MISSION-CRITICAL
INTERCONNECT SOLUTIONS

Glenair®

TURNKEY · CONNECTORIZED

Integrated Flex, Rigid Flex, and Rigid PCB Assemblies

IPC-6012/6013 Specializing in Class III, Types 1–4 · Design, Prototyping, and Production

JUNE 2019

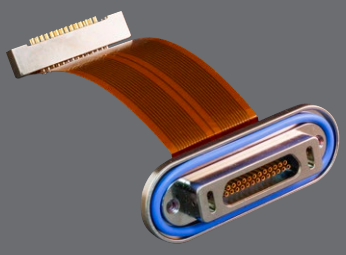
TURNKEY
INTERCONNECT
SYSTEMS/
ASSEMBLIES

integrated PCB/Flex assemblies

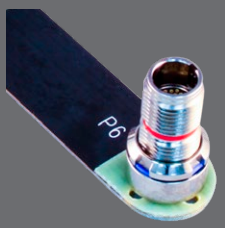
Flex, Rigid Flex, and Rigid PCB assemblies with signature interconnect technology available only from Glenair

Turnkey connectorized flex, rigid flex, and rigid PCB assemblies incorporating Glenair's broad range of innovative small form-factor circular and rectangular PC-tail connector solutions. All terminations backpotted for compliance with conformal coating processes.

GLENAIR SIGNATURE PC-TAIL CONNECTOR TYPES AVAILABLE IN TURNKEY FLEX ASSEMBLIES

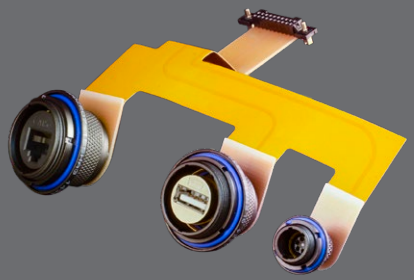


Series MWD Micro-D
and innovative pogo-pin
AlphaLink



Series 88
SuperFly

Series 79
Micro-Crimp



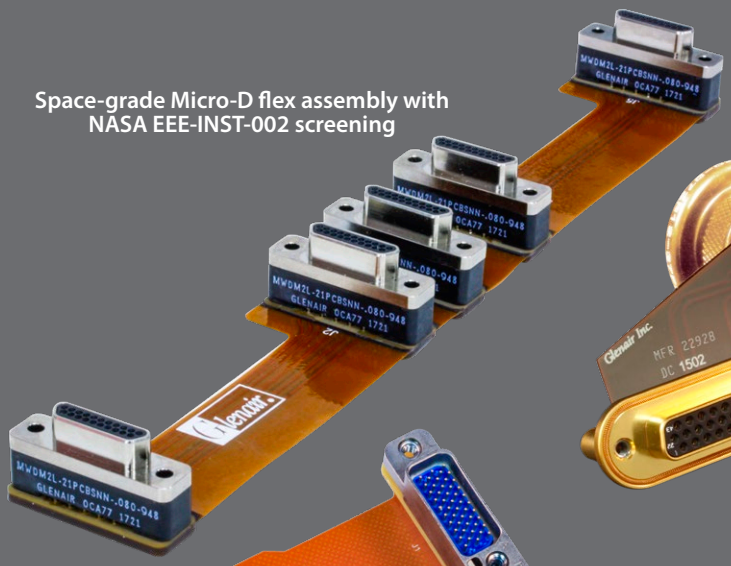
SuperSeal
RJ45 and USB

TURNKEY

Flex, Rigid Flex, and Rigid PCB Assemblies with Glenair signature PC tail connectors

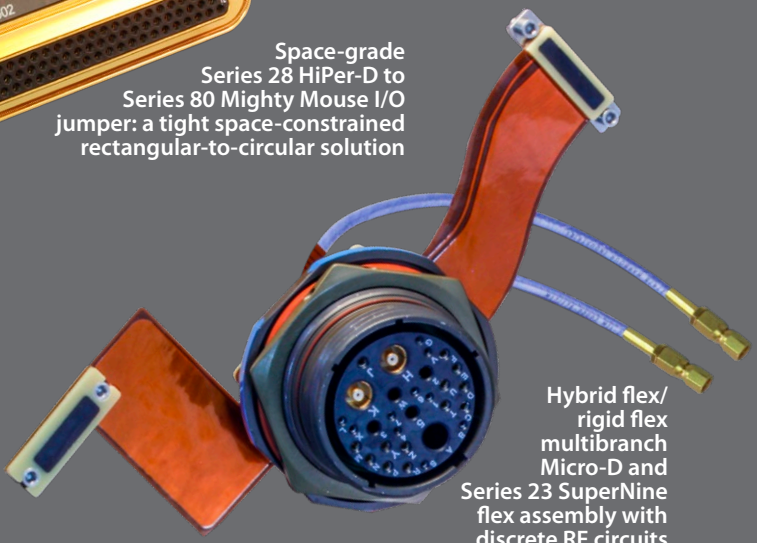
MULTIBRANCH FLEX / PCB ASSEMBLIES WITH GLENAIR SIGNATURE CONNECTORS

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

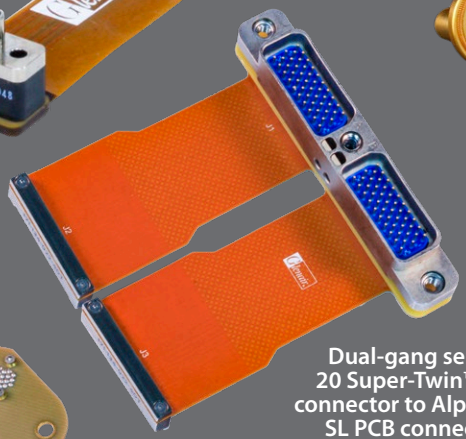


High-shock matched-impedance Mighty Mouse assembly with flex circuit

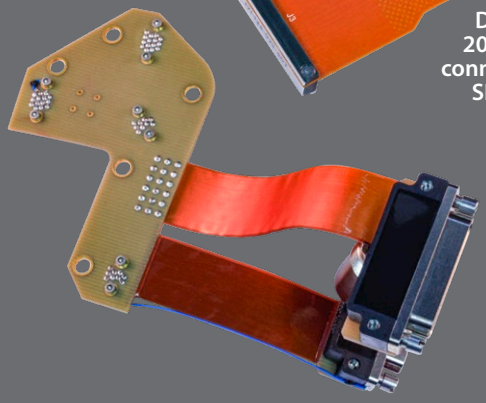
Space-grade Series 28 HiPer-D to Series 80 Mighty Mouse I/O jumper: a tight space-constrained rectangular-to-circular solution



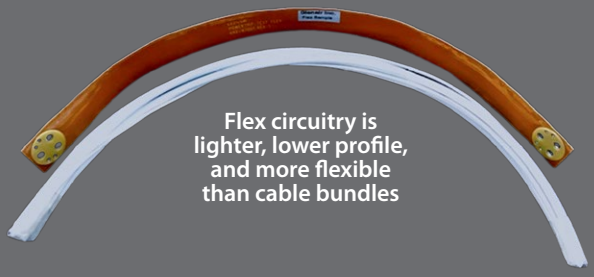
Hybrid flex/rigid flex multibranch Micro-D and Series 23 SuperNine flex assembly with discrete RF circuits



Dual-gang series 20 Super-Twin™ I/O connector to AlphaLink SL PCB connector



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



Flex circuitry is lighter, lower profile, and more flexible than cable bundles

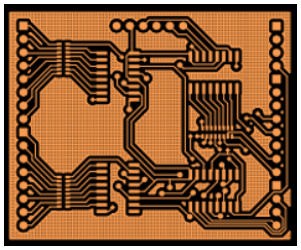
CONVENIENT PACKAGING AND INTEGRATION

Flex circuit assemblies are ideal for space-constrained electronic packages and enclosures, or for interconnect systems that are required to flex in 3 axes during normal use. Flex circuitry offers complete freedom to design boards and wiring for even the most densely-packed electronic enclosures. In mission-critical applications, the ability to reduce or even eliminate discrete wiring and boards in favor of flex circuitry helps designers make the most efficient use of available space.

TURNKEY

Flex, Rigid Flex, and Rigid PCB Assemblies

Flex and rigid board specification standards



SPECIFICATION STANDARDS

The following tables describe, in brief, Glenair flex and rigid flex manufacturing formats and specifications. Glenair recommends commercial customers understand and adhere to IPC-6012/6013 specification standards which are fully supported by Glenair. Military customers may alternatively cite specifications IAW MIL-PRF-31032.

* Information below is based on the most common materials and physical property requirements. Please consult the factory for alternatives

Flex Assemblies

Design Formats	PADS • PADS PRO • Pro E / Creo • SolidWorks • Autodesk Inventor • CAM 350 • Altium • Valor • POLAR • XPedition
Manufacturing Formats	DXF • Gerber • ODB++ • IPC 2581
Layer Count	Max typ. up to 8
Termination	Thru hole • Reverse bare • Floating fingers / Sculpted circuits • ZIF Termination
Conductor Width/Space	Lines: .003" • Spacing: .003" (dependent on copper weight)
Bend Radius (military)	Single Metal Layer: 4–6X overall flex thickness• Double Metal Layers: 6–10X overall flex thickness • Multi Layer Metal: 12–15X overall flex thickness
Materials / Tg	Substrate: DuPont™ Kapton® polyimide flex adhesive and adhesiveless -60°C to 125°C Cover layer: DuPont™ Kapton® Stiffener: FR4 or DuPont™ Kapton® (metal stiffeners available upon request) Conductor: Copper, Aluminum, SS, Constantan High-temperature materials available
Surface Finish	ENIG • HASL • Immersion Tin and Silver • Soft and Hard Gold
Specs and Quality Management	IPC-6013 Class I, II, III, types 1-3 • ISO 9001, AS 9100

Rigid Flex Assemblies

Design Formats	PADS • PADS PRO • Pro E / Creo • SolidWorks • Autodesk Inventor • CAM 350 • Altium • Valor • POLAR • XPedition
Manufacturing Formats	DXF • Gerber • ODB++ • IPC 2581
Max Panel Thickness	Range of thicknesses from .010" to as thick as .250"
Layer Count	27 +
Via Technology	Blind, buried • Thru hole • Filled (conductive and non-conductive)
Conductor Width/Space	Lines: .003" • Spacing: .003" (dependent on copper weight)
Materials / Tg	Substrate: Nelco 4000, Rogers, Megtron, Polyimide, and more
Surface Finish	ENIG • HASL • Immersion Tin and Silver • Soft and Hard Gold
Specs and Quality Management	IPC-6013 Class I, II, III, type 4 • ISO 9001, AS 9100, J-STD-001 Space

TURNKEY

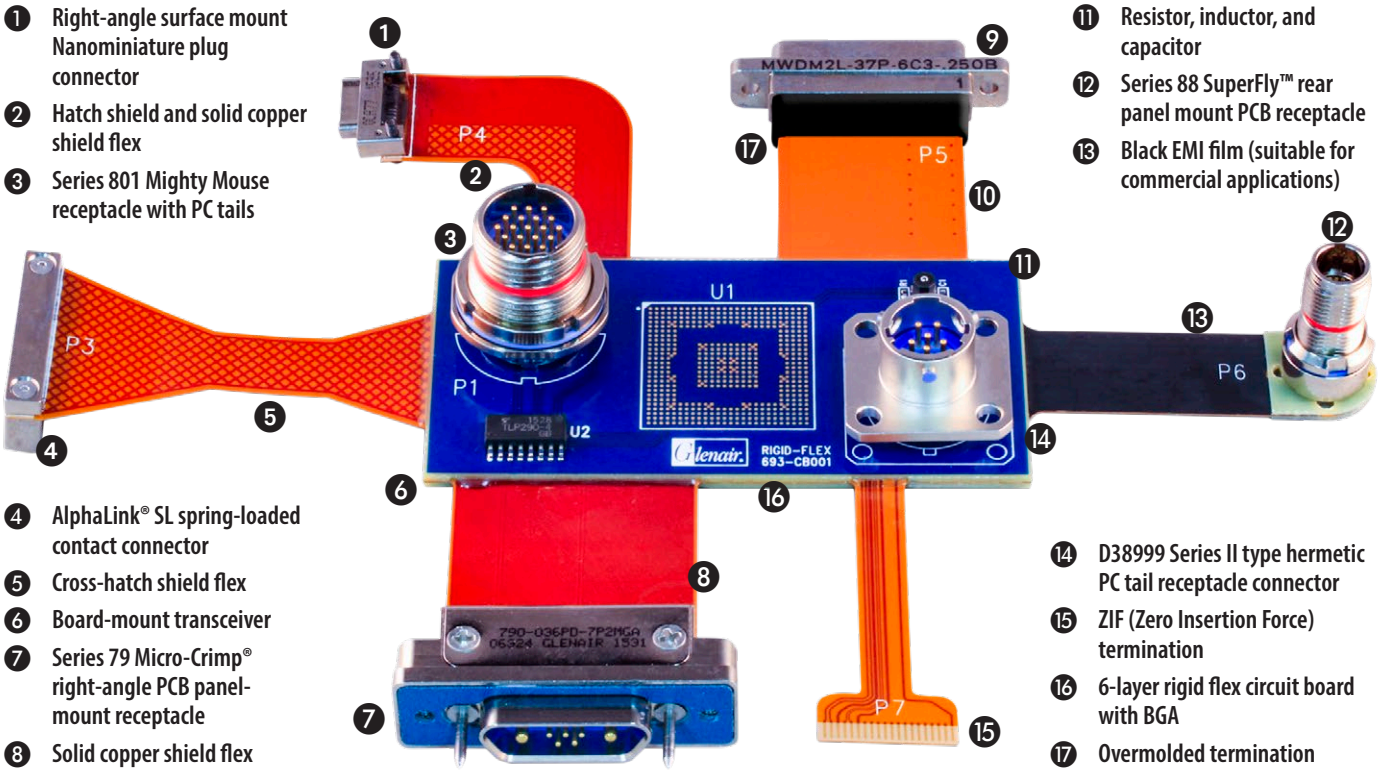
Flex, Rigid Flex, and Rigid PCB Assemblies

Design options, grounding and shielding

STANDARD DESIGN OPTIONS FOR INTEGRATED (CONNECTORIZED) FLEX/RIGID FLEX ASSEMBLIES

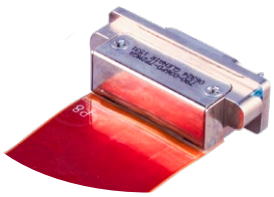
Properly designed flex and rigid flex assemblies offer significant space and weight savings compared to wire harnesses. Many design options are available, including integrated stiffeners, shielding, factory forming, selective bonding, termination, layer count and so on.

1. Right-angle surface mount Nanominiature plug connector
2. Hatch shield and solid copper shield flex
3. Series 801 Mighty Mouse receptacle with PC tails
4. AlphaLink® SL spring-loaded contact connector
5. Cross-hatch shield flex
6. Board-mount transceiver
7. Series 79 Micro-Crimp® right-angle PCB panel-mount receptacle
8. Solid copper shield flex
9. Micro-D 37-pin connector
10. Silver paste shield flex
11. Resistor, inductor, and capacitor
12. Series 88 SuperFly™ rear panel mount PCB receptacle
13. Black EMI film (suitable for commercial applications)
14. D38999 Series II type hermetic PC tail receptacle connector
15. ZIF (Zero Insertion Force) termination
16. 6-layer rigid flex circuit board with BGA
17. Overmolded termination

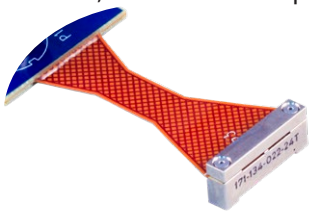


GROUND PLANES AND SHIELDS

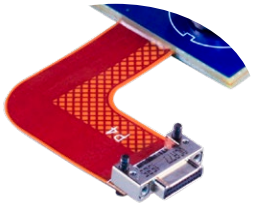
Managing EMI emissions and signal line impedance are critical aspects of flex circuit design. Effective use of ground / shield planes, appropriate connector interfaces, and matched-impedance flex circuits delivers optimal high-speed signal integrity.



Full copper shield



Cross-hatch mesh shield

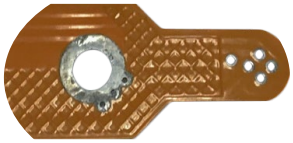


Hybrid solid/mesh

Black Tatsua and silver epoxy

Connector-to-flex shielding (soldered pin insert)

Stitched vias



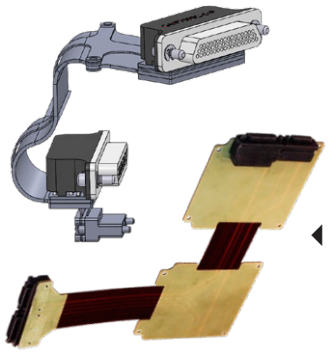
Polyimide-bared for contact grounding

FAST TURNAROUND

3-D Modeling and Rapid Prototyping

SolidWorks modeling · 3-D printed prototyping

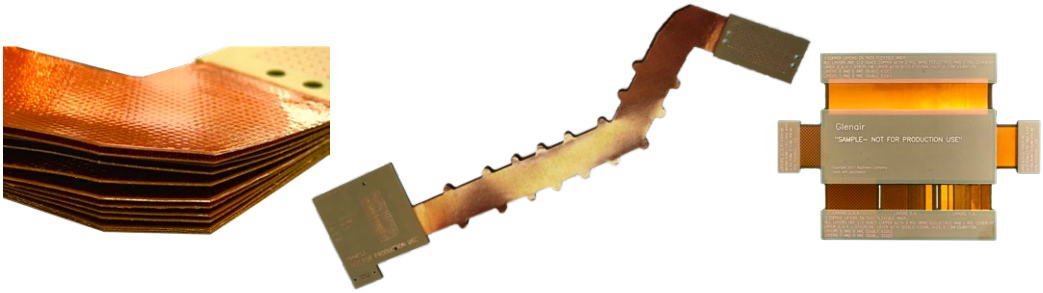
MODELING AND 3-D PRINT RAPID PROTOTYPING



- 3-D representation of flex assemblies using SolidWorks
- 3-D printed "paper doll" outline mockups for fit checks with copper clad DuPont™ Kapton® to simulate actual flexibility
- Incorporation of customer-supplied wiring diagram and chassis information in laser-cut mechanical samples

◀ Example SolidWorks and 3-D printed paper doll prototype mockups produced by Glenair's Integrated Flex Assembly team—typical turnaround 2–3 days upon receipt of request, unless extraordinary requirements are requested (e.g. loose leaf, cross-hatch shielding on 5+ layers)

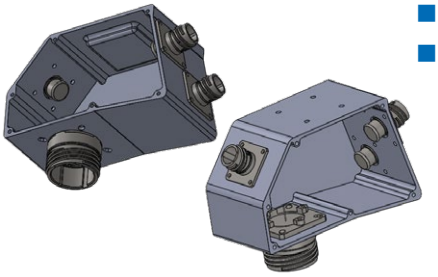
▶ Here, a custom 3-D printed model is mated to a plug connector to check form and fit before actual part production



▲ Complimentary quick-turn mockups produced by by Glenair: 28-layer rigid flex (close-up and full-length), and 12-layer multibranch rigid flex

▲ HD Stacker board-to-board connector/flex mockup

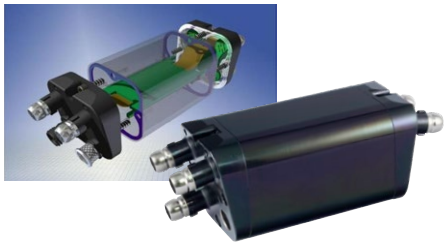
SOLIDWORKS 3-D PROTOTYPING: "VIRTUAL" CONNECTOR MODIFICATIONS



- Customer-supplied STEP file of box with panel cutouts
- Glenair-supplied 3-D model of connector flange modifications

◀ In this example, customer supplied a STEP file of a box enclosure with panel cutouts. The Glenair engineering team used SolidWorks to design a specially-modified connector flange, allowing the customer to take advantage of our signature size-and weight-saving circular connector, the Series 80 Mighty Mouse.

3-D MODELING FOR CONNECTORIZED INTEGRATED SYSTEMS



- Turnkey connector manufacture and interconnect cable / flex harnessing
- Electronic box builds supported by software-based design and prototyping
- Turnkey integration of harness technologies, boxes, and mechanisms

◀ This integrated system enclosure, complete with printed circuitry, I/O connectors, and power modules was designed and modeled in SolidWorks prior to actual manufacture.

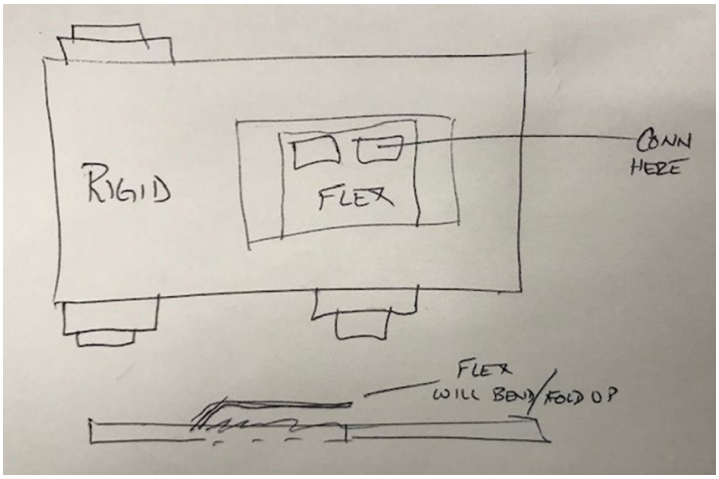
FAST TURNAROUND

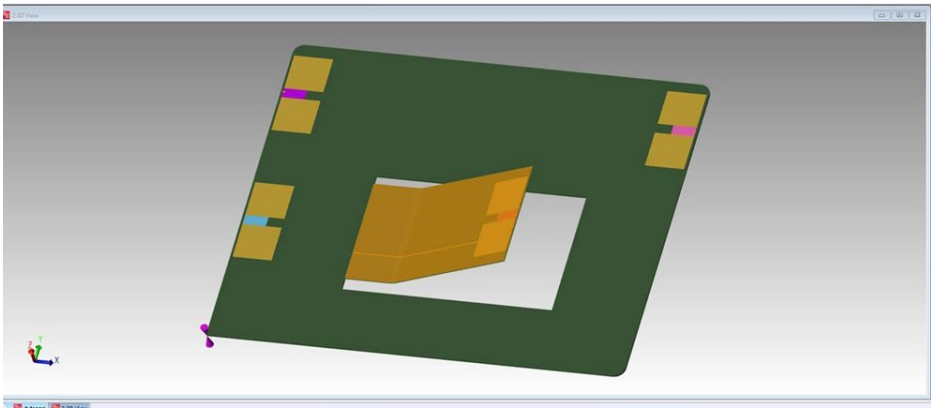
3-D Modeling and Rapid Prototyping

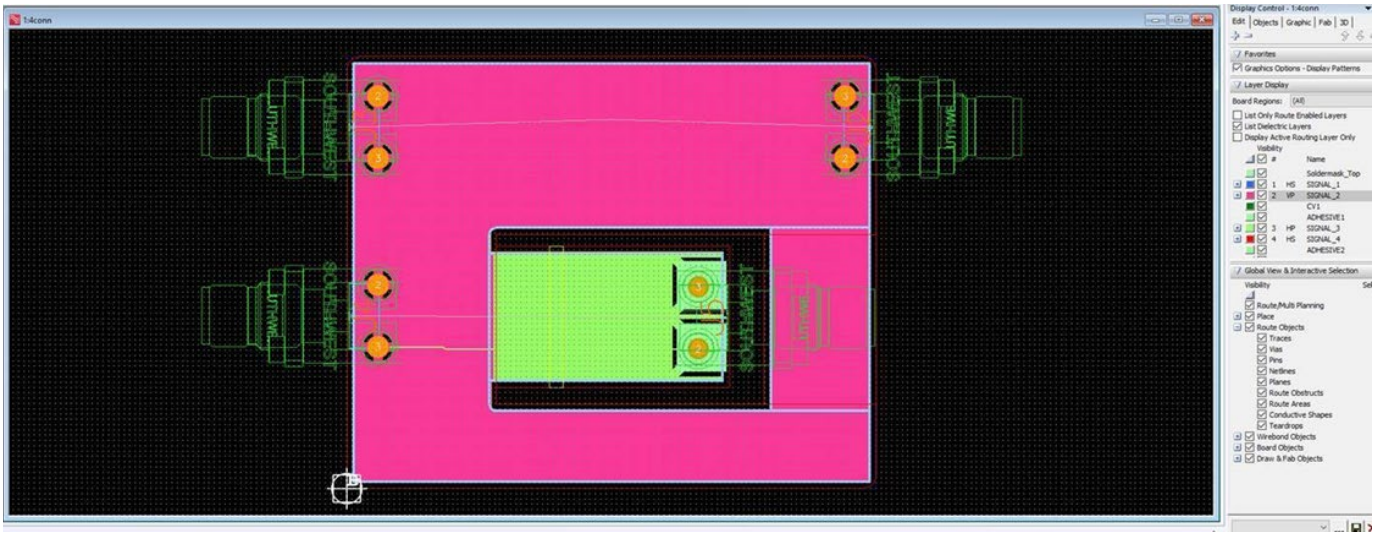
XPedition software with Rigid Flex license

GLENAIR INTEGRATED PCB/FLEX ENGINEERING: FROM 'NAPKIN SKETCH' CONCEPT TO DESIGN

An example of Glenair's quick-turnaround PCB/Flex design service: The rough concept for this design was sketched out during a meeting. Glenair engineers utilized Rigid Flex / Xpedition software to create an accurate and functional visual tool for reviewing, modifying, and adjusting the design prior to starting the build. Just 3 weeks later, the design was approved and ready for prototype manufacturing.







Application / Design Options

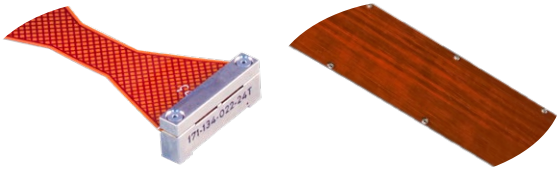
Packaging for optimal form, fit, and function

FLEX AND RIGID FLEX DESIGN OPTIONS

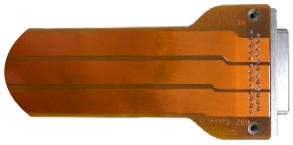
Factory forming facilitates assembly and helps the flex circuit adhere tightly to available space and routing

Stiffeners incorporated into flex: a practical approach for adding discrete mount points or component integration

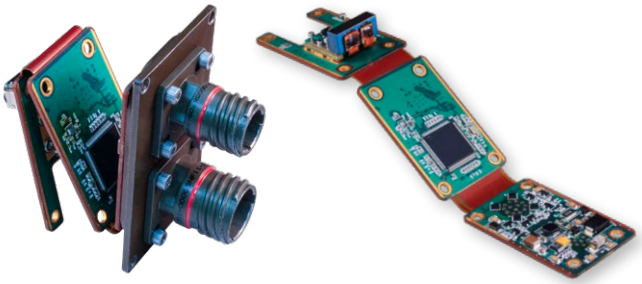
Grounding can be achieved by directly grounding the connector shell to flex circuitry as shown in the above example



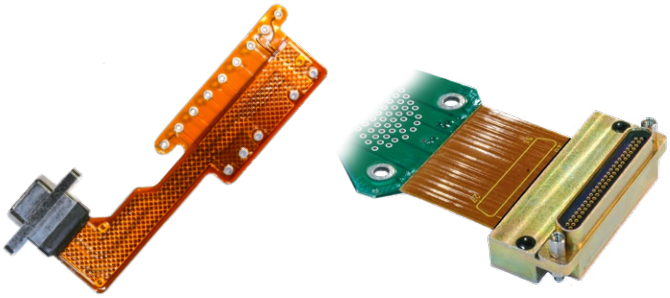
EMI/RFI Shielding is accomplished with solid or patterned shield planes, stitched vias, and/or with shielded I/O interconnects



High-Power may be routed through flex circuitry with wider traces

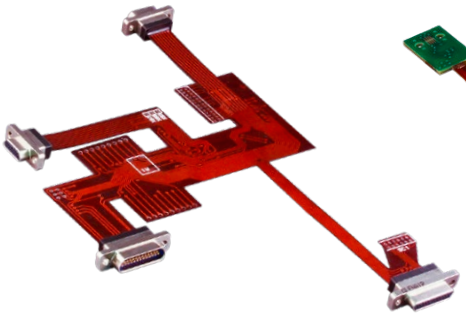


Hybrid flex, rigid flex, and embedded PCB technology facilitates electronic component size and weight reduction, and double-sided mounting of components

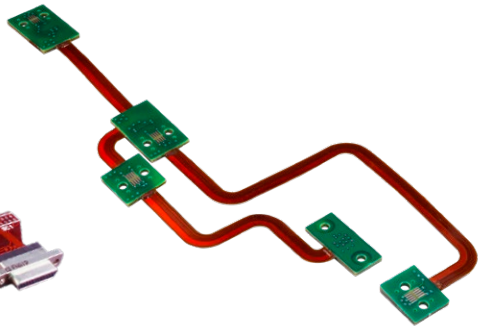


Flex and rigid flex combination assemblies provide hard mounting points and dynamic flexing and routing

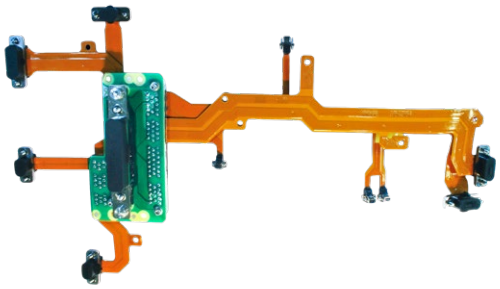
MULTIBRANCH FLEX AND RIGID FLEX CONNECTORIZED ASSEMBLIES



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



Multibranch RJ45 / Ethernet / USB Flex assembly



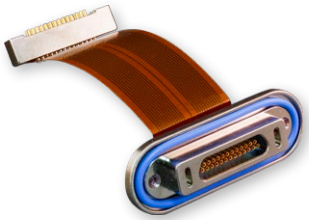
High density .025" contact center nanominiature multibranch flex assembly

RUGGEDIZED · HARSH-ENVIRONMENT

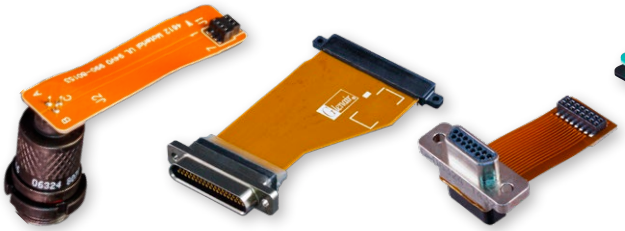
Application / Design Options

Packaging for optimal form, fit, and function

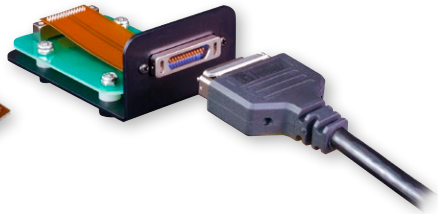
POINT-TO-POINT CONNECTORIZED FLEX AND RIGID FLEX JUMPER DESIGN OPTIONS



Environmentally sealed rectangular I/O interface flexi circuit

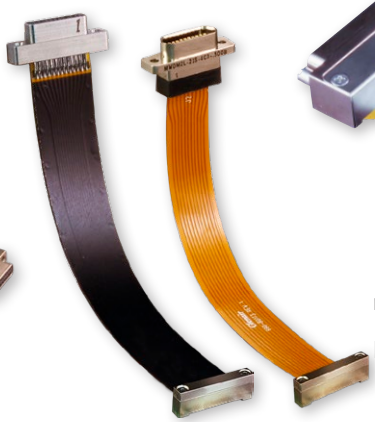


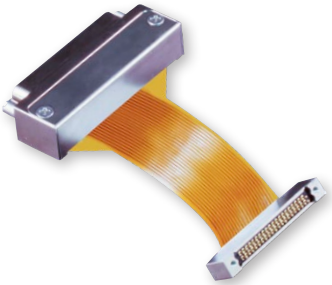
Military aerospace grade I/O connector to commercial-grade board level termination



Master-Latch quick disconnect Micro-D I/O flexi circuit

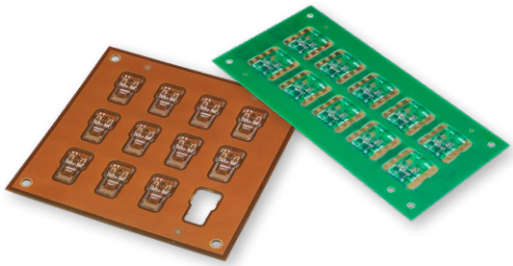
Military aerospace grade circular I/O connectors to matched impedance high-speed mil-aero board terminations





Military aerospace grade rectangular I/O connectors to matched impedance high-speed mil-aero board terminations

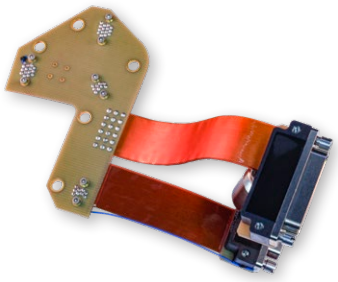
SPECIAL-PURPOSE FLEX, RIGID-FLEX DESIGNS, AND PHOTONICFLEX CAPABILITIES



Production run of individual PCBs in panelized form

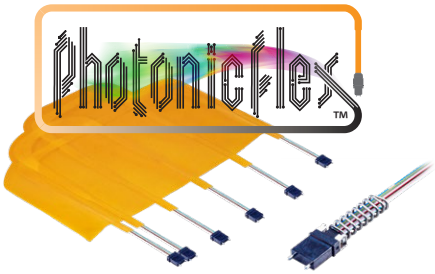
Space-grade Series 28 HiPer-D to Series 80 Mighty Mouse I/O jumper

High-shock matched-impedance Mighty Mouse assembly with flex circuit



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

EMI/RFI filtered power transmission flex circuit assembly



PhotonicFlex circuitry for lightweight, small form-factor management of fiber optic media and MT ribbon terminations

Dimensions in Inches (millimeters) are subject to change without notice.

TURNKEY

Flex, Rigid Flex, and Rigid PCB Assemblies

Interconnect I/O and termination design guide

PARYLENE COMPATIBLE

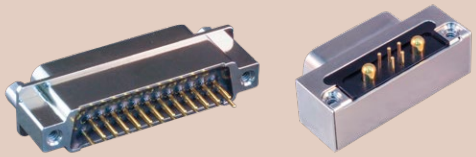
PARYLENE COMPATIBLE

First step in securing a time and delivery quote from Glenair is to communicate basic information regarding the flex assembly, including quantity requirements, number of layers, overall size, special features such as factory forming, stiffeners and so on. Accordingly, here is a five step flex design guide, beginning with I/O interconnect selection.

Note: all Glenair PCB I/O connectors are potted/sealed and certified parylene compatible.

STEP 1: SELECT FLEX/RIGID FLEX ASSEMBLY I/O CONNECTOR(S)

HiPer-D 24308 is a high-performance, precision machined, shielded alternative to commercial-grade D-subminiatures



HiPer-D 24308 straight and 90°

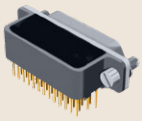
HiPer-D Combo straight and 90°

Series 79 Micro-Crimp is Glenair's high-density .075" contact center crimp- and shielded-contact, mil-aero grade rectangular

straight and 90° PC tail panel plugs and receptacles

high-speed datalink and rack-and-panel versions

Series MWDM (MIL-DTL-83513) high-density microminiature .050" contact spacing mil-aero grade Micro-D subs

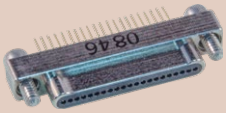


condensed-pitch board terminations/ compact flange

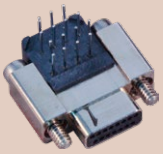
surface mount

vertical and 90° thru-hole

Series 89 (MIL-DTL-32139) ultra high-density .025" contact spacing mil-aero grade nanominiature



single-row vertical PCB plugs / receptacles



dual-row right angle PCB plugs / receptacles

SuperNine "better than QPL" advanced performance D38999 Series III type connectors

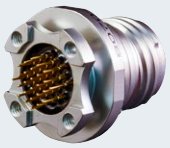
SuperSeal field RJ45/USB

dual flange receptacle

High-speed El Ochito octaxial contacts

Ultra high density .075" contact center mil-aero solution for size and weight reduction

straight and 90° receptacles



Dual-flange PCB receptacles

New Series 806 for SWAMP-zone applications

SuperFly: the ultimate nanominiature tactical connector

straight and 90° QDC or threaded receptacles with mounting holes

high-speed datalink version with El Ochito® contacts

Series 89 circular nanominiature connectors

Threaded straight and 90°

Breakaway straight and 90°

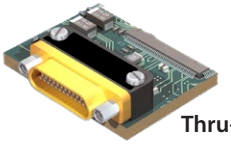
TURNKEY

Flex, Rigid Flex, and Rigid PCB Assemblies

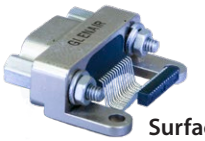
Interconnect I/O and termination design guide

The termination of flex and rigid flex assemblies to backplane and motherboard PCBs may be accomplished with a variety of interconnect technologies and flex design features. Glenair flex engineers have deep fluency in the maintenance and protection of signal continuity from the I/O interface to the board, including high-speed, matched impedance signal management, EMI/RFI shielding and so on.

STEP 2: DEFINE STYLE OF PCB / FLEX TERMINATIONS

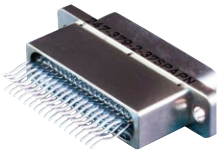


Thru-hole

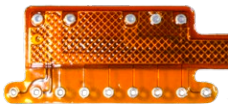


Surface mount

Pogo pin / spring-loaded contacts



Straddle mount



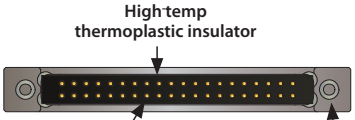
Nail head pins

Direct termination

Encapsulating pot

ZIF (zero insertion force

AlphaLink® board-level pogo-pin connectors and flex jumpers



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

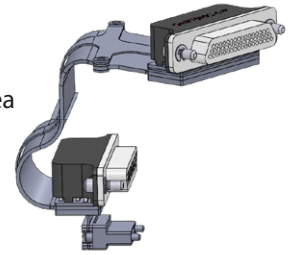
Press-fit (compliant pin) board mounting

.0625" pitch contact spacing: highest available density

Polarized shells and keyed guide pin hardware

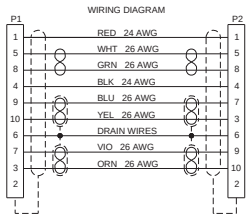
STEP 3: DEFINE MECHANICAL SCHEMATIC

- Customer-supplied 3-D file to determine "keep out areas"
- "Napkin sketch" with rough idea of routing
- Customer-supplied 2-D DXF



STEP 4: DEFINE ELECTRICALS

- To approximate layer count, we need a wiring diagram "schematic" complete with signal types, currents, and shielding requirements
- Used to determine ROM pricing



STEP 5: DEFINE VALIDATION TEST REQUIREMENTS

Glenair offers complete circuit design and generation of PCB/flex fabrication data packages including component level documentation. Most flex customers specify a certain level of validation testing as a required part of the documentation package. Tests may include DWV/IR, continuity, impedance (eye pattern), and others.

Dimensions in Inches (millimeters) are subject to change without notice.

INTEGRATED PCB / FLEX

Design Service Information Form

Electronic copy available upon request
[see back of catalog for contact information]

Please fill in as much as possible. We understand that information will need to be modified / adjusted later during the design process.

Customer Name _____

Customer Address _____

Engineer / Point of Contact
Name, email, Phone Number _____

GENERAL QUESTIONS

PCB P/N _____ Assembly P/N _____

Revision (1, 2… A, B…) _____

Title _____

DCN Number (when applicable) _____

Class 2 Class 3 RoHS Compliant Yes No

Job Number _____

Where Used, and Program Name _____

Schematic Provided Yes No If Yes, Schematic P/N _____

Schematic Completed and Reviewed? Yes No Provide Part Geometries? Yes No

Provide Part Datasheets? Yes No Provide Net List in Xpedition Format Yes No

Design Rules from Customer Yes No *(If Yes, please list details in "Notes and Additional Instructions" section below)*

Will Require Gerber Files Yes No Silkscreen and Etch Required? Yes No

Glenair H/W in place of Existing H/W? Yes No Is Glenair H/W currently used? Yes No

DESIGN / CONSTRUCTION

Design Type (Rigid, Flex, Rigid Flex, etc.) _____

Final Board Thickness (e.g. .062" ±.006") _____ Material and DK _____

Proposed Layer Count (may change) _____

Will This Design Utilize Stiffeners? Yes No If Yes, Type: _____

Proposed Finished Copper Weight (start foil +.001" after plating): _____

Continued on next page…

INTEGRATED PCB / FLEX

Design Service Information Form

DESIGN / CONSTRUCTION (continued)

Board Outline Supplied in DXF and/or IDF Format? Yes No

Dimensions Provided? Yes No

Connector Location Provided? Yes No

Tooling Hole Locations Provided? Yes No

Tooling Holes Plated? Yes No

Stiffener/Bend Locations Provided? Yes No

Height Restrictions/Keepouts Defined? Yes No

Maximum and Minimum Lengths _____

Conformal Coating? Yes No

If Yes, Type: _____

Testing Requirements Yes No

If Yes, Type: _____

TECHNOLOGY (HIGH SPEED, RF, EMI, SHIELDING, ETC.)

Any High Current Lines (please define)

Controlled Impedance? Yes No

Controlled Impedance Value and ± Tolerance _____

Matched Pairs/Lengths ? Yes No

Controlled Impedance Calculation Provided? Yes No

Routing Constraints Received? Yes No

OUTPUT FILES / INSTRUCTIONS / DELIVERABLES

Require Export Control Notes? Yes No

Require Schematic Files PDF Yes No

Require Fabrication/Assembly PDFs? Yes No

Require ODB++ File? Yes No

Require Gerber Files? Yes No

Require BOM? Yes No

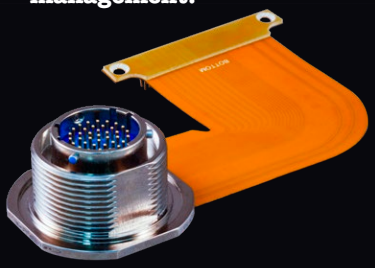
SPECIAL NOTES AND ADDITIONAL INSTRUCTIONS

Integrated Flex, Rigid Flex, and PCB Assembly Production Lab

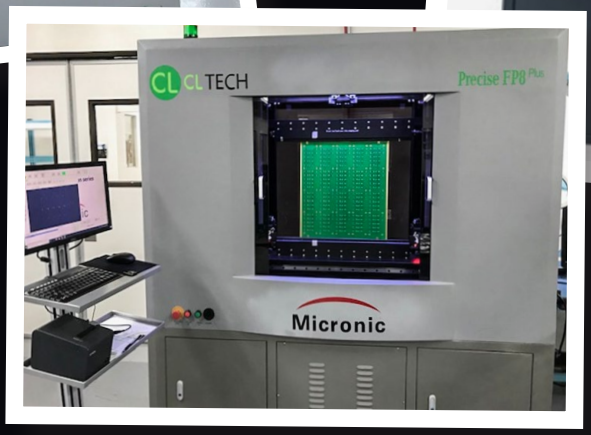
GLENDALE, CALIFORNIA

IPC 6012/6013 Class I, II, III, types 1–4
ISO 9001, AS9100 Certified

Glenair Integrated PCB/ Flex assembly production facilities are operated in accordance with commercial and military standards. Staff includes 200+ PCB and cable assemblers with Nadcap certification for special processes and ESD management.

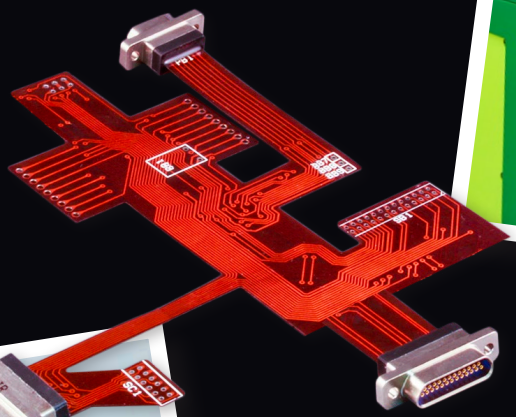


- **High-availability catalog components as well as custom design and manufacture**
- **No minimums**
- **We never obsolete parts**



Automated Optical Inspection, Flying Probe Electrical Test, and Defluxing Washer

Glenair's PCB/Flex interconnect team is housed together under one roof. From electrical design to computer-aided manufacturing and assembly, the team has a well-deserved reputation for on-time delivery of even the most complex PCB/Flex assemblies.



integrated PCB/Flex assemblies

MISSION-CRITICAL

INTERCONNECT SOLUTIONS

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