for every connector sold with this feature, Glenair would miss the opportunity to sell a backshell. However, the band platform proved to be a key selling feature, and eventually the integral band platform spread not only to Glenair's other connectors but also to the industry at large.

The original satellite opportunity went away, but we had already put the wheels in motion to build tooling and prototypes. We discovered that we could squeeze seven contacts into the same size connector as the four pin, so we added the "6-7" layout.



◀ Original 4 pin Mighty Mouse engineering sketch, October 1998.

Hunting for customers

By 1999 we had an interesting new general-purpose ultraminiature connector but no customers, so we went looking for business. We made a few dozen mated pairs and sent them to some of our sales reps, who showed the product to their customers. Opportunities quickly started surfacing for tactical gear, weaponry, communications, industrial applications, missiles, aircraft sensors, UAVs and satellites. Two of these opportunities were vital to the development of the Mighty Mouse. These influential programs, Arrowhead and JEDI, not only enabled Glenair to start developing the

product into a range of styles to suit disparate applications, but also enabled Glenair to realize the scope of the untapped market for ultraminiature circular military-grade connectors.

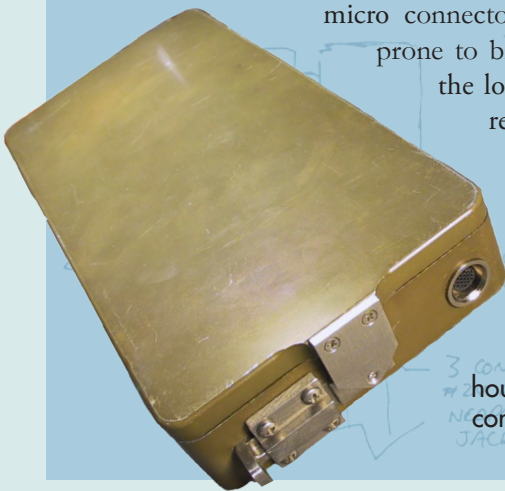
Arrowhead adopts the Mighty Mouse

The Lockheed Arrowhead program played a pivotal role in Mighty Mouse development. The modular design of the Arrowhead system reduced maintenance expenses and downtime but resulted in space constraints and increased wiring complexity. Standard connectors were too big to fit the modules. In 1999, Glenair showed the new Mighty Mouse connector to Lockheed, who wasted no time designing the part into their equipment. They also needed connectors with higher pincounts. Glenair responded by expanding the offering to include up to 85 contacts. It soon became apparent that the original product design with UNF mating threads and small polarizing keys, while satisfactory for small diameters, was not the best design for larger connectors. Glenair’s answer was an upgraded Mighty Mouse with double-start ACME threads and bigger keys. This new version eventually became known as the Series 801. Other Arrowhead “firsts” included printed circuit board mount versions and coaxial contacts.

Re-design of the JEDI

In 1999 Glenair was supplying microminiature twistpin connectors to Booz Allen and Hamilton, who was developing a new concept for handheld wireless technologies for dismounted combatants. This system, the Joint Expeditionary Digital Information System (JEDI), coupled a Collins Plugger GPS, a Leica Viper laser-ranging binoculars, a handheld computer and a satphone. A forward observer could locate a target with the laser-ranging binoculars and send a digital message identifying the target type and precise location to a

faraway command center. The light-duty micro connectors and cables were prone to breakage. Fortunately the local Glenair sales rep received samples of the new, yet-to-be-named Mighty



◀ The first dismounted soldier box for the JEDI system. This box housed an HP handheld computer and had a 19 pin Mighty Mouse.

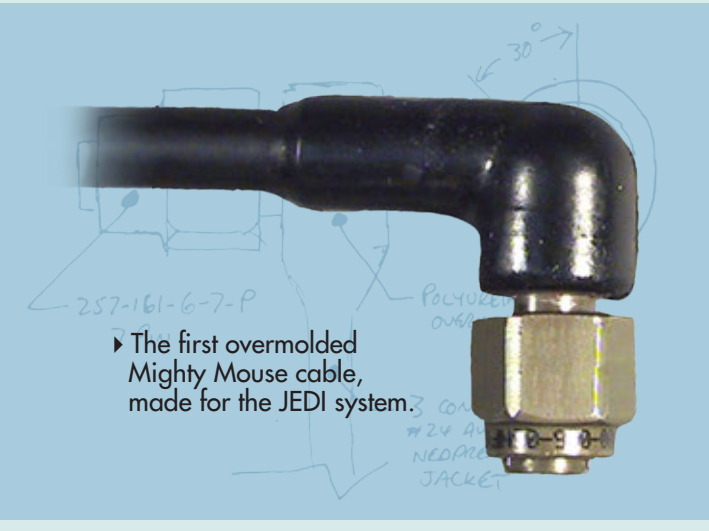


The Apache Arrowhead pod with Mighty Mouse interconnects.

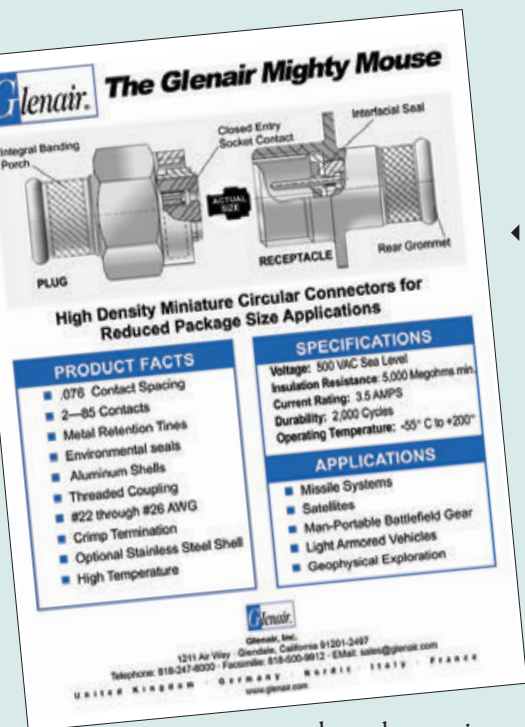
Mouse. His initial response, sent by fax, was “They look fantastic”, and he proposed changing the JEDI interconnects to this new connector. Booz Allen agreed, and the JEDI equipment was re-designed to use the Mighty Mouse. JEDI “firsts” include the first Mighty Mouse on dismounted soldier gear, the first Mighty Mouse overmolded cables, and the first Glenair-made box assemblies with Mighty Mouse connectors. JEDI never went into production, but it’s worth noting that JEDI has similarities to today’s state of the art soldier systems. Knowledge gained from JEDI was invaluable in shaping Mighty Mouse development for dismounted soldier electronics.

We need a name

By the beginning of 2000 it was clear that our new ultraminiature connector should be marketed as a standalone product, so we named it the “Series 80.” But what should



▶ The first overmolded Mighty Mouse cable, made for the JEDI system.



◀ The first Mighty Mouse data sheet. August, 2000.

we call it? “Mighty Mouse” was suggested as a play on the small size and high performance. A check of existing trademarks showed several registrations, most notably for the cartoon character

trademark registered to CBS/Viacom.

Fortunately, Glenair’s use of the Mighty Mouse name for electrical connectors did not conflict with any registered mark. The Mighty Mouse name first appeared in print on a one page promotional flyer released in 2000.

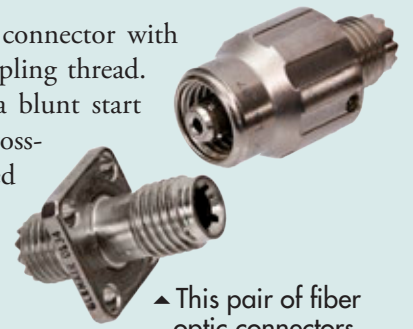
The first catalog

By 2001 the Mighty Mouse was starting to get traction with aerospace and defense customers including Lockheed, Raytheon, Boeing and General Dynamics, and in 2001 the first catalog was published. This 48 page catalog covered the Series 800 with unified coupling threads. Included in this catalog were standard overmolded cordsets.

Birth of the Series 801 double-start

The original Mighty Mouse with UNF coupling threads had mechanical drawbacks that became obvious on larger shell sizes. The unified threads were prone to cross-threading, and the polarizing keys were small. We needed a completely new connector. The inspiration for the Series 801 was a miniature

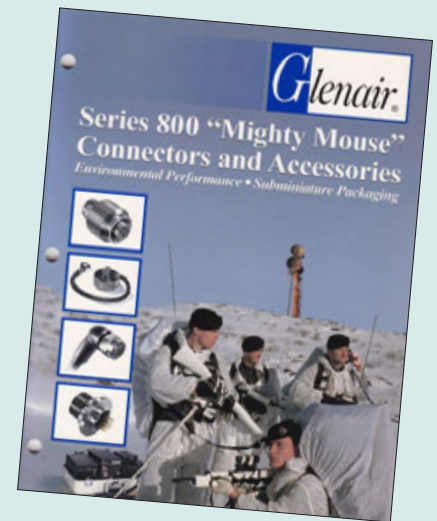
single-channel fiber optic connector with a double-start ACME coupling thread. This part (180-071) had a blunt start thread resistant to cross-threading. Everyone liked the feel of the threads on the fiber optic connector, so in 2002 the double-start Mighty Mouse made its debut on Lockheed’s Arrowhead system. In January of 2003 the standard Series 801 double-start Mighty Mouse was released. Sales of the double-start soon eclipsed the original Series 800, and the Series 801 remains our most popular Mighty Mouse.



▶ This pair of fiber optic connectors was the inspiration for the double-start Series 801.

The Land Warrior Part I

By 2003 several dozen tactical soldier programs were using Mighty Mouse for handheld devices, radios, keyboards and computers. However, the single biggest soldier program, Land Warrior, did not use any Mighty Mouse interconnects. The Land Warrior program was the US Army’s effort to equip dismounted soldiers with state-of-the-art computer and communications gear.



▶ The first Mighty Mouse Catalog, released in 2000.

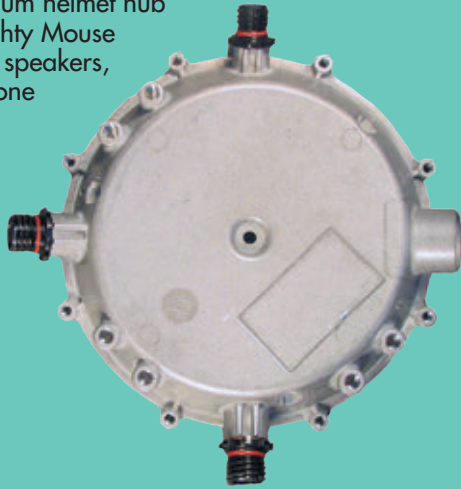


The cover of the first Mighty Mouse catalog showed Scandinavian soldiers on winter maneuvers. This seems like an odd choice of artwork, but there was a reason: the photo was chosen in tribute to Glenair’s Nordic office in Stockholm, Sweden. Glenair Nordic played an early role in Mighty Mouse development. Nordic, recognizing the product’s potential, helped to convince us that the Mighty Mouse was a diamond in the rough. They worked with their tool partners to develop the first contact crimpers and insertion/removal tools. The Stockholm office also arranged the first formal Mighty Mouse seminar. They invited several dozen engineers from Sweden’s defense industry to a full day briefing, lunch included, at the Villa Pauli outside of Stockholm.



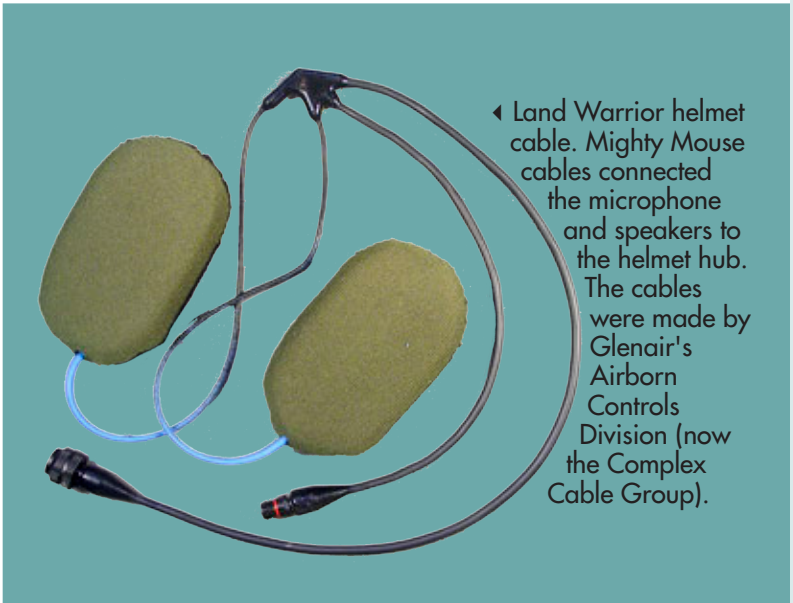
◀ A connector used on Land Warrior.

▶ Magnesium helmet hub with Mighty Mouse ports for speakers, microphone and vest hub.



▲ Mighty Mouse connectors used on Land Warrior.

2006 Army Land Warrior field trials at Fort Lewis.



◀ Land Warrior helmet cable. Mighty Mouse cables connected the microphone and speakers to the helmet hub. The cables were made by Glenair's Airborne Controls Division (now the Complex Cable Group).

The first LW systems fielded in the 1990s were designed by a consortium of traditional defense contractors. The LW gear featured a backpack-mounted computer and an elaborate helmet subsystem. This first-generation LW system had weight problems, excessive cost, unmanageable power consumption and unreliable interconnects. The Army stopped work on this version and came up with a new development concept. Instead of relying on traditional defense contractors, the Army turned to entrepreneurial "Silicon Valley" companies who, it was thought, would bring a fresh approach using COTS technologies. The helmet subsystem design task was given to a small company, Pemstar. Pemstar's search for a rugged, small form factor helmet connector led them to the Glenair Mighty Mouse. Mighty Mouse receptacles were installed on a small magnesium helmet-mounted hub. The mating plugs connected the microphone and speakers. A splined flange receptacle was threaded directly into the hub, eliminating screws or jam nuts. This approach freed up real estate inside the hub. A stamped metal tab ring prevented rotation.

The Land Warrior Part II: GD takes over

By 2003, General Dynamics had taken over responsibility for Land Warrior development. The search for the right connector led the GD development team straight to the Series 80 Mighty Mouse. This excerpt from an Army whitepaper details why :

"Connectors and cables were a continuing challenge, especially in meeting the human factors requirements for size, flexibility, robustness and ability to integrate with the body armor. In addition, the battlefield conditions – sand, dirt, mud, water, and vibration proved problematic with certain connectors. Following a trade study in August 2003 the Land Warrior prime contractor recommended use of the Glenair Series 80 connectors as the path forward."

—White Paper on Nett Warrior Interconnect Architecture, Project Manager Nett Warrior, 4 June 2012



GD's use of USB 2.0 greatly simplified the wiring compared to earlier Land Warrior versions. The hodgepodge of different connectors was replaced with a single Mighty Mouse layout, the 6-6. This layout deleted the center contact and slightly lengthened pin 2 to provide a ground connection before the USB data pair was connected.

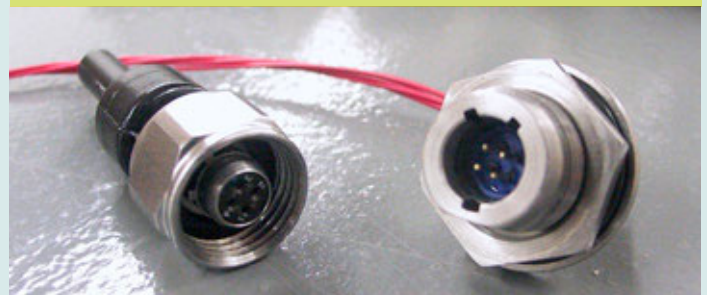
Land Warrior kicked into high gear in 2004. Each Land Warrior ensemble—one soldier's equipment—weighed 17 pounds and contained literally dozens of Mighty Mouse interconnecting the weapon, computer, radio, battery, GPS, and helmet. From May to September 2006 an infantry battalion at Fort Lewis, Washington performed an assessment of the system. Following this assessment the Land Warrior system was deployed to Operation Iraqi Freedom in 2007. General Dynamics produced 440 Land Warrior ensembles, requiring over 30,000 Mighty Mouse connectors and over 6,000 overmolded cordsets.

Birth of the Series 802 AquaMouse™

The Series 802 was created in 2003 as a next-generation miniaturized version of the Series 22 Geo-Marine® connector. The Series 22, with its stainless steel shell and high pressure environmental seals, had enjoyed widespread use in pipeline inspection “pigs” made by British Gas, Pipetronics, and others. The term “pig” originated in the early 20th century



▲ The first AquaMouse™ connectors in February 2004. This pair was used for hydrostatic pressure testing.



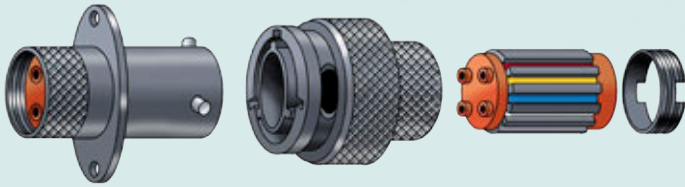
when Texas roughnecks would send bundles of straw and barbed wire through their lines. The bundles would screech like a pig and would emerge covered in muck. The modern “smart pigs” have powerful magnets that detect corrosion sites and defects in the wall of the pipe. The AquaMouse™, with its rugged shell design and 3500 PSI pressure rating, became the preferred Mighty Mouse for geophysical exploration and marine applications. In 2004 the AquaMouse™ went into production and was added to the catalog lineup. The original stainless steel coupling nut was changed to marine bronze.

Birth of the Bayonet

The Series 803 story starts in 1998. Glenair proposed an innovative modular connector for a Formula 1 racing team. Formula 1 cars are loaded with telemetry and sensors, interconnected with a small bayonet connector aptly named the “autosport” connector. Glenair's MultiMod autosport connector, because of its modular design, could potentially replace dozens of individual part numbers with a single part. The concept was clever, but it never got off the ground.



In 2001, Glenair Sweden, familiar with the MultiMod connector, suggested replacing the modular insert with a 10 pin Mighty Mouse insert. In 2004 this product became the Series 803 and was added to the catalog. The bayonet Mighty Mouse, with its push-to-mate, ¼ turn to lock feature, was not a contender for dismounted soldier applications because of its limited durability and immersion performance compared to the Series 801 and 804.



▲ The "Multi-Mod" bayonet connector. We replaced the insert with a 10 pin Mighty Mouse insert and called it the Series 803.

Birth of the Push-Pull

The first Mighty Mouse connectors used on soldier systems had threaded coupling mechanisms, but soldier gear and many other applications also needed "bailout," or breakaway, connectors. We needed a version of the Mighty Mouse that would snap to mate and would de-mate with a tug on the cable. In 2001 work was started on a push-pull design. After a year of development the first version was not working properly and had to be scrapped. By 2002 the re-designed push-pull connector was working fine, thanks to a canted coil spring that had consistent release forces.



▲ The first Series 803 aircraft application. This cockpit-mounted box controlled the video feed from cabin-mounted cameras.



▲ The original push-pull Mighty Mouse used on Eurocopter, 2002.

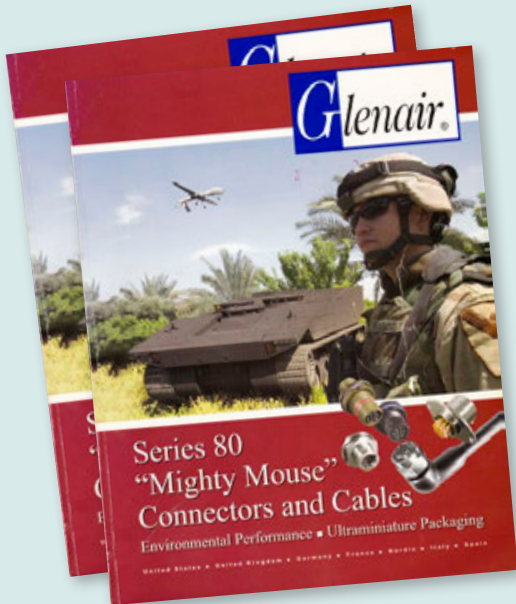
The push-pull was useful for dismounted soldier equipment, but the first two programs showed that the product had a promising future in flight equipment. The push-pull's first application was for a pilot headset on the Eurocopter. We cautioned the customer that we had not yet qualified the connector for ejection seats, but the customer was quick to point out that ejection seats are a bit of a problem on rotary wing aircraft! Another early application was for an unmanned aerial vehicle. By 2003 the push-pull was in use on Land Warrior, and as of 2017 is the standard breakaway connector for Nett Warrior and other soldier programs, along with the LI-145 soldier battery.

▼ Push-pull connector on the LI-145 soldier battery.



The second Mighty Mouse catalog

2004 was a big year for the Mighty Mouse. The second edition Mighty Mouse catalog was released mid-year. Making their debut in



◀ The 138 page 2004 catalog, featuring for the first time, the Series 801, 802, 803, and 804 plus accessories, all in a single catalog

this catalog were the Series 801 double-start, the AquaMouse

802, the bayonet 803 and the push-pull 804, along with a new accessories section.

The birth of the Series 805 triple-start

The original Mighty Mouse with triple-start ACME threads was created for a Formula 1 racing team. The customer needed higher pincounts than available with the standard autosport bayonet connectors. They were not opposed to a threaded coupling mechanism if the connectors could be mated quickly. Glenair proposed a fast-coupling triple-start Mighty Mouse connector. The coupling nut required only 180 degrees of rotation to fully mate the connector. This connector went into production in 2004, and later that year was adopted for several foreign defense programs. We wanted to add a triple-start to the Mighty Mouse lineup, but this first version with its 180 degree coupling was not the right answer. In 2005 we released the standard Series 805 triple-start with a coupling nut that requires 360 degrees of rotation.



▲ The original triple-start, with half a turn to full mate, is still in production for several foreign defense programs.



was constrained by a slow, labor-intensive manufacturing process. The polyurethane overmolds required up to one hour of cure time. The cable jacket was “blown on” neoprene, so the bulk cable had to be laid up by hand. The cable shop at that time was not part of Glenair’s high availability model, which is a polite way of saying they were too slow. We needed a different manufacturing approach.



The first Mighty Mouse sample box

◀ In 2005 we made our first demonstration box. Series 800, 801, 803, and 804 receptacles were mounted into the lid of a composite box. We added a 38999 connector in order to show the dramatic size reduction possible with the Mighty Mouse. Overmolded plugs were supplied with the box, allowing customers to mate and de-mate the four types of connectors.

Mighty Mouse cordsets

Several factors led to the success of the Mighty Mouse. One obvious factor was simply “right product, right time”. But another factor, product availability, also played an important role. This availability strategy included standard overmolded cordsets. Conventional wisdom held that aerospace/defense cable assemblies are highly customized, and it is pointless to try to anticipate customer requirements. Customers were expected to create a



▲ The first triple-start connector, 2004. Originally designed for Toyota, this connector featured full mating with 180° coupling nut rotation. This machined composite prototype never went into production, but can be seen on Marco’s desk.

detailed cable assembly specification, then wait days, if not a week or more, for a price quote. The quote typically would include tooling charges, setup charges, and months for delivery. Glenair chose a different direction. Cordsets would be part of the Mighty Mouse availability strategy.

The first Mighty Mouse catalog, released in 2001, contained 19,200 cordset part number possibilities, not counting length.

This cordset availability strategy was constrained by a slow, labor-intensive manufacturing process. The polyurethane overmolds required up to one hour of cure time. The cable jacket was “blown on” neoprene, so the bulk cable had to be laid up by hand. The cable shop at that time was not part of Glenair’s high availability model, which is a polite way of saying they were too slow. We needed a different manufacturing approach.

Mighty Mouse cordsets part deux: “hot melt” to the rescue

Producing Mighty Mouse cordsets in days instead of weeks meant that we needed to find a faster overmolding process, suitable for the Mighty Mouse assembly area.

The breakthrough came from Glenair's Mansfield, England operation, who developed "hot melt" overmolding on cable assemblies. Hot melt is a term describing low pressure encapsulation using polyamide plastic material. In 2003 Mansfield sent a hot melt tryout kit to Glendale, consisting of molding equipment, raw material and an overmold tool for size 6 Mighty Mouse connectors. The results were spectacular. A cordset could be overmolded in minutes instead of hours. The mold tools were inexpensive and easy to machine. The hot melt process was simple and allowed us to move cordset fab to the connector assembly area. We switched the cable jackets from neoprene to extruded polyurethane. This change made it practical to stock spools of cable in advance of customer orders. The 2004 Mighty Mouse catalog included a full range of these new style overmolded cordsets. Our timing was good, because by 2004 the soldier systems programs were moving too fast to wait around for cordsets.

Growing pains

By 2005 the Land Warrior program was hitting high volume, and every day brought new Mighty Mouse customers and applications. The factory struggled to keep up with demand. As capacity increased, so did the backlog. The growing number of stocked "Same

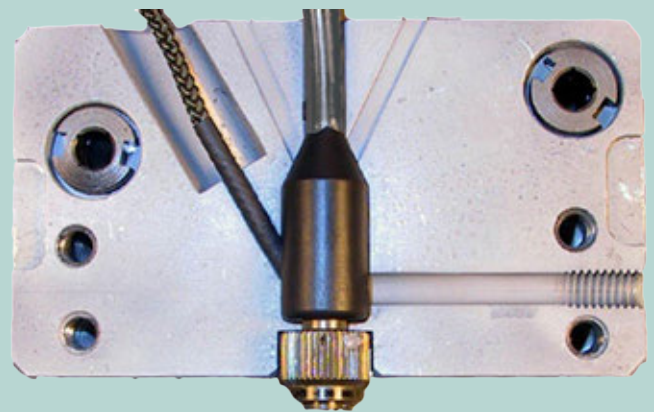
"Reduce the leadtime to three weeks, and the business will explode"

Day" items helped somewhat, but the leadtime for standard assemble-to-order catalog items was stuck at eight weeks. The turning point occurred following the Association for Unmanned Vehicle Systems International show in August, 2007. Many of the vehicles on display contained Mighty Mouse connectors. Trade shows are a great place to hear candid remarks from our customers, and we got an earful. Customer after customer pointed out that they had to deliver finished vehicles to their customers in 12 weeks or less, and Glenair's 8 week leadtime was a problem. This message was brought back to Glenair headquarters. The response was "reduce the Mighty Mouse leadtime to three weeks, and the business will explode". We came up with a phase-in plan to reduce leadtime, but this was rejected in favor of an across-the-board immediate reduction. Reducing the leadtime from 8 to 3 weeks in the midst of a capacity crunch would seem to be a really bad idea. But it worked! Parts got shipped on time, and business boomed.

Overmolded Cordsets



▲ The first standard catalog cordset, with neoprene jacket and polyurethane overmold.



▲ The first high volume cordset, for a radio keyboard.

▼ Original hot melt overmolding tool (furnished to the Glendale factory by Glenair UK).



▲ The first hot melt overmold cordset, with polyurethane jacket.

Spinoffs

The success of the Mighty Mouse led to several spinoff products. One of these spinoffs was born when Glenair decided to create a “rectangular Mighty Mouse”. Development started in 2006, and the Series 79 Micro-Crimp product line was released the following year. Another spinoff, the SuperFly, was born out of the need to further miniaturize electronics such as for dismounted soldier applications. The Series 88 SuperFly, introduced in 2013, featured three contact sizes, the Mighty Mouse size 23, the Micro twistpin, and the Nano TwistPin.



► The first big Mighty Mouse spinoff, the Series 79 MicroCrimp, released in 2007.

Birth of the Series 811 Mighty Mouse HD



▲ The original Mighty Mouse High Density with twistpins on .050 inch centers. This 55 pin connector was the same size as the standard 19 pin Mighty Mouse.

The series 79 Micro-Crimp connector used Mighty Mouse contacts in a Micro-D housing. But what about the opposite? Why not use Micro-D twistpin contacts in a Mighty Mouse housing? And so the Series 811 was born. An early “Mighty Mouse HD” with twistpin contacts on .050 inch centers was a custom connector for a soldier weapon sighting system. This connector, first sold in 2003 to

a DRS subsidiary, was the same size as a standard 19 pin Mighty Mouse but with 55 contacts. Eventually a new Series, the 811, was tooled and added to the Mighty Mouse catalog. In 2011 the first Series 811 catalog was released.

High Speed Mighty Mouse

The standard Mighty Mouse connector, although not designed for controlled impedance, worked well for USB 2.0 signals used in the



▲ The Series 88 SuperFly ultraminiature tactical connector series is a spinoff of the Mighty Mouse.

re-vamped Land Warrior system, and it also proved to be more than adequate for 100BASE-T and gigabit Ethernet. Mighty Mouse connectors started appearing on avionics boxes and ruggedized Ethernet switches. We learned that, when customers asked if Glenair made Ethernet connectors, the correct answer was “Yes we do. It’s our Mighty Mouse connector.” Standard receptacles were fine for the boxes, but what about the mating plug cordset? Our standard catalog overmolded cordsets were not compatible with high speed cables. In 2006 we found sources for aerospace-grade high speed twisted pair and quad cables and created a new set of standard catalog high speed cordsets. These cables were added to the 2007 catalog.

The standard Mighty Mouse, with thermoplastic insulators, was OK for USB 2.0 and gigabit Ethernet, but with the advent of the higher data rate USB 3.0 and 10G Ethernet, the connectors were too “lossey”. The solution, introduced in 2011, was to replace the thermoplastic insulator with PFA fluorocarbon, which has a low dielectric constant. This new PFA Mighty Mouse first appeared in a 2013 high speed Mighty Mouse catalog.

First Fiber Optic Mighty Mouse

The first Mighty Mouse with fiber optic termini was created in 2003. A derivative of the Series 801 size 10, this connector accepted size 16 front release “COTS” termini. It went into production in 2004 but it was never released as a standard catalog product.

One year later, in 2005, A hybrid fiber optic version of a Series 804 push-pull was prototyped, but with the exception of a single order, never went into production and never made it into the catalog.

Fiber Optic



The original fiber optic Mighty Mouse, first made in 2004.



The second fiber optic Mighty Mouse, circa 2005.

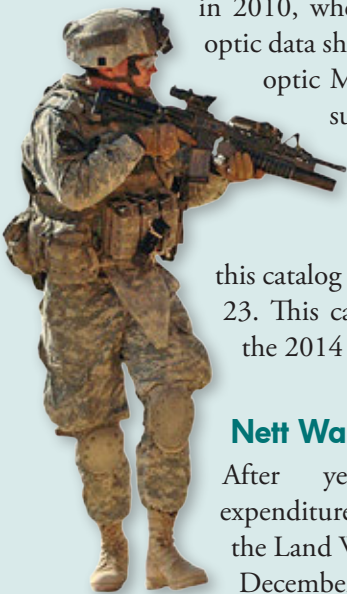


The first Fiber Optic Mighty Mouse data sheet, released in 2010.

▶ The 212 page third edition Mighty Mouse catalog, published in 2007, included high speed cordsets, Series 805, plus filtered connectors.



By 2007, the Mighty Mouse lineup included a few size 16 rear release arrangements, so it made sense to create a rear release fiber optic termini compatible with Mighty Mouse. For the first couple of years, these termini were exclusively used for Glenair-made cable assemblies. This changed in 2010, when the first Mighty Mouse fiber optic data sheet was released. The size 16 fiber optic Mighty Mouse became an instant success.



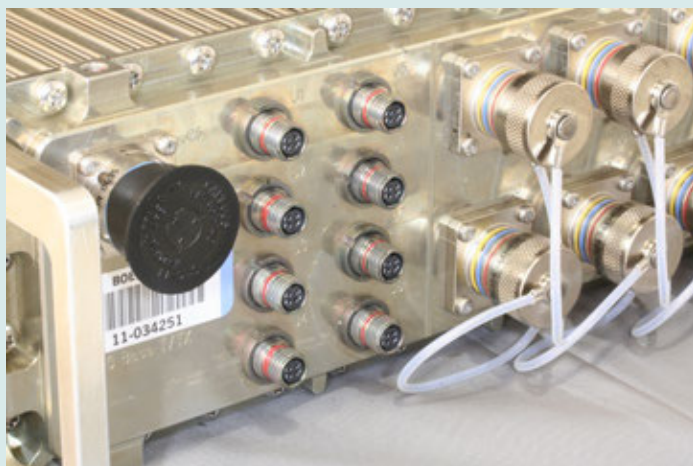
The 2012 Fiber Optic catalog contained a new section on the Mighty Mouse. Included in this catalog were two new sizes—20HD and 23. This catalog section was also added to the 2014 Mighty Mouse catalog.

Nett Warrior

After years of development and expenditures of more than \$500 million, the Land Warrior program was cancelled in December, 2006. However, the program

was given a new lease on life following its first combat deployment. In May, 2007, the 4th Battalion, 9th Infantry Regiment took several hundred Land Warrior ensembles to Iraq. The 4-9 “Manchu” infantry became the first digitally networked soldiers in a combat theater. This combat test of the Land Warrior lasted until June 2008. The system worked well enough to be given a second chance. The program was re-named Ground Soldier System (GSS), then re-named Nett Warrior (NW) in honor of Robert B. Nett, a WWII Medal of Honor recipient.

By 2012 the Nett Warrior program had come up with a new concept. No longer would the soldier be forced to lug around ten pounds of gear. Instead, the Nett Warrior would become a much simpler, lighter weight system, relying on a commercially available smartphone coupled to a soldier radio. The program office had to decide whether or not to stay with the Mighty Mouse connector. Nett Warrior adopted the Glenair Series 804 breakaway connector and dropped the Series 801 threaded connector.



▲ This 2004 flight-grade Ethernet switch was installed on Boeing aircraft. The four pin Mighty Mouse connectors were used for ARINC 664 ports.

▶ This 2007 demonstration box showcased the Mighty Mouse for Ethernet, CANbus, USB and 1394 firewire.



▶ This photo, taken in 2006, was used to demonstrate size and weight savings of a high speed Mighty Mouse cordset compared to a MIL-DTL-38999 Series III with an RJ45 Ethernet insert.



“Feedback on the breakaway type of connector...indicated no issues with user acceptance, robustness, or environmental compliance.”

—White Paper on Nett Warrior Interconnect Architecture, Project Manager Nett Warrior, 4 June 2012

The Nett Warrior program has been a success by all accounts, and ongoing funding and deployment seems certain. Equally certain is the continuing reliance on Glenair Mighty Mouse connectors.

Braze-on breakthrough

In 2009 Glenair designed and built an interconnect hub for a variant of the Land Warrior soldier gear. This module had Series 804 plug shells integrated directly into the box. This was the first time that discrete panel-mounted connectors were replaced by connector shells brazed directly onto a metal box. “Braze-on’s” enabled size reduction, but size and weight savings were not the only benefits. Potential water leak paths were eliminated, and EMI shielding was improved. This solution was used on soldier radio adapters and the new STAR-PAN™ hubs.



▲ An early example of a “braze-on” hub, made in 2009, with the Mighty Mouse panel plugs integrated directly into the box.



▲ Longtime Mighty Mouse maven Lisa Amling demonstrates Glenair STAR-PAN™ with Series 804 Mighty Mouse connector and cable technology at AUSA, the premiere North American land power and professional development forum.

Size 8 Mighty Mouse debuts in 2012

By 2010 the Mighty Mouse had expanded to include a full range of size 12 and size 16 contacts. In 2012 we added size 8 arrangements. These new Mighty Mouse layouts accepted standard MIL-DTL-38999 Series III size 8 coax, twinax, and quadax contacts.

Even more spinoffs

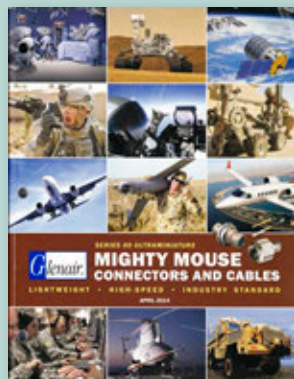
Glenair’s involvement with soldier systems led to the development of several new products. These new connectors were designed for low profile vest-mounted gear. Instead of the crimp, rear release Mighty Mouse contact system, these connectors used a “hot shoe” receptacle and a spring-loaded pin on the plug. The first of these connectors, the circular MouseBud, featured a snap-lock mechanism with a release trigger. The other version, the rectangular Jughead, has a spring latch that provides for secure mating but can be released with a torsional force.

The Series 824 locking push-pull joins the lineup

By 2012 the Mighty Mouse line included a broad range of coupling styles. However, customers kept asking for a locking push-to-mate connector similar to European-made connectors commonly found on medical equipment and instrumentation. Spring-loaded latches on the plug barrel provide secure mating. Unmating is accomplished by pulling on the integral release sleeve. In 2014 the first Series 824 locking push-pull data sheet was released.



▲ The 288 page 2010 catalog added 29 new contact arrangements, bringing the total number of layouts to 43.



▲ Tipping the scales at just under 3 pounds, the 640 page 2014 catalog was more than twice the size of the previous edition.

STAR-PAN™: the perfect storm spinoff

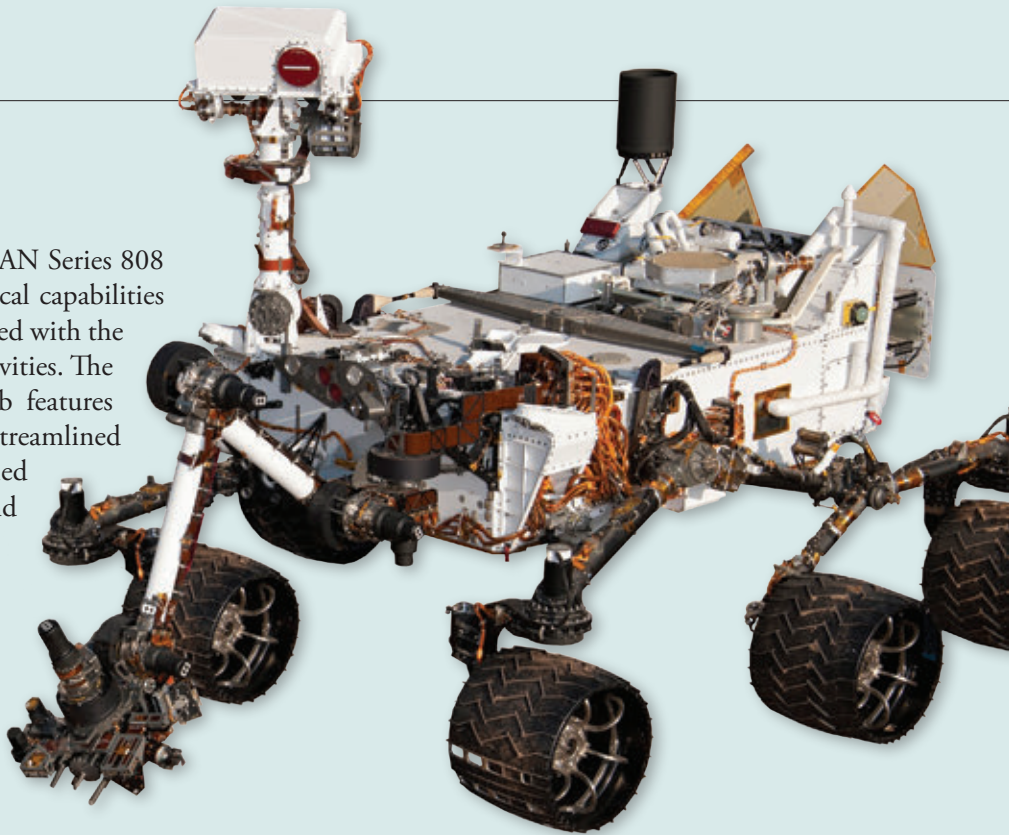
The latest Mighty Mouse spinoff, the STAR-PAN Series 808 product line, is a perfect storm of new technical capabilities acquired over the past half dozen years combined with the knowledge gained from our soldier systems activities. The STAR-PAN data and power distribution hub features dip-brazed connector ports for a low profile, streamlined appearance. Inside the hub, a Glenair-designed circuit board manages the flow of power and data.

Would you like to hear about our specials?

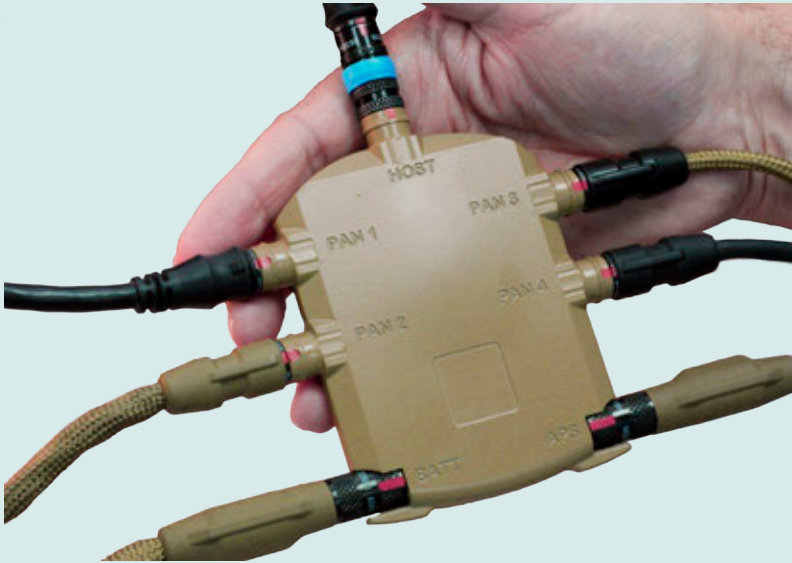
Our 20-year Mighty Mouse success story would not be complete without a mention of the thousands of custom cable assemblies, modified connectors, and bespoke accessories, collectively called “specials” at the factory. Virtually every day at Glenair, at least one new special order Mighty Mouse is released for production. It might be a part with a custom flange or maybe a lengthened contact, a customized filter array, or a multi-branch cable assembly. These specials have played a huge part in the growth of this ultraminiature connector series because the industry and market we serve is very much a high-touch, low-volume business that values Glenair’s ability to rapidly design, prototype, and manufacture solutions that meet exact customer requirements.

Mission-critical? You bet!

What started out for Glenair as a one-off connector job for a jet engine accelerometer has evolved over the past 20 years into the high-reliability interconnect industry’s most successful small form-factor connector. The Series 80 Mighty Mouse, in its many forms, is currently in use on thousands of mission-critical platforms. JPL’s Mars Curiosity Rover is just one of the showcase applications where this “itty-bitty connector with awesome performance” has delivered the right combination of size, weight, and outstanding performance.



- ▲ Mighty Mouse: the best-selling connector on Mars!
- ▼ “Warfighter Tough” STAR-PAN™ USB / power distribution hub with Mighty Mouse 804 push-pull connectors.



▼ The Series 824 locking push-pull made its debut in 2014.

▲ The Series 860 MouseBud.

CODE RED

Series 806 Mighty Mouse Mil-Aero ultra-lightweight aluminum hermetic: encapsulant-sealed, 1×10^{-7} leak rate, low-resistance copper contacts

Next-Generation Series 806 Mighty Mouse Mil-Aero

Constant, relentless innovation has been the philosophy of our Mighty Mouse team since 1997. Not content to rely on legacy designs and print position, Glenair is one of the few hi-rel interconnect industry suppliers truly committed to new product innovation. And now, for 2017, Glenair is proud to introduce the first and only small form-factor replacement for MIL-DTL-38999 that truly meets the broad range of performance requirements necessary for both pressurized and high-altitude unpressurized zone aerospace applications.



▲ Mighty Mouse Series 806 Mil-Aero with modified triple-start stub ACME mating is ideally suited as a next-generation interconnect for EWIS size and weight savings on commercial and military aircraft—in both pressurized and unpressurized zones.



Series 806 Mighty Mouse Mil-Aero is a signal/sensor interconnect with high density #20HD and #22HD contact arrangements for both pressurized and unpressurized airframe applications. Meets all 38999 benchmarks (altitude immersion, vibration and shock, mating durability, temperature and voltage).

Series 806 Mighty Mouse Mil-Aero offers significant size and weight savings for EWIS designers while meeting key military and aerospace performance benchmarks for voltage, altitude immersion, and shock and vibration. Series 806 features mechanical design innovations—including durable mechanical insert retention, radial seals and triple-ripple grommet seals for environmental protection, plus enhanced corrosion protection delivering longer connector life for lower total installed cost. Its modified triple-start mating and next-gen ratchet mechanism prevent decoupling, particularly in small shell sizes—solving one of the major problems of shell size 9 and 11 MIL-DTL-38999 Series III connectors.

Save Size and Weight with Series 806 Mil-Aero

▼ Series 806 smallest size: .500" mating threads, 3 #20HD or 7 #22HD contacts.



▲ MIL-DTL-38999 smallest size: .625" mating threads, 3 #20 contacts or 6 #22 contacts.

About The Series 806

The Series 806 is an aerospace-grade ultraminiature circular connector with modified triple-start threaded coupling and size #20HD and #22HD contacts (all other Mighty Mouse series connectors are standard with size #23 contacts). Series 806 offers significant size and weight reduction compared to D38999 with no compromise in electrical / mechanical performance. Independent laboratory testing has demonstrated that Mighty Mouse Mil-Aero meets the requirements of MIL-DTL-38999 Series III.

This new high-performance connector has many innovative features that meet the most aggressive requirements of the military/aerospace industry including better resistance to vibration-induced decoupling. This is accomplished by re-engineering the ratchet mechanism and introducing a shallower mating-thread ramp angle. Glenair pioneered integral banding platforms to reduce weight and to allow direct attachment of cable shields, boots and overmolds. This innovation continues with the 806—Glenair's first connector to exclusively use our ultralightweight Nano band.

Another enhancement is a "top hat" insulator with raised bosses for foolproof alignment of insulator cavities and retention clips, as well as higher voltage ratings.

The 806 series connector features an O-ring radial interface sealing design instead of a flat gasket. This innovation allows for more reliable metal-to-metal bottoming, improved sealing, and better EMI performance. The MIL-DTL-38999 Series III as well as other legacy aerospace circular connectors rely on flat gaskets which must be fully and consistently compressed for adequate shell-to-shell sealing. In certain tolerance conditions, legacy seals of this type make it difficult to fully mate connectors "without the use of tools" as is required by the MIL-DTL-38999 specification.

MIGHTY MOUSE

Series 806 Mighty Mouse Mil-Aero

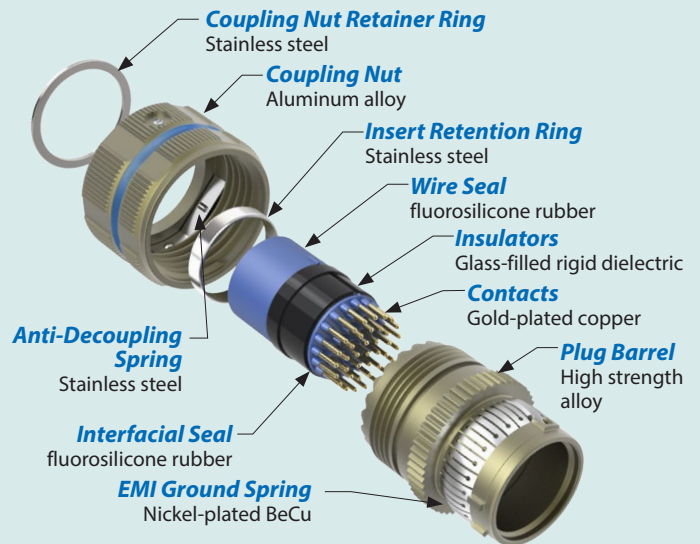
Series 806 Mil-Aero: Features / Specifications

- Next-generation Mighty Mouse designed for universal mil-aero use including high-altitude, unpressurized zone applications
- High-density #20HD and #22HD arrangements for reduced size and weight
- Supported wire sizes:
#20HD contacts 20–24 AWG
#22HD contacts 22–28AWG
- Dielectric withstanding voltage
#20HD layouts: 1800 Vac
#22HD layouts: 1300 Vac
- Reduced pitch triple-start modified anti-decoupling stub ACME mating threads
- +200°C operating temperature
- “Triple ripple” wire sealing grommet (75,000 ft. rated)
- Snap in, rear release crimp contacts
- Metal contact retention clips
- Integral Nano-Band shield termination platform
- EMI shielding effectiveness per D38999M para. 4.5.28 (65 dB min. leakage attenuation @ 10GHz)
- 10,000 amp indirect lightning strike
- MIL-S-901 Grade A high impact shock
- Environmental crimp contact, glass-to-metal seal plus CODE RED lightweight encapsulant-sealed aluminum hermetic connector classes

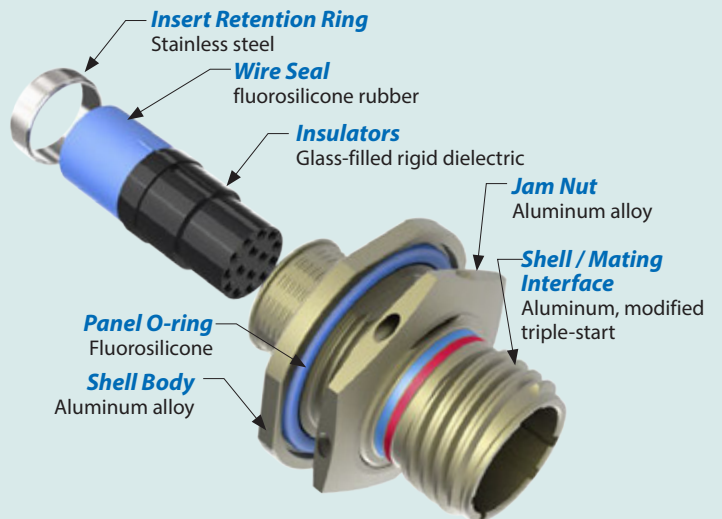


Series 806 Mighty Mouse is designed for universal mil-aero use, including high-altitude, unpressurized zones. Other Mighty Mouse Series connectors, such as the 801 and 805 with size #23 contact layouts, are optimized for maximum size and weight reduction in pressurized zones.

Series 806 Mil-Aero Plug



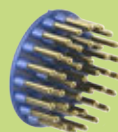
Series 806 Mil-Aero Receptacle



Smaller and lighter with equal D38999 performance?

High-Density Layouts

Twice as many contacts in a smaller package



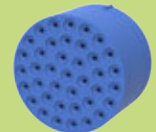
“Top Hat” Insulator

High voltage rating, foolproof alignment



Triple Ripple Wire Seal

Reliable 75,000 ft. altitude immersion



BOTTLECAP REBUS PUZZLE



1



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8



9



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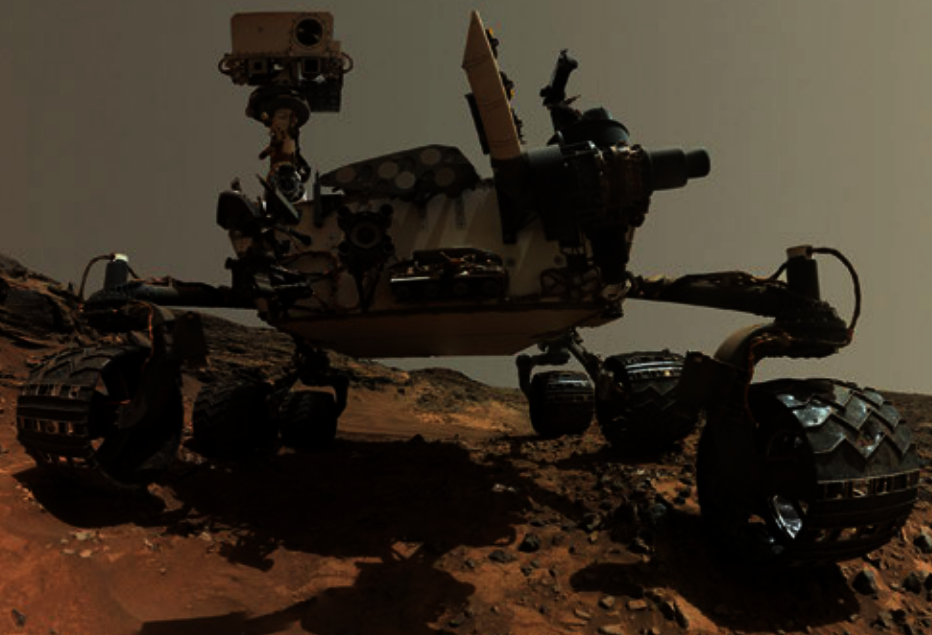
38

ANSWERS
POSTED
MAY 15th

www.glenair.com/qwikconnect



**SERIES 80
MIGHTY
MOUSE
20 YEARS**



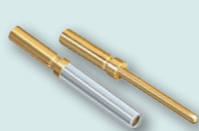
Reducing the Size and Weight of Electrical Wire Interconnect Systems

Mighty Mouse: The industry standard ultraminiature for ground, sea, air, and space

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

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

FULL RANGE OF SUPPORTED CONTACTS, 67 CONTACT ARRANGEMENTS



Signal



Power



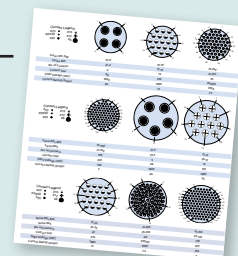
Shielded



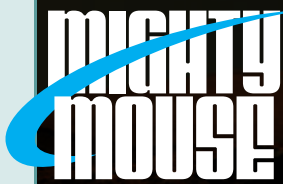
Fiber Optic



Pneumatic



67 arrangements, from 1-130 contacts



Mighty Mouse Connectors and Cables

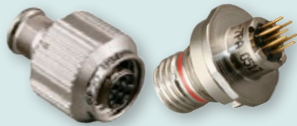
CHOOSE FROM 8 DIFFERENT COUPLING DESIGNS



Series 800
UN thread



Series 801
double-start ACME thread



Series 802
AquaMouse UNEF thread



Series 803
bayonet coupling



Series 804
quick-disconnect



Series 824
locking quick-disconnect



Series 805
triple-start thread, size #23
contact layouts



Series 806
modified triple-start, size
#22HD and #20HD layouts



AVAILABLE MIGHTY MOUSE CONNECTOR CLASSES



IP67
environmental



Glass-to-metal seal
hermetic



CODE RED
encapsulant-seal hermetic



EMI/RFI
Filter



EMP Transient Voltage
Suppression



Bulkhead feed-thrus
and penetrators



Sav-Con®
connector savers



High-pressure subsea /
submersible



High-speed
Ethernet



Single- and multimode
fiber optic

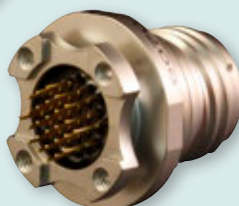
AVAILABLE COTS SPECIAL-PURPOSE DESIGNS AND PACKAGING



Low-profile COBRA



Mouse Bud



Double-standoff PC tail



COTS flex jumpers



Special feed-thrus

Glencair[®]

**SERIES 80
MIGHTY
MOUSE
20 YEARS**

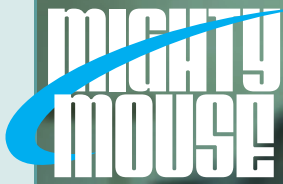


Advancing Tactical Soldier Networking with Reliable and Universal Interconnect/ Hub Technology

Warfighter-tough embedded
system technology with proven
Mighty Mouse connectors
and cables

STAR-PAN™ packaging
reduces heat and increases
power efficiency and
battery life.

- Series 804 and 824 push-pull and locking push-pull connectors: the absolute industry standard for tactical soldier systems
- Lightweight, low-profile power and data distribution hubs
- Turnkey catalog (MCOTS) cables, radio, and power adapters



Mighty Mouse Tactical Soldier Solutions

SMALL, RELIABLE PUSH-PULL AND LOCKING PUSH-PULL TACTICAL CONNECTORS



Series 804
cable plugs



Series 804
Cobra plugs



Series 804
panel-mount plugs



Series 804
in-line receptacles



Series 804 PCB / solder
cup receptacles



Series 804
hermetic receptacles



Series 804
COTS cordsets

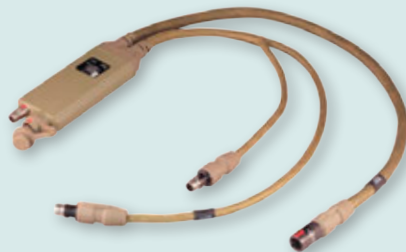


Series 824
high-speed El Ochito™

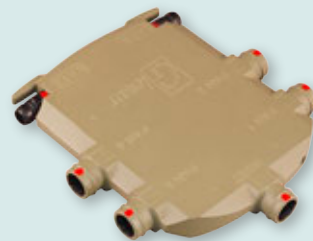


Series 824
locking push-pull

STAR-PAN™ PERSONAL AREA NETWORK POWER AND DATA DISTRIBUTION HUBS



STAR-PAN™ II
2-port power and data hub



STAR-PAN™ IV
4-port power and data hub



STAR-PAN™ VI
6-port power and data hub

TURNKEY SOLDIER PERSONAL AREA NETWORK CABLES, JUMPERS, AND HARDWARE



Connectorized
smartphone X-frame



Soldier radio
data adapter



Hand-held radio
battery adapter



PAN hub-to-tactical
peripheral jumper



Hybrid pan hub to
EUD jumper

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**SERIES 80
MIGHTY
MOUSE
20 YEARS**

Accelerating Datarates and Expanding Bandwidth in EWIS Applications

**Mighty Mouse: turnkey
high-speed solutions for
10G Ethernet and other
datalink protocols**



Small form-factor Ethernet switch with Mighty Mouse I/O-to-board interconnects.

- Industry standard Quadrax, Twinax, Coax (RF) shielded contact solutions
- Innovative next-generation EI Ochito™ full 10G Ethernet solution
- Smallest and most reliable interconnect packaging with proven / tested performance



**MIGHTY
MOUSE**



Mighty Mouse High-Speed Data Solutions

MIGHTY MOUSE HIGH-SPEED WITH FLUOROPOLYMER PFA INSULATORS



- For high-speed protocols: eSATA, 10GBASE-T, USB 2.0 / 3.0
- Fluoropolymer PFA insulators for superior insertion loss and balanced impedance
- Series 801 double-start ACME thread and Series 804 push-pull quick disconnect connectors available
- Discrete components or overmolded cordsets

MIGHTY MOUSE ULTRA-TWINAX CONNECTORS WITH SIZE #12 TWINAX CONTACTS



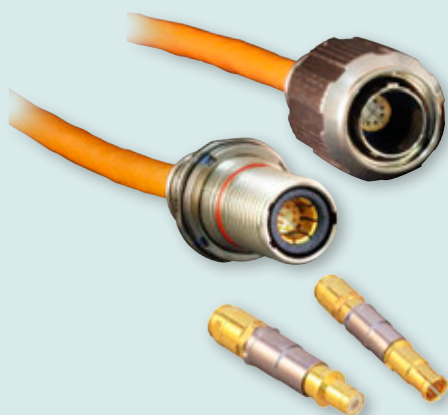
- For ultra high-speed differential pair applications: LVDS, CML
- Size #12 Twinax and hybrid contact arrangements
- Series 801 double-start ACME thread connectors
- Discrete components or overmolded cordsets

MIGHTY MOUSE WITH SIZE #8 QUADRAx AND DIFFERENTIAL TWINAX CONTACTS



- Differential Twinax contacts for 100 Ohm serial data transmission
- Quadrax contacts for 100BASE-T Ethernet
- Arrangements for 1, 2, 3, 4 or 5 snap-in, rear-release contacts
- Lightweight, low profile
- Comprehensive range of assembly tooling
- Available for Series 801 (double-start) and 805 (triple-start) Mighty Mouse connectors

EL OCHITO®: THE ULTIMATE ETHERNET DATA CONTACT



- One full Ethernet channel per standard size #8 cavity—solutions for #24 and #26 AWG cable
- Fast and easy crimp termination of wires to contacts, with factory terminated jumpers and PC tail versions available
- 100% drop-in Mighty Mouse solution with no redesign or reinstallation of interfaces
- Integral spline and short termination maximizes interconnect/cable performance and minimizes crosstalk
- The highest density shielded contact system available—twice the density of Quadrax, split Quadrax, or other shielded contact solutions
- Tested, qualified, and in-stock for immediate shipment



**SERIES 80
MIGHTY
MOUSE
20 YEARS**



The Smallest and Lightest Weight Fiber Optic Solutions for Mission-Critical Applications Available

Mighty Mouse fiber optics: size #23, #20, and #16 ultraminiature designs for high-speed high-bandwidth data transfer



Series 801
Shell size 6, 4 channel
5 Grams (less contacts)

D38999 Series III
Shell size 13, 4 channel
21 Grams (less contacts)

SIZE #16 FO TERMINI



SIZE #20HD FO TERMINI



SIZE #23 FO TERMINI





Mighty Mouse Fiber Optic Solutions

AVAILABLE INSERT ARRANGEMENTS FOR SERIES 801, 802, AND 805

Series 80 Insert Arrangements for use with #16 Fiber Optic termini

6-1 (8-1)	8-2 (10-2)	9-4 (11-4)	9-200 (11-200)	10-5 (12-5)	10-202 (12-202)	12-7 (13-7+) (15-7*)	13-202 (12-202+)(15-202*)	13-203 (12-203+)(15-203*)	16-12 (14-12+) (18-12*)
16-204 (14-204+) (18-204*)	16-205 (14-205+) (18-205*)	17-14 (15-14+) (19-14*)	17-203 (15-203+) (19-203*)	19-19 (21-13*)	21-22 (23-22*)				

Series 80 Insert Arrangements for use with #20HD Fiber Optic termini

6-23 (8-23*)	7-25 (9-25*)	8-28 (10-28*)	9-210 (11-210*)	13-220 (12-220+)(15-220*)	16-235 (14-235+)(18-235)	17-241 (15-241+)(19-241*)	19-255 (21-255*)

Series 80 Insert Arrangements for use with #23 Fiber Optic termini

5-3 (N/A*)	6-4 (8-4*)	6-6 (8-6*)	6-7 (8-7*)	7-10 (9-10*)	8-13 (10-13*)	9-19 (11-19*)	9-200 (11-200*)	10-26 (12-26*)	10-202 (12-202*)	11-31 (13-31*)	13-37 (12-37+)(15-37*)
13-202 (12-202+) (15-202*)	13-203 (12-203+) (15-203*)	16-55 (14-55+)(18-55*)	16-204 (14-204+)(18-204*)	16-205 (14-205+)(18-205*)	17-85 (15-85+)(19-85*)	19-100 (21-100*)	21-130 (23-130*)				



Glencair®

**SERIES 80
MIGHTY
MOUSE
20 YEARS**



Improving Field Data Communications with Smaller, Lighter, Mighty Mouse RJ45 and USB Solutions

IP67 open-face, robust insert-to-shell grounding, complete range of wire, cable, and circuit board terminations



- Superior sealing—IP67 unmated—for complete system protection against water, sand and dust
- Highly durable RJ45 design, including enhanced operating temperature, increased life-cycle, and rugged vibration and shock performance
- Shielded/grounded coupler designs in both receptacle and plug connectors
- Crimp, solder-cup, PC tail, and Quadrax contact/wire termination options



Mighty Mouse Field RJ45/USB Solutions

USB 2.0 TYPE A SERIES 801, 804 AND 805 MIGHTY MOUSE



Series 801 double-start

Series 804 push-pull

Series 805 triple-start

RJ45 CAT 5E ETHERNET COMPATIBLE SERIES 801, 804 AND 805 MIGHTY MOUSE

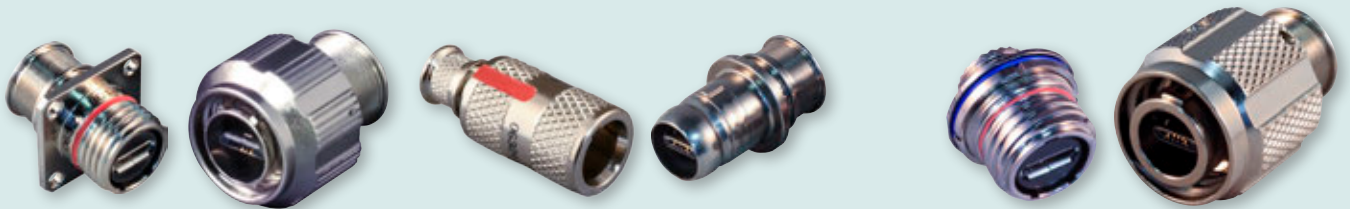


Series 801 double-start

Series 804 push-pull

Series 805 triple-start

MICRO USB 2.0 SERIES 801, 804 AND 805 MIGHTY MOUSE



Series 801 double-start

Series 804 push-pull

Series 805 triple-start

FACTORY-TERMINATED CORDSETS, ACCESSORIES, AND TOOLS



Terminated and tested point-to-point cordsets

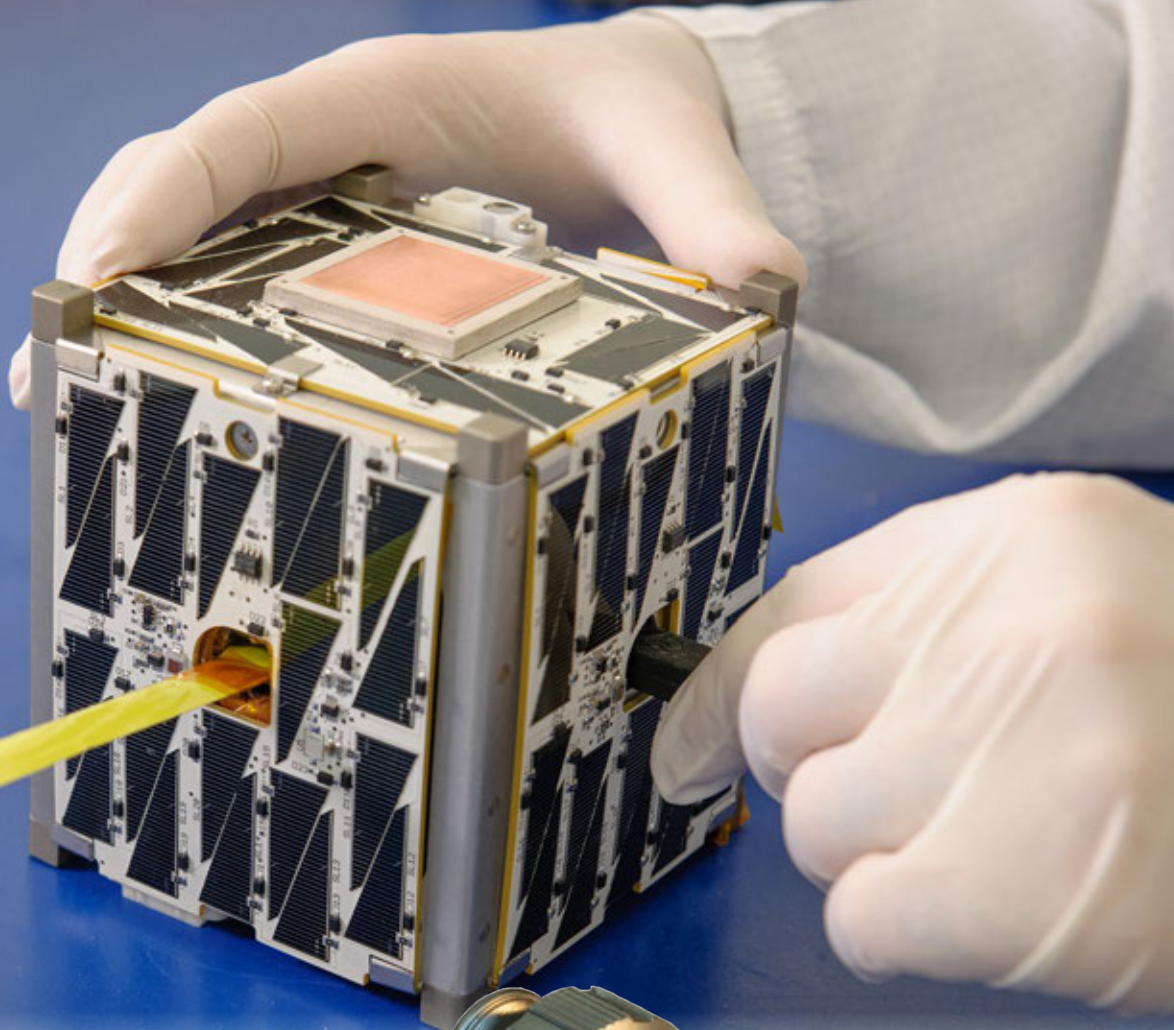
Shield termination band and shrink boot adapters

Environmental shrink boots and protective covers

Glencair[®]

**SERIES 80
MIGHTY
MOUSE**

20 YEARS



Micro-TwistPin Contacts Double Mighty Mouse Circuit Density

**Superior vibration and shock,
higher mating and demating
normal force, plus additional
size and weight reduction**



811-001-06
plug



811-003-07
Receptacle

- High Density Micro TwistPin Contact System
- 600 VAC DWV rating
- 7 to 42 contacts
- 3 Amp current rating
- Water resistant to 1 meter
- Supplied as prewired pigtail assemblies, overmolded cordsets, PCB receptacles

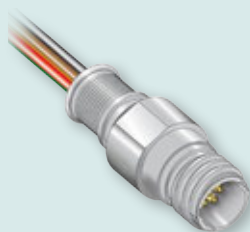


Mighty Mouse Ultra High Density

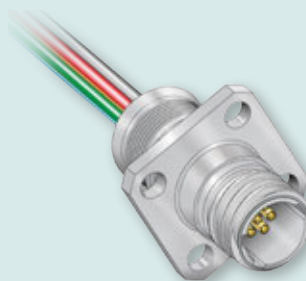
MIGHTY MOUSE HIGH-DENSITY CONNECTOR SELECTOR



In-Line Plugs



In-Line Receptacles



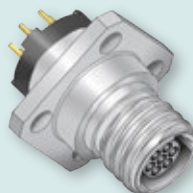
Square Flange Receptacles



Jam Nut Receptacles



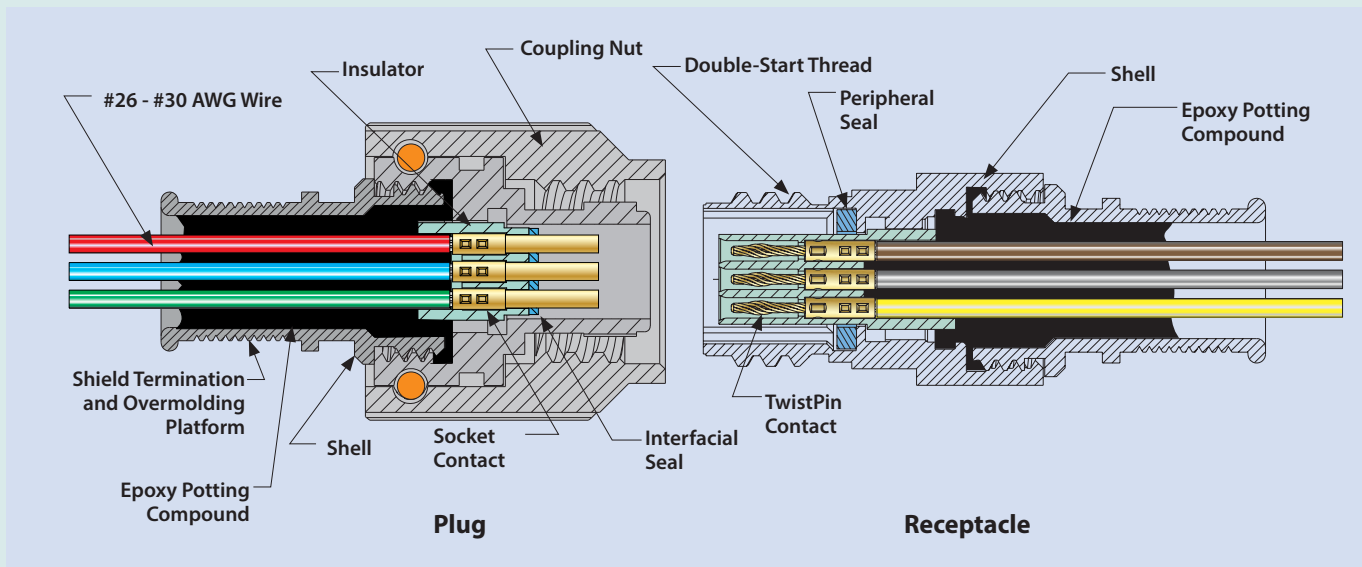
Jam Nut PCB Receptacles



Square Flange PCB Receptacles



Overmolded Cordsets



ABOUT TWISTPIN CONTACTS

The Micro TwistPin is a spring pin composed of helically wound strands of copper alloy wire, welded into a bundle, then "bulged" and crimped to a copper alloy sleeve. These gold-over-nickel plated contacts offer low, stable resistance even when subjected to temperature extremes and vibration. Unlike other microminiature contacts, the TwistPin is terminated with a military-approved eight-indent crimp joint, resulting in a gas tight connection between the wire and the contact. Designers of soldier systems electronics equipment have turned to the TwistPin contact in order to reduce the size and weight of warfighter electronics.



TwistPin



Socket



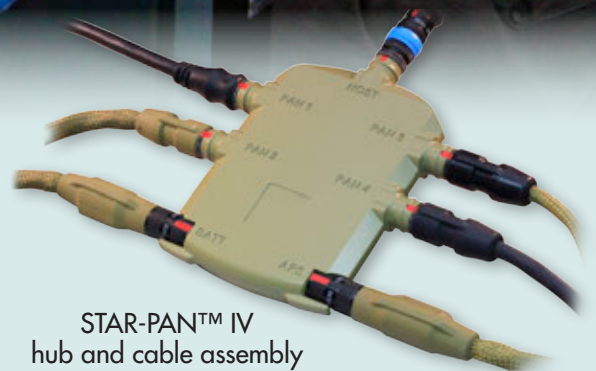
Glencair®

SERIES 80
MIGHTY
MOUSE
20 YEARS



Turnkey Point-to-Point Jumpers and Complex Harness Assemblies for Rugged Applications

Massive in-house Mighty Mouse wire harness layout, termination, and test of both COTS and customer-bespoke designs



STAR-PAN™ IV
hub and cable assembly

- EMI/RFI shielded cordsets
- STAR-PAN™ series jumpers and cordsets
- Ethernet and other high-speed data application cables
- High-pressure subsea AquaMouse assemblies
- Ultra-flexible overbraided fabric designs
- Ultra harsh-environment overmolded assemblies



Mighty Mouse Complex Cable Assemblies

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



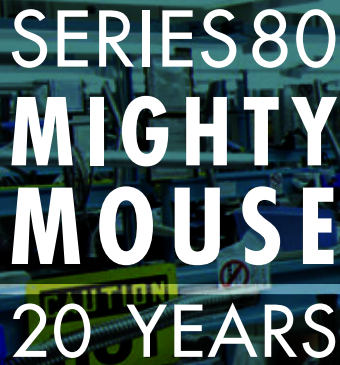
Environmental cable with Glenair Series 804 Mighty Mouse, Series 79 Micro-Crimp, and RF Coax terminations




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



Glencair®



SERIES 80
MIGHTY
MOUSE
20 YEARS



**Made in America:
From Design
Engineering to
Component Part
Manufacture and
Assembly**

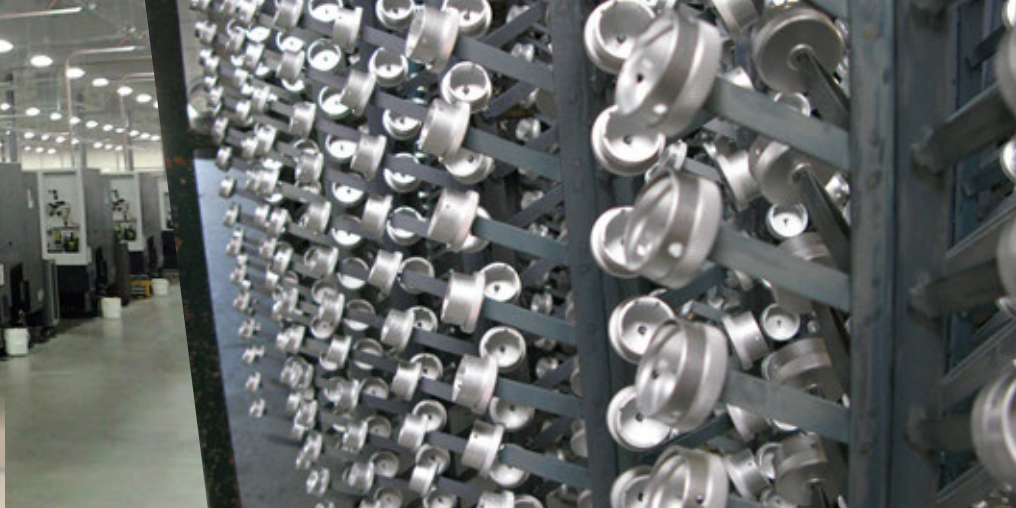
**Connector shells, plating,
inserts, contacts, environmental
seals, filter arrays, assembly
and test all controlled in-house**



- Largest small form-factor connector engineering team in the industry
- Largest U.S. CNC metal turning operation in the high-rel interconnect industry
- Largest U.S. interconnect component part fabrication and assembly facility
- Massive same-day inventory of Mighty Mouse connectors and cables—bagged, tagged, and ready for immediate shipment



Mighty Mouse Mighty Mouse Total Vertical Integration



Brutal Honesty

I was sent a link to an investment newsletter written by Morgan Housel making a powerful argument for “brutal honesty” in business dealings. Housel opens her piece with an anecdote about a German surgeon, Matthias Rothmund who had the misfortune to leave a surgical clamp inside a patient:

“[this is] the kind of thing you’d think would hurt a surgeon’s reputation. But he managed the opposite. Rothmund blamed no one but himself, corrected the mistake, and asked his insurance company to offer the patient a quick settlement. He hoped that was the end of it, but it wasn’t. The patient returned five years later, requesting Rothmund perform an unrelated surgery. The patient explained that he trusted Rothmund and his clinic precisely because Rothmund had admitted his error and corrected it.”

Housel makes the observation that, “The best way to build trust isn’t to convince people that you don’t make mistakes. It’s to convince them that you’ll be honest and corrective when you inevitably do.”

An important example of this truth comes to mind on the distribution side of our business that Mike McGuire and his team manage so well at Glenair. For distributors that do application development work in the field, it is vitally important that their efforts in developing an opportunity be both rewarded and protected. Our promise to our distribution partners has always been that if they develop the opportunity we will keep our commitment to compensate their efforts over the life of a program.

Unfortunately, it sometimes occurs that the end-user customer changes their mind on how they prefer to source a product and winds up coming directly to Glenair for fulfillment. The customer always being right, we book the order. But in the process, we’re careful not to leave the distributor in the lurch: in fact, we do everything we can to make this business up with terms on a future opportunity or some other concession. This commitment to building and maintaining a relationship of mutual trust has paid massive dividends for us, even if we do sometimes “leave a surgical clamp inside the patient.”

We have many stakeholders in our business—customers, colleagues, suppliers, distribution partners, etc. To the extent we make it a practice to deal with each and every one of them with “brutal honesty” (whenever we do make a mistake), we will surely keep their trust and loyalty—for now and decades to come.

Oh and by the way, congratulations to the entire Glenair team on 20 years of success with Mighty Mouse. What a ride it has been!



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