

***tyco***

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*Electronics*

**FIBER OPTIC PRODUCTS**  
**LIGHT YEARS AHEAD®**

**Catalog 1307895**  
**Revised 1-03**

**AMP**

**LDI.**  
Laser Diode Incorporated

# LIGHT YEARS AHEAD®

Whether you're designing local area networks, communications systems, or equipment, innovative fiber optic applications begin with innovative fiber optic products. Tyco Electronics offers a complete line of fiber optic products to help your designs make light work for you.



## CONNECT LIGHT

Pages 7-106

Tyco Electronics' comprehensive fiber connector line delivers virtually all industry-standard single fiber/duplex connections including LC, MU, SC, ST, FC, FDDI, and others. Tyco Electronics also offers ruggedized Expanded Beam Products for harsh environments, as well as field installable and multi-fiber connections including MT-RJ, LightCrimp™, LightCrimp Plus™, and MPO. Offerings also include LC, MU, SC, FC, ST, Fibre Channel, mode conditioning, armored and unarmored trunk, and Para-Optix™ Cable Assemblies, as well as CORELINK™ Splices, LightPlane™ and LIGHTRAY MPX™ Fiber Backplane Systems.



## CONFIGURE LIGHT

Pages 107-122

Tyco Electronics offers a complete line of integrated Packaged Solutions, including fiber management systems, enclosures, customer interface panels, xWDM Modules, and advanced optical modules. Our LIGHTRAY OFX™ Optical Circuit System offers fiber management for complex, high-density applications, and our FIBERSHAPE™ Laser Process provides a state-of-the-art solution for opto-electronic device pigtailling.



## CREATE LIGHT

Pages 123-216

Digital and analog fiber applications begin and end with Tyco Electronics' electro-optic products: packaged LEDs, photo diodes, PINAMPs, laser components, and transceivers. Utilizing its vertical integration, Tyco Electronics offers products to meet the latest industry packaging trends including Small Form Factor (SFF), Small Form-Factor Pluggable (SFP), and high density Para-Optix™ Transceivers, as well as Coaxial, Mini Dil, Butterfly, and DIL for the Enterprise, Datacom, Telco, Military, Storage, and Metro Markets.



## CONTROL LIGHT

Pages 217-240

When you need to attenuate, split, combine or switch an optical signal, attenuators, Wavelength Division Multiplexers/Demultiplexers (WDMs), WDM Modules, and switches from Tyco Electronics provide high performance in a variety of packaging options. Many of these products offer plug-and-go simplicity, low reflectance and low loss. Tyco Electronics also offers a ruggedized multimode switch solution with >150G's resistance to shock for harsh environments.

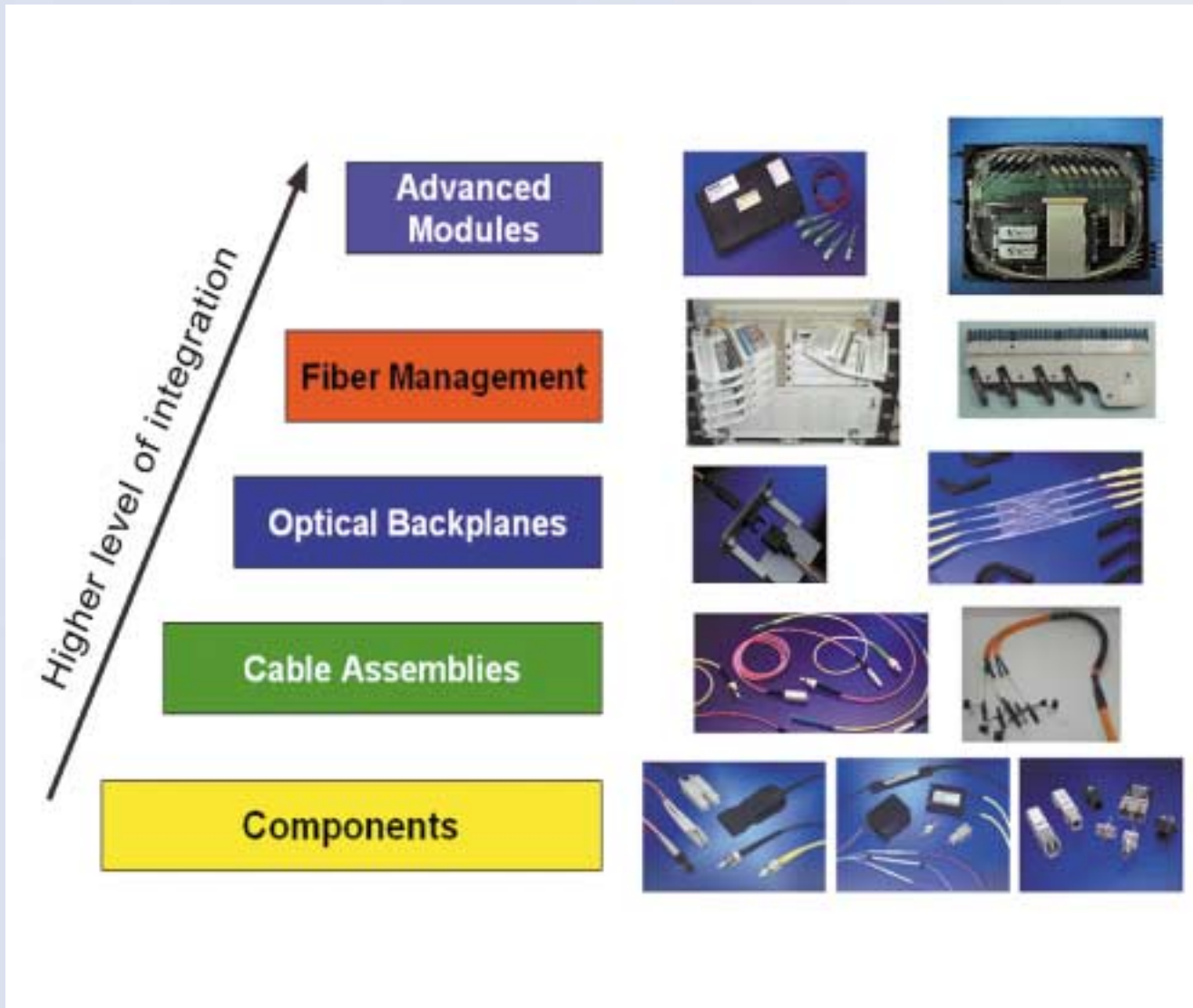
## NEED MORE INFORMATION?

In the U.S. call 1-800-522-6752. Internationally, call 717-986-7777.  
AMP FAX 1-800-522-6752

[www.tycoelectronics.com/fiberoptics](http://www.tycoelectronics.com/fiberoptics)

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## COMPONENTS TO ADVANCED MODULES



# LIGHT YEARS AHEAD®

Tyco Electronics' Fiber Optics Business Unit is recognized as the world's preeminent supplier of fiber optic connectors and interconnection devices. We offer an extensive variety of optical connectors, cable assemblies, fiber management systems, and optoelectronic active and passive components — connectivity solutions. With unparalleled, world-class technologies and high quality products, Tyco Electronics demonstrates its commitment to satisfying all types of customers. Our sales service and support is available globally via an extensive network of Tyco Electronics sales engineers, field program managers, and applications engineers.

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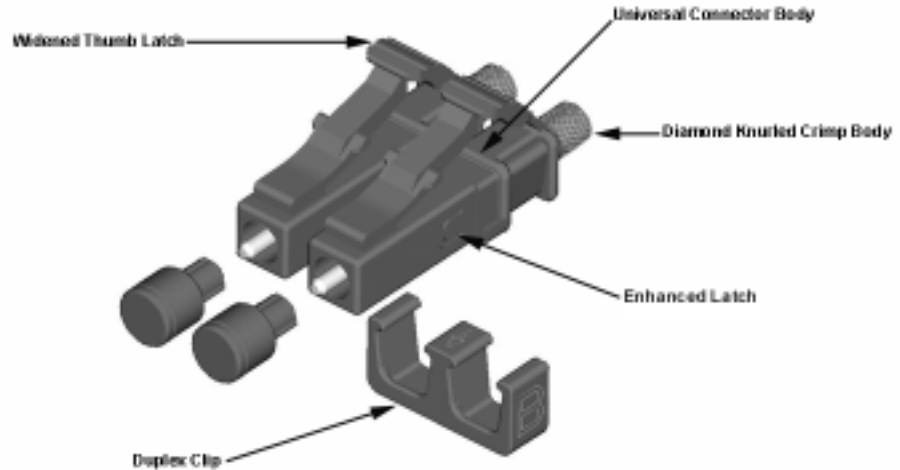
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*(See Cable Assemblies & Backplane Interconnects Section 2, pages 74-85)*
- LIGHTRAY MPX™**  
*(See Cable Assemblies & Backplane Interconnects Section 2, pages 91-106)*

**“NEW” LC Connectors**



**Product Facts**

- Singlemode Telecordia GR-326 tested
- Universal Connector Body
  - Common body for simplex or duplex
  - Common body for jumper or buffer applications
  - Fewer parts to inventory
- Duplex Clip
  - Field installable
  - Makes simplex assemblies duplex
  - Correct polarity errors
  - Used for both jumpers and buffered fiber applications
- Enhanced Latch
  - Improved rigidity
  - Stronger Body
  - Improved side-load strength
- Widened Thumb Latch
  - Increased hit area
  - Increased bend strength
  - Ramped front latch for snag resistance



- Diamond Knurled Crimp Body
    - Increased tensile proof strength
    - Identical to Tyco Electronics' SC/FC design
- Performance Characteristics**  
 Insertion Loss – 0.2 dB Typical  
 Reflectance – -58 dB Typical  
 Operating Temperature – -40°C to +75°C  
 Durability – 200 Cycles

**LC Connector Kits**

Fiber Type	Kit Part Number	Description	Packaging
<b>Multimode (beige body &amp; Strain Relief)</b>	1588705-1	Simplex, 1.6-2.0 mm Straight Strain Relief	Individual
	1588705-2	Simplex, 1.6-2.0 mm Straight Strain Relief	Bulk
	1588706-1	Simplex, 900 μm	Individual
	1588706-2	Simplex, 900 μm	Bulk
	1588707-1	Duplex, 1.6-2.0 mm Straight Strain Relief	Individual
	1588707-2	Duplex, 1.6-2.0 mm Straight Strain Relief	Bulk
	1588708-1	Duplex 900 μm	Individual
	1588708-2	Duplex, 900 μm	Bulk
<b>Singlemode (blue body &amp; Strain Relief)</b>	1588709-1	Simplex, 1.6-2.0 mm Straight Strain Relief	Individual
	1588709-2	Simplex, 1.6-2.0 mm Straight Strain Relief	Bulk
	1588710-1	Simplex, 900 μm	Individual
	1588710-2	Simplex, 900 μm	Bulk
	1588711-1	Duplex, 1.6-2.0 mm Straight Strain Relief	Individual
	1588711-2	Duplex, 1.6-2.0 mm Straight Strain Relief	Bulk
	1588712-1	Duplex, 900 μm	Individual
	1588712-2	Duplex, 900 μm	Bulk



**“NEW” LC Connectors** (Continued)

LC Connector Component Selection Chart (bulk packaged)

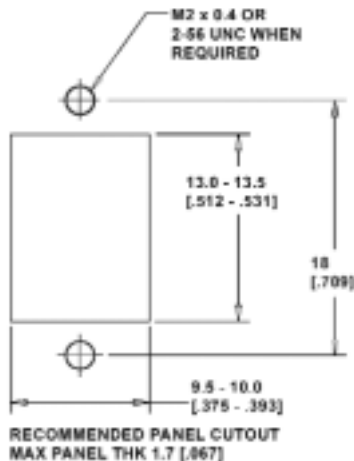
Fiber Type	Simplex Connector Assembly & Dust Cap	Duplex Clip	Cable Size	Crimp Eyelet with Heat Shrink	Crimp Eyelet	Strain Relief Description	Strain Relief Part Number (see chart below)
Singlemode (blue)	1588239-1	1374728-1	1.6-2.0 mm	1374150-1	—	Straight/Bend Limiting	1588153-X
			1.6-2.0 mm	1374150-1	—	Right Angle	1374737-X
			1.6-2.0 mm	1374150-1	—	50 Degree Angle	1457543-X
			2.4 mm	1588189-1	—	Straight/Bend Limiting	1588153-X
			2.4 mm	1588189-1	—	Right Angle	1374737-X
			2.4 mm	1588189-1	—	50 Degree Angle	1457543-X
			3.0 mm	—	504118-3	Straight	502716-X
			900 μm	—	—	900 μm Buffer, 10mm	1588612-X
Multimode (beige)	1588240-1	1374728-2	1.6-2.0 mm	1374150-1	—	Straight/Bend Limiting	1588153-X
			1.6-2.0 mm	1374150-1	—	Right Angle	1374737-X
			1.6-2.0 mm	1374150-1	—	50 Degree Angle	1457543-X
			2.4 mm	1588189-1	—	Straight/Bend Limiting	1588153-X
			2.4 mm	1588189-1	—	Right Angle	1374737-X
			2.4 mm	1588189-1	—	50 Degree Angle	1457543-X
			3.0 mm	—	504118-3	Straight	502716-X
			900 μm	—	—	900 μm Buffer, 10mm	1588612-X

Note: Crimp Tool Dieset only - 1588175-1  
Instruction Sheet: 408-8675



Strain Relief Color

Base Part Number	Beige	Blue	Black	Yellow	Red
1588153	-5	-2	-3	-4	N/A
1374737	-2	-1	-3	-6	-4
1457543	-1	-2	-4	-6	-3
502716	-3	-4	N/A	-2	N/A
1588612	-1	-2	-5	NA	-4



LC Duplex Adapter - Plastic

Alignment Sleeve Material	Housing Color	Description	Part Numbers
Ceramic	Blue	Flangeless	1457567-1
Ceramic	Beige	Flangeless	1457567-2
Ceramic	Green	Flangeless	1457567-3
Ceramic	Blue	Flanged	1457567-4
Ceramic	Beige	Flanged	1457567-5
Ceramic	Green	Flanged	1457567-6
Metal	Beige	Flangeless	1457567-7
Metal	Beige	Flanged	1457567-8

**MU High Density Connectors**

**Product Facts**

- Singlemode and multimode product range
- For digital network applications PC end face available on both singlemode and multimode connectors
- For analog network applications, APC end face available on singlemode connectors (8°)
- Connector design uses 1.25mm ceramic ferrule technology
- Polarized for precise insertion
- Factory terminated cable assemblies
- LSZH sheathed cable available
- High optical performance (low insertion, high return loss)
- High density (up to 8 lines per module)

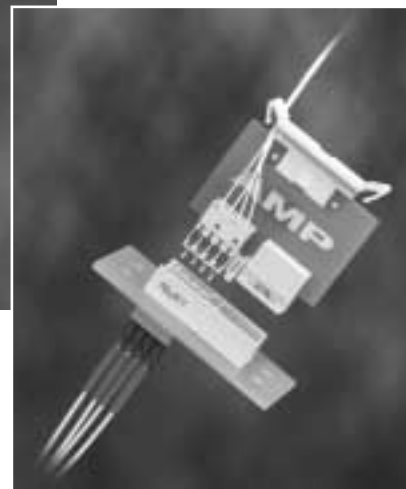
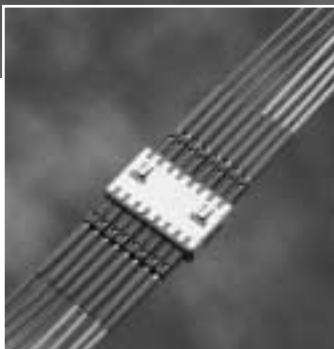
**Performance Characteristics**

Insertion Loss -0.1 dB Typical

Reflectance - -55 dB Typical

Operating Temperature -  
-25°C to +75°C

Durability -500 Cycles



The MU high density fiber optic interconnection system offers a new solution for high performance telecommunications networking.

The system centers around the fully standardized MU connector, which is also sometimes known as the Mini SC. The MU connector is at least half the size of the standard SC connector. It can offer twice the port density but all the optical performance of traditional fiber optic connectors.

Featuring a similar latching mechanism to the SC connector, the MU is just as easy to connect and disconnect.

The MU system includes a complete range of multimode and singlemode pre-terminated cable assemblies; bulkhead adapters; backplane housings; system card housings; connector kits; termination tooling and customer polishing processes.

### MU High Density Connectors (Continued)

#### Key Applications

Front Panel I/O and High Density Patch Panels for Optical Transmission Equipment, Optical Distribution Frames and Optical Network Units.

- Full range of simplex, duplex and 8 position bulkhead adapters
- Color coded adapters for ease of identification
- Tuneable versions available to achieve lower insertion losses
- "Push-pull" type latching mechanism
- Fully compliant with relevant IEC standards (IEC 60874-1, CECC 86 305 801)
- Exceeds ETSI performance requirements (ETSI Grade P)

Back Panel I/O in Optical Transmission and Switching Equipment

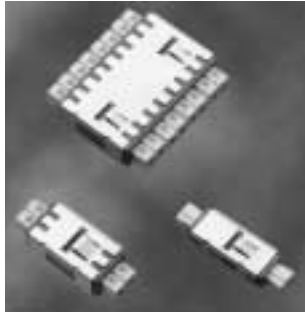
- 8 position Type L optical modules available
- Hybrid (optical / electrical) modules Type M available
- 2.0mm misalignment pickup tolerance during mating
- Zero force on backplane when fully mated
- Zero tensile load on daughter card when fully mated
- Constant mating force during 2.5mm free float
- Fully compliant with IEC 60917 and IEC 61076-4-101

#### MU Standards Compliance

**Product range** –  
MU cable assembly  
**Applicable standards** –  
IEC 60874-1  
CECC 86 305 801 (MU-APC)  
I-ETS 300 671  
IEC 61300

**Product range** –  
Z-PACK 2mm HM  
**Applicable standards** –  
IEC 60917  
IEC 61076-4-101

**MU High Density Connectors** (Continued)



**MU Bulkhead Adapter**

The MU bulkhead adapter is designed to help save valuable panel space in high density applications. The adapter enables the interconnection of two MU connectors and features a 1.25mm ceramic alignment sleeve to ensure precise fiber alignment and low insertion loss, both during and after the interconnection process.

The MU bulkhead adapter is available in PC and APC versions for both digital and analog network applications. It is also available in a choice of simplex, duplex and 8 position versions.

Description	Part Number
<b>PC finish</b>	
Simplex MU Adapter	233263-1
Duplex MU Adapter	233263-3
Duplex MU Adapter with SC cut-out	1348842-2
8 position MU Adapter	1206974-1
<b>APC finish</b>	
Simplex MU Adapter	233263-2
Duplex MU Adapter	233263-4
Duplex MU Adapter with SC cut-out	1348842-1
8 position MU Adapter	1206974-2



**Z-PACK 2mm HM<sup>1</sup> Type L and M Connector Housings**

Z-PACK 2mm HM connector housings offer a solution to the demand for discrete fiber lines, allowing single disconnects and routing on the backplane.

The 8 position Type L connector housing is fully optical and can accommodate up to 8 fiber lines. These connector housings are available in female configurations and are designed for use on the system card.

The hybrid Type M connector housing combines optical and electrical contacts in one housing, with 55 signal contact positions and 4 fiber optic lines. It allows easy migration from combined optical / electrical to full optical backplane inter-connections. Female Type M

Description	Part Number
<b>Type L</b>	
Male	106743-1
Female	106744-1
<b>Type M</b>	
Male	106745-1
Female	106746-1
Male, reversed	106747-1
Female, reversed	106748-1

<sup>1</sup>HM : Hard Metric

connector housings are suitable for use on the system card while male Type M connector housings are designed for back panel application.

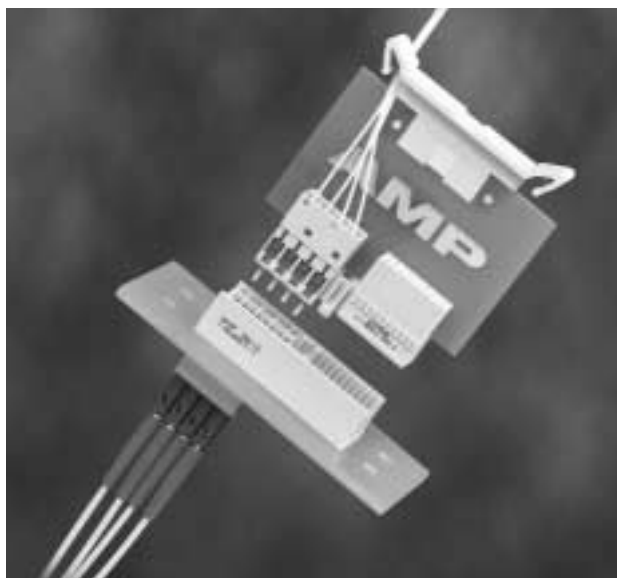
Tyco Electronics also designs and manufactures a range of MT based fiber optic backplane connectors, LIGHTRAY MPX™. For further information, see Cable Assemblies & Backplane Interconnects Section 2, pages 91-106.

**MU High Density Connectors** (Continued)

**MU Backplanes**

**Product Facts**

- Complies to IEC 60917 and IEC 61076-4-101
- Constant mating force during 2.5 mm free float
- Zero tensile load on system card and backplane when fully mated
- Low insertion / extraction forces
- Scalable system allows easy implementation of future upgrades
- Low loss
- High return loss
- APC versions available
- Float in all directions (including x and y)
- Misalignment pick up tolerances 2.0 horizontal, 2.5 mm vertical, and 2 degrees angular



Description	Part Number
<b>2 Position</b>	
Backplane Housing (includes mounting bracket)	1391160-1
Systemcard Housing	1391095-1
<b>4 Position</b>	
Backplane Housing (includes mounting bracket)	1391161-1
Systemcard Housing	1391094-1

**Note:** Future product extensions planned: 6 position and 8 position versions. Please contact your local Sales Engineer for additional information.



## Fiber Optic Products Catalog

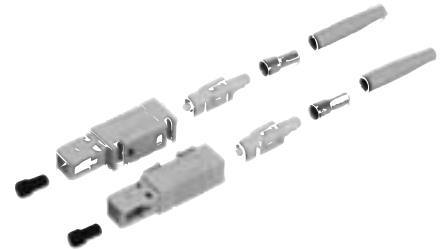
### SC Connectors — Epoxy Type

#### Product Facts

- One-piece connector body:
  - Fastest assembly
  - Field installable
- Compliant with
  - JIS C-5973
  - Fibre Channel
  - TIA 568B
  - TIA FOCIS-3
- Pre-radiused ferrules
- For 125 μm cladding diameter



Simplex Connector



Duplex Connector



"NEW" SC 1.6mm Connector



#### Performance

#### Characteristics

Insertion Loss <-0.2 dB Typical

Operating Temp. Range -  
-40°C to +85°C

Durability -500 Cycles

#### Multimode SC Connector Kits

Ferrule Type	Jacket Size	Simplex/ Duplex	Indiv. Pack w/Strain Relief	Bulk Pack No Strain Relief	Bulk Pack w/Strain Relief	Termination Kit	Inspection Microscope	Instruction Sheet
Ceramic	3.0 mm	Simplex	503948-1	503948-3	503948-2	503746-7	502970-1	408-4159
Ceramic	3.0 mm	Duplex	504657-1	504657-3	504657-2	503746-7	502970-1	408-4211
Ceramic	2.4 mm	Simplex	504930-1	NA	504930-2	503746-7	502970-1	408-4159
Ceramic	2.4 mm	Duplex	504927-1	NA	504927-2	503746-7	502970-1	408-4211
Ceramic	2.0 mm	Simplex	504931-1	NA	504931-2	503746-7	502970-1	408-4159
Ceramic	2.0 mm	Duplex	504928-1	NA	504928-2	503746-7	502970-1	408-4211
Ceramic	900 μm	Simplex	504932-1	504932-3	504932-2	503746-7	502970-1	408-4159
Ceramic	900 μm	Duplex	504929-1	NA	504929-2	503746-7	502970-1	408-4211
Polymer	3.0 mm	Simplex	1457045-2	1457045-1	N/A	503746-7	502970-1	408-4364
Polymer	3.0 mm	Duplex	1457044-2	1457044-1	N/A	503746-7	502970-1	408-4363
Ceramic	1.6-2.0mm	Simplex	1588715-1	1588715-2	N/A	N/A	502970-1	408-8674

**Note:** Strain Reliefs included in kits determined by cable jacket size.

#### Performance

#### Characteristics

Insertion Loss <-0.2 dB Typical

Return Loss <-59 dB Typical

Operating Temp. Range -  
-40°C to +85°C

Durability -200 Cycles

#### Singlemode SC Connector Kits

Ferrule Type	Jacket Size	Simplex/ Duplex	Indiv. Pack w/Strain Relief	Bulk Pack No Strain Relief	Bulk Pack w/Strain Relief	Termination Kit	Inspection Microscope	Instruction Sheet
Ceramic	3.0 mm	Simplex	504646-2	504646-6	504646-4	503746-7	502970-3	408-4208
Ceramic	3.0 mm	Duplex	504655-1	504655-3	504655-2	503746-7	502970-3	408-4212
Ceramic	2.4 mm	Simplex	504933-2	NA	504933-4	503746-7	502970-3	408-4208
Ceramic	2.4 mm	Duplex	504935-2	NA	504935-4	503746-7	502970-3	408-4212
Ceramic	2.0 mm	Simplex	504934-2	NA	504934-4	503746-7	502970-3	408-4208
Ceramic	2.0 mm	Duplex	504936-2	NA	504936-4	503746-7	502970-3	408-4212
Ceramic	900 μm	Simplex	492123-3	492123-7	492123-4	503746-7	502970-3	408-4208
Ceramic	900 μm	Duplex	NA	NA	504655-4	503746-7	502970-3	408-4212
Ceramic	1.6-2.0mm	Simplex	1588714-2	1588714-4	NA	NA	502970-3	408-8674

**Note:** Strain Reliefs included in kits determined by cable jacket size.

**SC Connectors — Epoxy Type** (Continued)



3.0mm



3.0mm Right Angle



900µm Short



900µm

**SC Strain Reliefs – Jacketed Cable**

Description	Part Number					
	Jacket Color					
	Black	Yellow	Red	Beige	Blue	Green
3.0 mm	1-503971-0	503971-7	1-503971-1	503971-1	503971-2	1-503971-8
2.4 mm	1-503971-2	503971-8	1-503971-3	503971-3	503971-4	NA
2.0 mm	NA	503971-9	NA	503971-5	503971-6	NA
1.6 mm	1588153-3	1588153-4	NA	1588153-5	1588153-2	NA

**SC Strain Reliefs – Right Angle**

Description	Simplex/ Duplex	Part Number					
		Jacket Color					
		Black	Yellow	Red	Beige	Blue	Green
3.0 mm	Simplex	1-1278705-5	1-1278705-7	1-1278705-6	1-1278705-4	1-1278705-3	1-1278705-8
	Duplex	2-1278705-1	2-1278705-3	2-1278705-2	2-1278705-0	1-1278705-9	2-1278705-4

**SC Strain Reliefs – 900 micron**

Description	Part Number					
	Jacket Color					
	Black	Yellow	Red	Beige	Blue	Green
900 µm	1457493-3	1457493-5	1457493-4	1457493-9	1457493-1	1457493-6
Short (10 mm) 900 µm	1278309-1	NA	1278309-3	NA	1278309-2	NA

**AMP SC Low Loss Loopback Connector**

Part Number 503141-1

**Product Facts**

- 62.5/125 Multimode
- Use for Equipment Testing
- 0.6 dB Insertion Loss
- 0.5" Ferrule Centerline

Part Number 503141-2

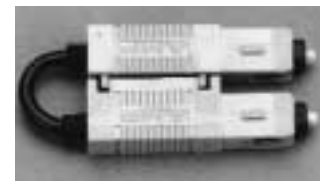
**Product Facts**

- 50/125 Multimode
- Use for Equipment Testing
- 0.8 dB Insertion Loss
- 0.5" Ferrule Centerline

Part Number 504883-1

**Product Facts**

- Singlemode
- Use for Equipment Testing
- 1.5 dB Insertion Loss
- 0.5" Ferrule Centerline





**SC Connectors — Multimode**

**AMP SC Tooling and Accessories**

**Termination Kit:** Includes all tools and accessories except adhesives.

Description	Part Number
Termination kit for all SC epoxy connectors	503746-7

**Crimp Tools**

Cable Jacket diameter (mm)	Hand tool w/die set	Hand tool Only	Die Set Only
3.0	503911-1	58588-1	503910-1
2.0 & 2.4/2.5 & 3.0	492026-1	58588-1	492025-1
1.6 - 2.0	1588176-1	58966-1	1588175-1

**Adhesives**

Description	Approx. No. of Connectors	Part Number
Epoxy - (25) Bipax Pkgs	250	501195-4
Epoxy - (1) Tube	400	502418-1
Epoxy Applicator	N/A	501473-3

**Polishing Films:** Package of (10) 8.5 x 11 in. Sheets. Each package will polish between 60 and 80 connectors.

Description	Part Number
5 μm	228433-8
0.3 μm	228433-5

**Miscellaneous Tools:**

Polishing Bushing	Curing Sleeve/ 12 Pieces	Strip Card Kit
502631-1 (Polymer)	502656-1	501818-1
503787-1 (Metal)	—	—

**SC Adapters**

**Product Facts**

- Suitable for any SC connector
- Available with metal or ceramic alignment sleeves
- Choice of housing colors
- Duplex adapters accept two simplex connectors or one duplex connector
- Assortment of hybrid configurations available
- Mounting screws available P/N 503663-1

**SC Simplex Adapter - Plastic**



SC Simplex Adapter - Plastic

Alignment Sleeve Material/Application	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM only	Beige	504614-1	504614-2
Metal	MM/SM	Black	502632-7	1-502632-4
Metal	MM/SM	Blue	502632-8	1-502632-5
Metal	MM/SM	Beige	502632-9	1-502632-6
Ceramic	SM/MM	Black	1-502632-0	1-502632-7
Ceramic	SM/MM	Blue	1-502632-1	1-502632-8
Ceramic	SM/MM	Beige	1-502632-2	1-502632-9
Ceramic/APC SM	SM APC	Green	2-106901-6	—



Flange-less SC Simplex Adapter - Plastic

**Flange-less SC Simplex Adapter - Plastic**

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM/SM	Black	504632-1	—
Ceramic	SM/MM	Black	504632-2	—
Metal	MM/SM	Blue	504632-3	—
Ceramic	SM/MM	Blue	504632-4	—



SC Simplex Adapter - Metal

**SC Simplex Adapter - Metal**

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM/SM	Electroless Nickel	1278348-1	1278348-2
Ceramic	SM/MM	Electroless Nickel	1278348-3	1278348-4



Flange-less SC Simplex Adapter - Metal

**Flange-less SC Simplex Adapter - Metal**

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM/SM	Electroless Nickel	1278348-5	1278348-6
Ceramic	SM/MM	Electroless Nickel	1278348-7	1278348-8



SC Duplex Adapter - Plastic

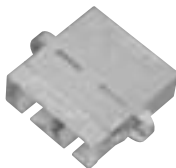
**SC Duplex Adapter - Plastic**

Alignment Sleeve Material/Application	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM only	Black	504640-4	—
Metal	MM only	Beige	504640-1	504640-2
Metal	MM/SM	Black	502776-7	1-502776-3
Metal	MM/SM	Blue	502776-8	1-502776-4
Metal	MM/SM	Beige	502776-9	1-502776-5
Ceramic	SM/MM	Black	1-502776-0	1-502776-6
Ceramic	SM/MM	Blue	1-502776-1	1-502776-7
Ceramic	SM/MM	Beige	1-502776-2	1-502776-8
Ceramic	SM/MM	Black No Logo	—	2-502776-5
Ceramic	SM APC	Green	2-502776-3	—

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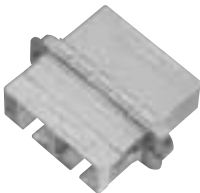
**SC Adapters** (Continued)



SC Duplex Adapter

**SC Duplex Adapter - Metal**

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM/SM	Electroless Nickel	1278049-1	1278049-2
Ceramic	SM/MM	Electroless Nickel	1278049-3	1278049-4



SC Duplex Metal Adapter w/ EMI Shielding

**Shielded SC Duplex Adapter - Metal**

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM/SM	Electroless Nickel	1374223-1	1374223-2
Ceramic	SM/MM	Electroless Nickel	1374223-3	1374223-4

- Designed to help prevent EMI leak
- Ideal for high-speed applications

**SC to ST Hybrid Adapters**



SC to ST Simplex Adapter - Plastic

**SC to ST Simplex Adapter - Plastic**

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM/SM	Black	502780-1	502780-7
Metal	MM/SM	Blue	502780-2	502780-8
Metal	MM/SM	Beige	502780-3	502780-9
Ceramic	SM/MM	Black	502780-4	1-502780-0
Ceramic	SM/MM	Blue	502780-5	1-502780-1
Ceramic	SM/MM	Beige	502780-6	1-502780-2



SC to ST Simplex Adapter - Metal

**SC to ST Simplex Adapter - Metal**

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM/SM	Electroless Nickel	1278350-1	1278350-2
Ceramic	SM/MM	Electroless Nickel	1278350-3	1278350-4

**SC to ST Hybrid Adapters** (Continued)



Flange-less SC to ST Simplex Adapter - Metal

**Flange-less SC to ST Simplex Adapter - Metal**

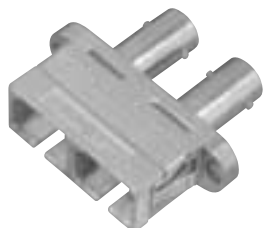
Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM/SM	Electroless Nickel	1278350-5	1278350-6
Ceramic	SM/MM	Electroless Nickel	1278350-7	1278350-8



SC to ST Duplex Adapter - Plastic

**SC to ST Duplex Adapter - Plastic**

Alignment Sleeve Material	Housing Color	Part Numbers	
		Single Pkg.	50 pc. Bulk Pkg.
Metal (MM Only)	Black	504663-5	—
Metal (MM Only)	Beige	504663-4	—
Metal	Black	503137-1	503137-7
Metal	Blue	503137-2	503137-8
Metal	Beige	503137-3	503137-9
Ceramic	Black	503137-4	1-503137-0
Ceramic	Blue	503137-5	1-503137-1
Ceramic	Beige	503137-6	1-503137-2



SC to ST Duplex Adapter - Metal

**SC to ST Duplex Adapter - Metal**

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	MM/SM	Electroless Nickel	1278051-1	1278051-2
Ceramic	SM/MM	Electroless Nickel	1278051-3	1278051-4

**ST Connectors — Singlemode**

**Product Facts**

- Epoxy type connector
- Pre-radiused ferrule finish
- Available in bulk packages

**Performance Characteristics**

Insertion Loss -0.3 dB typical  
 Back Reflection <-40 dB typical  
 Operating Temp Range -  
 -20°C to +75°C  
 Durability -200 cycles

**Materials**

Ferrule Material - Ceramic  
 Body Material - Nickel Plated Brass  
 Coupling Nut Material -  
 Plated Die Cast  
 Nominal Fiber Size - 126

Ceramic



Part Number	Hole Size (µm)	Strain Relief Type & Color
<b>126</b>		
502579-2		Bend Limiting/Yellow
502580-2		Short/Yellow
503613-2		Bare Buffer/Yellow

Bulk packaged epoxy style components and kits are available with other strain relief colors.

**ST Application Tooling**

**Termination Kit:** Includes all tools and accessories except Epoxy

Description	Part Number
Termination Kit for all ST epoxy connectors	503746-1

**Polishing Films:** Package of (10) 8.5 x 11 in. sheets

Description	Part Number
5 µm	228433-8
0.3 µm	228433-5
Final Polish Film	502748-2

**Crimp Tool**

Cable Jacket Dia.	Hand-Tool w/Die Set	Hand Tool Only	Die Set Only
3.0	58433-4	58532-1	58424-1

**Adhesive**

Description	Part Number
Epoxy - 25 Bipax pkgs. (2 grams/each)	501195-4
Epoxy - 1 Tube	502418-1
Epoxy Applicator	501473-3

**Miscellaneous Tools**

Description	Part Number
Polishing Bushing	503337-1
Curing Sleeve	502259-1 (12 pcs.)
Strip Card	501818-1

**ST Coupling Receptacles — Singlemode**

**Product Facts**

- Free-hanging or panel mount design



Alignment Sleeve Material	Packaging	Part Number
Metal	Single	504021-1
	Bulk (50)	504021-2
Zirconia Ceramic	Single	502750-1
	Bulk (50)	502750-2

**ST Connectors — Multimode**

**Product Facts**

- Epoxy type connector
- Pre-radiused ferrule finish
- Available in bulk packages

**Performance Characteristics**

Insertion Loss -0.3dB typical  
Operating Temp. Range -  
-20°C to +75°C  
Durability -500 cycles

Ceramic



Fiber Size	Conn. Type†	Strain Relief Type & Color	Max. Cable Dia.	Part Number
125	1	Short/Black	3.0	503569-2*
125	1	Short/Black/Bare Buffer	3.0	503571-3
140	2	Bend Limiting/BL/Bare Buffer	3.0	501380-6
125	2	Bulk Pk. No Strain Relief	3.0	492458-3*
125	2	Short/BL/Bare Buffer	3.0	492458-1
125	2	Short/Black	3.0	492458-2*
125	2	W/O Strain Relief/Bulk	3.0	503676-1
125	2	With Strain Relief/Bulk	3.0	503677-1

† Connector Type 1 – Zirconia Ceramic Ferrule, Polymer Body, Polymer Coupling Nut  
Connector Type 2 – Zirconia Ceramic Ferrule, Nickel Plated Brass Body, Nickel Plated Die Cast Coupling Nut  
\* Bulk packages are 1000 piece quantities.

**Product Facts**

- Epoxy type connector
- Pre-radiused ferrule finish
- Available in bulk packages

**Performance Characteristics**

Insertion Loss -0.3dB Typical  
Operating Temp. Range -  
-30°C to +70°C  
Durability -500 cycles

**Materials**

Ferrule -Stainless Steel  
Body -Nickel Plated Brass  
Coupling Nut -Nickel Plated Die Cast

Stainless Steel



Fiber Size	Strain Relief Type & Color	Max. Cable Dia.	Part Number
125	Bend Limiting/Black	3.0	504008-3
140	Bend Limiting/Black	3.0	504008-7
125	Bulk Pk. No Strain Relief	3.0	5-504008-4



## Fiber Optic Products Catalog

### ST Connectors — Multimode (Continued)

#### Product Facts

- Epoxy type connector
- Pre-radiused ferrule finish
- Available in bulk packages

#### Performance Characteristics

Insertion Loss - 0.3dB Typical  
Operating Temperature Range -  
-20°C to +75°C

Durability - 500 Cycles

#### Materials

Ferrule - Composite Polymer

Body - Polymer

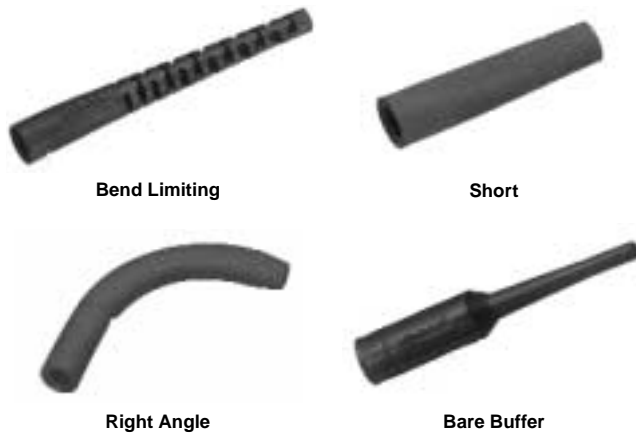
Coupling Nut - Polymer

#### Polymer Composite



Fiber Size	Connector Type	Strain Relief Type & Color	Max. Cable Dia.	Part Number
125	1	Short/Black/Bare Buffer/900 μm	3.0	503415-1
125	1	Short/Black	3.0	503424-3*
125	1	Bulk Pk. No Strain Relief	3.0	503424-1*
125	1	Bare Buffer/Black	.9	503424-5*

\* Bulk packages are 1000 piece quantities.



#### Strain Relief Bulk packages (100 pcs./package)

Color	Bend Limiting	Short	Right Angle	Bare Buffer
Black	502128-9	501457-8	502667-6	503628-2
Red	1-502128-1	1-501457-0	502667-9	2-503628-4
Blue	1-502128-3	1-501457-2	502667-7	503628-9

#### ST Tooling and Accessories

Termination Kit: Includes all tools and accessories except adhesives

Description	Part Number
Termination kit for all ST epoxy connectors.	503746-1

#### Crimp Tools

Description	Hand Tool with Die Set	Hand Tool Only	Die Set Only
Ceramic/Polymer Ferrules	58433-4	58532-1	58424-1
Stainless Steel Ferrules	58551-1	58532-1	58552-1

#### Miscellaneous Tools

Polishing Bushing	Part Number
Metal Bushing, Ceramic & Stainless Steel Ferrules	503337-1
Polymer Bushing-Black, Ceramic & Stainless Steel Ferrules	503304-1
Polymer Bushing-Beige, Polymer Ferrule	503304-2
Curing Sleeve/Pieces	502259-1
Strip Card Kit	501818-1

#### Adhesives

Description	Approx. No. of Connectors	Part Number
AMP Quick Cure Adhesive Tube (3 grams)	100	492508-1
Epoxy - (25) Bipax Pkgs	250	501195-4
Epoxy - (1) Tube	400	502418-1
Epoxy Applicator	N/A	501473-3

Polishing Films: Package of (10) 8.5 x 11 in. Sheets  
Each package will polish between 60 and 80 connectors

Description	Part Number
5 μm	228433-8
1 μm	228433-7
0.3 μm	228433-5

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**ST Connectors — Multimode** (Continued)

**Product Facts**

- Free-hanging or panel mount design

**ST Coupling Receptacles**



Alignment Sleeve Material	Packaging	Part Number
Polymer Composite Multimode	Single	501381-1
	Bulk (1000)	501381-2
Metal Multimode/Singlemode	Single	504021-1
	Bulk (50)	504021-2
Zirconia Ceramic Singlemode	Single	502750-1
	Bulk (50)	502750-2

**ST Polymer Duplex Receptacle**



Alignment Sleeve	Color	Part Number
Metal/MM Only	Beige	504662-2
Ceramic/SM & MM	Beige	503273-6

**ST Active Device Mounts — Multimode**

**Product Facts**

- Designed to accept multimode TO-18, TO-46 and TO-52 active devices
- Nickel plated, die cast zinc
- Mount to PCB or through panel
- Includes positioning ring



Description	Packaging	Style	Height	Part Number
Standard height	Single	A	.410	501474-1
Low profile	Single	B	.280	502585-2
Low profile	Single	C	.314	504022-2
Low profile	Bulk (50)	C	.314	504022-3

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**FC Connectors-Epoxy Type — Singlemode** (Continued)

**Product Facts**

- One-piece connector body:
  - Fastest assembly
- Compliant with:
  - JIS C-5970
- Pre-radiused ferrule

**Performance Characteristics**

Insertion Loss <-0.2 dB Typical  
Return Loss <-59 dB Typical  
Operating Temp. Range -  
-40°C to +85°C  
Durability -200 Cycles



**Singlemode FC-Style Connector Kits**

Ferrule Type	Mode	Jacket Size	Indiv. Pack w/Strain Relief	Bulk Pack w/Strain Relief	Termination Kit	Inspection Microscope	Instruction Sheet
Ceramic	Single	3.0 mm	504649-2	504649-8	503746-7	502970-3	408-4213
Ceramic	Single	2.4 mm	504914-2	504914-4	503746-7	502970-3	408-4213
Ceramic	Single	2.0 mm	504915-2	504915-4	503746-7	502970-3	408-4213
Ceramic	Single	900 µm	492052-3	492052-4	503746-7	502970-3	408-4213

**Note:** 3.0mm strain reliefs are included in kits that come with strain reliefs.  
Strain relief kits with jacket size 2.0 mm to 3.0 mm come with blue strain reliefs.  
Strain relief kits with jacket size 900 µm come with yellow strain reliefs.

**FC Strain Reliefs – Jacketed Cable**



3.0mm

Description	Part Number					
	Jacket Color					
	Black	Yellow	Red	Beige	Blue	Green
3.0 mm	1-503971-0	503971-7	1-503971-1	503971-1	503971-2	1-503971-8
2.4 mm	1-503971-2	503971-8	1-503971-3	503971-3	503971-4	NA
2.0 mm	NA	503971-9	NA	503971-5	503971-6	NA

**FC Strain Reliefs – Right Angle**



3.0mm Right Angle

Description	Simplex/ Duplex	Part Number					
		Jacket Color					
		Black	Yellow	Red	Beige	Blue	Green
3.0 mm	Simplex	1-1278705-5	NA	1-1278705-6	1-1278705-4	1-1278705-3	1-1278705-8
	Duplex	2-1278705-1	NA	2-1278705-2	2-1278705-0	2-1278705-9	2-1278705-3

**Other Tooling Accessories**

**Adhesives**

Description	Part Number
Epoxy -1 BIPAX (4 grams)	504035-1
Epoxy -1 Tube	502418-1
Epoxy Applicator	501473-3

**Miscellaneous Tools**

Description	Part Number
Polishing Bushing	504862-1
Curing Sleeve	502862-2 (6 pcs.)
Strip Card	501818-1

**Polishing Films: Package of (10) 8.5 x 11 in. sheets**

Description	Part Number
5 µm	228433-8
0.3 µm	228433-5
Final Polish Film	502748-2

**FC Adapters**



FC Square Flange Adapter

**FC Simplex Square Flange Adapter - Metal**

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Panel Cut-out	Keyway Slot (Nom.)	Part Numbers	
				Single Pkg.	50 pc. Bulk Pkg.
Metal	SM/MM	Square Flange	Std. 2.33 mm	501506-2	501506-4
Ceramic	SM/MM	Square Flange	Std. 2.33 mm	501506-1	501506-3

**FC Simplex 8mm/9mm Dia. Round (D-Hole) Adapter - Metal**



FC 8mm/9mm Dia. Round

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Panel Cut-out	Keyway Slot (Nom.)	Part Numbers	
				Single Pkg.	50 pc. Bulk Pkg.
Metal (Ph Bronze)	SM/MM	D-Hole	Std. 2.33 mm	1-504407-0	—
Metal (Copper)	SM/MM	D-Hole	Std. 2.33 mm	504407-1	504407-2
Ceramic	SM/MM	D-Hole	Std. 2.33 mm	504407-3	504407-4
Ceramic	SM/APC	D-Hole	2.05 mm Type R	504407-8	504407-9
Ceramic	SM/APC	D-Hole	Prec. 2.02 mm	504407-7	504407-6



FC 8mm Dia. Round (Double D)

**FC Simplex 8mm Dia. Round (Double D-Hole) Adapter - Metal**

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Panel Cut-out	Keyway Slot (Nom.)	Part Numbers	
				Single Pkg.	50 pc. Bulk Pkg.
Metal	SM/MM	Double D-Hole	Std. 2.33mm	504013-1	504013-3



FC to ST Simplex Adapter - Metal

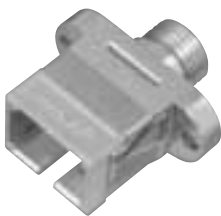
**Hybrid FC to ST Simplex Adapter - Metal**

Alignment Sleeve Material	Housing Color	Part Numbers	
		Single Pkg.	50 pc. Bulk Pkg.
Metal	Electroless Nickel	503640-1	—
Ceramic	Electroless Nickel	503640-2	—



## Fiber Optic Products Catalog

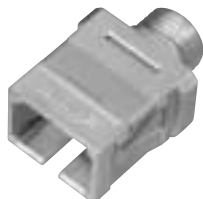
### Hybrid Adapters-SC/FC/ST (Continued)



SC to FC Simplex Adapter - Metal

#### SC to FC Simplex Adapter - Metal

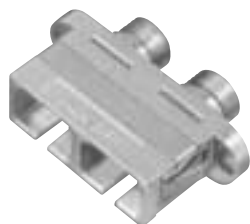
Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	SM/MM	Electroless Nickel	1278349-1	1278349-2
Ceramic	SM/MM	Electroless Nickel	1278349-3	1278349-4



Flange-less SC to FC Simplex Adapter - Metal

#### Flange-less Simplex Adapter - Metal

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	SM/MM	Electroless Nickel	1278349-5	1278349-6
Ceramic	SM/MM	Electroless Nickel	1278349-7	1278349-8



SC to FC Duplex Adapter - Metal

#### SC to FC Duplex Adapter - Metal

Alignment Sleeve Material	Singlemode (SM)/ Multimode (MM)	Housing Color	Part Numbers	
			Single Pkg.	50 pc. Bulk Pkg.
Metal	SM/MM	Electroless Nickel	1278050-1	1278050-2
Ceramic	SM/MM	Electroless Nickel	1278050-3	1278050-4

**FSD (FDDI) Connector Components — Multimode**

**Product Facts**

- Meets specifications of FDDI PMD - ANSI X3.166
- Ceramic or polymer composite ferrules
- Designed in polarization and user defined keying

**Performance Characteristics**

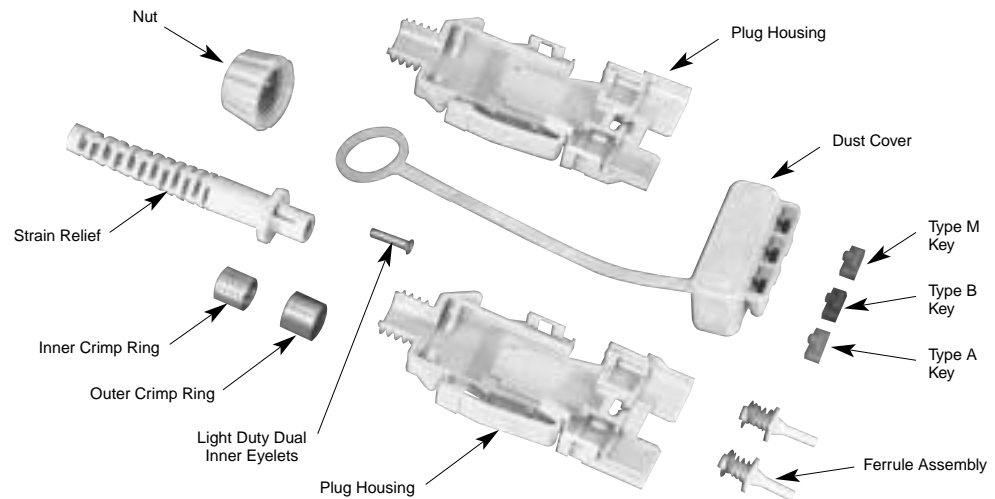
Insertion Loss -0.5dB typical

Operating Temp Range -  
-40°C to +85°C

**Durability -**

Ceramic Ferrules 500 cycles  
Polymer Ferrules 250 cycles

Ceramic Instruction Sheet -408-9373  
Polymer Instruction Sheet -408-9972



**FSD**

Diameter (µm)	Part Number				Replacement Ferrules
	Cable Type				
	DUALAN		Light Duty Dual		
	Single Packed	Bulk Packed	Single Packed	Bulk Packed	
<b>Ceramic Ferrules</b>					
125	501780-1	501780-3***	502015-1	502015-3***	501779-1
140	501780-2	—	502015-2	—	501779-3
<b>Polymer Composite</b>					
125	503347-1	503347-4**	503347-5	503347-7**	502653-4*

Termination Kit: 503746-6

\* Part number is for 25 ferrules.

\*\* Bulk packed, 250 per package.

\*\*\* Bulk packed, 200 per package.

Assembly Fixtures: with Polishing Tool: 501795-1; without Polishing Tool: 502023-1

**FSD Tooling and Accessories**

**Termination Kit:** Includes all tools and accessories except adhesives.

Description	Part Number
Termination kit for all FSD connectors	503746-6

**FSD Curing Fixture Kit**

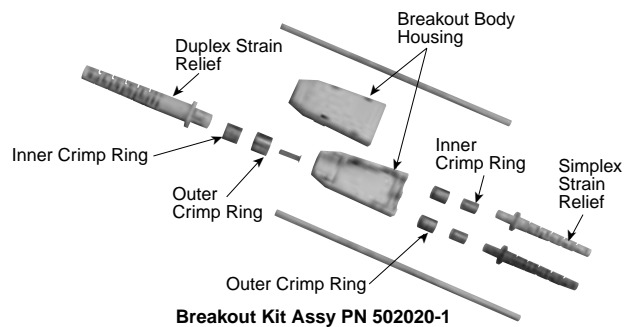
To hold ferrules during assembly, epoxy curing and polishing.  
Allows simultaneous polishing of both ferrules.

Description	Part Number
Used to protect fiber during the epoxy curing process. Kit includes polishing bushing.	FSD 501795-1
Curing assembly kit without polishing bushing.	FSD 502023-1
Strip Card Kit	501818-1

**Crimp Tools**

PRO-CRIMPER Tool	Part Number
Hand Tool with die set	58519-1
Die Set Only	58510-1

Kit also includes 1-meter length of breakout tubing and 1 each "receive" and "transmit" labels.



**Adhesives**

Description	Approx. No. of Connectors	Part Number
Epoxy - (25) Bipax Pkgs	250	501195-4
Epoxy - (1) Tube	400	502418-1
Epoxy Applicator	N/A	501473-3

**Polishing Films:** Package of (10) 8.5 x 11 in. Sheets  
Each package will polish between 60 and 80 connectors.

Description	Part Number
5 µm	228433-8
1 µm	228433-7
0.3 µm	228433-5

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**FSD (FDDI) Connector Components — Multimode** (Continued)

Fixed Key FSD Receptacles and Adapters

FSD to ST Bulkhead Adapter

Housing Material	Threaded Insert Size	Part Numbers			
		Keying Type			
		A	B	M	S
Plastic	4-40	501798-1	501798-2	501798-3	501798-4
Plastic	M3	501933-1	501933-2	501933-3	501933-4

FSD to FSD Receptacle



Style	Threaded Insert Size	Part Numbers	
		Keying Type	
		A to B	M to S
With Mounting Ears	4-40	501926-1	501926-2
Ears	M3	501931-1	501931-2
Without Mounting Ears	—	501805-1	501805-2

Field Keyable FSD Receptacles and Adapters



Singlemode Receptacles

Description	Ceramic Sleeve Material
FSD to FSD	502807-1
FSD to ST	502809-1
FSD to FC	502874-1

Multimode Receptacles

Description	Sleeve Material	
	Metal	Ceramic
FSD to FSD	502806-2	502806-4
FSD to ST	502808-2	502808-4
FSD to FC	502873-2	502873-4



## Fiber Optic Products Catalog

### ESCON Connector Components

#### ESCON Connector Plug

##### Product Facts

- Multimode
- IBM Approved
- Simple field assembly

##### Performance Characteristics

Assembly Loss -0.2 dB Typical

Operating Temperature -  
+10°C to +60°C

Durability -200 cycles

Instruction Sheet 408-9808



Description	Part Number
125 μm	Black
DUALAN	492181-1
DUALAN	492181-2*

\* Bulk packed, 50 per package  
Termination Kit: 503746-6.

#### ESCON Receptacles

##### Product Facts

- Multimode



Description	Part Number
	Black
ESCON to ESCON	502825-2
ESCON to ST	502826-2

#### Receptacle Dust Cover



Description	Part Number
	Black
With Mounting Strap	503004-4
Without Mounting Strap	503004-3

#### ESCON Assembly Fixture Kit

Used to hold ferrules during assembly, epoxy curing, and polishing. Allows simultaneous polishing of both ferrules.



Description	Part Number
	Black
Without Polishing Bushing	492236-2
Polishing Bushing	492269-1

**FSMA Products — Multimode**

**Product Facts**

- Industry compatible with 905 (FSMA-I) and 906 (FSMA-II) style connectors
- Terminates fiber sizes from 125 through 1000 microns in diameter
- Design parameters conform to NATO and IEC interface standards

**Performance Characteristics**

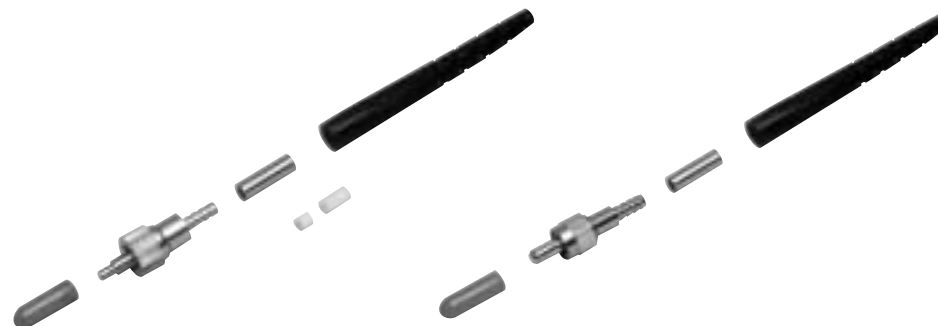
Insertion Loss - 1.5 dB Typical

Temperature Range -55°C to +105°C

Durability - 200 cycles

**Instruction Sheet**

FSMA 905 & 906 -408-9863



**FSMA Connectors**

Ferrule Material	Connector Body Material	Fiber Diameter (µm)	Nominal Jacket O.D.			
			3.1mm		4.3mm	5.3mm
			905	906	905	905
Stainless Steel	Nickel-Plated Brass	125	504566-1	504014-1	504567-1	504568-1
		140	504566-2	1-504014-0	504567-2	504568-2
		231	504566-7	—	—	—
		1000	3-504566-0	—	—	2-504568-8

**FSMA Tooling and Accessories**

**Termination Kit**

Description	Part Number
Termination kit for all FSMA connectors	503746-2

**Crimp Tools**

Description	Cable Jacket diameter (mm)	Hand tool w/die set	Hand tool Only	Die Set Only
All FSMA	3.0	58551-1	58532-1	58552-1 (hex die)

**Adhesives**

Description	Approx. No. of Connectors	Part Number
Epoxy - (25) Bipax Pkgs	250	501195-4
Epoxy - (1) Tube	400	502418-1
Epoxy Applicator	N/A	501473-3

**Polishing Films**

Package of (10) 8.5 x 11 in. Sheets.  
Each Package will polish between 60 and 80 connectors.

Description	Part Number
5 µm	228433-8
1 µm	228433-7
0.3 µm	228433-5

**Miscellaneous Tools**

Description	Part Number
Curing Sleeves/Pieces (12)	502249-1
Strip Card Kit	501818-1
Polishing Bushing	228025-1



**Adapter Product Facts**

- Precision mating adapter for all FSMA connectors
- In-line splice or panel mount design

**Active Device Mount Product Facts**

- Designed to house TO-18, TO-46, and TO-52 devices
- Constructed of nickel plated die cast zinc alloy or stainless steel
- Mounts to PC board or through panel

Description	Part Number
<b>FSMA Adapters</b>	
Hex Flange, Stainless Steel	501049-1
Hex Flange, Stainless Steel, Counterbore, Sealed	501050-1
Fixed Flange, Nickel-Plated Brass	504026-1
In-Line, Stainless Steel	504028-1
In-Line, Nickel-Plated Brass, Counterbore	504030-1
In-Line, Stainless Steel, Counterbore, Short	504031-1
<b>FSMA Active Device Mounts</b>	
PC Mount Receptacle, Die Cast	502136-1
PC Mount Receptacle, Die Cast, Bulk Packaged	502136-2
PC Mount Receptacle, Stainless Steel	501055-1

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**Tooling and Accessories**



**Professional Installer Kits – Epoxy Type Connectors**

The Professional Installer Kits from Tyco Electronics provide the professional installer with the necessary tools required to perform terminations on the complete line of epoxy type fiber optic connector products. Included in the kit is a crimp tool, with a set of interchangeable dies. In addition, an Inspection Microscope and Epoxy Curing Oven are included with specific kits.

**Part Number 501258-7**

For: FSD Connectors, ST, FC, FSMA, AMP SC

Includes those tools necessary to terminate the connectors listed above. This is a complete kit which includes:

- Crimp tool and crimping dies

- Polishing bushings
- Polishing film
- Cable and fiber strippers
- Microscope with tripod (see page 34 for details)
- Epoxy curing oven (see page 34 for details)

**Part Number 501258-8**

The same as 501258-7 except the epoxy oven operates at 220 VAC.

**Part Number 501258-9**

The same as 501258-7 except kit does not contain microscope or epoxy curing oven.

**Note:** Epoxy not included in kit. It must be purchased separately. See specific product page for part numbers.



**Termination Kits – Epoxy Type Connectors**

Termination kits provide the materials and tools (except epoxy, curing oven, and microscope) required to terminate a particular type of fiber optic connector. Tools are conveniently packaged in a handy carrying case. The kits contain polishing materials for approximately 60 connectors. The consumable items in the kit can be purchased separately.

For: AMP SC, FSMA, FC, ST, FSD, RSD

**Termination Kit**

Connector Type	Part Number
ST	503746-1
FSMA	503746-2
FSD	503746-6
Next Generation FC and SC	503746-7

**Cyclops Cable Stripper Part Number 1375317-1**

Ideal for stripping twisted-pair (UTP & STP) and fiber optic cables up to 0.43" diameter.

**Termination Tool Kits – No Epoxy Type**

For MT-RJ Jack and Plug Termination Tool Kits, see page 54.

For LightCrimp Plus Termination Tool Kits, see page 56.

For LightCrimp Termination Tool Kits, see page 57.

For Additional Tooling Information, Request Global Application Tooling Catalog 296240.

**Tooling and Accessories** (Continued)

**AMP QC Quick Cure Adhesive**

**Product Facts**

- One-part adhesive eliminates the hassle and mess of mixing
- Applies easily and cures in minutes without heat or UV light
- Works with standard multimode epoxy-style connectors without performance degradation
- Faster procedure for time-saving productivity and lower installed costs



Tube Size	Typical Connector Terminations Per Tube*	Part Number
3 grams	100	492508-1

\*Your individual termination techniques will affect the number of terminations per tube.

**Epoxies**

**EPO-TEK Epoxies**

Tyco Electronics offers EPO-TEK epoxies formulated for fiber optic applications. Each epoxy is a pre-measured, two-part material packaged in a BIPAX. Simply remove the BIPAX center divider and work the epoxy together.



**Adhesive Applicator  
Part Number 501473-3**

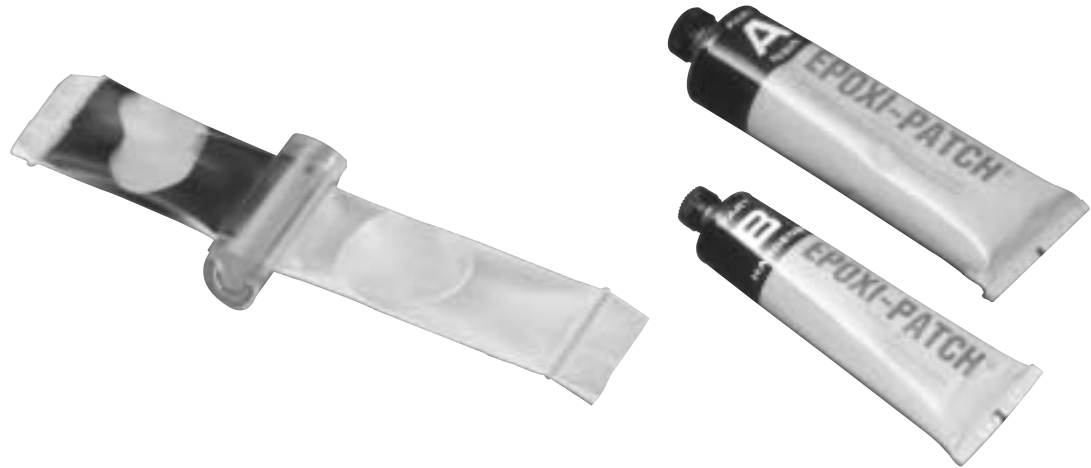
**Product Facts**

- EPO-TEK Epoxy
- Pre-measured BIPAX for consistent results
- Ideal for bonding fibers
- Long relative pot life
- High service temperature

Description	Part Number
<b>Individual Epoxies</b>	
4-gram pack EPO-TEK 353ND	504035-1
<b>Recommended Accessories</b>	
Syringe manual use (3ccs)	501473-3
<b>Epoxy Specifications 600-4EPO</b>	
Cure Time Room Temp.	15 min @ 115°C
Pot Life	4 hr.
Color Before Curing	Amber
Color After Curing	Red
Viscosity (cps)	2000
Maximum Temperature	200°C
Glass Transition Temp.	124°C

**Tooling and Accessories** (Continued)

**Epoxies** (Continued)



**TRA-CON Epoxy-Bipax**

Properties	Use With	Number of Packs/ Size (gr)	Approx. Number of Conn.	Part Number
<b>General Purpose Use:</b>				
Low Viscosity High Impact Blue for Easy Polish 30 min. Pot Life Operating Temperature: -60 to 100°C Ambient Cure: 24 hr. @ 25°C Oven Cure: 2 hr. @ 65°C or 10 min. at 110°C	FSD ST FC AMP SC FSMA	25/2	250	501195-4

**Hysol Epoxy-Tubes**

Properties	Use With	Number of Packs/ Size (gr)	Approx. Number of Conn.	Part Number
<b>General Purpose Use:</b>				
Medium Viscosity Blue Color for Easy Polish 30 min. Pot Life Oven Cure: 30 min. @ 100°C	FSD ST FC AMP SC FSMA	1 set of tubes	400	502418-1

Description	Part Number						
	FSMA	Multimode ST	Singlemode ST	FC	FSD/RSD	AMP SC	LightCrimp XTC
<b>Hand Polishing Film: (Pack of 10 sheets)</b>							
15µm	—	—	—	—	—	—	228433-9
5µm	228433-8	228433-8	228433-8	228433-8	228433-8	228433-8	228433-8
1µm	228433-7	228433-7	—	—	228433-7	—	228433-7
0.3µm	228433-5	228433-5	228433-5	228433-5	228433-5	228433-5	228433-5
<b>Final Polish Film*</b>	—	—	502748-2	502748-2	—	502748-2	—
<b>Consumables Kit**</b>	502306-1	502306-1	502306-2	502306-2	502306-1	502306-2	—

\*Pack of 5.

\*\*Contains all consumable supplies for at least 100 connectors.

**Tooling and Accessories** (Continued)

**Epoxy Curing Oven**

The Epoxy Curing Oven reduces the time required to cure epoxy in fiber optic connectors. The oven provides a uniform, controlled curing environment which increases productivity and consistency of terminations. The unit accepts all Tyco Electronics connectors. The unit comes equipped to cure up to four duplex connectors and 12 single connectors at once. Optional adapter blocks are available to cure 8 duplex or 24 single connectors. It features a variable temperature control from 60°C to 125°C and includes a thermometer and cable support bracket. 110 and 220 VAC units are available.



Description	Part Number
110 VAC	502134-1
240 VAC	502134-2
Adapter Block for 8 Duplex Connectors	502222-1
Adapter Block for 24 Single Connectors	502129-1
Block Assembly for 1.6 mm cable connector	1457628-1

Instruction Sheet 804-9460

**Inspection Microscope Kits**

The Inspection Microscope is designed specifically for visual examination of terminated or cleaved ends of singlemode and multimode fibers in both field and laboratory applications. This portable, hand-held unit provides magnification for optimum detection of flaws. It operates on battery power. The complete microscope kit includes a handy carrying case, tripod stand, and all adapters needed to inspect the following connectors: FSMA, FSD, ST, FC, F07 and SC.

See page 35 for Microscope Part Numbers.

**Product Facts**

- Pre-centered adapter mount provides quick, easy focusing, and changing of connectors
- Kg-3 infrared filter to protect the user
- Durable, lightweight A.B.S. plastic microscope body
- Lockable, high-density polyethylene, double-well carrying case with anti-static foam cutouts





**Tooling and Accessories** (Continued)

**Microscope with 10x Objective Kits**

Components Description	Part Number	Qty.	Adapter Markings	Microscope Kit	
				502970-1	502970-3
100x Microscope (10x Eyepiece)	502978-1	1	—	yes	—
200x Microscope (20x Eyepiece)	502978-2	1	—	—	yes
FSMA	502971-1	1	FSMA	yes	yes
D4	502975-1	1	D4	yes	yes
Universal 2.5 mm**	502977-1	1	—	yes	yes
LC 1.25 ferrule adapter	1278997-1	1	—	—	—
FC/APC adapter (not included with kit)	504617-1	1	—	—	—
SC/APC adapter (not included with kit)	504618-1	1	—	—	—
<b>Batteries</b>					
"AA" Alkaline	N/A	2	—	yes	yes
<b>Bulb</b> , 2.8V Lamp Red on/off Switch	502964-1	1	—	yes	yes
<b>Bulb</b> , 2.5V Lamp Green on/off Switch	1278471-1	1	—	—	—
Tripod	502965-1	1	—	yes	yes
<b>Carrying Case</b>	N/A	1	—	yes	yes
<b>Accessories</b>					
20x Eyepiece	502969-2	—	—	—	Included
10-20x Zoom Eyepiece	502969-3	—	—	—	—
10x Eyepiece	502969-1	—	—	Included	—
<b>Adapters 100x Microscope Version</b>					
F07	492547-1	—	—	—	—
MT-RJ	492749-1	—	—	—	—
MPO	492414-1	—	—	—	—
MPO APC	492415-1	—	—	—	—
MPX	492526-1	—	—	—	—
MPX APC	492527-1	—	—	—	—
ESCON	492477-1	—	—	—	—

\*\* Inspects ST, SC, FC, FSD and RSD connectors.



**Inspection Microscope  
Pocket Model**

**Product Facts**

- 100 power magnification
- Compact hand-held size
- Range of adapters available for fiber optic connectors
- Built-in illumination
- Battery operated

Description	Part Number
Microscope	1278132-1
SMA Adapter	1278133-1
2.5 mm Universal Adapter (SC or ST)	1278134-1

**Danger:** Active fibers should never be viewed through a microscope.

Instruction Sheet 408-4497



**Scribe Tool**

**Sapphire-Tipped Scribe Tool**  
Part No. 504064-1

**Replacement Blades**  
Part No. 504290-1

**Product Facts**

- Long-lasting sapphire blade
- Pen-type case

Instruction Sheet 408-4293

**Tooling and Accessories** (Continued)

Hand Tools



**PRO-CRIMPER II**  
Instruction Sheet 408-4020

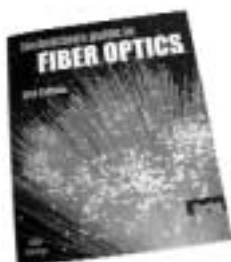
**PRO-CRIMPER II Hand Tool**

Connector	Cable Jacket Diameter (mm)	Part Number		
		Hand Tool w/ Die Set	Hand Tool Only	Die Set Only
FSMA	3.0	58551-1	58532-1	58552-1 (hex die)
ST Ceramic	3.0	58433-4	58532-1	58424-1
ST Stainless Steel	3.0	58433-4	58532-1	58424-1
ST Polymer Composite	3.0	58433-4	58532-1	58424-1
ST Ceramic Used with Loose Tube	3.8	—	58532-1	503890-1
ST Stainless Steel (504xxx series only)	3.0	58551-1	58532-1	58552-1
Next Generation FC	3.0	503911-1	58588-1	503910-1
	2.0 & 2.4/2.5 & 3.0	492026-1	58588-1	492025-1
Next Generation AMP SC	3.0	503911-1	58588-1	503910-1
	2.0 & 2.4/2.5 & 3.0	492026-1	58588-1	492025-1
LC		1588176-1	58532-1	1588175-1
MPO		1588698-1	—	—
FSD - Ceramic	DUALAN & LDD	58519-1	58532-1	58510-1
FSD - Polymer	DUALAN & LDD	58519-1	58532-1	58510-1
FSD/MC - Ceramic	DUALAN & LDD	58519-1	58532-1	58510-1
FSD Breakout Kit	DUALAN & Protection Kit	58519-1	58532-1	58510-1
LightCrimp ST	3.0	492623-1	58532-2	492622-1
LightCrimp SC	3.0	492782-1	58532-2	492783-1
LightCrimp Plus and LightCrimp ST	3.0	492623-1	58532-2	492622-1
LightCrimp Plus and LightCrimp SC	3.0	492782-1	58532-2	492783-1

**Polishing Bushing, Curing Sleeves and Strip Card Kits**

Connector	Cable Jacket Diameter (mm)	Part Number		
		Polishing Bushing	Curing Sleeves/Pieces	Strip Card Kit
<b>FSMA</b>	3.0	228025-1	502249-1 (12 pcs.)	501818-1
<b>ST</b>				
Ceramic, Stainless Steel	3.0	503337-1 (Metal) 503304-1 (Black Polymer)	502259-1 (12 pcs.)	501818-1
Polymer Composite	3.0	503304-1 (Beige Polymer)	502259-1 (12 pcs.)	501818-1
FC	3.0	502862-1	502862-2 (6 pcs.)	501818-1
AMP SC	3.0	502631-1 (Black Polymer)	502656-1 (1 pc.)	501818-1
LC		—	1457630-X <sup>1</sup> (12 pcs.)	1588756-1
FSD - Ceramic & Polymer	DUALAN & LDD	501795-1*	502023-1**	501818-1

\* Curing Assembly Kit with polishing bushing.  
\*\* Curing Assembly Kit without polishing bushing.  
<sup>1</sup> -1 LC Behind the wall  
-2 LC Jumper



**Technicians Guide to Fiber Optics (Third Edition)**

**Part Number 228838-1**

An excellent introductory and intermediate level fiber optic text, this informative book covers the fundamentals of data transmission, fiber theory, fiber characteristics, sources and detectors, connectors and splice products, and other fiber optic components.

**Expanded Beam Fiber Optic Products**

**Expanded Beam Products**

- Pro Beam Connector and Pro Beam Jr. Connector field deployable interconnects
- ARINC 600 and 404 connectors, with inserts/holder blocks designed for Mini-Expanded Beam and Junior inserts –up to 128 channels on size 3 ARINC 600
- MIL-C-38999 Series III shell size 13 and 11 style circular connectors –Cable assemblies up to 4 fibers
- Common insert for 1- through 4-channels
- Tactical cables, cable reels, man-packs
- Cable assembly and termination services



**Product Facts**

- Non-contacting method of mating optical fibers
- Lenses expand, then focus and collimate light; Housed in high strength, high precision connectors
- No wear on fiber optic interface; Very vibration resistant
- Easy to handle, easy to clean. Durable connection that is highly resistant to dirt/debris
- Singlemode or multimode
- Common 850, 1300, 850/1310 Dual Wavelength, 1310, or 1550 nm wavelengths
- Easy alignment for low-loss, repeatable performance
- Consistent overall optical "link budget"
- Low sensitivity to thermal fluctuations and interface contamination
- Repeatable low-loss performance in harsh environments

Fiber Optic interconnect/cable system using Expanded Beam technology, which physically expands and collimates transmission signal into an optical beam over 14 times its original diameter (the cross sectional area of the light beam increases over 200 times for multimode optical signals. For singlemode signals, the collimated beam is over 45 times its original diameter

and the cross-sectional area of the light beam increases over 2,000 times.). It is then refocused back down onto the core of the receiving fiber. This concept provides ease of alignment and low sensitivity to thermal changes and contamination. High strength, precision connector housings enhance a durable connection, optimizing low loss and repeatable performance.

Suitable for aerospace, avionics, field-deployable communications, marine ship-to-shore applications, security systems, mobile diagnostic units, oil and gas exploration and other harsh environment applications demanding strength, durability and reliable performance in conditions of multiple coupling/decouplings, blindmate situations, and high vibration.

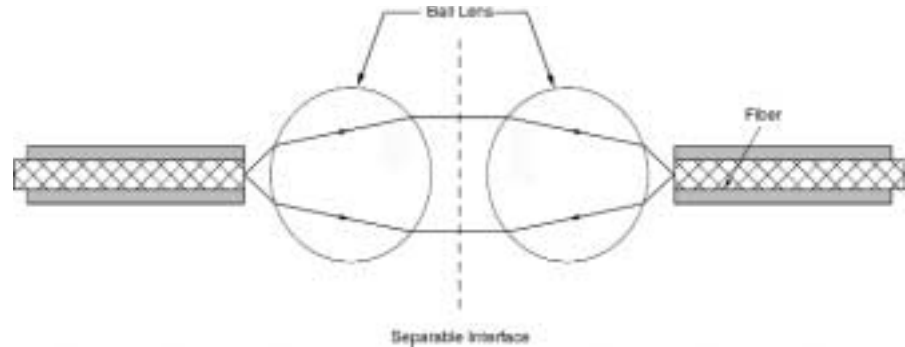
**Please consult Tyco Electronics for Design guidance and production availability.**

**Expanded Beam Fiber Optic Products** (Continued)

**Expanded Beam Principle**



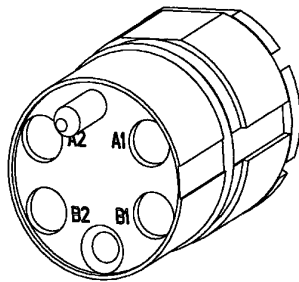
From left to right: Pro Beam, Pro Beam Jr. & Mini-Expanded Beam inserts.



**Product Facts**

- Light is expanded, collimated, and transmitted across an air gap
- Ball lens expands cross-sectional area of light over 200 times for multimode and over 2000 times for singlemode

**Expanded Beam Inserts**



- Unique patented Modular Design, for use with multi-mode and singlemode fiber
- Rugged hermaphroditic construction (i.e., same insert mates to each other)
- Three different insert sizes, up to four channels per insert
- Mini-Expanded Beam insert for multi-channel small form factor –the smallest expanded beam multi-channel insert in the industry, a Tyco Electronics exclusive
- Physically non-contacting mating conditions; no wear
- Easy to terminate and easy to clean
- Low transmission loss

**Expanded Beam Avionics-Related Standards and Specifications for ARINC 763 and 664**

**ARINC 763 –Avionics Network Server System**

AMP ARINC 600 Connectors are designed to meet/exceed 100 Base-FX Ethernet LAN applications

**Network Server Unit (NSU)** –can use ARINC 600 Size 1 connector with up to 8 Expanded Beam fiber optic channels (two Mini-Expanded Beam inserts in cavity C)

**Server Interface Unit (SIU)** –can use ARINC 600 Size 3 connector with up to 16 Expanded Beam fiber optic channels (four Mini-Expanded Beam inserts in cavity F)

**Integrated Network Server Unit (INSU)** –can use ARINC 600 Size 3 connector with up to 16 Expanded Beam fiber optic channels (four Mini-Expanded Beam inserts in cavity F)

**ARINC 664 –Aircraft Data Network**

AMP ARINC Connectors with Mini-Expanded Beam inserts will meet/exceed all 100 Base-FX Ethernet LAN applications



Connector/Cable Assembly  
Nomenclature

Expanded Beam Fiber Optic Products (Continued)

Part Number Nomenclature Example:	PSS	H	805	1	TN	500	4.8	FFC	F																										
<b>Left-End Connector</b>																																			
<p>PSS = Plug, ProBeam Sr. - Sealed                      PJS = Plug, ProBeam Jr. - Sealed                      P13 = Plug, MIL 38999 Shell Size 13 - Sealed                      P11 = Plug - MIL 38999 Shell Size 11 - Sealed                      BSS = Bulkhead Sr. - D-hole                      BFL = Bulkhead Jr. - Flange Mount - Sealed - Low Profile                      BPS = Bulkhead Jr. - Flange Mount - Sealed                      BFB = Bulkhead Jr. - Flange Mount - Sealed with Boot                      BFE = Bulkhead Jr. - Flange Mount - Environmental Sealed                      BDL = Bulkhead Jr. - D-Hole - Sealed - Low Profile                      BDS = Bulkhead Jr. - D-hole - Sealed                      BDB = Bulkhead Jr. - D-hole - Sealed with Boot                      BDE = Bulkhead Jr. - D-hole - Environmental Sealed                      B13 = Receptacle - MIL-38999 Shell Size 13 - Sealed                      B11 = Receptacle - MIL-38999 Shell Size 11 - Sealed                      ISS = Insert - Senior - sealed                      IJS = Insert - Junior - sealed                      IMS = Insert - Mini-sealed                      FFC = FC                      FSC = SC                      FST = ST                      FSM = SMA                      FLC = LC                      FCU = Customized                      XXX = Nothing</p>																																			
<p><b>Connector Finish (applicable to ProBeam &amp; 38999 Styles)</b>                      F = Nickel Plated (MIL 38999)                      G = Green Chromate                      H = Hard Anodized</p>																																			
<p><b>Mode/Wavelength</b>                      805 = Multimode, 850 nm - 50/125 µm                      806 = Multimode, 850 nm - 62.5/125 µm                      835 = Multimode 850, 1300 nm - 50/125 µm                      836 = Multimode 850, 1300 nm - 62.5/125 µm                      305 = Multimode, 1300 nm - 50/125 µm                      306 = Multimode, 1300 nm - 62.5/125 µm                      309 = Singlemode, 1310 nm - 9/125 µm                      509 = Singlemode, 1550 nm - 9/125 µm                      609 = Customized</p>																																			
<p><b>Number of Fibers</b>                      1                      2                      4</p>																																			
<p><b>Cable Type</b>                      TN = TYCO, non-radiation hard                      BN = MILLE, non-radiation hard, rodent resistant                      TR = TYCO, radiation hard                              BR = MILLE, radiation hard, rodent resistant                      CU = Customized</p>																																			
<p><b>Cable Length (Indicate Length in Meters)</b>                      1 meter through 2500 meters</p>																																			
<p><b>Cable Diameter (mm)</b>                      4.8 = ProBeam Connector and ProBeam Jr. Connectors                      00 = All other connectors</p>																																			
<p><b>Right-End Connector (use code from Left end or below)</b></p> <table border="0"> <tr> <td>PSS = Plug, ProBeam Sr. - Sealed</td> <td>B13 = Receptacle - MIL-38999 Shell Size 13 - Sealed</td> </tr> <tr> <td>PJS = Plug, ProBeam Jr. - Sealed</td> <td>B11 = Receptacle - MIL-38999 Shell Size 11 - Sealed</td> </tr> <tr> <td>P13 = Plug, MIL 38999 Shell Size 13 - Sealed</td> <td>ISS = Insert - Senior - sealed</td> </tr> <tr> <td>P11 = Plug - MIL 38999 Shell Size 11 - Sealed</td> <td>IJS = Insert - Junior - sealed</td> </tr> <tr> <td>BSS = Bulkhead Sr. - D-hole</td> <td>IMS = Insert - Mini-sealed</td> </tr> <tr> <td>BFL = Bulkhead Jr. - Flange Mount - Sealed - Low Profile</td> <td>FFC = FC</td> </tr> <tr> <td>BPS = Bulkhead Jr. - Flange Mount - Sealed</td> <td>FSC = SC</td> </tr> <tr> <td>BFB = Bulkhead Jr. - Flange Mount - Sealed with Boot</td> <td>FST = ST</td> </tr> <tr> <td>BFE = Bulkhead Jr. - Flange Mount - Environmental Sealed</td> <td>FSM = SMA</td> </tr> <tr> <td>BDS = Bulkhead Jr. - D-hole - Sealed</td> <td>FLC = LC</td> </tr> <tr> <td>BDB = Bulkhead Jr. - D-hole - Sealed with Boot</td> <td>FCU = Customized</td> </tr> <tr> <td>BDE = Bulkhead Jr. - D-hole - Environmental Sealed</td> <td>XXX = Nothing</td> </tr> <tr> <td>BDL = Bulkhead Jr. - D-Hole - Sealed - Low Profile</td> <td></td> </tr> </table>										PSS = Plug, ProBeam Sr. - Sealed	B13 = Receptacle - MIL-38999 Shell Size 13 - Sealed	PJS = Plug, ProBeam Jr. - Sealed	B11 = Receptacle - MIL-38999 Shell Size 11 - Sealed	P13 = Plug, MIL 38999 Shell Size 13 - Sealed	ISS = Insert - Senior - sealed	P11 = Plug - MIL 38999 Shell Size 11 - Sealed	IJS = Insert - Junior - sealed	BSS = Bulkhead Sr. - D-hole	IMS = Insert - Mini-sealed	BFL = Bulkhead Jr. - Flange Mount - Sealed - Low Profile	FFC = FC	BPS = Bulkhead Jr. - Flange Mount - Sealed	FSC = SC	BFB = Bulkhead Jr. - Flange Mount - Sealed with Boot	FST = ST	BFE = Bulkhead Jr. - Flange Mount - Environmental Sealed	FSM = SMA	BDS = Bulkhead Jr. - D-hole - Sealed	FLC = LC	BDB = Bulkhead Jr. - D-hole - Sealed with Boot	FCU = Customized	BDE = Bulkhead Jr. - D-hole - Environmental Sealed	XXX = Nothing	BDL = Bulkhead Jr. - D-Hole - Sealed - Low Profile	
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Notes:  
 Cable Adapter Kit — For ProBeam Connector and ProBeam Jr. Connectors; three versions for bulkheads, one for plugs.  
 Field Deployable Reel Size — Consult Tyco for available options.  
 Number of Fibers — May indicate if multiple connectors/inserts/ferrules are needed on either end.

### Expanded Beam Fiber Optic Products (Continued)

#### Connectors and Cable Assemblies

##### Product Facts

- Pro Beam Connector and Pro Beam Jr. Connectors are inter-mateable with other Expanded Beam Connectors in the market
- Singlemode and multimode connectors with proven high-performance during field use
- Easy termination suitable for field use
- Use 1 to 4 channel Expanded Beam inserts
- Cable connector plugs, standard bulkhead (d-hole cut out) and flange-mount bulkhead
- Cable connector plugs provide protection from harsh environments
- Cable adapter kits for bulkheads –standard, standard with boot, environmentally sealed with boot
- Descriptive nomenclature can be used to define connector and cable assembly requirements
- Spare parts are available



Plug

Bulkhead

Front Mount Square Flange

**Expanded Beam Fiber Optic Products** (Continued)

**Pro Beam Connectors**

**Typical Dimensions for Pro Beam Connectors**

**Performance Specifications**

**Optical, Multimode**

Insertion Loss, Typical -

0.5 - 1.0 dB @ 1300 nm

**Optical, Singlemode**

Insertion Loss, Typical -

0.5 - 1.0 dB @ 1310 nm

Return Loss -> 32 dB @ 1310 nm

**Mechanical**

**Vibration, Sinusoidal -**

10 - 500 Hz, 3 directions;  
0.75 mm amplitude @ 10g acceleration

**Bump -**4,000 Bumps, 3 directions

@ 40g acceleration

**Free Fall -**500 falls on concrete;

Severity 1.2 m

**Coupling Endurance -**

3,000 couplings

**Weight -**

Plug -290 grams, typical  
Chassis bulkhead -150 grams,  
typical

**Temperature**

**Operational Temperature -**

-40°C/+85°C

**Storage Temperature -**

-55°C/+85°C

**Temperature, Cyclic -**

-55°C/+85°C

**Damp Heat, Cyclic -**+55°C

**Corrosion**

**Salt -**Conforms

**Acid -**Conforms

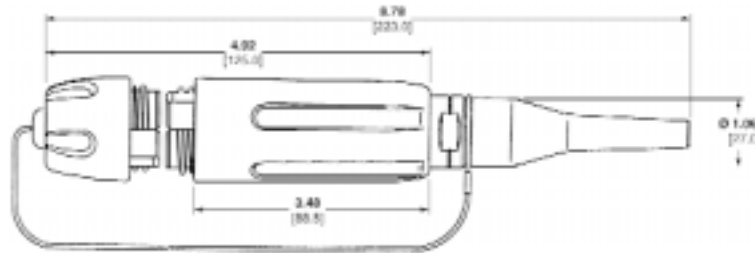
**Immersion**

**Water -**5 m depth

**Mud -**Conforms

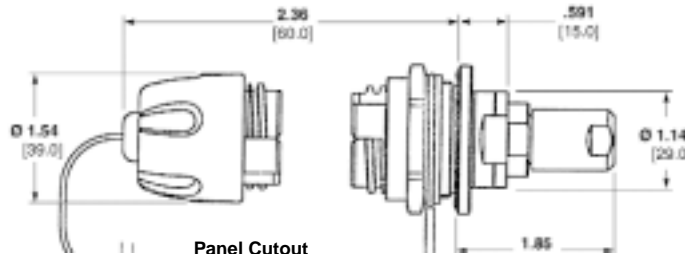
**Pressure**

**Low Pressure -**25 kPa @ -55°C



**Cable Connector, Plug**

**Front View  
Cap Removed**



**Panel Cutout**

**D-Hole Bulkhead with Standard Cable Adapter**

**Front View  
Cap Removed**

Also Square-flange Mount available, per drawing 1516133  
(reference drawing for dimensions)

**For Pro Beam designs, consult  
Tyco Electronics for availability.**

Dimensions on this page  
in inches over [mm]



Expanded Beam Fiber Optic Products (Continued)

Pro Beam Jr. Connectors

Performance Specifications

■ NATO Approved TL 6020-003

Optical, Multimode

Insertion Loss, Typical –  
0.3 - 0.8 dB @ 1300 nm

Optical, Singlemode Version

Insertion Loss, Typical –  
0.4 - 0.9 dB @ 1310 nm

Return Loss → 32 dB @ 1310 nm

Mechanical

Vibration, Sinusoidal –  
10 - 500 Hz, 3 directions:  
0.75 mm amplitude @ 10g acceleration

Bump –4,000 Bumps, 3 directions  
@ 40g acceleration

Free Fall –500 falls on concrete;  
Severity 1.2 m

Coupling Endurance –  
3,000 couplings

Weight –  
Plug –123 grams, typical  
D-Hole bulkhead –102 grams, typical

Temperature

Operational Temperature –  
-40°C/+85°C

Storage Temperature –  
-55°C/+85°C

Temperature, Cyclic –  
-55°C/+85°C

Damp Heat, Cyclic –+55°C

Corrosion

Salt –Conforms

Acid –Conforms

Immersion

Water –5 m depth

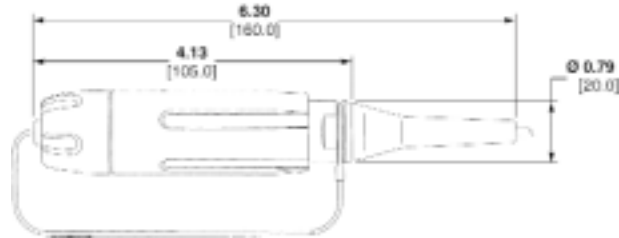
Mud –Conforms

Pressure

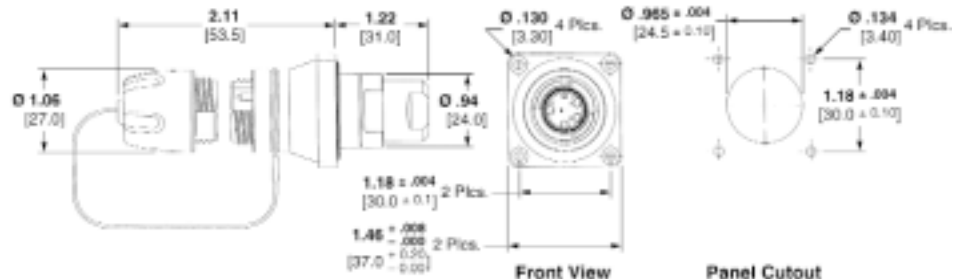
Low Pressure –25 kPa @ -55°C

Dimensions on this page  
in inches over [mm]

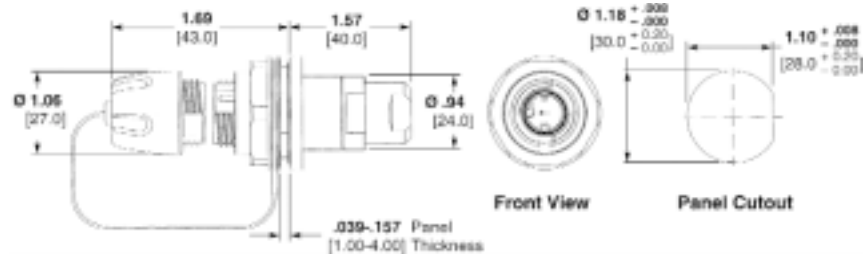
Typical Dimensions for Pro Beam Jr. Connectors



Cable Connector, Plug



Square Flange Mount Bulkhead,  
Standard Cable Adapter



D-Hole Bulkhead,  
Standard Cable Adapter



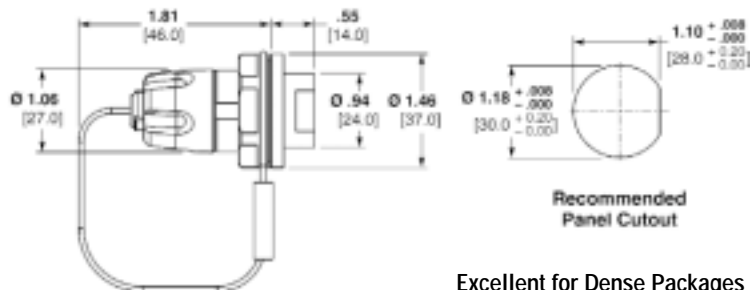
Standard Cable Adapter,  
with Boot

Environmentally Sealed Cable Adapter,  
with Boot



The new Low Profile Pro Beam Jr. Bulkhead rear flange depth dimension is 14mm, versus the standard bulkhead depth dimension of 40 mm.

“NEW” Low Profile Pro Beam Jr. Bulkhead



Excellent for Dense Packages and  
Harsh Environment Equipment.

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Cable Adapter Kits

Use with the Pro Beam Connector and Pro Beam Jr. Connector and Cable Assemblies

Expanded Beam Fiber Optic Products (Continued)

Composition of Typical Cable Adapter Kits:

	Bulkhead, Standard Cable Adapter	Bulkhead, Standard Cable Adapter with Boot	Bulkhead, Environmentally Sealed Cable Adapter, with boot	Cable Plug
Screw	X	X		
Extension	X	X		
Crimp Sleeve	X	X	X	X
Support Tube	X	X	X	X
Boot		X	X	X
Flat Washer			X	X
Cable Seal			X	X
Rear Extension			X	
Jam Nut			X	
O-ring			X	

Pro Beam Connector Plug Cable Adapter Kits

Cable Dia. (Max.)	AMP Part No.
.222 5.65	1515801-1*
.201 5.10	1515940-1*

Pro Beam Connector Bulkhead Cable Adapter Kits

Cable Dia. (Max.)	Style	AMP Part No.
.222 5.65	Standard Cable Adapter	1515724-2*
.197 5.00	Standard Cable Adapter	1515847-1*

Pro Beam Jr. Connector Plug Cable Adapter Kits

Cable Dia. (Max.)	AMP Part No.
.122 3.10	1515814-1
.142 3.60	1515781-3
.161 4.10	1515848-2
.181 4.60	1516147-1
.201 5.10	1515834-2
.222 5.65	1515827-2
.240 6.10	1515859-3
.264 6.70	1588116-1

Pro Beam Jr. Connector Bulkhead Cable Adapter Kits

Cable Dia. (Max.)	Style	AMP Part No.
.087 2.20	Standard Cable Adapter, with Boot	1515878-1
.122 3.10	Standard Cable Adapter	1515791-2
.126 3.20	Standard Cable Adapter, with Boot	1515810-3
.142 3.60	Standard Cable Adapter	1515808-1
.161 4.10	Environmentally Sealed Cable Adapter, with Boot	1515848-2
.165 4.20	Standard Cable Adapter, with Boot	1515839-2
.201 5.10	Standard Cable Adapter	1515835-2
.222 5.65	Standard Cable Adapter	1515829-1
.240 6.10	Standard Cable Adapter	1515796-2
4 x .118 4 x 3.00	Standard Cable Adapter	1515749-1

Dimensions on this page in inches over [mm]

Spare Parts

Components are available from Tyco Electronics for spare parts and repair. These items include boots, seals, protective caps, crimp support tubes and ferrule assemblies with springs. Contact Tyco Electronics or your local Sales Representative.

Protective Caps

Description	Part Number
Standard cap, for D-Hole Bulkhead, Pro Beam Jr. Connectors	1515868-1
Standard cap, for Flange-mount Bulkhead, Pro Beam Jr. Connectors	1515787-2
Standard cap, for connector plug, Pro Beam Jr. Connectors	1515867-1
Standard cap, for D-Hole Bulkhead, Pro Beam Connectors	1515726-2
Standard cap, for connector plug, Pro Beam Connectors	1515799-1
Standard cap, for Flange-mount Bulkhead, Pro Beam Connectors	1515769-1

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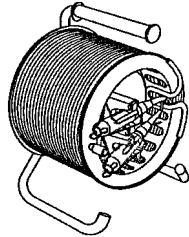
**Expanded Beam Fiber Optic Products** (Continued)

**Cable Assemblies and Accessories**

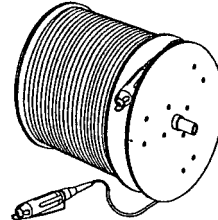
**Product Facts**

- Ruggedized cable assemblies custom tailored for field use in harsh environments
- Heavy-duty light-weight cable reel organizes and protects connectors and cable for easy pay-out and safe storage
- Reels available in 500 meter and 2000 meter versions
- Options for 500 meter reels include special Man-Pack harnesses, a separate reel stand, or a combination reel and reel stand

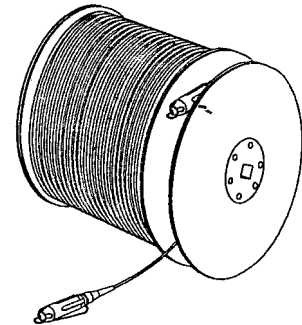
**Typical Reels and Reel Stands for Field-Deployable Cable Assemblies**



Part Number 1515900-1



Part Number 1515756-1

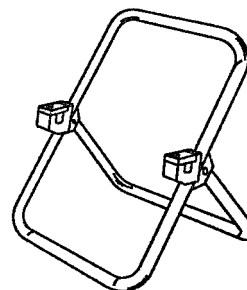


Part Number 1515757-1

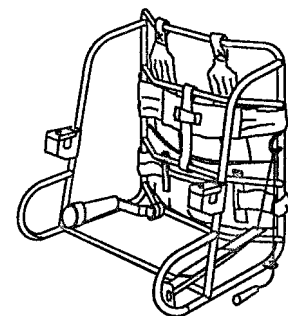
**Cable Reels**

Reel Capacity (2-fiber)	Max. Diameter	Width	Weight (kg)	Notes/Description	AMP Part No.
500 meters	13.78 350	11.42 290	6.4	Reel & Reel Stand Combination. Reel can be detached from stand without tools.	1515900-1*
500 meters	13.78 350	12.80 325	15.5	Fits on Man-Pack or Reel Stand	1515756-1*
2000 meters	21.65 550	17.91 455	58.5	For fixed installation on vehicle	1515757-1*

Dimensions on this page in inches over [mm]



Reel Stand  
Part Number 1515758-1



Man-Pack Harness  
Part Number 1515759-1

**Accessories**

Description	Dimension			Weight (kg)	AMP Part No.
	Height	Width	Length		
Reel Stand*	15.35 390	15.35 390	14.76 375	2	1515758-1**
Man-Pack Harness*	19.69 500	14.37 365	14.37 365	4.1	1515759-1**

\*For use with Part Number 1515756-1 reel.  
\*\*Consult Tyco Electronics for availability.



**Expanded Beam Fiber Optic Products** (Continued)

**MILLE Tactical Field Deployable Fiber Optic Cable for Extreme Environments (Metallic for Rodent Resistance)**

- NATO approved TL 6020-003



**MILLE 1 Fiber Singlemode and Multimode**

**Technical Data:**

Attenuation	≤ 0.4 dB/km @ 1310nm / ≤ 0.25 dB/km @ 1550nm
Diameter	3.4mm
Weight	18 kg/km
Minimum Bending Radius	30mm
Breaking Load	2000N
Crush Resistance	2500N/cm
Operating Temperature	-55° C to +85° C (Short -65° C to +160° C)

**MILLE 2 and 4 Fiber Singlemode and Multimode**

**Technical Data:**

Attenuation	≤ 0.4 dB/km @ 1310nm / ≤ 0.25 dB/km @ 1550nm
Diameter	3.8mm
Weight	21 kg/km
Minimum Bending Radius	35mm
Breaking Load	3000N
Crush Resistance	2 fiber = 1400N/cm 4 fiber = 1200N/cm
Operating Temperature	-55° C to +85° C (Short -65° C to +160° C)

**Non-Metallic Tactical Field Deployable Fiber Optic Cable**

**Product Facts**

- All terrain field deployable cable, up to 4 fibers, singlemode or multimode
- Developed for deployment under the most demanding conditions
- Tight buffered fibers are protected by Aramid yarns and a tough ruggedized polyurethane sheath
- Tested in accordance with DEF STAN 60-1 (PART 0)
- Flexible, water resistant, high crush resistant, lightweight, and nuclear proof

Other fibers (i.e. Polyimide, Silicon buffer, Carbon coated, radiation hardened, etc.) are available upon request.

Contact Tyco Electronics or your local Tyco Electronics Sales Representative for part numbers, pricing, and availability.

**Mil-Standard Breakout Cable - 1 Fiber Singlemode and Multimode**

**Technical Data:**

Attenuation	≤ 0.5 dB/km @ 1310nm / ≤ 0.5 dB/km @ 1550nm
Diameter	4.0mm
Weight	15 kg/km
Minimum Bending Radius	32mm
Breaking Load	≥ 700N
Crush Resistance	440N/cm
Operating Temperature	-55° C to +85° C

**Mil-Standard Breakout Cable - 2 Fiber Singlemode and Multimode**

**Technical Data:**

Attenuation	≤ 0.5 dB/km @ 1310nm / ≤ 0.5 dB/km @ 1550nm
Diameter	6.5mm
Weight	31 kg/km
Minimum Bending Radius	55mm
Breaking Load	≥ 2000N
Crush Resistance	440N/cm
Operating Temperature	-55° C to +85° C

**Mil-Standard Breakout Cable - 4 Fiber Singlemode**

**Technical Data:**

Attenuation	≤ 0.5 dB/km @ 1310nm / ≤ 0.5 dB/km @ 1550nm
Diameter	7.0mm
Weight	42 kg/km
Minimum Bending Radius	58mm
Breaking Load	≥ 2000N
Crush Resistance	440N/cm
Operating Temperature	-55° C to +85° C

**Mil-Standard Breakout Cable - 2 Fiber Multimode**

Fiber Type	50µm/125µm
Attenuation	≤ 3.0 dB/km @ 850nm / ≤ 1.0 dB/km @ 1300

**Mil-Standard Breakout Cable - 4 Fiber Multimode**

Fiber Type	50µm/125µm
Attenuation	≤ 3.0 dB/km @ 850nm / ≤ 1.0 dB/km @ 1300

**Expanded Beam Fiber Optic Products** (Continued)

**Additional Cable Assembly Hardware Options**



Reel on Stand with Carry Wrap



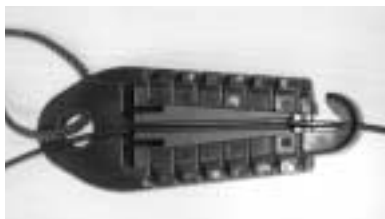
Backpack



Tactical Reel/Drum Options



Backpack with Reel



**Dielectric Fitting for MILLE 1-4F**

Army approved. Use to properly attach MILLE Cable tension points. Adjustable, with easy, one-handed usage. Securely grips cable without damage.



**Dead End Fitting for MILLE 1-4F**

Army approved. Use to properly attach MILLE Cable tension points. Non-adjustable. Securely grips cable without damage.

Contact Tyco Electronics or your local Tyco Electronics Sales Representative for part numbers, pricing, and availability.



Fiber Optic Products Catalog

Pro Beam/Pro Beam Jr.  
Connector Kit and  
Component Cross  
Reference(C18)

Expanded Beam Fiber Optic Products (Continued)

AMP Part No.	Connector	No. of Channels	Mode	Type	Wavelength
1515780-2	Pro Beam Jr.	1	Singlemode	Cable Plug	1310 nm
1588104-1	Pro Beam Jr.	1	Singlemode	Cable Plug	1550 nm
1588106-1	Pro Beam Jr.	1	Multimode	Cable Plug	850 nm
1588108-1	Pro Beam Jr.	1	Multimode	Cable Plug	1300 nm
1515789-3	Pro Beam Jr.	1	Singlemode	Bulkhead	1310 nm
1588105-1	Pro Beam Jr.	1	Singlemode	Bulkhead	1550 nm
1588107-1	Pro Beam Jr.	1	Multimode	Bulkhead	850 nm
1588109-1	Pro Beam Jr.	1	Multimode	Bulkhead	1300 nm
1515790-2	Pro Beam Jr.	1	Singlemode	Bulkhead, Flange Mount	1310 nm
1515832-2	Pro Beam Jr.	2	Multimode	Cable Plug	850/1300 nm
1515836-2	Pro Beam Jr.	2	Multimode	Cable Plug	1300 nm
1588106-2	Pro Beam Jr.	2	Multimode	Cable Plug	850 nm
1515833-2	Pro Beam Jr.	2	Multimode	Bulkhead	850/1300 nm
1515837-2	Pro Beam Jr.	2	Multimode	Bulkhead	1300 nm
1588107-2	Pro Beam Jr.	2	Multimode	Bulkhead	850 nm
1515850-1	Pro Beam Jr.	2	Singlemode	Cable Plug	1310 nm
1588104-2	Pro Beam Jr.	2	Singlemode	Cable Plug	1550 nm
1515852-1	Pro Beam Jr.	2	Singlemode	Bulkhead	1310 nm
1588105-2	Pro Beam Jr.	2	Singlemode	Bulkhead	1550 nm
1515805-1	Pro Beam Jr.	3	Singlemode	Cable Plug	1310 nm
1588104-3	Pro Beam Jr.	3	Singlemode	Cable Plug	1550 nm
1515795-3	Pro Beam Jr.	3	Singlemode	Bulkhead, Flange Mount	1310 nm
1588110-1	Pro Beam Jr.	3	Singlemode	Bulkhead	1310 nm
1588105-3	Pro Beam Jr.	3	Singlemode	Bulkhead	1550 nm
1588629-1	Pro Beam Jr.	4	Multimode	Low Profile Blkhd	1300 nm
1515826-2	Pro Beam Jr.	4	Multimode	Cable Plug	1300 nm
1588106-3	Pro Beam Jr.	4	Multimode	Cable Plug	850 nm
1588111-1	Pro Beam Jr.	4	Multimode	Cable Plug	850/1300 nm
1515748-1	Pro Beam Jr.	4	Multimode	Bulkhead	850/1300 nm
1515828-2	Pro Beam Jr.	4	Multimode	Bulkhead	1300 nm
1588107-3	Pro Beam Jr.	4	Multimode	Bulkhead	850 nm
1588881-1	Pro Beam Jr.	4	Singlemode	Flange Mt Blkhd	1310 nm
1588882-1	Pro Beam Jr.	4	Singlemode	Low Profile Blkhd	1310 nm
1515851-1	Pro Beam Jr.	4	Singlemode	Cable Plug	1310 nm
1588104-4	Pro Beam Jr.	4	Singlemode	Cable Plug	1550 nm
1515853-1	Pro Beam Jr.	4	Singlemode	Bulkhead	1310 nm
1588105-4	Pro Beam Jr.	4	Singlemode	Bulkhead	1550 nm
—	Pro Beam	2	Multimode	Bulkhead, Flange Mount	1300 nm
—	Pro Beam	2	Multimode	Cable Plug	850 nm
—	Pro Beam	2	Multimode	Cable Plug	1300 nm
—	Pro Beam	2	Multimode	Cable Plug	850/1300 nm
—	Pro Beam	2	Multimode	Bulkhead	850 nm
—	Pro Beam	2	Multimode	Bulkhead	1300 nm
—	Pro Beam	2	Multimode	Bulkhead	850/1300 nm
—	Pro Beam	2	Singlemode	Cable Plug	1310 nm
—	Pro Beam	2	Singlemode	Cable Plug	1550 nm
—	Pro Beam	2	Singlemode	Bulkhead	1310 nm
—	Pro Beam	2	Singlemode	Bulkhead	1550 nm
—	Pro Beam	4	Multimode	Bulkhead, Flange Mount	1300 nm
—	Pro Beam	4	Multimode	Cable Plug	850 nm
—	Pro Beam	4	Multimode	Cable Plug	1300 nm
—	Pro Beam	4	Multimode	Cable Plug	850/1300 nm
—	Pro Beam	4	Multimode	Bulkhead	850 nm
—	Pro Beam	4	Multimode	Bulkhead	1300 nm
—	Pro Beam	4	Multimode	Bulkhead	850/1300 nm
—	Pro Beam	4	Singlemode	Cable Plug	1310 nm
—	Pro Beam	4	Singlemode	Cable Plug	1550 nm
—	Pro Beam	4	Singlemode	Bulkhead	1310 nm
—	Pro Beam	4	Singlemode	Bulkhead	1550 nm

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Expanded Beam Fiber Optic Products (Continued)

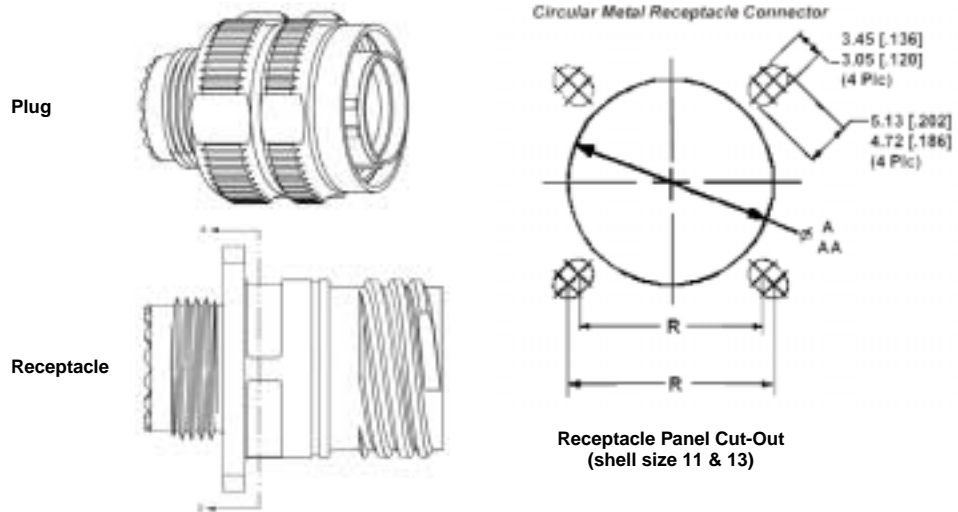
“NEW” “Mini” Expanded Beam for Harsh Environments



“Mini” Expanded Beam

Product Facts

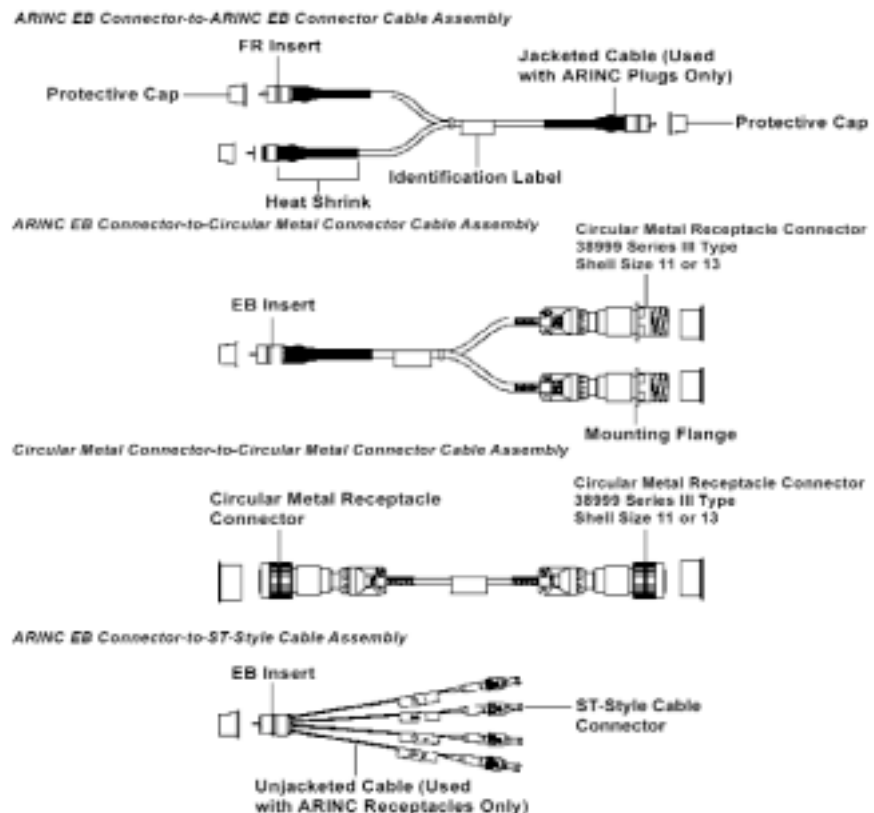
- Available in shell size 11, housed on D38999 Series III style shells for harness applications



Panel Cut-Out Dimensions

Shell Size	A Dia. Min. Back Panel	AA Dia. Min. Front Panel	R1	R2
10-11	20.22 .796	15.88 .625	20.62 .812	18.26 .719
12-13	23.42 .922	19.05 .750	23.01 .906	20.62 .812

Typical Assemblies for In Flight Network Applications



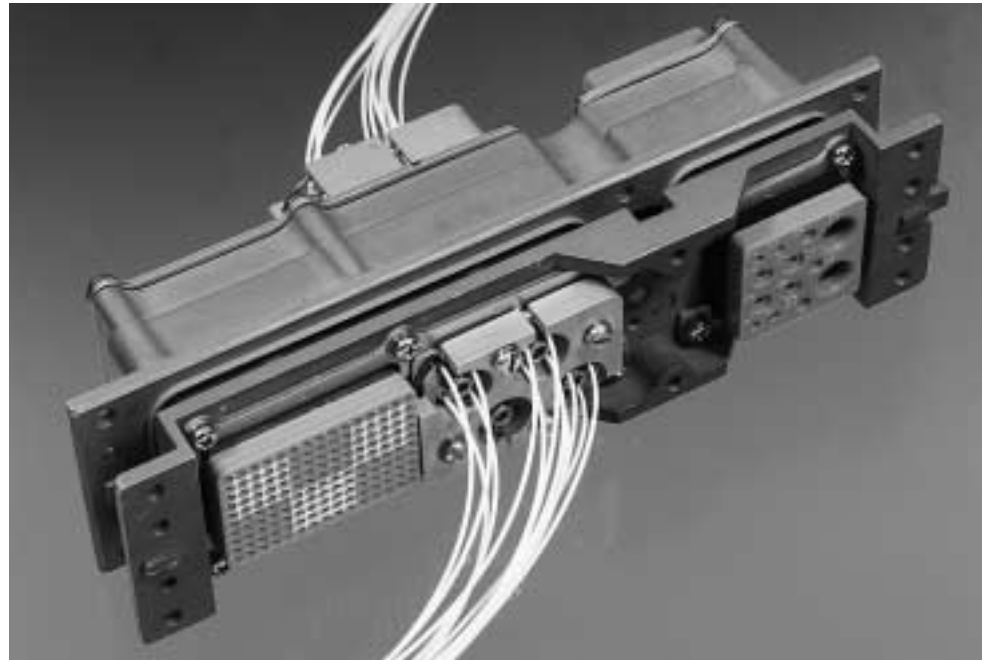
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**Expanded Beam Fiber Optic Products** (Continued)

**ARINC 600 AND 404**

**Product Facts**

- For use in 100 base-FX Ethernet LAN applications per ARINC 664 and ARINC 763
- For Mini-Expanded Beam and Jr. Expanded Beam inserts
- Insert holders designed to ARINC 600, Supplement 13 or to specific customer needs
- Drop-In Insert Holders utilize Standard ARINC 404 and 600 Retainers
  - Hard Stop on Plug Side
  - Spring-Loaded Stop on Receptacle Side
  - Captive Hardware
- Facial Sealing –Optional
  - Bonded to Receptacle Block Mating Face
  - Raised Collar Seal around Optics Insert compresses against Chamfer on Plug Block Mating Face

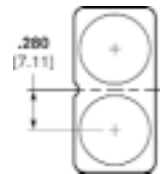


**ARINC 600 Insert Holders for Mini-Expanded Beam Contacts**

**Size 1  
Power Cavities**



ARINC 600, 1 Position  
1MP

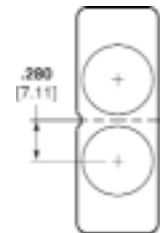


ARINC 600, 2 Position  
2MP

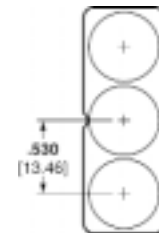
**Size 1  
Signal Cavities**



ARINC 600, 1 Position  
1MS

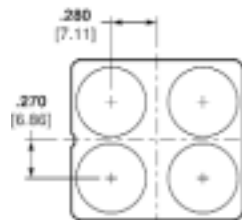


ARINC 600, 2 Position  
2MS

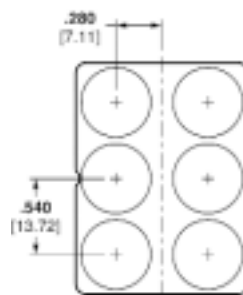


ARINC 600, 3 Position  
3MS

**Size 2 / 3  
Power and Signal Cavities**



ARINC 600, 4 Position  
4MP



ARINC 600, 6 Position  
6MS

Dimensions on this page  
in inches over [mm]

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For drawings, technical data or samples, contact your Tyco Electronics sales engineer, call 1-800-522-6752, or visit our Website at: <http://www.amp.com/fiberoptics>. Specifications subject to change. Consult Tyco Electronics for latest specifications.

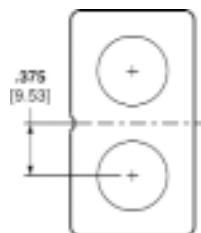
**Expanded Beam Fiber Optic Products** (Continued)

**ARINC 600 Insert Holders  
for Jr. Expanded Beam  
Contacts**

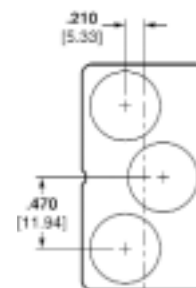
Size 2 & 3  
Signal Cavities



ARINC 600, 1 Position  
1JS



ARINC 600, 2 Position  
2JS

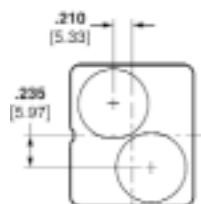


ARINC 600, 3 Position  
3JS

Size 2 & 3  
Power Cavities



ARINC 600, 1 Position  
1JP

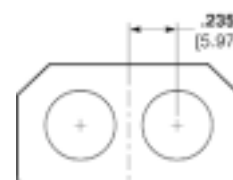


ARINC 600, 2 Position  
2JP

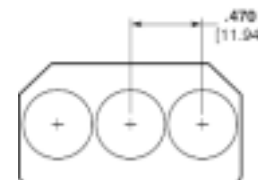
**ARINC 404 Insert Holders  
for Mini-Expanded Beam  
Contacts**



ARINC 404, 1 Position  
M1



ARINC 404, 2 Position  
M2

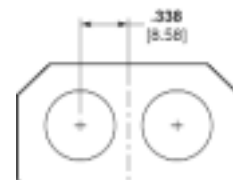


ARINC 404, 3 Position  
M3

**ARINC 404 Insert Holders  
for Jr. Expanded Beam  
Contacts**



ARINC 404, 1 Position  
J1



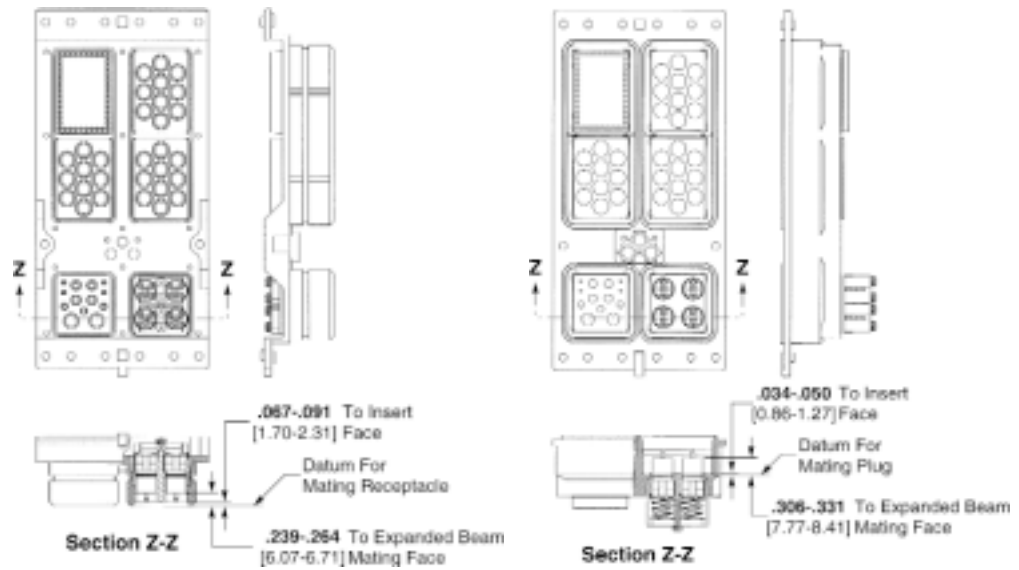
ARINC 404, 2 Position  
J2

Dimensions on this page  
in inches over [mm]

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**Expanded Beam Fiber Optic Products** (Continued)

**ARINC 600 Insert Holders  
for Mini-Expanded Beam  
Contacts**



Dimensions on this page  
in inches over [mm]

**Comparative on Expanded Beam Inserts' weight  
when applied to an ARINC housing**

- ARINC 600 connector mated pair size 2 = 440 grams (without copper contacts)
- ARINC style Mini and Junior size Expanded Beam inserts = 5 pounds insertion force each when applied to the Rack and Panel ARINC Connector inserts
- Signal Cavity Optical Holder insert (i.e.: holds up to six mini inserts with four fiber ball lenses each or up to 24 fibers each insert set) = @ 30 grams
- Power Cavity Optical Holder insert (i.e.: holds up to four mini inserts with four fiber ball lenses each or up to 16 fibers each insert set) = @ 20 grams
- Insert mated pair Pro Beam Jr. insert set = @ 41.79 grams
- Insert mated pair Pro Beam mini insert set = @ 16.17 grams
- Fiber = single fiber ≤ 4 kg / km
- Fiber = four fiber jacketed with a support member ≤ 24 kg / km
- Static spring force per mated Expanded Beam insert pair = 5 lbs.

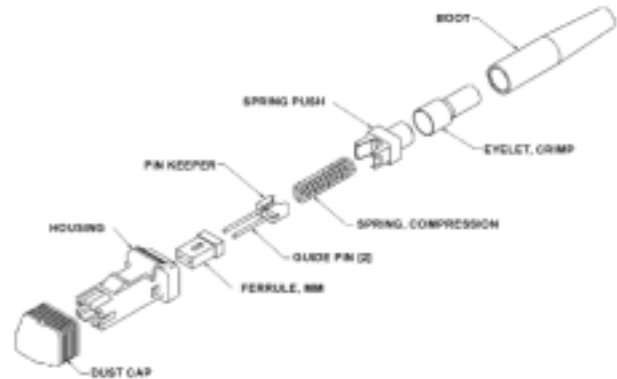
**MT-RJ Connectors**

**Product Facts**

- Designed to meet TIA/EIA 568B.3
- Wide industry and electronics supplier acceptance and support
- Multimode and singlemode versions for existing and future network applications
- MT-RJ Plug is half the size of duplex SC and ST connectors
- MT-RJ Jack is installable in conventional RJ-45 faceplates and outlet boxes
- MT-RJ Jack is easily terminated –no epoxy or polishing and can be re-terminated, making moves, adds, and changes less expensive
- Intuitive RJ-45 type latching mechanism
- MT-RJ Plug kits available in multimode and single-mode versions for both Mini DUALAN and Mini Zipcord cable

**MT-RJ Plugs**

The MT-RJ plugs are available in multimode and singlemode versions, with or without guide pins, for both Mini DUALAN and Mini Zipcord cable. The MT-RJ plug components are bulk packaged in quantities of 100 to make it easy for cable assembly houses to distribute the product to the assembly area.



Description	Part Number
MT-RJ Multimode Plug Kit without guide pins for Mini DUALAN Cable	1278398-1
MT-RJ Multimode Plug Kit with guide pins for Mini DUALAN Cable	1278398-2
MT-RJ Singlemode Plug Kit without guide pins for Mini DUALAN Cable	1278399-1
MT-RJ Singlemode Plug Kit with guide pins for Mini DUALAN Cable	1278399-2
MT-RJ Multimode Plug Kit without guide pins for Mini Zipcord Cable	1278750-1
MT-RJ Multimode Plug Kit with guide pins for Mini Zipcord Cable	1278750-2
MT-RJ Singlemode Plug Kit without guide pins for Mini Zipcord Cable	1278751-1
MT-RJ Singlemode Plug Kit with guide pins for Mini Zipcord Cable	1278751-2

**MT-RJ Workstation Jack**

This two-fiber, pre-polished, epoxyless and reusable fiber jack fits into existing RJ-45 style jack workstation faceplate openings and most conventional wall boxes. The MT-RJ workstation jack length has been reduced so that it is now comparable to a copper jack.

This feature reduces the possible interference with outlet boxes or furniture raceway systems. It can be re-terminated and is suitable for use with industry standard fiber cable or ribbon fiber innovations. The kit includes a one-piece jack, 110 housing, 900µm fiber guide, actuator key, and dust cover.

Description	Part Number
MT-RJ Jack, Multimode 50/125µm (black housing)	1278414-1
MT-RJ Jack, Multimode 62.5/125µm (almond housing)	1278415-1

**Note:** Workstation jack housings are available in other colors. Please contact your local Tyco Electronics sales representative for more information.

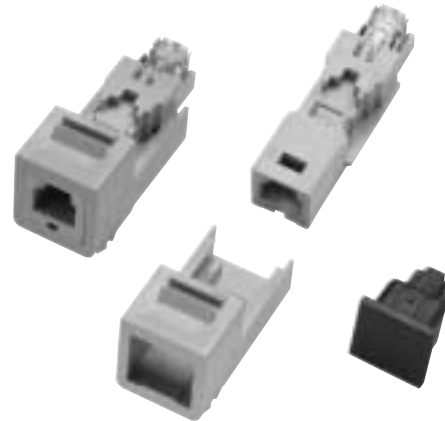
Special secure "Keyed" Jacks and Cable Assemblies are now available. Please contact your local Tyco Electronics sales representative for more information.

**MT-RJ Connectors** (Continued)

**MT-RJ High Density Patch Panel Jack**

High-density, two-fiber jacks are epoxyless, reusable and pre-polished for consistent performance. Jacks fit into 6-position snap-in adapter plate in the AMP Solarum Patch Panel, which enables 24 ports in a 1U space, equaling the density of

copper. The jacks also fit into a snap-in adapter plate for use in existing rack and wall mount enclosures. Jacks are used with industry standard fiber cable or ribbon fiber innovations. The kit includes 6 patch panel jacks, 250µm and 900µm fiber guides, 2 actuator keys, icon wheel (beige = MM, blue = SM), and dust covers.

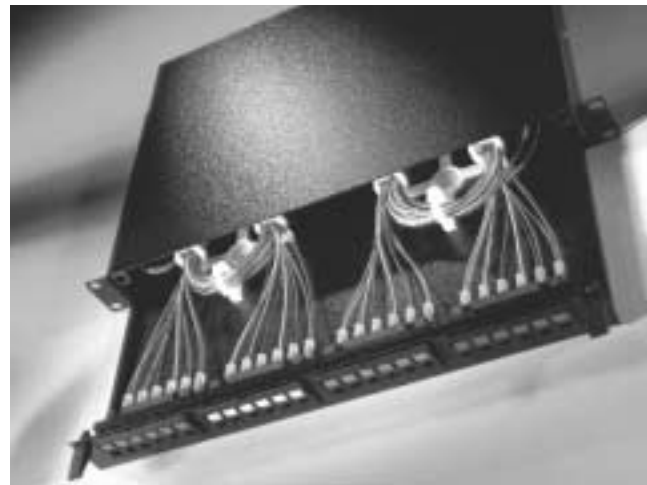


Description	Part Number
MT-RJ Jacks Multimode 50/125µm (pack of 6 pieces) with actuator key and icon labeling	1278303-1
MT-RJ Jack, Multimode 62.5/125µm (pack of 6 pieces) with actuator key and icon labeling	1278303-2
MT-RJ Jacks, Multimode 50/125 µm (XG (pack of 6 pieces) with actuator key and icon labeling	1278303-4

**Solarum MT-RJ Optical Patch Panel**

AMP Solarum MT-RJ optical patch panels feature 24-port (48 fiber) capacity in a 1U high rack mounted enclosure and offer twice the fiber density of conventional patch panels. Features include pre-installed cable management, rugged cable entry

strain relief, and a sliding, tilt-out drawer for easy termination of tight buffer or loose tube cable. Adjustable mounting brackets allow the user to mount the enclosure in forward, flush or recessed positions. The patch panel is supplied ready for MT-RJ jack installation.



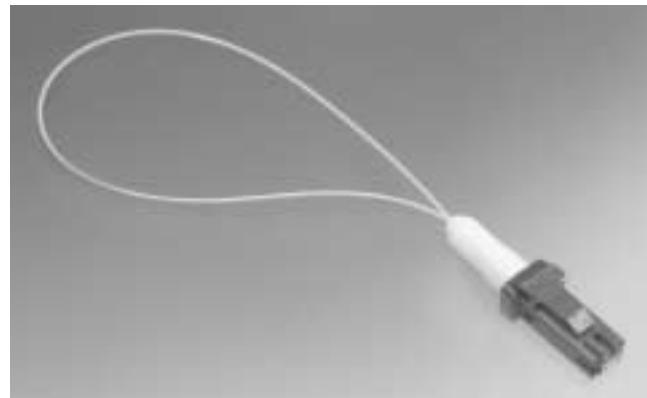
Description	Part Number
Solarum 1U Patch Panel with four, six-position MT-RJ interface housing Cable Management Rings (2 pieces), Cable Glands PG16, PG13.5, Dust Caps (24 pieces). (Jack modules not included)	1206704-4

**MT-RJ Cable Assemblies**

See Cable Assemblies & Backplane Interconnects Section 2, page 70-73.

**MT-RJ Loopbacks**

Description	Part Number
MT-RJ to Singlemode Loopback	1278358-1
MT-RJ to Multimode Loopback, 50/125µm	1278357-1
MT-RJ to Multimode Loopback, 62.5/125µm	1278153-1



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**MT-RJ Connectors** (Continued)

**MT-RJ Snap-In Adapter Plate**

The MT-RJ snap-in adapter plate manages six MT-RJ Patch panel jacks (ordered separately). The adapter plate is designed to fit into existing rack and wall mount enclosures with the benefit of industry standard labels and icons for port identification.

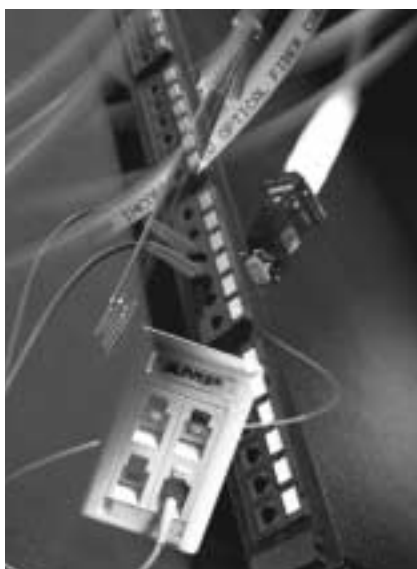


Description	Part Number
MT-RJ Snap-In Adapter Plates (Jack modules not included)	1278328-3

The MT-RJ Optical Fiber Cabling System is designed to remove the last great hurdle in the way of economical fiber networking: The size of the connectors and the resulting high price.

The MT-RJ connector is a little smaller than a standard phone jack, and it's just as easy to connect and disconnect. It's half the size of the SC connector it was designed to replace, so it offers twice the port density of traditional fiber connectors. And it's designed to fit into conventional RJ-45 faceplates and patch panel cutouts, minimizing the equipment needed for conversion to fiber.

Fiber networking is more cost-effective than ever. MT-RJ is the cabling system that's making it happen.



**MT-RJ Termination Tool Kits**

Description	Part Number
MT-RJ Plug Termination Kit Tool Kit for termination of the MT-RJ Plug in handy plastic case. Contents are as follows: Cleave Pen, Jacket/Buffer/Coating Stripper, Kevlar Shears, Strip Template, Cable Clamps, Cure Fixtures, Crimp Tool, Die Sets, Epoxy Dispensers	1278745-1
MT-RJ Jack Termination Kit Tool Kit for termination of the MT-RJ Jacks in handy soft case. Contents are as follows: Cleave Tool, Buffer/Coating Strip Tool, Micro Stripper, Kevlar Shears, MT-RJ Jack Strip Length Template, Actuator Key, Alcohol Wipes	1278346-1
Universal Termination Kit Tool Kit for termination of LightCrimp, LightCrimp Plus, and MT-RJ Jacks	1278949-1



**CORELINK Splice**

**Product Facts**

- Permanent, easy-to-use fiber splice
- Reusable
- High performance for singlemode and multimode
- Designed to TIA/EIA 568-b.3
- Clamping mechanism prevents torsional failure
- Accommodates both 250 μm and 900 μm buffers

**Applications**

- Outside Plant
- Fiber-in-the-Loop
- Fiber-to-Jumper Splicing
- Premises Networks
- Testing
- Emergency Restoration

**Performance**

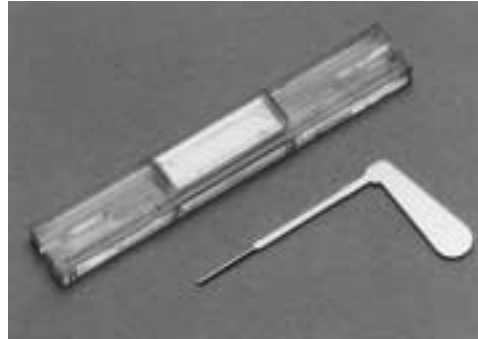
**Characteristics**

- Mean Splice Loss -- <0.3 dB
- Mean Return Loss -- >26 dB
- Temperature Range -- 0° to 60° C

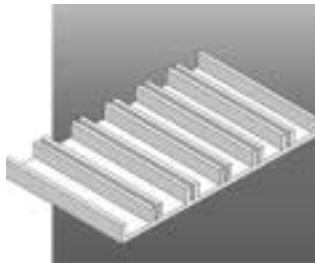
The CORELINK splice is an easy-to-use, high-performance mechanical splice for 125 μm single-mode and multimode fibers. Its unique clamping mechanism is activated with a simple key; no other tooling is required. The transparent material allows the crafts person to both see and feel the fiber position. CORELINK is re-mateable — either fiber can be removed and replaced in the splice at any time.

CORELINK can be housed in a variety of splice trays for placement in closures, ONUs, and fiber enclosures.

Instruction Sheet 408-4019



Description	Part Number
CORELINK splices - 12 pack - Includes 2 keys (singlemode)	503577-1
CORELINK splices - 12 pack - Includes 2 keys (multimode)	503901-1
2 Replacement keys in key holder	503681-1
Holder for up to 6 CORELINK splices - Mount on splice trays or in distribution boxes	559066-1
Splice Tray - Holds up to 12 CORELINK splices - for use in AMP closures and distribution boxes	559067-1



1.5" x 2.4" elastomer holder for 6 CORELINK splices. Mount on splice trays or in distribution boxes.



**AMP CORELINK Splice Workstation**  
Part Number 503605-1

Instruction Sheet 408-4131



**Splice Tray-holds 12 splices**  
Part Number 559067-1



**Universal Fiber Optic Cleaving Tool**  
Part Number 503924-1

**LightCrimp Plus No Polish ST and SC Connectors**

**LightCrimp Plus Connectors**

**Product Facts**

- Meets TIA/EIA 568-B.3
- Meets IEC 11801 with insertion loss of .75 dB Max as tested per Design Objectives 108-1923 (ST) and 108-1881 (SC)
- Easiest and quickest fiber termination available
- No polishing needed – just strip, cleave and crimp
- No curing
- XG version now available for 10 Gbs (10GBASESR) applications



Style	Fiber Type	Ferrule	Part Number
ST	Multimode, 62.5/125	Ceramic	492642-1
ST	Multimode, 50/125	Ceramic	1278082-1
Simplex SC	Multimode, 62.5/125	Ceramic	492643-1
Simplex SC	Multimode, 50/125	Ceramic	1278079-1
Duplex SC	Multimode 62.5/125	Ceramic	1278009-1
Duplex SC	Multimode, 50/125	Ceramic	1278080-1
Simplex SC 'XG'	Multimode, 50/125	Ceramic	1588291-1
Duplex SC 'XG'	Multimode, 50/125	Ceramic	1588292-1

**Performance Characteristics**

Insertion Loss –0.75 dB Max as tested per Design Objectives 108-1923 (ST) and 108-1881 (SC)

Temperature Range --10° to 60° C

Durability –500 cycles

**Instruction Sheets:**

- ST 408-4457
- SC Simplex 408-4471
- SC Duplex 408-8603

**LightCrimp Plus Termination Kits and Upgrade Kits**



**LightCrimp Plus Termination Kits**

Description	Part Number
Combination LightCrimp Plus ST & SC, and MT-RJ Jack type termination kit includes crimp tool, ST and SC die set, stripper tools, kevlar shears, ST and SC cable holder and cleave tool	1278118-1
ST termination kit includes crimp tool, ST die set, stripper tools, kevlar shears, cable holder and cleave tool	492697-1
SC termination kit includes crimp tool, SC die set, stripper tools, kevlar shears, cable holder and cleave tool	1278022-1

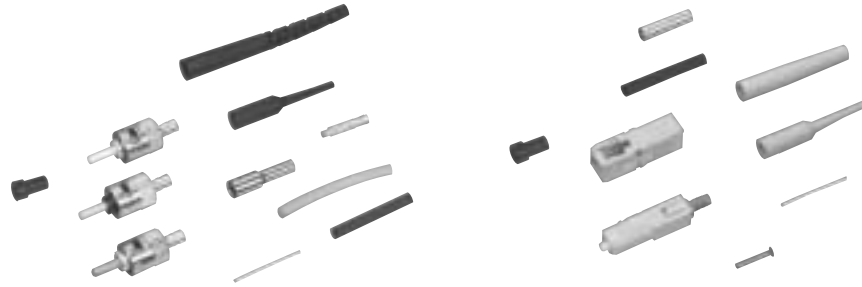
**LightCrimp Plus Individual Tools**

Description	Part Number
LightCrimp to LightCrimp Plus Upgrade Tool Kit (with die sets)	492702-1
LightCrimp to LightCrimp Plus Upgrade Tool Kit (without die sets)	492702-2
Crimper with Die -Set, ST	492623-1
Crimper with Die -Set, SC	492782-1
Die Set only, ST	492622-1
Die Set only, SC	492783-1
Cleaver, ST and SC	492674-1
Cable Holder/Template, ST	492703-1
Cable Holder/Template, SC	1278023-1

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**LightCrimp Epoxyless ST and SC Connectors**

LightCrimp Epoxyless Connectors



**Product Facts**

- Singlemode or multimode ST
- Just crimp it on the fiber and polish
- No epoxy
- 2-minute termination
- Innovative crimp design
- Compliant with TIA/EIA-568-B.3
- No epoxy or adhesives
- Shorter assembly time
- Reduced polishing time

- Lower installed cost
- Secure, repeatable matings
- No need for curing oven or power supply
- Consistent performance over a wide range of temperatures

**Performance Characteristics**

Insertion Loss -0.4 dB Typical  
Temperature Range --40° to 65° C  
Durability -500 cycles

Instruction Sheet 408-4066 (SC)  
Instruction Sheet 408-9860 (ST)

Style	Fiber Type	Ferrule	Part Number
ST	Multimode	Polymer	492168-1
ST	Multimode	Stainless Steel	504034-1
ST	Multimode	Ceramic	504001-1
ST	Singlemode	Ceramic	504000-1
SC Simplex	Multimode	Ceramic	503692-1
SC Duplex	Multimode	Ceramic	503693-1

**LightCrimp Termination Kits - Epoxyless**

ST Kits

Description	Part Number
Termination Kit No Microscope	503330-1
Termination Kit with Premium Microscope	503330-2
Termination Kit with Pocket Microscope	503330-3
Mini Tool Kit	492322-1

SC Kits

Description	Part Number
Termination Kit No Microscope	503706-1
Termination Kit Premium Microscope	503706-2



Combo ST and SC Kits

Description	Part Number
Termination Kit No Microscope	503957-1
Termination Kit with Premium Microscope	503957-2
Termination Kit with Pocket Microscope	503957-3
Mini-Combo Termination Kit	492543-1
Universal LightCrimp Cleave Tool	503705-1

**MPO Connectors**

**Product Facts**

- Tested to Telecordia GR-1435
- Push Pull Latching
- 4, 8, 12, OR 24 fibers
- Color-coded housings differentiate singlemode and multimode:
  - Multimode - Beige
  - Singlemode - Green
- Manufactured to IEC Standards 1754-7 and TIA/EIA 604-5

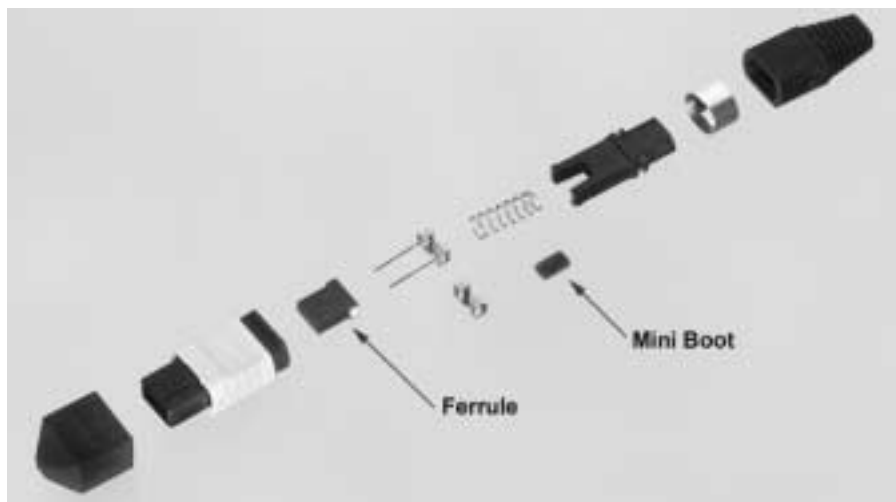
**Industry Standard Performance Characteristics**

**Singlemode**

Insertion Loss (Typ) -0.25 dB  
 Insertion Loss (Max) -0.75 dB  
 Return Loss -> 55 dB

**Multimode**

Insertion Loss (Typ) -0.2 dB  
 Insertion Loss (Max) -0.5 dB  
 Return Loss -> 20 dB



**MPO Connector Kit Selection - Plug Kits**

Fiber Type	Female (no pins)	Male (with pins)
Singlemode	1457981-1	1457981-2
Multimode	1457983-1	1457983-2

**Note:** Ferrules and Mini-Boots are sold separately. See chart below for proper part numbers.



**MPO Ferrule Kit with Mini-Boot**

Fiber Type	4 Position	8 Position	12 Position
Singlemode	492221-1	492221-2	492221-3
Multimode	503839-1	503839-2	503839-3

**Crimping Tool with Dieset**

**1588698-1**



**MPO Adapters**

Adapter Type	Single Pack	50 pc Bulk Pack
Adapter w/flange	1588172-1	1588172-5
Adapter w/flange and clip	1588172-2	1588172-6
Adapter w/o flange	1588172-3	1588172-7
Adapter w/o flange and clip	1588172-4	1588172-8

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**LIGHTRAY OFX™ Optical Fiber Circuit**

(See Fiber Management, Packaged Solutions, Sub Systems, and Laser Process Section 3, page 109)

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**LC Cable Assemblies**

**Product Facts**

- For high performance applications/high density
- 125 $\mu$ m Ceramic Ferrule Technology
- Small size –1/2 size of standard SC and FC products
- Singlemode and multimode
- Tuned singlemode assemblies
- High performance small size cable
  - 900 $\mu$ m buffered fiber assemblies
  - 1.6mm cable assemblies
- Hybrid assemblies available with all standard connectors
- Hybrid SC's and FC's terminated to 1.6mm cable and 900 $\mu$ m buffered fiber
- Factory terminated/factory tested



LC Cable Assembly

**Performance Characteristics**

- Insertion loss
  - Singlemode .25 dB maximum < .1 dB Typical
  - Multimode .1 dB typical .1 dB Typical  $\sigma$
- Return loss
  - Singlemode 55 dB – PC endface
  - Multimode 20 dB



Hybrid LC-SC Cable Assembly



# Fiber Optic Products Catalog

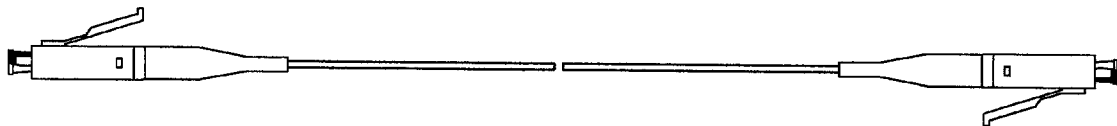
## LC Cable Assemblies (Continued)

Description	Cable Type	Part Numbers/Lengths (m)						
		1	2	3	4	5	10	
<b>Simplex</b>								
Singlemode	LC to LC	900 micron	1374518-1	1374518-2	1374518-3	1374518-4	1374518-5	1-1374518-0
		1.6mm jacketed Riser	1374110-1	1374110-2	1374110-3	1374110-4	1374110-5	1-1374110-0
	LC to SC	900 micron	1374610-1	1374610-2	1374610-3	1374610-4	1374610-5	1-1374610-0
		1.6mm jacketed Riser	1374611-1	1374611-2	1374611-3	1374611-4	1374611-5	1-1374611-0
50/125µm Multimode	LC to LC	900 micron	1660038-1	1660038-2	1660038-3	1660038-4	1660038-5	1-1660038-0
		1.6mm jacketed Riser	1374656-1	1374656-2	1374656-3	1374656-4	1374656-5	1-1374656-0
	LC to SC	900 micron	1374108-1	1374108-2	1374108-3	1374108-4	1374108-5	1-1374108-0
		1.6mm jacketed Riser	1374612-1	1374612-2	1374612-3	1374612-4	1374612-5	1-1374612-0
62.5/125µm Multimode	LC to LC	1.6mm jacketed Riser	1374109-1	1374109-2	1374109-3	1374109-4	1374109-5	1-1374109-0
	LC to SC	1.6mm jacketed Riser	1374614-1	1374614-2	1374614-3	1374614-4	1374614-5	1-1374614-0
<b>Duplex</b>								
Singlemode	LC to LC	1.6mm jacketed Riser	1374657-1	1374657-2	1374657-3	1374657-4	1374657-5	1374657-6
	LC Duplex to SC Duplex	1.6mm jacketed Riser	1457072-1	1457072-2	1457072-3	1457072-4	1475072-5	1-1457072-0
	2 LC Simplex to 2 SC Simplex	1.6mm jacketed Riser	1374515-1	1374515-2	1374515-3	1374515-4	1374515-5	1-1374515-0
	LC to MT-RJ	1.8mm jacketed Riser	1374645-1	1374645-2	1374645-3	1374645-4	1374645-5	1-1374645-0
50/125µm Multimode	LC to LC	1.6mm jacketed Riser	1374658-1	1374658-2	1374658-3	1374658-4	1374658-5	1-1374658-0
	LC to SC	1.6mm jacketed Riser	1374613-1	1374613-2	1374613-3	1374613-4	1374613-5	1-1374613-0
	LC to MT-RJ	1.8mm jacketed Riser	1374647-1	1374647-2	1374647-3	1374647-4	1374647-5	1-1374647-0
62.5/125µm Multimode	LC to LC	1.6mm jacketed Riser	1374659-1	1374659-2	1374659-3	1374659-4	1374659-5	1-1374659-0
	LC to SC	1.6mm jacketed Riser	1374615-1	1374615-2	1374615-3	1374615-4	1374615-5	1-1374615-0
	LC to MT-RJ	1.8mm jacketed Riser	1374646-1	1374646-2	1374646-3	1374646-4	1374646-5	1-1374646-0

### LC Loopbacks

Description	Part Number	
	Singlemode	Multimode
LC Loopback	1457047-1	1457048-1
	1457048-1	1457049-1
	1457049-1	

### 900µm Buffer, Singlemode LC to LC, Optimate



### 1.6mm ZIPCORD, Singlemode LC Simplex to SC Simplex

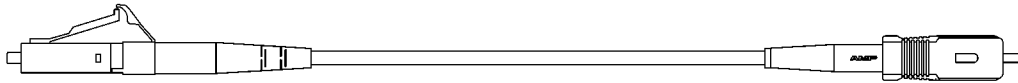


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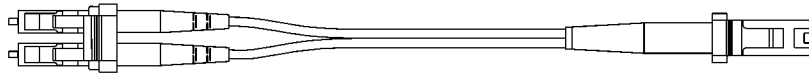
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**LC Cable Assemblies** (Continued)

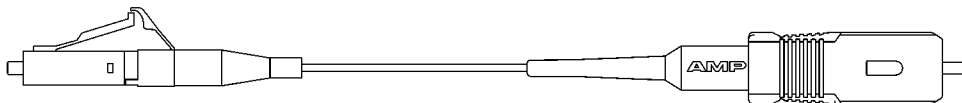
LC to Simplex SC  
1.6mm cable



LC Duplex to MT-RJ



LC Simplex to SC  
on 900µm buffered fiber



LC Duplex to LC Duplex



**MU Cable Assemblies**

**Product Facts**

- Can be used with MU backplane connectors (Z-Pack 2mm HM type L and M connector housings) for complete backplane or board to board solution
- 1.25 mm ferrule design
- Polarized to ensure precise insertion
- High density (up to 8 lines per module)
- "Push Pull" (SC style) latching mechanism
- Fully compliant with:
  - 1.25mm ferrule design IEC60917 and IEC 61076-4-101
  - IEC 60874-1
  - CECC 86 305 801 (MU-APC)
  - JIS C-5970
  - I-ETS 300 671
  - IEC 61300



**MU Cable Assemblies**

Description	Part Numbers		
	1 Meter	2 Meters	3 Meters
LC to MU Board Plug Singlemode 900µm	1457327-1	—	—
LC to MU 62.5/125 900µm	1457328-1	—	—
MU to SC Singlemode 900µm	1457329-1	1457329-2	1457329-3
MU to SC 62.5/125 900µm	1457330-1	1457330-2	1457330-3
MU to MU Singlemode Buffered	1457482-1	1457482-2	1457482-3
MU to MU Singlemode 2mm	1457523-1	1457523-2	1457523-3
MU to SC Singlemode 2.0mm	1588145-1	1588145-2	—

Other lengths available upon request.

**Performance Characteristics**

**Insertion Loss –**

Singlemode: 0.3 dB Max  
<0.1dB Typical  
Multimode: 01.dB Typical

**Return Loss –**

Singlemode: 55 dB - PC endface  
Typical  
>65 dB - APC endface  
Multimode: 20dB

**MU Boardplug Pigtails**

MU boardplug pigtails are designed for use with female Z-PACK 2mm HM housings on the daughter-card. Available with 900µm buffered fiber and in lengths of 1 meter as standard, custom lengths are available upon request.



Fiber Size (µm)	Endface	Cable Type	Length (meter)	Part Number
9/125	PC	900µm pigtail	1	106751-1
9/125	APC	900µm pigtail	1	106752-1
50/125	PC	900µm pigtail	1	1206077-1
62.5/125	PC	900µm pigtail	1	1206078-1



**SC & FC Singlemode Cable Assemblies**

**SC-SC Style Cable Assemblies**

**Product Facts**

- Composite body w/ ceramic ferrule
- Compliant with:
  - JIS C-5973
  - ANSI X3T11 Fibre Channel
  - TIA 568
- Insertion Loss:
  - 0.2 dB typical
  - 0.5 dB maximum



SC/APC Connectors

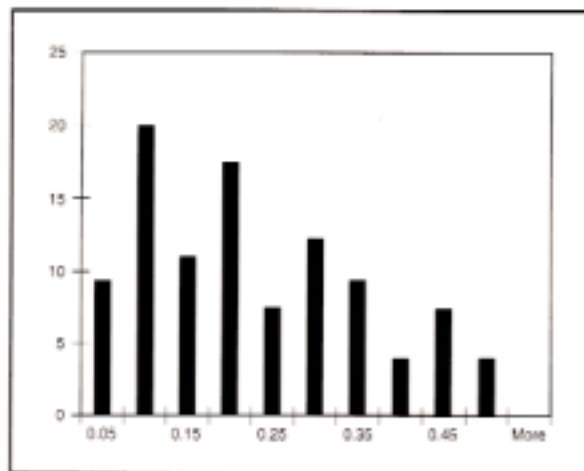


SC/UPC to SC/UPC Cable Assembly

Description	Min. Return Loss	Cable Diameter	Part Numbers				
			Length (m)				
			1	3	5	10	15
<b>Single-Fiber Jumpers</b>							
Simplex SC/APC to SC/APC	65 dB	3.0mm	492188-1	492188-3	492188-5	1-492188-0	1-492188-5
	65 dB	900µm	504678-1	504678-3	504678-4	504678-5	—
	55 dB	3.0mm	492015-1	492015-3	492015-4	492015-5	492015-6
Simplex SC/UPC to SC/UPC	55 dB	2.0mm	1278236-1	1278236-3	1278236-5	1-1278236-0	1-1278236-5
	55 dB	900µm	492276-1	492276-3	492276-5	1-492276-0	—
Simplex SC/UPC to SC/APC	55/65 dB	3.0mm	492191-1	492191-3	492191-5	1-492191-0	1-492191-5
<b>Single-Fiber Pigtails</b>							
Simplex SC/APC	65 dB	3.0mm	492193-1	492193-3	492193-5	1-492193-0	1-492193-5
	55 dB	3.0mm	492081-1	492081-3	492081-5	1-492081-0	1-492081-5
Simplex SC/UPC	55 dB	2.0mm	1278242-1	1278242-3	1278242-5	1-1278242-0	1-1278242-5
	55 dB	900µm	492065-1	492065-3	492065-5	1-492065-0	1-492065-5
<b>Two-Fiber Jumpers — Zipcord</b>							
Duplex SC/UPC to Duplex SC/UPC	55 dB	3.0mm	492019-1	492019-3	492019-4	492019-5	492019-6
(2) Simplex SC/UPC to (2) Simplex SC/UPC	55 dB	3.0mm	492207-1	492207-3	492207-5	1-492207-0	1-492207-5

All cable OFNR (Riser).

**Typical Insertion Loss  
SC Connector on Singlemode Fiber at 1300 nm**



Number of readings: 100  
Average reading: 0.20 dB

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**SC & FC Singlemode Cable Assemblies** (Continued)

**FC-FC Style Cable Assemblies**

**Product Facts**

- Composite body w/ ceramic ferrule
- Compliant with:
  - JIS C-5970
  - IEC 1754-13-1
  - TIA 504.4 (FOCIS-4)
- Insertion Loss:
  - 0.2 dB typical
  - 0.5 dB maximum



FC/APC Connectors

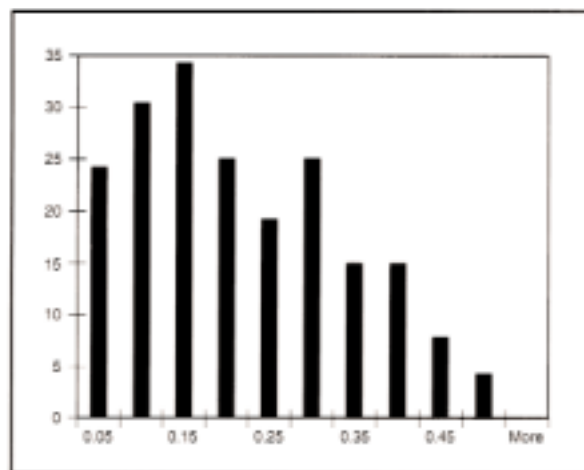


FC/UPC to FC/UPC Cable Assembly

Description	Min. Return Loss	Cable Diameter	Part Numbers				
			Length (m)				
			1	3	5	10	15
<b>Single-Fiber Jumpers</b>							
Simplex FC/APC to FC/APC	65 dB	3.0mm	492187-1	492187-3	492187-5	1-492187-0	1-492187-5
	65 dB	900µm	503868-1	503868-3	503868-5	—	—
Simplex FC/UPC to FC/UPC	55 dB	3.0mm	492014-1	492014-3	492014-4	492014-5	492014-6
	55 dB	2.0mm	1278240-1	1278240-3	1278240-5	1-1278240-0	1-1278240-5
	55 dB	900µm	492230-1	492230-3	492230-5	1-492230-0	—
Simplex FC/UPC to FC/APC	55/65 dB	3.0mm	492190-1	492190-3	492190-5	1-492190-0	1-492190-5
<b>Single-Fiber Pigtailed</b>							
Simplex FC/APC	65 dB	3.0mm	492192-1	492192-3	492192-5	1-492192-0	1-492192-5
	55 dB	3.0mm	492194-1	492194-3	492194-5	1-492194-0	1-492194-5
Simplex FC/UPC	55 dB	2.0mm	1278244-1	1278244-3	1278244-5	1-1278244-0	1-1278244-5
	55 dB	900µm	1278247-1	1278247-3	1278247-5	1-1278247-0	1-1278247-5
<b>Two-Fiber Jumpers — Zipcord</b>							
(2) Simplex FC/UPC to (2) Simplex FC/UPC	55 dB	3.0mm	492022-1	492022-3	492022-4	492022-5	492022-6

All cable OFNR (Riser).

**Typical Insertion Loss  
FC Connector on Singlemode Fiber at 1300 nm**



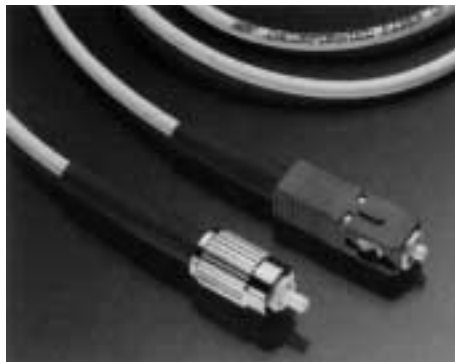
Number of readings: 200  
Average reading: 0.20 dB

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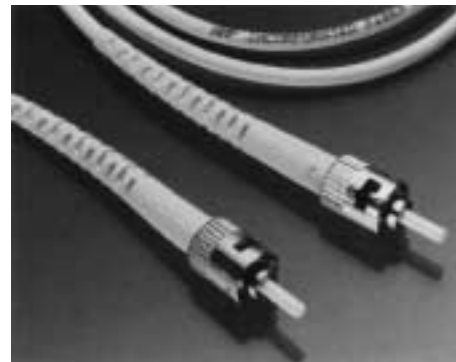
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**SC & FC Singlemode Cable Assemblies** (Continued)

Hybrid FC/SC and Other Cable Assemblies



FC/UPC to SC/UPC Cable Assembly



ST/UPC Cable Assembly

Description	Min. Return Loss	Part Numbers				
		Length (m)				
		1	3	5	10	15
<b>Stocked Assemblies (FC/SC Hybrid)</b>						
Simplex FC/APC to SC/APC	65 dB	492189-1	492189-3	492189-5	1-492189-0	1-492189-5
Simplex FC/UPC to SC/UPC	55 dB	492017-1	492017-3	492017-4	492017-5	492017-6
<b>Other Simplex Assemblies</b>						
Simplex SC/ST	55 dB	492016-1	492016-3	492016-4	492016-5	492016-6
Simplex FC/ST	55 dB	492018-1	492018-3	492018-4	492018-5	492018-6
Simplex ST/ST	55 dB	502796-1	502796-3	502796-5	1-502796-0	1-502796-1
<b>Other Duplex Assemblies</b>						
SC Duplex/FC	55 dB	492021-1	492021-3	492021-4	492021-5	492021-6
SC Duplex/ST Style	55 dB	492020-1	492020-3	492020-4	492020-5	492020-6
ST/ST Style	55 dB	503162-1	503162-3	503162-5	1-503162-0	1-503162-1

Insertion Loss: 0.5 dB Max., 0.2 dB Typical, when measured against a Reference Lead.  
All cable 3mm OFNR (Riser).

**ST & SC Multimode Cable Assemblies**

**ST-Style**

Description	Ferrule Type	Part Numbers				
		Length (m)				
		1	2	3	5	10
ST-ST, Simplex, 62.5/125, Riser	Ceramic	1278789-1	1278789-2	1278789-3	1278789-4	1278789-7
ST-ST, Zipcord, 62.5/125, Riser	Ceramic	503995-1	503995-2	503995-3	503995-4	503995-5
ST-ST, Zipcord, 62.5/125, Riser	Polymer	503994-1	503994-2	503994-3	503994-4	503994-5
ST/ST, Zipcord, 50/125, Riser	Ceramic	1278207-1	1278207-2	1278207-3	1278207-5	1-1278207-0



**SC-Style**

Description	Ferrule Type	Part Numbers				
		Length (m)				
		1	2	3	5	10
SC-SC, Simplex, 62.5/125, Riser	Ceramic	504970-1	504970-2	504970-3	504970-4	504970-5
SC-SC, Zipcord, 62.5/125, Riser	Ceramic	492050-1	492050-2	492050-3	492050-4	492050-5
SC Dup-SC Dup, Zipcord, 62.5/125, Riser	Ceramic	504971-1	504971-2	504971-3	504971-4	504971-5
SC Dup-SC Dup, Zipcord, 62.5/125, Riser	Polymer	492249-1	492249-2	492249-3	492249-5	1-492249-0
SC-ST, Simplex, 62.5/125, Riser	Ceramic	504972-1	504972-2	504972-3	504972-4	504972-5
SC Dup-ST, Zipcord, 62.5/125, Riser	Ceramic	504958-1	504958-2	504958-3	504958-4	504958-5
SC Dup-ST, Zipcord, 62.5/125, Riser	Polymer	492250-1	492250-2	492250-3	492250-5	1-492250-0

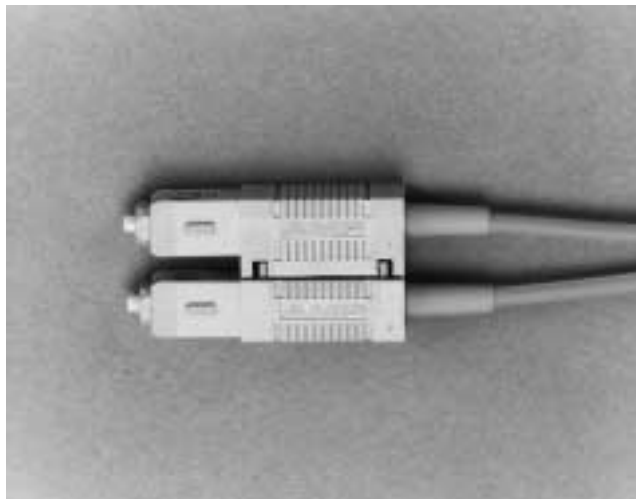
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**Fibre Channel Fiber Optic Assemblies**

**Product Facts**

- Specified connector float assures intermateability with all Fibre Channel compliant devices
- Connector's minimal metal contact helps contain RFI/EMI
- Assemblies available with riser & plenum grade cable
- Custom cable assembly lengths available
- 50/125µm multimode fiber
- 62.5/125µm multimode fiber



Multimode	Ferrule Material	Fiber Size	Riser or Plenum	Part Numbers				
				Length (m)				
				1	2	3	5	10
SC Dup/SC Dup Zipcord	Ceramic	50/125	Plenum	1278016-1	1278016-2	1278016-3	1278016-5	1-1278016-0
SC Dup/SC Dup, Zipcord	Ceramic	62.5/125	Riser	1374040-1	1374040-2	1374040-3	1374040-5	1-1374040-0
SC Dup/SC Dup, Zipcord	Ceramic	62.5/125	Plenum	1374039-1	1374039-2	1374039-3	1374039-5	1-1374039-0
SC Dup-SC Dup, Zipcord	Ceramic	50/125	Riser	504969-1	504969-2	504969-3	504969-4	504969-5
SC Dup-ST, Zipcord	Ceramic	62.5/125	Riser	1374038-1	1374038-2	1374038-3	1374038-5	1-1374038-0
SC Dup-ST, Zipcord	Ceramic	50/125	Riser	492591-1	492591-2	492591-3	492591-5	1-492591-0

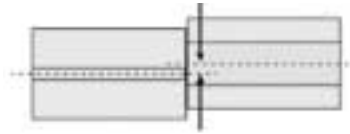
**“NEW” Mode Conditioning Cable Assemblies**



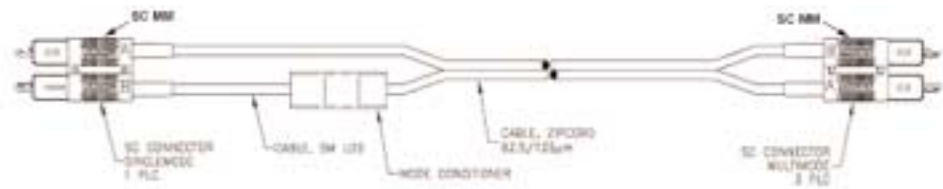
**“NEW” Mode Conditioning Patch Cords**

**Product Facts**

- Allows use of SM Gigabit Ethernet equipment with MM installed fiber
- Designed for Longwave (-LX) multimode applications for Gigabit Ethernet Compliant with IEEE-802.3z
- Masks Differential Mode Delay (DMD) signal degradation
- Functions the same as a standard patchcord



Singlemode Centerline Offset From Multimode Centerline



Description	Part Number		
	1 Meter	2 Meters	3 Meters
<b>SC — SC Mode Conditioning Patch Cords</b>			
SC Duplex/SC Duplex, SM 62.5	1206821-1	1206821-2	1206821-3
<b>LC — SC Mode Conditioning Patch Cords</b>			
LC Duplex/SC Duplex, SM 62.5	1588844-1	1588844-2	1588844-3



**MT-RJ Cable Assemblies**

MT-RJ two-fiber cable assemblies are factory terminated and tested. They enable connection directly to MT-RJ based electronics or to legacy products (SC or ST based) via hybrid assemblies.

Secure MT-RJ Plugs mate with like-colored MT-RJ Jacks only. Secure MT-RJ Assemblies have one standard plug and one secure plug.

Custom lengths or configurations for all cable assemblies are available upon request.



**MT-RJ to MT-RJ**

Description	Part Number / Lengths				
	1 meter	2 meters	3 meters	5 meters	10 meters
MT-RJ to MT-RJ Singlemode Cable Assembly	1278033-1	1278033-2	1278033-3	1278033-5	1-1278033-0
MT-RJ to MT-RJ Multimode Cable Assembly 50/125µm	1278128-1	1278128-2	1278128-3	1278128-5	1-1278128-0
MT-RJ to MT-RJ Multimode Cable Assembly 62.5/125µm	1278032-1	1278032-2	1278032-3	1278032-5	1-1278032-0

**Note:** Custom Lengths are available.

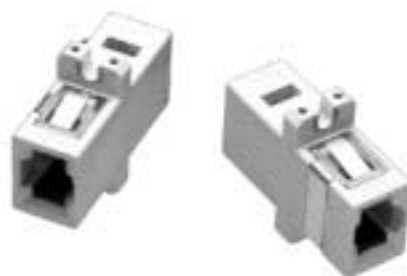
**MT-RJ Secure to MT-RJ**

Description	Part Number / Lengths				
	1 meter	2 meters	3 meters	5 meters	10 meters
MT-RJ Secure Red to MT-RJ Multimode Cable Assembly 50/125µm	1278873-1	1278873-2	1278873-3	1278873-5	1-1278873-0
MT-RJ Secure Red to MT-RJ Multimode Cable Assembly 62.5/125µm	1278890-1	1278890-2	1278890-3	1278890-5	1-1278890-0
MT-RJ Secure Yellow to MT-RJ Multimode Cable Assembly 50/125µm	1278874-1	1278874-2	1278874-3	1278874-5	1-1278874-0
MT-RJ Secure Yellow to MT-RJ Multimode Cable Assembly 62.5/125µm	1278891-1	1278891-2	1278891-3	1278891-5	1-1278891-0
MT-RJ Secure Green to MT-RJ Multimode Cable Assembly 50/125µm	1278875-1	1278875-2	1278875-3	1278875-5	1-1278875-0
MT-RJ Secure Green to MT-RJ Multimode Cable Assembly 62.5/125µm	1278892-1	1278892-2	1278892-3	1278892-5	1-1278892-0
MT-RJ Secure Blue to MT-RJ Multimode Cable Assembly 50/125µm	1278876-1	1278876-2	1278876-3	1278876-5	1-1278876-0
MT-RJ Secure Blue to MT-RJ Multimode Cable Assembly 62.5/125µm	1278893-1	1278893-2	1278893-3	1278893-5	1-1278893-0

**Note:** Custom Lengths are available.

**MT-RJ to MT-RJ Adapter**

Part Number 1278017-1



**MT-RJ Cable Assemblies** (Continued)



**MT-RJ to SC**

Description	Part Number / Lengths				
	1 meter	2 meters	3 meters	5 meters	10 meters
MT-RJ to SC (Duplex) Singlemode Cable Assembly	1278031-1	1278031-2	1278031-3	1278031-5	1-1278031-0
MT-RJ to SC (Duplex -Ceramic Ferrule) Multimode Cable Assembly 50/125µm	1278126-1	1278126-2	1278126-3	1278126-5	1-1278126-0
MT-RJ to SC (Duplex - Ceramic Ferrule) Multimode Cable Assembly 62.5/125µm	1278028-1	1278028-2	1278028-3	1278028-5	1-1278028-0
MT-RJ to SC (Simplex) Multimode Cable Assembly 50/125µm	1278127-1	1278127-2	1278127-3	1278127-5	1-1278127-0
MT-RJ to SC (Simplex) Multimode Cable Assembly 62.5/125µm	1278030-1	1278030-2	1278030-3	1278030-5	1-1278030-0

**Note:** Custom Lengths are available.

**MT-RJ Secure to SC**

Description	Part Number / Lengths				
	1 meter	2 meters	3 meters	5 meters	10 meters
MT-RJ Secure Red to SC (Duplex) Multimode Cable Assembly 50/125µm	1278877-1	1278877-2	1278877-3	1278877-5	1-1278877-0
MT-RJ Secure Red to SC (Duplex) Multimode Cable Assembly 62.5/125µm	1278894-1	1278894-2	1278894-3	1278894-5	1-1278894-0
MT-RJ Secure Yellow to SC (Duplex) Multimode Cable Assembly 50/125µm	1278878-1	1278878-2	1278878-3	1278878-5	1-1278878-0
MT-RJ Secure Yellow to SC (Duplex) Multimode Cable Assembly 62.5/125µm	1278895-1	1278895-2	1278895-3	1278895-5	1-1278895-0
MT-RJ Secure Green to SC (Duplex) Multimode Cable Assembly 50/125µm	1278879-1	1278879-2	1278879-3	1278879-5	1-1278879-0
MT-RJ Secure Green to SC (Simplex) Multimode Cable Assembly 62.5/125µm	1278896-1	1278896-2	1278896-3	1278896-5	1-1278896-0
MT-RJ Secure Blue to SC (Duplex) Multimode Cable Assembly 50/125µm	1278880-1	1278880-2	1278880-3	1278880-5	1-1278880-0
MT-RJ Secure Blue to SC (Simplex) Multimode Cable Assembly 62.5/125µm	1278897-1	1278897-2	1278897-3	1278897-5	1-1278897-0

**Note:** Custom Lengths are available.

**MT-RJ Cable Assemblies** (Continued)



**MT-RJ to ST**

Description	Part Number / Lengths				
	1 meter	2 meters	3 meters	5 meters	10 meters
MT-RJ to ST Singlemode Cable Assembly	1278298-1	1278298-2	1278298-3	1278298-5	1-1278298-0
MT-RJ to ST (Ceramic Ferrule) Multimode Cable Assembly 50/125 $\mu$ m	1278199-1	1278199-2	1278199-3	1278199-5	1-1278199-0
MT-RJ to ST (Ceramic Ferrule) Multimode Cable Assembly 62.5/125 $\mu$ m	1278027-1	1278027-2	1278027-3	1278027-5	1-1278027-0

**Note:** Custom Lengths are available.

**MT-RJ Secure to ST**

Description	Part Number / Lengths				
	1 meter	2 meters	3 meters	5 meters	10 meters
MT-RJ Secure Red to ST Multimode Cable Assembly 50/125 $\mu$ m	1278881-1	1278881-2	1278881-3	1278881-5	1-1278881-0
MT-RJ Secure Red to ST Multimode Cable Assembly 62.5/125 $\mu$ m	1278898-1	1278898-2	1278898-3	1278898-5	1-1278898-0
MT-RJ Secure Yellow to ST Multimode Cable Assembly 50/125 $\mu$ m	1278882-1	1278882-2	1278882-3	1278882-5	1-1278882-0
MT-RJ Secure Yellow to ST Multimode Cable Assembly 62.5/125 $\mu$ m	1278899-1	1278899-2	1278899-3	1278899-5	1-1278899-0
MT-RJ Secure Green to ST Multimode Cable Assembly 50/125 $\mu$ m	1278883-1	1278883-2	1278883-3	1278883-5	1-1278883-0
MT-RJ Secure Green to ST Multimode Cable Assembly 62.5/125 $\mu$ m	1278900-1	1278900-2	1278900-3	1278900-5	1-1278900-0
MT-RJ Secure Blue to ST Multimode Cable Assembly 50/125 $\mu$ m	1278884-1	1278884-2	1278884-3	1278884-5	1-1278884-0
MT-RJ Secure Blue to ST Multimode Cable Assembly 62.5/125 $\mu$ m	1278901-1	1278901-2	1278901-3	1278901-5	1-1278901-0

**Note:** Custom Lengths are available.

**MT-RJ Cable Assemblies** (Continued)

**MT-RJ Test Kits**

**Product Facts**

- Each Test Kit includes:
  - 2 - MT-RJ Adapters
  - 1 - ST-Style or SC to MT-RJ (no pins) Cable Assembly
  - 1 - MT-RJ to MT-RJ Cable Assembly
  - 2 - Dual ST-Style or SC to MT-RJ (with pins) Cable Assembly
  - 1 - Carrying case label
  - 1 - Carrying case



Description	Part Number	
MT-RJ to ST-Style	Multimode 50/125µm	1278861-2
	Multimode 62.5/125µm	1278862-2
	Singlemode	1278863-2
MT-RJ to ST-Style Secure	Multimode 50/125µm	1278861-5
	Multimode 62.5/125µm	1278862-5
	Singlemode	1278863-5
MT-RJ to SC	Multimode 50/125µm	1278861-1
	Multimode 62.5/125µm	1278862-1
	Singlemode	1278863-1
MT-RJ to SC Secure	Multimode 50/125µm	1278861-4
	Multimode 62.5/125µm	1278862-4
	Singlemode	1278863-4

**MT-RJ Test Leads**

MT-RJ test leads are divided into two primary categories:

- Launch Leads –made for use with standard test equipment
- OTDR Launch Leads – long lengths (100 meters) to deal with “dead zone” of OTDR equipment

**Standard MT-RJ Launch Leads**

Fiber Description	Part Number		
	MT-RJ — SC Simplex	MT-RJ — ST	MT-RJ — MT-RJ
No Pins, 62.5 Fiber	1435092-1	1435094-1	1435096-1
No Pins, 50/125 Fiber	1435092-2	1435094-2	1435096-2
No Pins, Singlemode	1435092-3	1435094-3	1435096-3
Pins, 62.5 Fiber	1435092-4	1435094-4	1435096-4
Pins, 50/125 Fiber	1435092-5	1435094-5	1435096-5
Pins, Singlemode	1435092-6	1435094-6	1435096-6

**OTDR MT-RJ Launch Leads (100 meter length)**

Part Number	Fiber Description
1588079-1	MT-RJ (No Pins) SC Simplex, 62.5/125 Fiber, 100 meters
1588080-1	MT-RJ (No Pins) SC Simplex, 50/125 Fiber, 100 meters

**MT-RJ Loopbacks**

Description	Part Number	
MT-RJ Loopback	Multimode 50/125µm	1278357-1
	Multimode 62.5/125µm	1278153-1
	Singlemode	1278358-1



**MPO Cable Assemblies**

**MPO to MPO Trunk Cable Assemblies**

**Product Facts**

- Quick connection of 12 fibers
- Pulling socks protect connectors during installation
- Available in 50µm or 62.5µm multimode and singlemode



Description	UL/NEC Ratings	Part Number
12 Fiber, Pair-Flipped (AB/BA)	Multimode 62.5/125µm	Plenum 1435024-X
		Riser 1435032-X
	Multimode 50/125µm	Plenum 1435028-X
		Riser 1435036-X
	Singlemode	Plenum 1435070-X
		Riser 1435071-X
24 Fiber, Pair-Flipped (AB/BA)	Multimode 62.5/125µm	Plenum 1435025-X
		Riser 1435033-X
	Multimode 50/125µm	Plenum 1435029-X
		Riser 1435037-X
36-Fiber, Pair-Flipped (AB/BA)	Multimode 62.5/125µm	Plenum 1435026-X
		Riser 1435034-X
	Multimode 50/125µm	Plenum 1435030-X
		Riser 1435038-X
72-Fiber, Pair-Flipped (AB/BA)	Multimode 62.5/125µm	Plenum 1435027-X
		Riser 1435035-X
	Multimode 50/125µm	Plenum 1435031-X
		Riser 1435039-X

X denotes length in feet: -1 = 10, -2 = 20, -3 = 30, -4 = 40, -5 = 50, -6 = 60, -7 = 70, -8 = 80, -9 = 90, 1- -0 = 100, 1- -1 = 110, 1- -2 = 120, 1- -3 = 130, 1- -4 = 140, 1- -5 = 150, 1- -6 = 160, 1- -7 = 170, 1- -8 = 180, 1- -9 = 190, 2- -0 = 200, 2- -1 = 210, 2- -2 = 220, 2- -3 = 230, 2- -4 = 240, 2- -5 = 250, 2- -6 = 260, 2- -7 = 270, 2- -8 = 280, 2- -9 = 290, 3- -0 = 300.

**MPO Cable Assemblies** (Continued)

**MPO Cable Assemblies for Premise Networks**

**Description**

- A modular “plug-and-go” optical cabling system

**Applications**

- A high-performance option for AMP NETCONNECT Zone cabling, and PYPLINE Cabling Systems

**Product Facts**

- Uses proven NTT MT linear array technology in the LIGHTRAY MPO connector
- MPO packs up to 12 optical fibers into a single miniaturized connector about the same size as one SC type
- Cables are pre-terminated and tested
- Distribution hardware is pre-loaded
- Cable rating options:
  - Riser rated, UL-OFNR
  - Plenum rated, UL-OFNP (std.)
  - Low Smoke, Zero Halogen rated, LSZH
- Singlemode or Multimode

**Other Applications**

- LIGHTRAY Cabling System for Mainframes Catalog 889414

**Performance Characteristics**

**Insertion Loss** –  
Singlemode – 0.35 dB typical  
Multimode – 0.50 dB typical

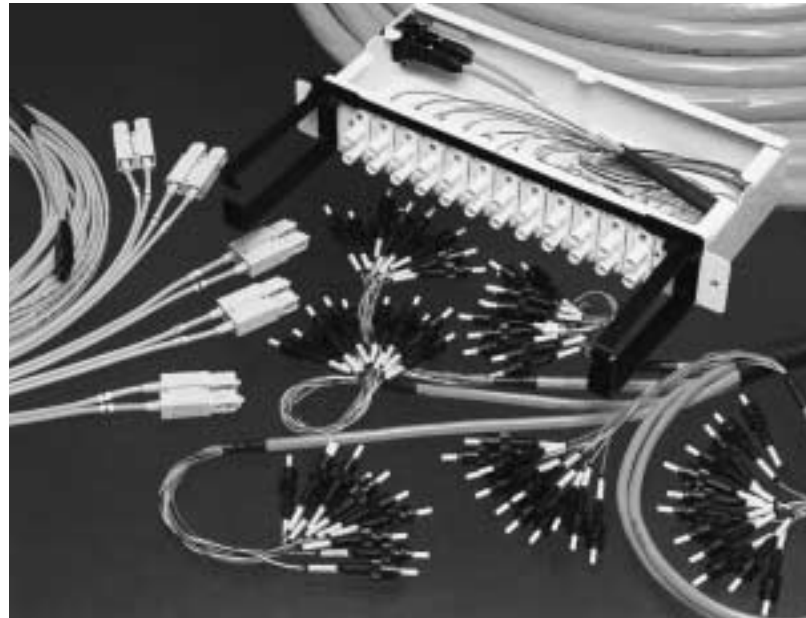
**Return Loss** –  
Angled SM – -50 dB typical  
Flat MM – -40 dB typical

**Durability** –  
After 500 matings ≤0.1 dB change

**Temperature Range** –  
-40°C to +80°C

- Produced under a Quality Management System certified to ISO 9001

A copy of the certificate is available upon request



Initially designed to replace thick copper parallel cables used under floors of computer rooms in large mainframe centers, the MPO Cabling System also makes perfect sense for campus and premise type Local Area Networks. It provides unparalleled ease and flexibility in cabling applications such as backbone and horizontal distribution to the desktop.

The MPO System uses the same simple concepts found in most structured networks following TIA/EIA 568A guidelines. The difference is that with LIGHTRAY Systems the cables come pre-terminated and tested, with a pulling sock over each end. Just pull through the conduit, remove the netting, and plug it in — that’s it.

LIGHTRAY trunk cables run through the building vertically between floors, and horizontally through walls, ceilings, and under floors to distribution enclosures and consolidation points

strategically located within the building. Mini-trunks and fan-out assemblies connect the consolidation point to the workstation outlets. Jumper cables connect the outlet to the workstation, and are also used for cross-connecting in the telecommunications closet.

Installation is easier and faster with cables selected specifically for each site.

MPO cabling is a high performance option for AMP NETCONNECT™ Zone Cabling, and complements the PYPLINE System as a furniture cabling solution. LIGHTRAY cables can reside parallel to existing UTP without fear of crosstalk.

Mini-trunk feeder cables and fan-out cable assemblies are an ideal solution for the open office environment. Their small size allows easy storage in modular office panels and raceways. When it’s time to move add or change the zone, the mini-trunks are simply

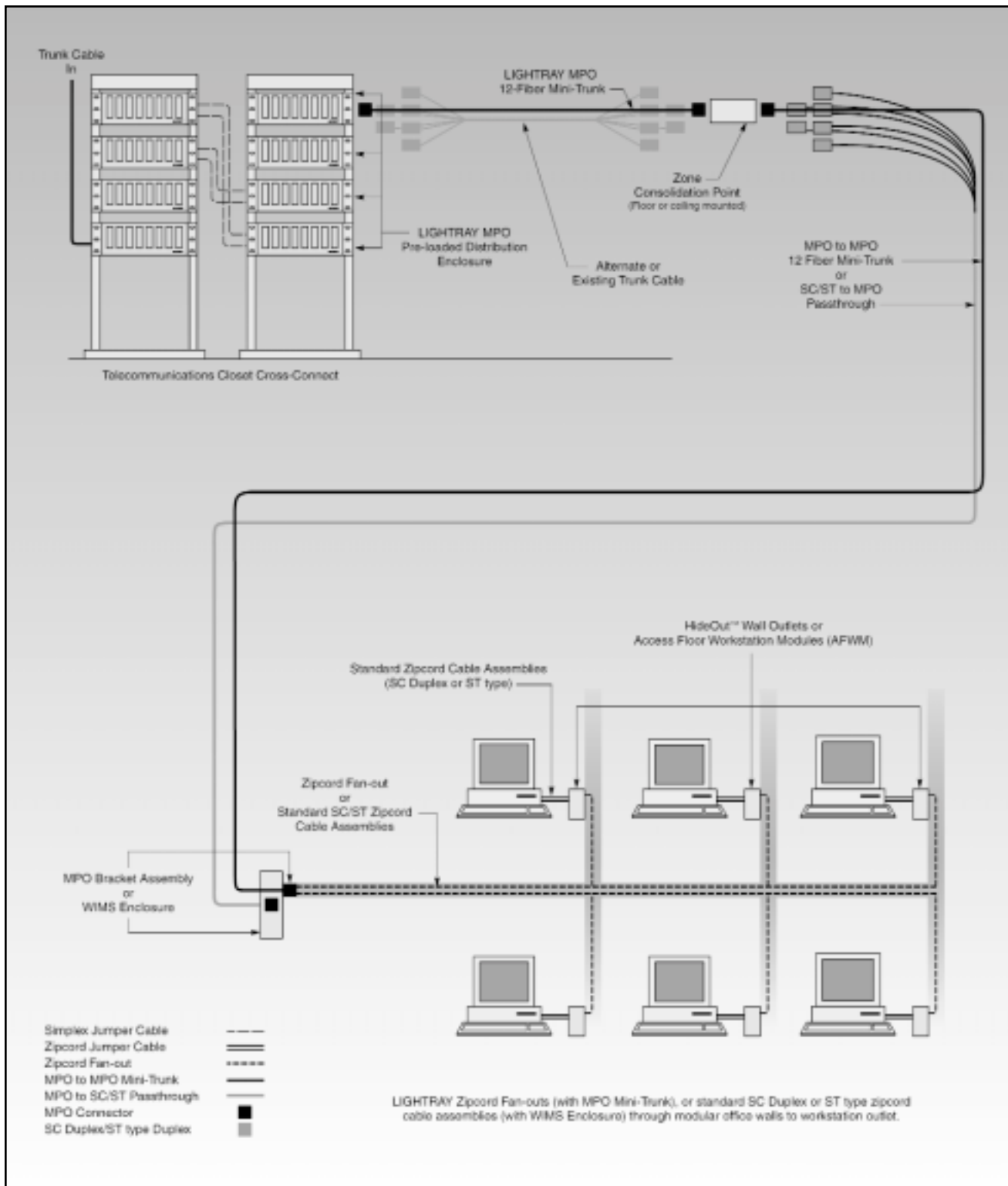
unplugged from nearby zone enclosures and moved with the furniture. Data outage is contained to the zone under construction. After the zone is reconfigured, just plug the MPO connectors back in to the network, and your workstations are up and running. Most moves can usually be done by the facilities crew or someone with minimal network experience. At last, “modular” is living up to its promise. You can take an office apart, move it, and put it back together.

There’s no longer a need to bring in a network staff to shut down the entire system to re-terminate and test the cabling for moves, adds, and changes. Moves can usually be done by the end-user’s facilities crew or someone with minimal network experience.

At last, “modular” is living up to its promise. You can take an office apart, move it, and put it back together — quick and simple!

**MPO Cable Assemblies** (Continued)

**MPO Cable Assemblies for Premise Networks** (Continued)



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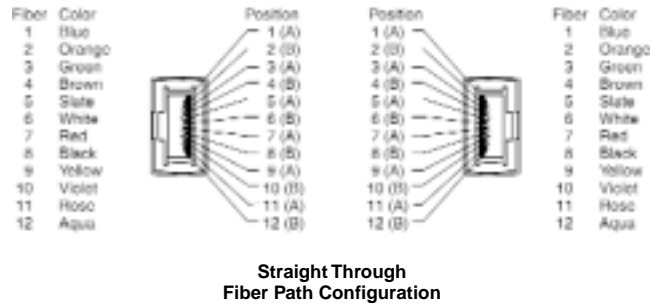
**MPO Cable Assemblies** (Continued)

**MPO Cable Assemblies for Premise Networks** (Continued)

**Pairs Flipped Versus Straight Through Fiber Path Configuration**

Unlike their mainframe application counterparts, LIGHTRAY MPO trunks for PREMISE applications typically do not require "pair flipping". Pair Flipping, or "AB/BA" transmit/receive configuration is a sequential channel cross-over scheme used for IBM Enterprise

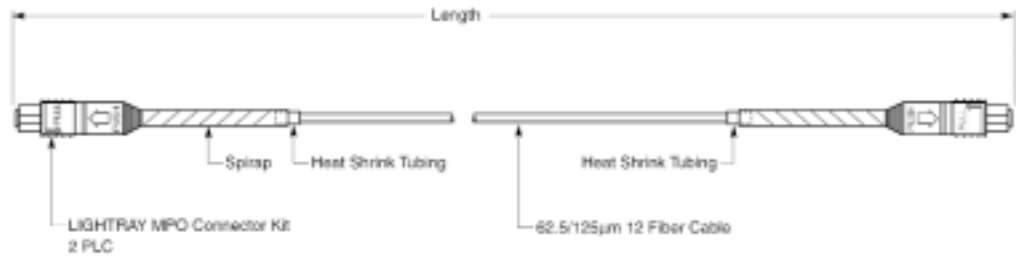
Systems Connectivity (ESCON™) architecture. LIGHTRAY MPO premise trunk fiber pairs are configured as "AB/AB". For example — blue fiber (1) travels straight through the cable and exits on the opposite end in the same position (1), as illustrated (right). This fiber path configuration is known as "straight through".



**MPO to MPO Mini-Trunk Cable Assembly**

4 pair (8 fiber), straight through 62.5/125 multimode

Part Number 492105



Pulling Sock (included on each end)

**MPO to MPO Mini-Trunks**

Trunk Length	Part Number (OFNP)
6 meter [19.7 feet]	1-492105-9
8 meter [26.3 feet]	2-492105-0
10 meter [32.8 feet]	492105-2
15 meter [49.2 feet]	492105-7
20 meter [65.6 feet]	492105-3
23 meter [75.5 feet]	2-492105-1
27 meter [88.6 feet]	2-492105-2
30 meter [98.4 feet]	492105-4
33 meter [108.3 feet]	2-492105-3
38 meter [124.7 feet]	1-492105-5
43 meter [141.1 feet]	2-492105-4
46 meter [150.9 feet]	1-492105-6
50 meter [164.1 feet]	492105-8
53 meter [173.9 feet]	1-492105-7
61 meter [200.1 feet]	1-492105-3

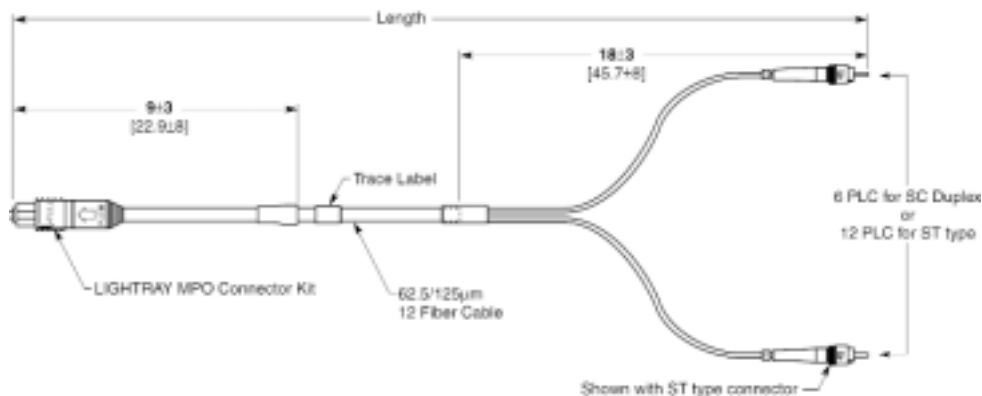
Additional lengths available.  
Custom lengths can be built to customer's specifications.

**MPO Cable Assemblies** (Continued)

**MPO Cable Assemblies for Premise Networks** (Continued)

**MPO to SC Duplex or ST type  
PASS-THROUGH Fan-out**

6 pair (12 fiber),  
straight through  
62.5/125 multimode



**MPO to ST Type**

Overall Length [L]	Part Number (OFNP)
6 meter [19.7 feet]	492361-6
8 meter [26.3 feet]	492361-8
10 meter [32.8 feet]	1-492361-0
15 meter [49.2 feet]	1-492361-5
20 meter [65.6 feet]	2-492361-0

Additional lengths available.  
Custom lengths can be built to customer's specifications.

**MPO to SC Type Duplex**

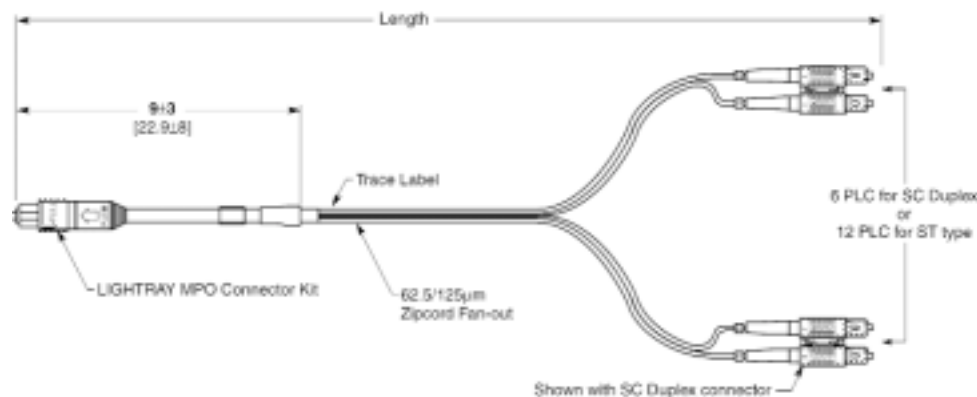
Overall Length [L]	Part Number (OFNP)
6 meter [19.7 feet]	492362-6
8 meter [26.3 feet]	492362-8
10 meter [32.8 feet]	1-492362-0
15 meter [49.2 feet]	1-492362-5
20 meter [65.6 feet]	2-492362-0

Additional lengths available.  
Custom lengths can be built to customer's specifications.

**MPO to SC Duplex or  
ST Type Zipcord Fan-out**

6 pair (12 fiber),  
straight through  
62.5/125 multimode

Metric dimensions in brackets are in  
centimeters.



**MPO to ST Type**

Overall Length [L]	Part Number
6 meter [19.7 feet]	492358-6
8 meter [26.3 feet]	492358-8
15 meter [49.2 feet]	1-492358-5

Additional lengths available.  
Custom lengths can be built to customer's specifications.

**MPO to SC Type Duplex**

Overall Length [L]	Part Number
6 meter [19.7 feet]	492363-6
8 meter [26.3 feet]	492363-8
15 meter [49.2 feet]	1-492363-5

Additional lengths available.  
Custom lengths can be built to customer's specifications.

Dimensions on this page  
in inches over [cm]

**MPO Cable Assemblies** (Continued)

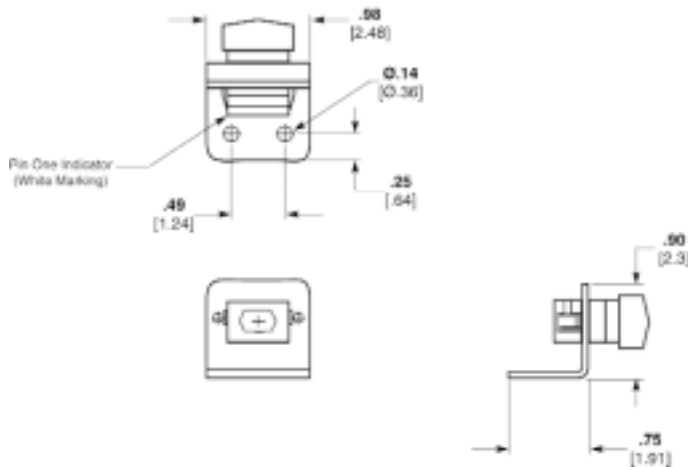
**MPO Cable Assemblies for Premise Networks** (Continued)

**Mounting Bracket MPO Receptacle**

Single Position  
Color: Black

Part Number 504954-1

Metric dimensions in brackets are in centimeters.



**MPO Adapters**

Color: Black



Adapter Type	Single Pack	50 pc Bulk Pack
Adapter w/flange	1588172-1	1588172-5
Adapter w/flange and clip	1588172-2	1588172-6
Adapter w/o flange	1588172-3	1588172-7
Adapter w/o flange and clip	1588172-4	1588172-8

Dimensions on this page  
in inches over [cm]

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**MPO Cable Assemblies** (Continued)

**MPO Cable Assemblies for Mainframes**

**Description**

- A modular “plug-and-go” optical cabling system for mainframe information centers

**Application**

- Replaces copper bus-and-tag cables in parallel architecture, or streamlines IBM ESCON serial fiber optic technology

**Product Facts**

- Proven NTT MT linear array technology in the MPO connector
- MPO packs up to 12 optical fibers into a single miniaturized connector about the same size as one SC type
- ESCON Connectors are IBM Approved and 100% compatible
  - Direct attach harnesses
  - Jumper cables
- Cables are pre-terminated and tested
- Distribution hardware is pre-loaded
- Cable rating options:
  - Riser rated, UL-OFNR (std.)
  - Plenum rated, UL-OFNP
  - Low smoke, Zero Halogen rated, LSZH
- Singlemode or Multimode

**Other Applications**

- LIGHTRAY Cabling System for Premise Networks
- Produced under a Quality Management System certified to ISO 9001

A copy of the certificate is available upon request



The MPO modular cabling system is structured to provide unparalleled ease and flexibility in the cabling of IBM Enterprise Systems Connection architecture (ESCON™).

MPO provides every thing you need to cable your data center:

- assorted lengths of MPO connectorized 36 and 72-fiber trunks
- 8 or 12-fiber mini-trunks
- MPO to ESCON direct attach harnesses
- pre-loaded distribution enclosures
- MPO coupler bushing mounting brackets
- cable clamps
- ESCON jumper cables

Select what you need to connect your system and plug it in. Installation is faster and easier with cables selected specifically for the hardware layout in your data center.

MPO trunk cables deployed around the periphery or down the center of the computer room through under-floor conveyance systems provide plug-and-go connectivity to pre-loaded MPO distribution enclosures mounted in main and zone cabinets throughout the data center.

Multiple layers of MPO trunks and distribution hardware allow the data center to be divided into zones. Zoning further increases simplicity and flexibility of connections between equipment.

MPO mini-trunks, ESCON jumper cables and harnesses plugged into the distribution panels provide final connections to IBM Enterprise Systems processors, ESCON directors, and I/O devices.

The MPO System eliminates thick, inflexible point-to-point copper cables, or tangled bundles of ESCON jumpers running under computer room floors.

Once installed, the MPO System simplifies the hassles associated with migration. Because fiber transmissions are electrically silent, systems can be upgraded without planned outages. Re-configuring and re-arranging equipment is twelve times faster and as simple as unplugging the trunk from the ESCON harness, leaving the harness to be removed with the equipment. Each MPO cable is removable and reusable.

The MPO System takes the superior performance of ESCON fiber optic technology one step further — by simplifying installation and migration, while opening up crowded space under computer room floors, improving air flow and breathing new life into data centers.

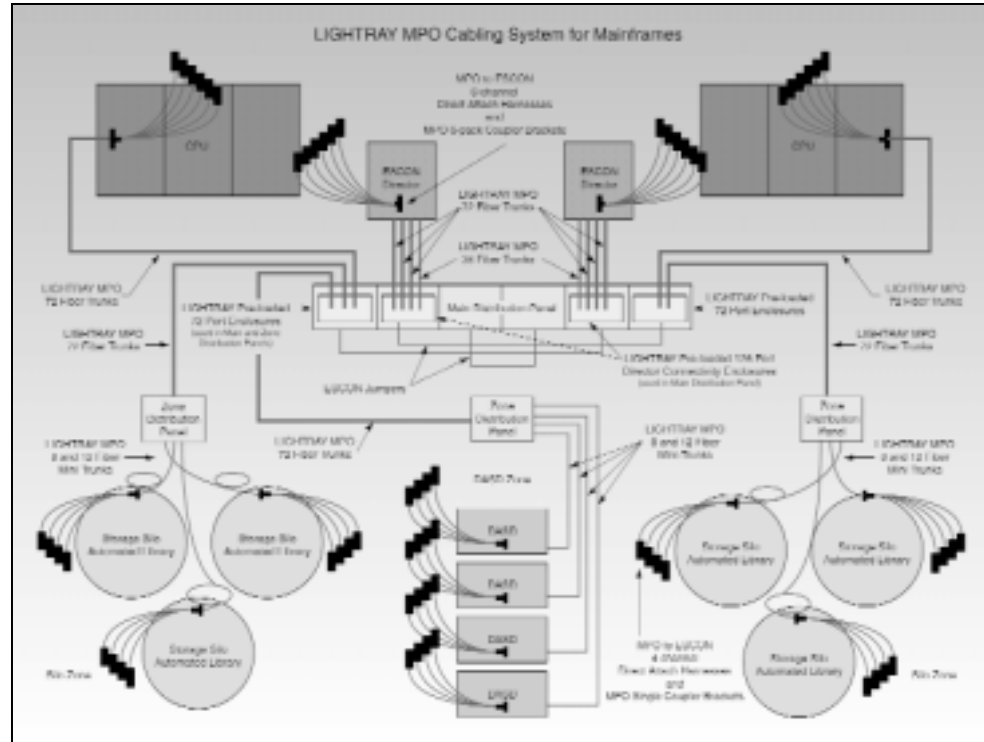


**MPO Cable Assemblies** (Continued)

**MPO Cable Assemblies for Mainframes** (Continued)

**Product Facts**

- Fiber wiring pattern is pair-flipped (AB/BA)
- Also available in straight-through (AB/AB) configuration
- Simple and flexible premise fiber cabling
- All cassettes have MPO trunk connections at rear
- Fit all AMP NETCONNECT enclosures listed in this catalog that accept snap-in adapter plates
- Easy installation, moves, adds and changes



**MPO Cassettes**

Part Number	Description	Color	Fiber Count	Fiber Type	Config
1278418-1	MPO-ST mod. assy.	Black	12	62.5	straight
1278418-2	MPO-ST mod. assy.	Black	12	62.5	crossed
1374207-1	MPO-MTRJ mod. assy.	Black	24	62.5	straight
1374207-2	MPO-MTRJ mod. assy.	Black	24	62.5	crossed
1435005-1	MPO-MTRJ mod. assy.	Black	12	62.5	straight
1435005-2	MPO-MTRJ mod. assy.	Black	12	62.5	crossed
1435006-1	MPO-MTRJ mod. assy.	Black	24	62.5	straight
1435006-2	MPO-MTRJ mod. assy.	Black	24	62.5	crossed
1435065-1	MPO-MTRJ mod. assy.	Black	12	50	straight
1435065-2	MPO-MTRJ mod. assy.	Black	12	50	crossed
1435066-1	MPO-MTRJ mod. assy.	Black	12	50	straight
1435066-2	MPO-MTRJ mod. assy.	Black	12	50	crossed
1435067-1	MPO-MTRJ mod. assy.	Black	12	50	straight
1435067-2	MPO-ST mod. assy.	Black	12	50	crossed
1435069-1	MPO-SC mod. assy.	Black	12	50	straight
1435069-2	MPO-SC mod. assy.	Black	12	50	crossed
1435180-1	MPO-SC mod. assy.	Black	12	62.5	straight
1435180-2	MPO-SC mod. assy.	Black	12	62.5	crossed
1435181-1	MPO-SC mod. assy.	Black	12	50	straight
1435181-2	MPO-SC mod. assy.	Black	12	50	crossed

Part Number	Description	Color	Fiber Count	Fiber Type	Config
1435247-1	MPO-MTRJ red cass.	Black	24	62.5	straight
1435247-2	MPO-MTRJ red cass.	Black	24	62.5	flipped
1435284-1	MPO-MTRJ green cass.	Black	24	62.5	straight
1435284-2	MPO-MTRJ green cass.	Black	24	62.5	flipped
1435285-1	MPO-MTRJ blue cass.	Black	24	62.5	straight
1435285-2	MPO-MTRJ blue cass.	Black	24	62.5	flipped
1435286-1	MPO-MTRJ yel. cass.	Black	24	62.5	straight
1435286-2	MPO-MTRJ yel. cass.	Black	24	62.5	flipped
1435429-1	MPO-LC mod. assy.	Black	12	50	straight
1435429-2	MPO-LC mod. assy.	Black	12	50	crossed
1435430-1	MPO-LC mod. assy.	Black	12	62.5	straight
1435430-2	MPO-LC mod. assy.	Black	12	62.5	crossed
1435431-1	MPO-LC mod. assy.	Black	12	50	straight
1435431-2	MPO-LC mod. assy.	Black	12	50	crossed
1435435-1	MPO-LC mod. assy.	Black	24	50	straight
1435435-2	MPO-LC mod. assy.	Black	24	50	flipped
1435436-1	MPO-LC mod. assy.	Black	24	62.5	straight
1435436-2	MPO-LC mod. assy.	Black	24	62.5	flipped
1435437-1	MPO-LC mod. assy.	Black	24	50	straight
1435437-2	MPO-LC mod. assy.	Black	24	50	flipped

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**MPO Cable Assemblies** (Continued)

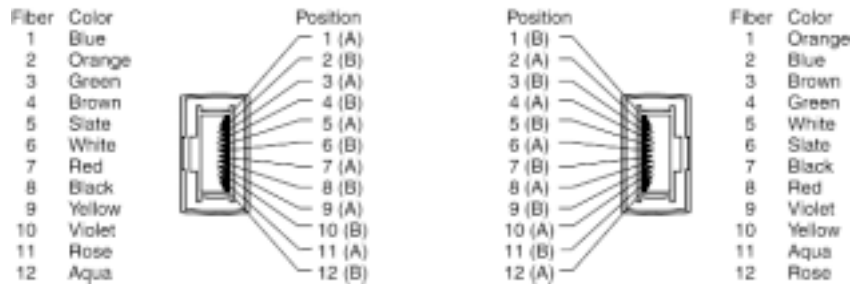
**MPO Cable Assemblies for Mainframes** (Continued)

**Pairs Flipped Versus Straight Through Fiber Path Configuration**

In order to preserve proper transmit and receive (A & B) channel orientation through the data center's ESCON architecture, Tyco Electronics' MPO trunks for mainframes use a sequential channel

crossover scheme known as "pair flipping" or AB/BA. Each fiber pair in the multi-fiber cable is inverted as it passes from end to end through the cable. For example — blue fiber (1) exits the cable on the oppo-

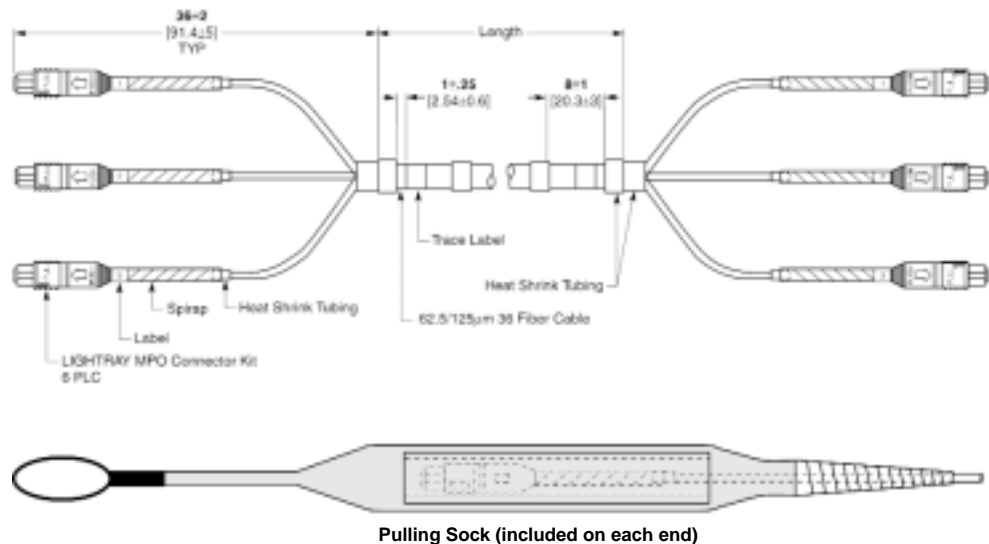
site end in position number two, while orange fiber (2) exits in position number one, as illustrated above. MPO trunk cables used in MAINFRAME applications normally require pair flipping.



**MPO to MPO Trunk**

18 channel (36 fiber), AB/BA  
36 channel (72 fiber), AB/BA  
62.5/125 multimode

Metric dimensions in brackets are in centimeters.



**18 Channel MPO to MPO Trunks**

Trunk Length	Part Number (Riser)	Part Number (Plenum)
50 feet [15.2 meters]	492474-1	504897-2
100 feet [30.5 meters]	492474-3	504897-4
150 feet [45.7 meters]	492474-5	504897-5
200 feet [61.0 meters]	492474-7	504897-6

**36 Channel MPO to MPO Trunks**

Trunk Length	Part Number (Riser)	Part Number (Plenum)
50 feet [15.2 meters]	492473-1	504896-2
100 feet [30.5 meters]	492473-3	504896-4
150 feet [45.7 meters]	492473-5	504896-5
200 feet [61.0 meters]	492473-7	504896-6

Additional lengths available.  
Custom configurations can be built to user's specifications.

Dimensions on this page in inches over [cm]

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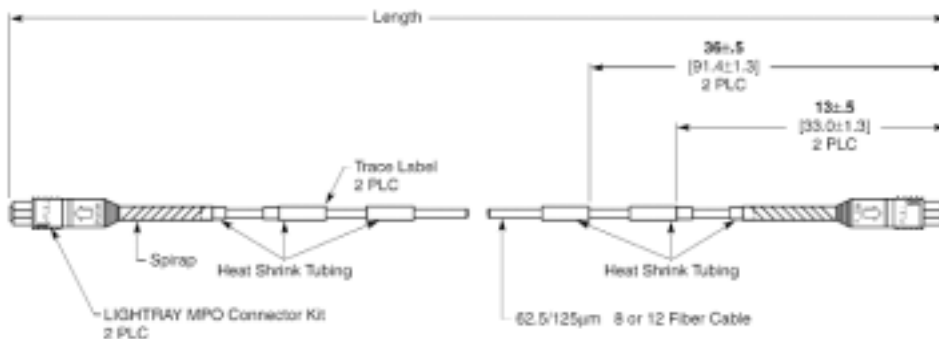
**MPO Cable Assemblies** (Continued)

**MPO Cable Assemblies for Mainframes** (Continued)

**MPO to MPO Mini-Trunk**

4 channel (8 fiber), AB/BA  
6 channel (12 fiber), AB/BA  
62.5/125 multimode

Metric dimensions in brackets are in centimeters.



Pulling Sock (included on each end)

**4 Channel MPO to MPO Mini-Trunks**

Trunk Length	Part Number (OFNR)	Part Number (OFNP)
50 feet [15.2 meters]	492476-2	504949-8
100 feet [30.5 meters]	492476-4	2-504949-5
150 feet [45.7 meters]	492476-6	2-504949-0
200 feet [61.0 meters]	492476-8	3-504949-1

**6 Channel MPO to MPO Mini-Trunks**

Trunk Length	Part Number (OFNR)	Part Number (OFNP)
50 feet [15.2 meters]	492475-1	504950-1
100 feet [30.4 meters]	492475-3	1-504950-4
150 feet [45.7 meters]	492475-5	1-504950-6
200 feet [61.0 meters]	492475-7	1-504950-3

Additional lengths available.  
Custom configurations can be built to user's specifications.

Dimensions on this page  
in inches over [cm]

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**MPO Cable Assemblies** (Continued)

**MPO Cable Assemblies for Mainframes** (Continued)

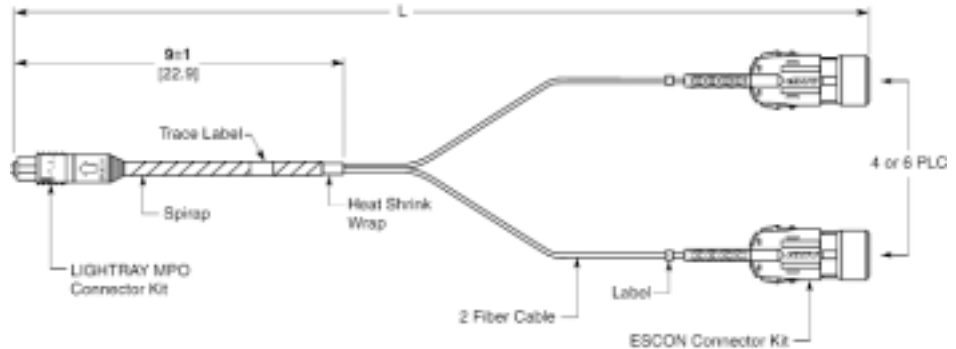
**MPO to ESCON Direct Attach Harness**

4 channel (8 fiber), AB/AB straight through

6 channel (12 fiber), AB/AB straight through

62.5/125 multimode

Metric dimensions in brackets are in centimeters.



Harness Length	4 Channel (8 fiber)	6 Channel (12 fiber)
	Part Number	Part Number
3 feet [0.9 meters]	492549-1	492550-1
5 feet [1.5 meters]	492549-2	492550-2
6 feet [1.8 meters]	492549-3	492550-3
12 feet [3.7 meters] for air-cooled processor	492549-4	492550-4

Custom lengths can be built to customer's specifications.  
Cable is Riser rated.

**ESCON Cable Assemblies**  
62.5/125µm Multimode

Cable Type	Length (meters)											
	1	2	3	4	5	7*	13*	22*	31*	46*	61*	122*
Riser	492231-1	492231-2	492231-3	492231-4	492231-5	492231-7	1-492231-3	2-492231-2	3-492231-1	4-492231-6	6-492231-1	9-492231-9
Plenum	492251-1	492251-2	492251-3	492251-4	492251-5	492251-7	1-492251-3	2-492251-2	3-492251-1	4-492251-6	6-492252-1	9-492251-9
Low Smoke Zero Halogen	492275-1	492275-2	492275-3	492275-4	492275-5	492275-7	1-492275-3	2-492275-2	3-492275-1	4-492275-6	6-492275-1	9-492275-9

Connectors are black, cable is orange.  
Cable construction is two fiber round.  
Custom lengths are available.

\* **Parts available from stock.**

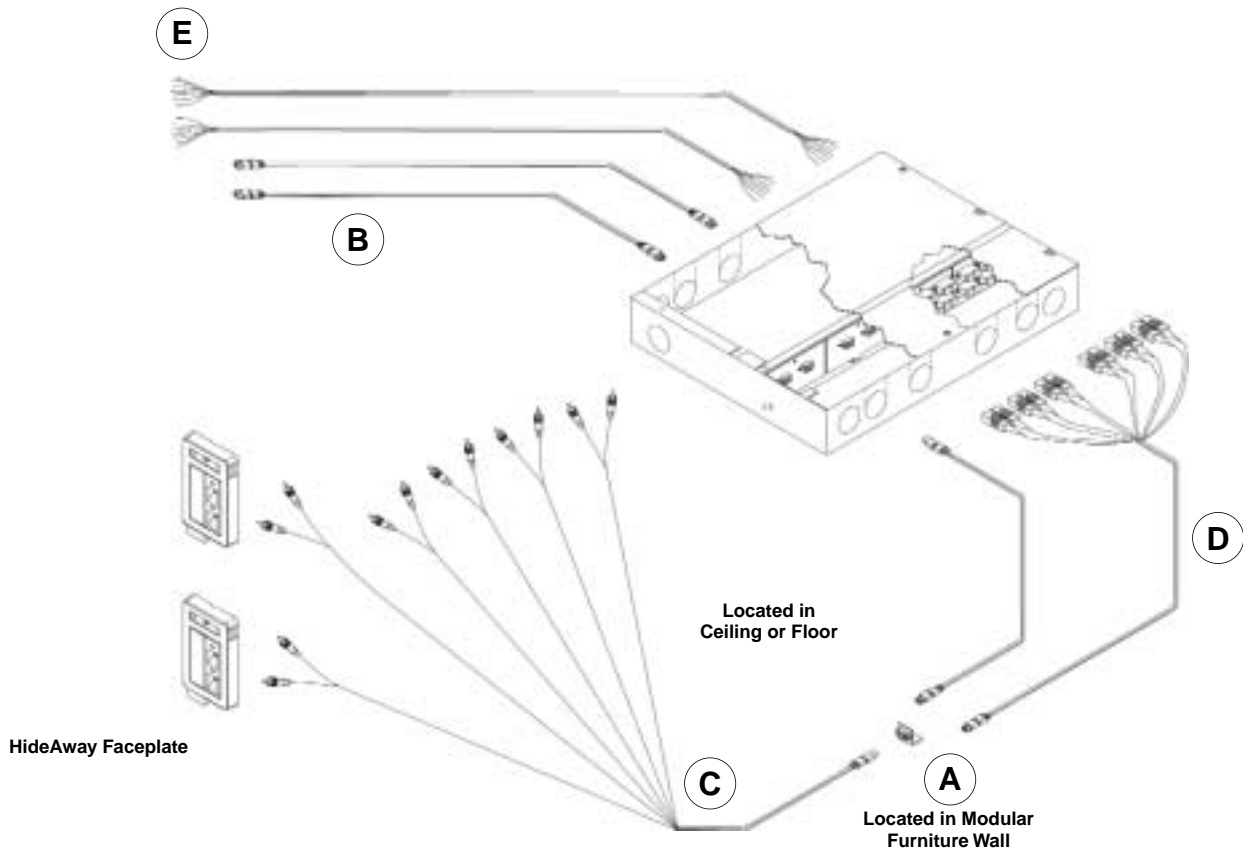
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**MPO Cable Assemblies** (Continued)

**MPO Cable Assemblies for Mainframes** (Continued)

The LIGHTRAY MPO System delivers the full bandwidth of optical fiber while maintaining the flexibility for the open office with reusable assemblies.



**Ordering Information:**

	Part Number	Description
A	504954-1	LIGHTRAY Receptacle Mounting Bracket
B	492105-X	LIGHTRAY Cable Assembly, MPO/MPO straight through, 12 fiber, 62.5/125 mm
	492475-V	LIGHTRAY Cable Assembly, MPO/MPO, Crossed, 12 fiber, 62.5/125 mm
C	492358-Y	LIGHTRAY Cable Assembly, MPO/ST-Style long fan-out, 12 fiber, 62.5/125 mm
	492363-Y	LIGHTRAY Cable Assembly, MPO/SC Duplex long fan-out, 12 fiber, 62.5/125 mm
	492361-Z	LIGHTRAY Cable Assembly, MPO/ST-Style short fan-out, 12 fiber, 62.5/125 mm
D	492362-Z	LIGHTRAY Cable Assembly, MPO/SC Duplex short fan-out, 12 fiber, 62.5/125 mm

V denotes length in meters: -1 = 15, -2 = 23, -3 = 31, -4 = 38, -5 = 46, -6 = 54, -7 = 61, -8 = 61

X denotes length in meters: -7 = 15, 1- -4 = 30, 1- -5 = 38, 1- -6 = 45, 2- -0 = 8, 2- -1 = 23

Y denotes length in meters: -6 = 6, -8 = 8, 1- -5 = 15

Z denotes length in meters: -6 = 6, -8 = 8, 1- -0 = 10, 1- -5 = 15, 2- -0 = 20



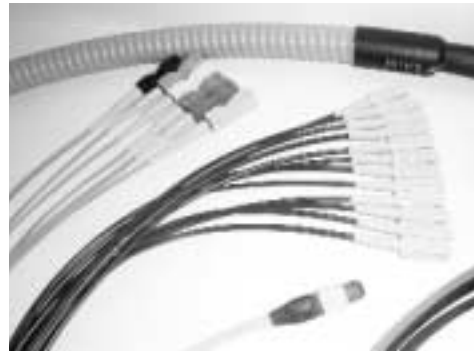
“NEW” Armored Fiber Optic Cable Assemblies



Product Facts

- Crush resistance and cable protection
- Factory pre-terminated and tested to ensure performance and quality
- Shipped with pulling sock to protect connectors during installation
- Applications in plenum areas and riser shafts
- Available in a wide assortment of connector styles including:
  - SC
  - LC
  - MT-RJ
  - MPO
  - Other styles upon request
- Custom manufactured to meet unique requirements of each installation
- Available in a wide variety of cable and armoring styles including:
  - 12 fiber 50/125, painted steel armoring
  - 12 fiber 50/125, plenum aluminum armoring
  - 12 fiber 62.5/125, painted steel armoring
  - 12 fiber 62.5/125, plenum aluminum armoring
  - 24 fiber 50/125, painted steel armoring
  - 24 fiber 50/125, plenum aluminum armoring
  - 24 fiber 62.5/125, painted steel armoring
  - 24 fiber 62.5/125, plenum aluminum armoring
  - Other styles upon request

Please contact your local sales representative or Tyco Electronics for part numbers, pricing, and availability.



Tyco Electronics offers a complete line of Armored Fiber Optic Trunk Cable Assemblies to meet customers’ “plug and play” needs. Trunks are available pre-terminated with the customers’ choice of connector and cable styles. Armoring provides both

crush resistance and cable protection. Armored trunks are used extensively in cable trays and riser shafts — connecting to the horizontal cross-connect or the telecommunications closet. Use of pre-terminated trunks

eliminates the need for field termination, thus dramatically shortening installation time and reducing end-user office down-time. All assemblies are factory tested to ensure performance, backed by Tyco Electronics’ commitment to quality and service.

Cable Standards Jacket Color	
Singlemode	Yellow
Multimode	Orange
XG	Orange

Armored Standards Color				
Jacketed/Painted Steel & Aluminum		Steel / Aluminum	Plastic	
Singlemode	Yellow	Not colored	Singlemode	Yellow
Multimode	Orange		Multimode	Orange
XG	Orange		XG	Orange

Attachment			
Non-armored trunks do NOT include an attachment device			
	Steel Armor	Aluminum Armor	Loom Tubing
Mechanical Connector	Yes	Yes	Yes
Electrically Grounded	Yes	Yes	No

Connectors							
	Multimode		XG - Multimode		Singlemode		
	IL (dB)	Conn Color	IL (dB)	Conn Color	IL (dB)	RL (dB)	Conn Color
SC	0.5	Beige	0.5	Grey	0.5	-55	Blue
SC/APC	N/A	N/A	N/A	N/A	0.5	-65	Green
ST	0.5	Metal	0.5	Metal	0.5	-55	Metal
LC	0.5	Beige	0.5	Beige	0.35	-45	Blue
MU	0.5	Beige	0.5	Beige	0.5	-45	Blue
MT-RJ	0.5	Black	0.5	Black	0.5	X	Black
MPO	1.0	Beige	1.0	Beige	1.0	X	Green

Cable Assembly Standards:

1. Fiber type is indicated on the cable legend for non-armored cable or on the trace label for armored cable.
2. Trace labels are applied immediately before the break-out on each end of the trunk.
3. Break-out lengths = 3 feet (±3" tolerance).
4. Break-out legs are identified on each end of the cable assembly by color or by leg labels.
5. Break-out tubing diameter is 3mm for standard connectors (SC, ST, FC, etc.); 1.8mm for LC and MU; 1.6mm zipcord for MT-RJ; cable sub-unit diameter for MTP.
6. A pulling sock is included on all trunk cable assemblies 20 feet long and longer. Assemblies shorter than 20 feet include packaging to protect the connectors.
7. Overall length tolerance is ±2%, -0% (minimum of +8", -0").

**“NEW” Parallel Optics High Density Para-Optix™ Cable Assemblies**



**Product Facts**

- Uses the latest generation MT-style ferrules
- Available in up to 72 fibers through a single MTP/MPO style connector
- Mates with high-density parallel optics XTM Para-Optics transceivers (see Electro-Optic Products, Section 5, pages 124-127)
- Available in 32, 48, and 72 fiber
- Save time during installation
- Reduced space requirements
- Provides cost benefit on a per-fiber basis



Tyco Electronics' parallel optics high density Para-Optix cable assemblies use the latest in MT-ferrule technology to provide the maximum fiber density for parallel optics applications.

By terminating these ferrules in MTP/MPO-style connectors, Tyco Electronics is able to take advantage of the industry standards and acceptance of the MTP/MPO connector family.

Tyco Electronics' parallel optics Para-Optix cable assemblies can support up to 72 fibers through a single connector, saving space on the board and time during installation.

**Potential Applications**

- Interface to transceiver
- Jumpers and trunk cables for Data Centers
- Optical backplanes
- SAN Very Short Reach applications

Please contact your local Sales Representative or Tyco Electronics for detailed performance characteristics and specifications.

Specifications are preliminary and subject to change.

Part Number	Description
1588930-x	12-fiber MPO-MPO, 50/125 Multimode
1588967-x	24-fiber MPO-MPO, 50/125 Multimode
1693070-x	32-fiber MPO-MPO, 50/125 Multimode
1693069-x	48-fiber MPO-MPO, 50-125 Multimode
1588930-x	72-fiber MPO-MPO, 50/125 Multimode
1693068-x	48-fiber MPO — (4), 12-fiber MPO, 50/125 bare ribbon
1693067-x	72-fiber MPO — (6), 12-fiber MPO, 50/125 bare ribbon

**Note:** “x” above denotes length. Check latest version of Tyco Electronics' customer drawing or contact your local sales representative for specific lengths available.

**For Tyco Electronics' “NEW” high speed parallel optics XTM Para-Optix Transceivers, see Electro-Optic Products, Section 5, page 124-127.**



Fiber Optic Products Catalog

“NEW” Parallel Optics High Density Para-Optix Cable Assemblies (Continued)

Parallel Optics Test Selection Charts

<b>-X = Module Speed</b>
-1 = 2.7 Gb/s
-2 = 3.125 Gb/s
-3 = 3.4 Gb/s

Please contact your local Sales Representative or Tyco Electronics for detailed performance characteristics and specifications.

For Tyco Electronics' high speed parallel optics XTM Para-Optix Transceivers, see the Electro-Optic Products Section 5, pages 124-127.

Specifications are preliminary and subject to change.

Link Testing			
Fiber	Modules (Qty.)	Test Board (Qty.)	Optical Cable Assy. (Qty.)
12	1511217-X (1)	1511224-1 (1)	1588930-3 (1)
	1511218-X (1)	1511225-1 (1)	
16	1511219-X (1)	1511226-1 (2)	1588967-3 (1)
24	1511220-X (1)	1511226-1 (2)	1588967-3 (1)
32	1511221-X (1)	1511227-1 (2)	1588903-2 (1)
48	1511222-X (1)	1511227-1 (2)	1588903-2 (1)
72	1511223-X (1)	1511227-1 (2)	1588903-2 (1)

Loopback Testing Bit Error Rate (BER) & Crosstalk				
Fiber	Modules (Qty.)	Test Board (Qty.)	Optical Cable Assy. (Qty.)	Adapter (Qty.)
12	1511217-X (1)	1511224-1 (1)	1588930-3 (1)	—
	1511218-X (1)	1511225-1 (1)		
16	1511219-X (1)	1511226-1 (1)	1693105-1 (1)	1588172-1 (2)
24	1511220-X (1)	1511226-1 (1)	1693105-1 (1)	1588172-1 (2)
32	1511221-X (1)	1511227-1 (1)	1693067-1 (1)	1588172-1 (2)
48	1511222-X (1)	1511227-1 (1)	1693067-1 (1)	1588172-1 (2)
72	1511223-X (1)	1511227-1 (1)	1693067-1 (1)	1588172-1 (3)

Sensitivity & Optical Eye Testing FC Interface				
Fiber	Modules (Qty.)	Test Board (Qty.)	Optical Cable Assy. (Qty.)	Adapter (Qty.)
12	1511217-X (1)	1511224-1 (1)	1693097-1 (2)	501506-1 (12)
	1511218-X (1)	1511215-1 (1)		
16	1511219-X (1)	1511226-1 (1)	1693105-1 (1)	501506-1 (8) 1588172-1 (3)
			1693099-1 (1)	
			1693100-1 (1)	
24	1511220-X (1)	1511226-1 (1)	1693105-1 (1)	501506-1 (12) 1588172-1 (3)
			1693097-1 (1)	
			1693098-1 (1)	
32	1511221-X (1)	1511227-1 (1)	1693067-1 (1)	501506-1 (8) 1588172-1 (3)
			1693099-1 (1)	
			1693100-1 (1)	
48	1511222-X (1)	1511227-1 (1)	1693067-1 (1)	510506-1 (8) 1588172-1 (3)
			1693099-1 (1)	
			1693100-1 (1)	
72	1511223-X (1)	1511227-1 (1)	1693067-1 (1)	501506-1 (12) 1588172-1 (4)
			1693097-1 (1)	
			1693098-1 (1)	

Sensitivity & Optical Eye Testing SC Interface				
Fiber	Modules (Qty.)	Test Board (Qty.)	Optical Cable Assy. (Qty.)	Adapter (Qty.)
12	1511217-X (1)	1511224-1 (1)	1-1374571-0 (2)	1278348-3 (12)
	1511218-X (1)	1511225-1 (1)		
16	1511219-X (1)	1511226-1 (1)	1693102-1 (1)	1278348-3 (8) 1588172-1 (3)
			1693104-1 (1)	
			1693105-1 (1)	
24	1511220-X (1)	1511226-1 (1)	1-1374571-0 (1)	1278348-3 (12) 1588172-1 (3)
			1693103-1 (1)	
			1693105-1 (1)	
32	1511221-X (1)	1511227-1 (1)	1693067-1 (1)	1278348-3 (8) 1588172-1 (3)
			1693102-1 (1)	
			1693104-1 (1)	
48	1511222-X (1)	1511227-1 (1)	1693067-1 (1)	1278348-3 (8) 1588172-1 (3)
			1693102-1 (1)	
			1693104-1 (1)	
72	1511223-X (1)	1511227-1 (1)	1-1374571-0 (1)	1278348-3 (12) 1588172-1 (4)
			1693067-1 (1)	
			1693103-1 (1)	

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**LightPlane Connector System**

**Product Facts**

- Optical interconnection of daughter cards to motherboard
- Bellcore compliant SC interface from motherboard
- 2 to 8 positions
- Centerline spacing 12.5mm (0.492 in.)
- Singlemode and multimode versions
- Daughtercard floats and alignment pins on mothercard assure mating

**Performance Characteristics**

- Insertion Loss -0.5 dB typ.
- Return Loss -40 dB min.
- Temperature Range -40°C to +85°C
- Durability -<0.5 dB after 200 cycles



Tyco Electronics' LightPlane Connector is a multi-position fiber optic backplane connector that permits blind mating of singlemode or multimode optical fibers from a daughtercard to a system backplane or motherboard. Now you can simultaneously make both the optical and electronic interconnections when installing the daughtercard. The LightPlane connector contains up to 8 fiber positions utilizing the standard SC interface. Use of off the shelf SC components

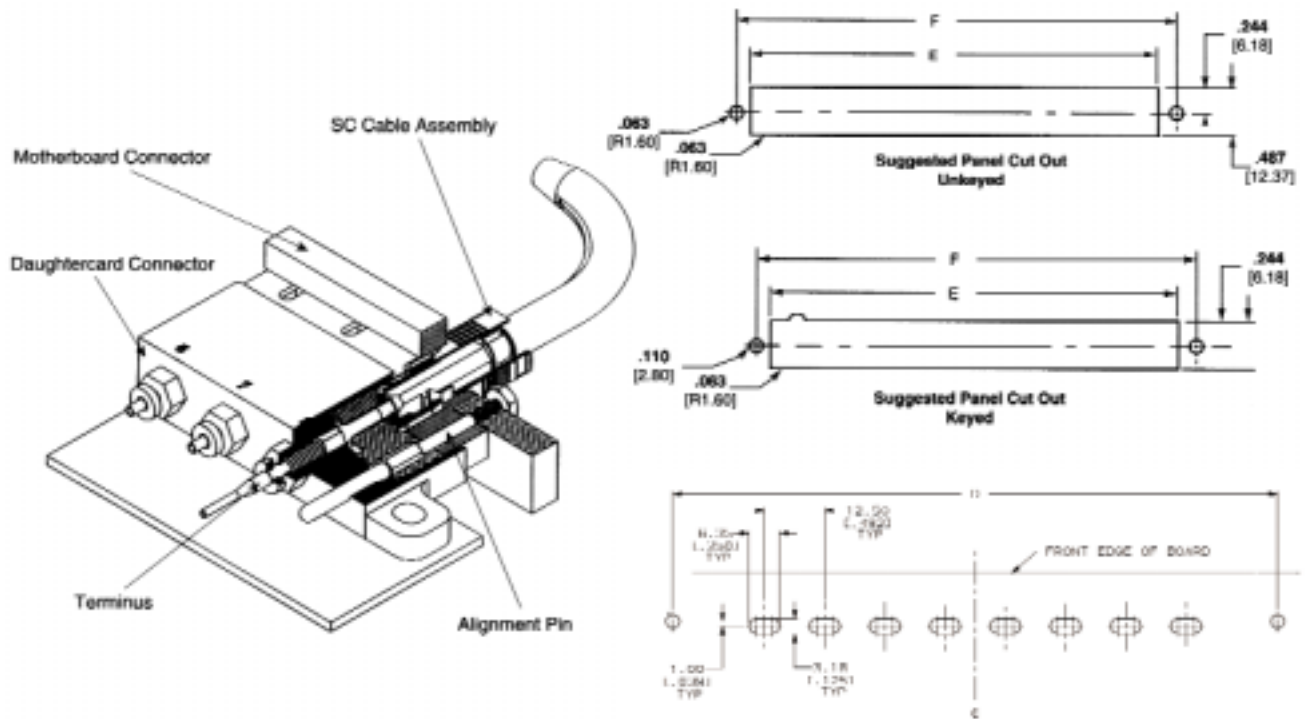
minimizes per line costs. It also eliminates the need for separate optical jumpers from the daughtercards to the front or back of the cabinet, minimizing labor costs and possible fiber damage.

Designed for telecommunications and networking equipment, the LightPlane connector provides performance comparable to conventional SC interconnections: 0.5 dB typical insertion loss and 40 dB return loss. Shoulder screws on the daughtercard module provide the

necessary float for precise alignment. Daughtercard termini are spring loaded to ensure optical contact between the backplane and daughtercard. The daughtercard connector acts like multiple SC connectors, providing fiber density and minimizing packaging all in one protective shell. The shell protects the optical contacts on all sides from accidental damage if the board is dropped or knocked against a hard surface.

Description	Size/No. of Positions	Part Number
<b>Daughtercard Connector</b>	2	503185-3
	4	503185-2
	8	503185-1
<b>Motherboard Connector</b> Ceramic Alignment Sleeves with Polarization Key	2	503682-3
	4	503682-2
	8	503682-1
Description	Type/Fiber Hole Dia. (µm)	Part Number
<b>Daughtercard Terminus</b> for 900µm buffered fiber	Singlemode/125	503186-1
	Singlemode/126	503186-2
	Singlemode/127	503186-3
	Multimode/125	503412-1
<b>Pre-Assembled Cable Assembly</b> Daughtercard Terminus on both ends-2 meters — Singlemode		503683-1

**LightPlane Connector System** (Continued)



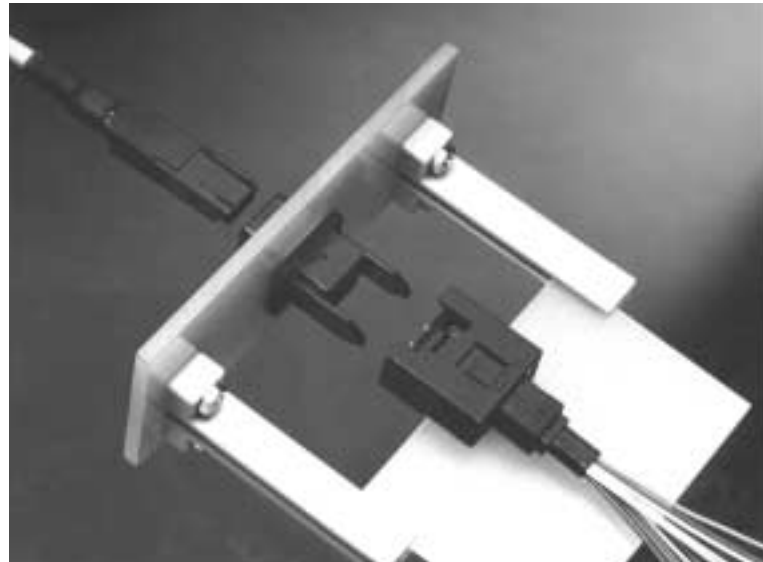
Dimensions on this page  
in inches over [mm]

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**LIGHTRAY MPX™ System Interconnects**

**Product Facts**

- MPX is a blindmate backplane solution
- A complete fiber optic system which is ideal for applications requiring customized solutions
- Features very small, high density MPX connectors
- Based on industry proven MT interconnection technology
- Can use both multimode (62.5/125µm or 50/125µm) and singlemode (9µm) fiber, and is designed to meet Bellcore 1435
- Saves valuable board space on the PCB, backplane and I/O
- Suitable for blind mate (free floating) and bulkhead applications. Offers flexible fiber routing and management
- 2.5mm of daughter card axial travel is provided
- Misalignment pick-up tolerance are:  
± 2.0mm horizontal  
± 2.5mm vertical  
± 2 degree angular



Tyco Electronics' LIGHTRAY MPX interconnection system is designed for blind mate backplane and bulkhead dense fiber-to-fiber interconnect applications, including stand alone interconnections when used with bulkhead adapters.

Tyco Electronics' LIGHTRAY MPX offers maximum

flexibility, making it ideal for customized requirements and solutions.

Based on the field-proven MT ferrule technology, the LIGHTRAY MPX interconnection system features a miniature multi-fiber connector, which holds up to 24 fibers on 250µm centers.

Tyco Electronics' LIGHTRAY MPX system is multi-sourced and features fanout assemblies, mini trunk and trunk cable assemblies, pre-loaded enclosures, cable management systems, PC card connector housings and tooling, bulkhead adapters and transceiver modules and datalinks.

**MPX Connector**



**LIGHTRAY MPX Design Objectives**

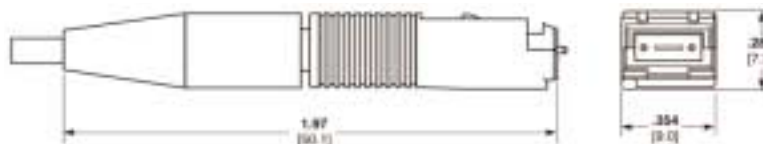
Parameter	Value		
	Multimode	Singlemode	Singlemode Low-Loss
Insertion Loss, Mean (typical)	0.20dB	0.25dB	0.20dB
Insertion Loss, Max.	0.50dB	0.75dB	0.30dB / 0.5dB*
Return Loss, Min.	20dB	45dB	45dB
Durability,	0.3dB CIT - 200 cycles		
Straight Pull 2.2N	0.3dB change		
Vibration, 10 to 55 Hz	0.3dB change		
Temperature, Storage	-40°C to +85°C		
Temperature Operating	-40°C to +85°C		
Thermal Aging, 14 Days @ +85°C	0.3dB change		
Humidity, 14 days 95% Rh @ +60°C	0.3dB change		

\* Low loss tested in-house to a maximum of 0.3dB against a reference. 0.5dB is maximum random mate loss.

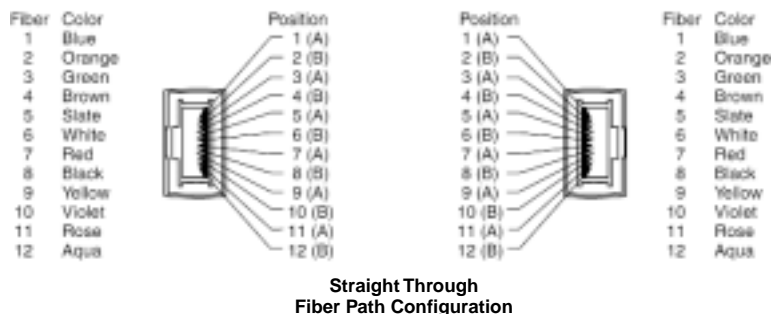


**LIGHTRAY MPX™ System Interconnects** (Continued)

**MPX Connector**



**Straight Through Fiber Path Configuration**



**Dimensions on this page in inches over [mm]**

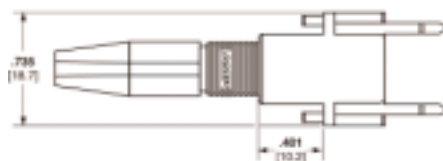
Unlike their mainframe application counterparts, LIGHTRAY MPX trunks for PREMISE applications typically do not require "pair flipping". Pair Flipping, or "AB/BA" transmit/receive configuration is a sequential

channel cross-over scheme used for IBM Enterprise Systems Connectivity (ESCON™) architecture. LIGHTRAY MPX premise-trunk fiber pairs are configured as "AB/AB". For example — blue fiber

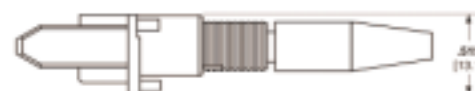
(1) travels straight the cable and exits on the opposite end in the same position (1), as illustrated below. This fiber path configuration is known as "straight through".

**Single Position Backplane Connector**

**MPX Mother Board Housing Part Number 492233-1**

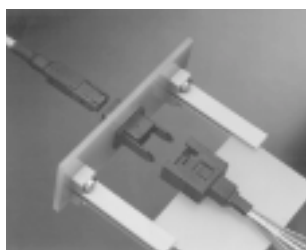


Top View

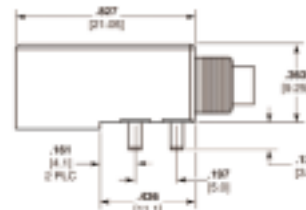


Side View

**MPX Daughter Card Housing Part Number 492234-1**



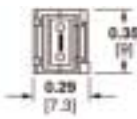
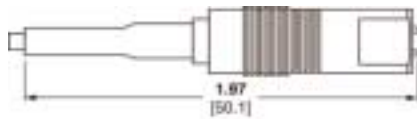
Top View



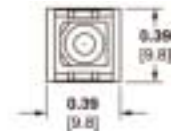
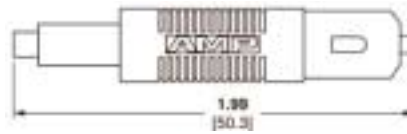
Side View

**LIGHTRAY MPX™ System Interconnects** (Continued)

MPX Connector



SC Connector



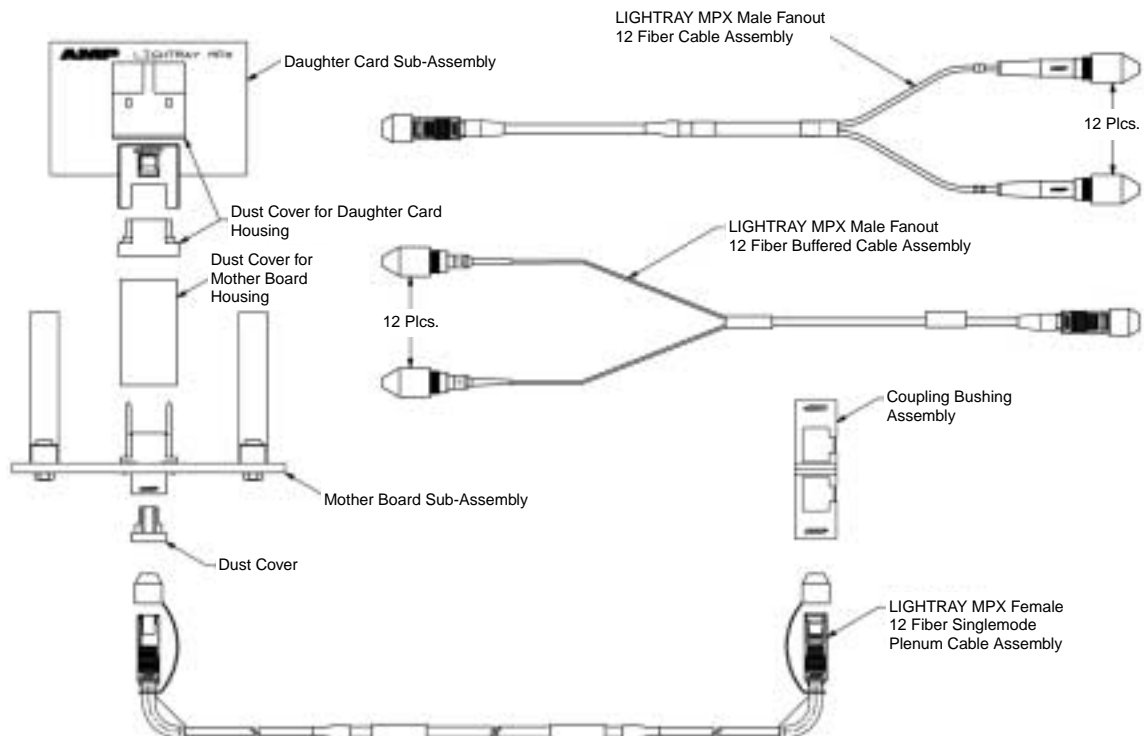
The MPX accommodates up to 12 fibers in a form factor smaller than typical single-fiber connectors

**Evaluation Kit**

**Product Facts**

- MPX female to MPX female  
12 fiber mini trunk
- Daughter card assembly test  
lead (MPX male to FC or SC,  
900µm buffered fiber)
- Jumper test lead (MPX male  
to FC or SC, ruggedized)
- Backplane - daughter card  
rail system (to simulate  
blind mate application)
- Coupling adapter:  
Part Number - 1278179

Description	Part Number
Singlemode kit with SC connectors	1278179-1
Singlemode kit with FC connectors	1278179-2
62.5/125 kit with SC connectors	1278180-1
62.5/125 kit with FC connectors	1278180-2



Dimensions on this page  
in inches over [mm]

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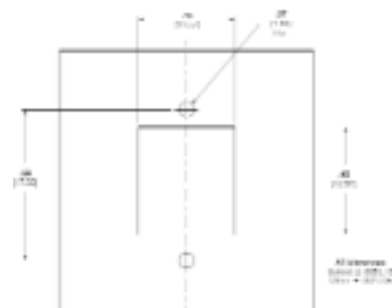
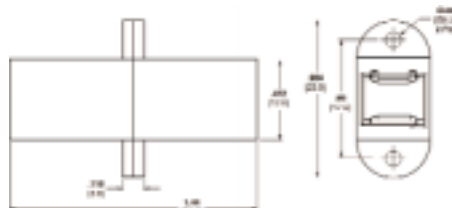


**LIGHTRAY MPX™ System Interconnects** (Continued)

**Bulkhead Coupling Adapter**



Part Number 492305-1



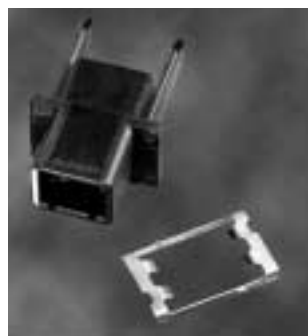
Panel Cutout

**Product Facts**

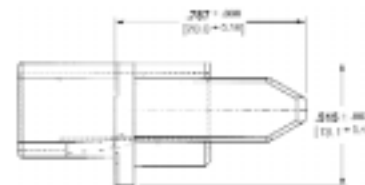
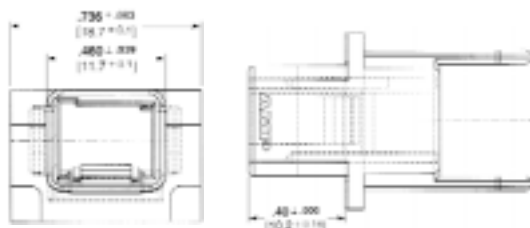
- Use two #2 screws for panel mounting
- LIGHTRAY MPX coupling adapter uses the same dust cover as the SC coupling adapter
- Can be mounted side-by-side for maximum port density

**Backplane Housings and Adapters**

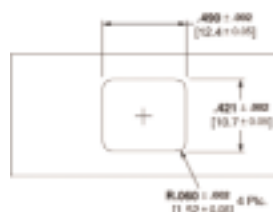
**Backplane Housing – Simplex**



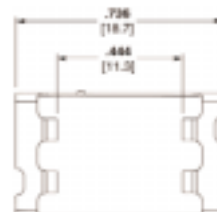
Part Number 492739-2



Clip Part Number 492740-2



Backplane Cutout



**Product Facts**

- All backplane mounting holes must be within 0.1 mm diameter true position of nominal from backplane datums to assure proper mating
- Used to mate any LIGHTRAY MPX Connector from the backplane side
- Mates to 492234-1

Dimensions on this page  
in inches over [mm]

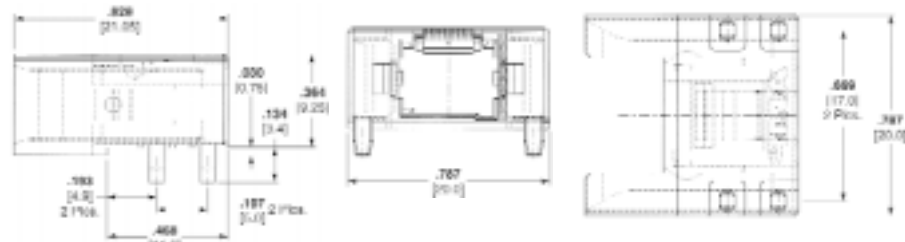
**LIGHTRAY MPX™ System Interconnects** (Continued)

**Backplane Housings and Adapters** (Continued)

**System Card Housing –Simplex**



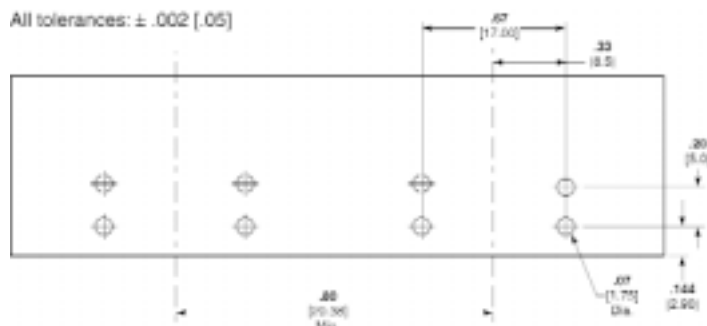
Part Number 492739-2



**Product Facts**

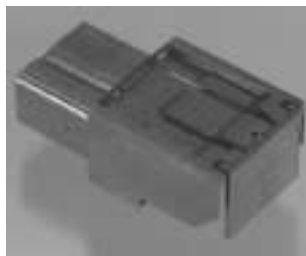
- Holds one standard or low loss LIGHTRAY MPX connector
- Simple press-fit mounting – no hardware needed
- Unique latching provides positive retention when card is unmated
- Space daughtercard mounting hole patterns no closer than 20.38 mm
- All daughtercard mounting holes must be within 0.1 mm diameter true position of nominal from daughtercard daturn to assure proper mating
- Mates to 492739-1

All tolerances: ± .002 [.05]

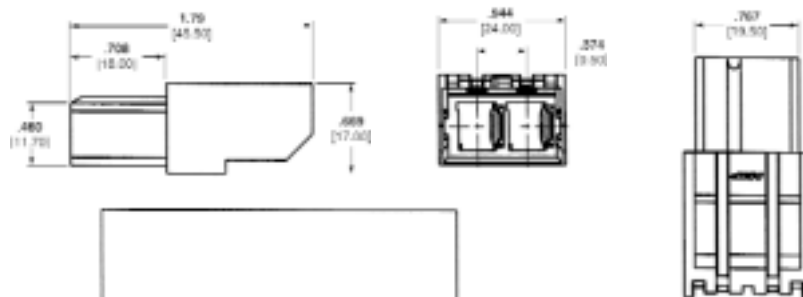


Daughtercard Housing Spacing

**Backplane Housing –Duplex**

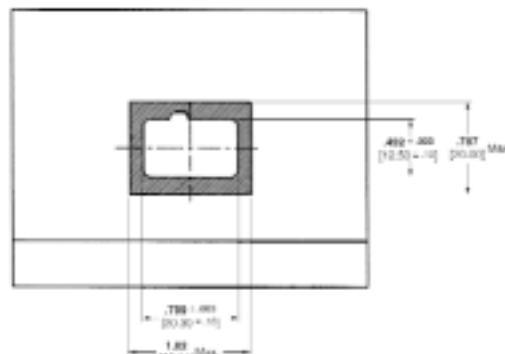


Part Number 1374490-1 and 1374493-1 (with safety shutter)



**Product Facts**

- Holds two standard or low loss LIGHTRAY MPX connectors
- Optional self actuated laser safety shutter
- Up to 48 fibers simultaneously mated and managed
- Mates to part number 1374491-1
- Used with clip part number 1278530-2 (next page)



Panel Cutout

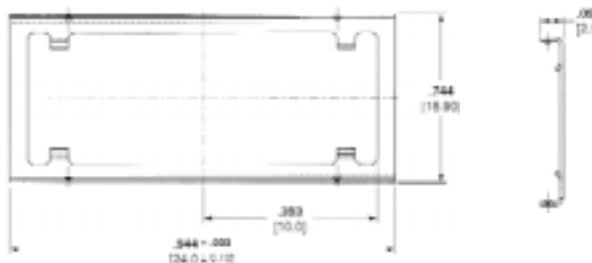
Dimensions on this page in inches over [mm]



**LIGHTRAY MPX™ System Interconnects** (Continued)

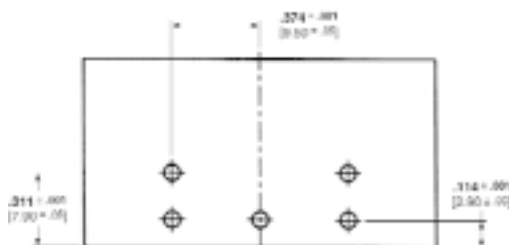
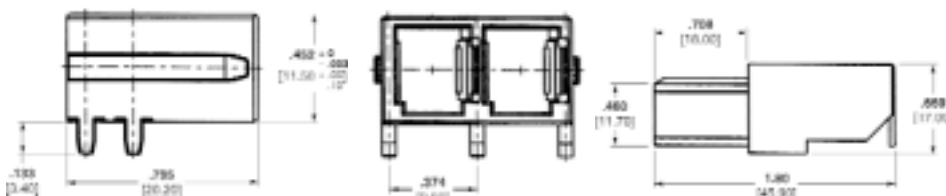
**Backplane Housings and Adapters** (Continued)

**Clip Part Number 1278530-2, 1 x 2 Duplex**



**System Card Housing – Duplex**

**Part Number 1374491-1**



Recommended Hole Pattern

**Product Facts**

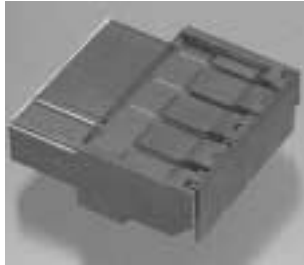
- Holds two standard or low loss LIGHTRAY MPX connectors
- Up to 48 fibers simultaneously mated and managed
- Simple press-fit mounting, no hardware needed
- Unique latching provides positive retention when card is unmated
- Mates to part number 1374490-1

Dimensions on this page in inches over [mm]

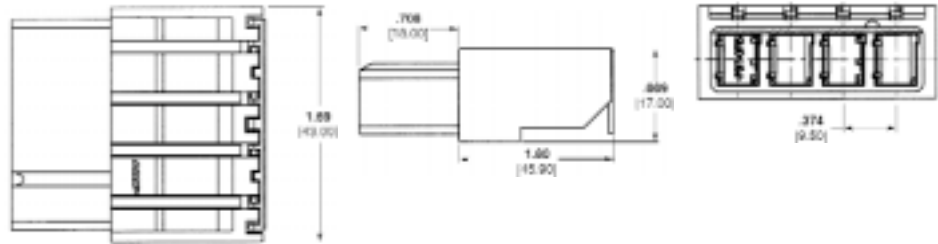
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Backplane Housings and  
Adapters (Continued)

Backplane Housing –  
Quad

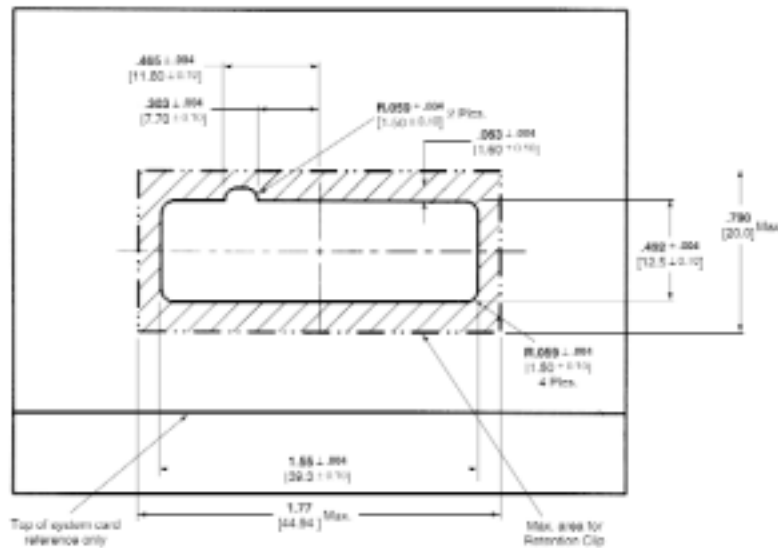


Part Number 1278529-1



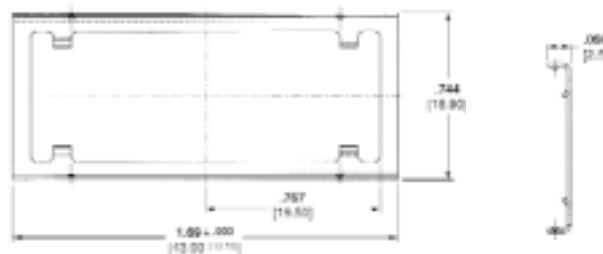
Product Facts

- Holds up to 4 standard or low loss LIGHTRAY MPX connectors
- Self actuated laser-safe shutter
- Up to 96 fibers simultaneously mated and managed
- Integral "tool safe" cable latching
- Mates to 1278391-1
- Used with clip 1278530-1



Suggested Panel Cutout Looking from System Card Side

Clip Part Number 1278530-1, 1 x 4 Quad



Dimensions on this page  
in inches over [mm]



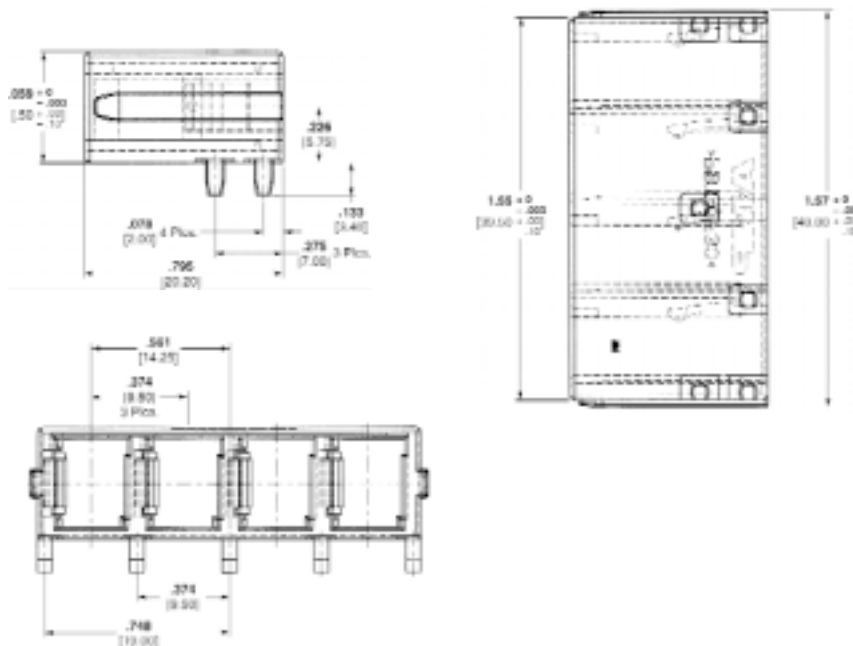
**LIGHTRAY MPX™ System Interconnects** (Continued)

**Backplane Housings and Adapters** (Continued)

**System Card Housing – Quad**

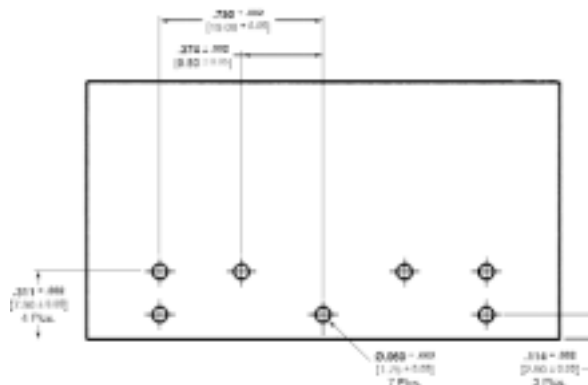


Part Number 1278391-1



**Product Facts**

- Holds 4 standard or low loss LIGHTRAY MPX connectors
- Up to 96 fibers simultaneously mated and managed
- Simple press-fit mounting – no hardware needed
- Unique latching provides positive retention when card is unmated
- Mates to 1278529-1



Recommended Hole Pattern

Dimensions on this page in inches over [mm]

**LIGHTRAY MPX™ System Interconnects** (Continued)

**Fanout Assemblies**

**Product Facts**

- Multimode 62.5/125µm and 50/125µm
- Singlemode 9µm, 8° angle interface
- Color coded buffered fiber or LSZH (Low Smoke Zero Halogen) sheathed cable with breakout kit
- Male MPX connectors (with guide pins)
- 4, 8, 12, 16 and 24 fibers
- Custom lengths available
- Connector labeling to guide insertion
- SC, ST, FC or MT-RJ terminations available



**Mini Trunk Assemblies**

**Product Facts**

- Multimode 62.5/125µm and 50/125µm
- Singlemode 9µm, 8° angle interface
- 250µm bare ribbon and LSZH (Low Smoke Zero Halogen) sheathed ribbon cable available
- Female MPX connectors (without guide pins)
- 4, 8, 12, 16 and 24 fibers
- Custom lengths available
- Connector labeling to guide insertion



**Trunk Assemblies**

**Product Facts**

- Multimode 62.5/125µm and 50/125µm
- Singlemode 9µm, 8° angle interface
- Available with female MPX connectors (without guide pins) and/or male MPX (with guide pins)
- SC, ST, FC or MT-RJ terminations available for hybrid configurations
- 4, 8 and 12 position ribbon fiber sub-units
- LSZH (Low Smoke Zero Halogen) sheathed cable (round construction)
- Internal/external cable
- Custom lengths available



**LIGHTRAY MPX™ System Interconnects** (Continued)

**System Card Assemblies**



**Fanout Assembly Options**

**Product Facts**

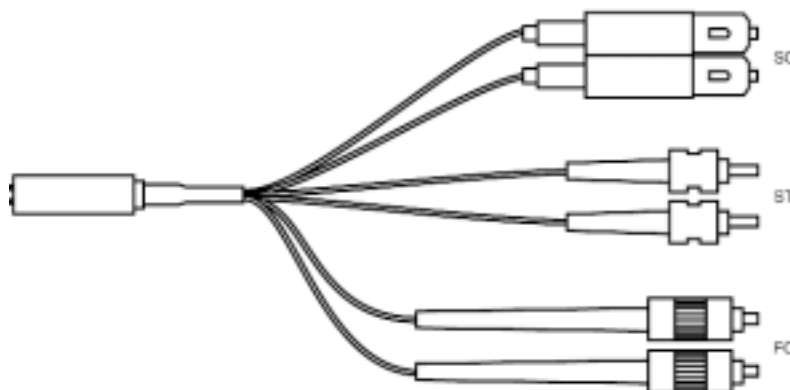
- Multimode and singlemode
- Available with 900µm buffered fiber, jacketed cable and ruggedized cable
- SC, ST, FC, MT-RJ, LC or other industry-standard connector terminations available
- Up to 24 fibers
- Custom lengths available

Factory terminated assemblies are supplied custom built for each application. Assemblies are fully tested and can be offered with standard (multimode) or 8° angled (singlemode) end finishes to meet return loss needs.

The connectors accommodate various cable types, including ribbon and easy strip cable. The variety of configurations in cable assemblies makes it easy to transition from industry standard transceiver interfaces at one end and patch panels at the other. Factory terminated cables also speed system assembly, since the cables quickly and simply snap into place.



LIGHTRAY MPX to LIGHTRAY MPX Connectors



LIGHTRAY MPX to Industry-Standard Connectors



LIGHTRAY MPX Pigtail

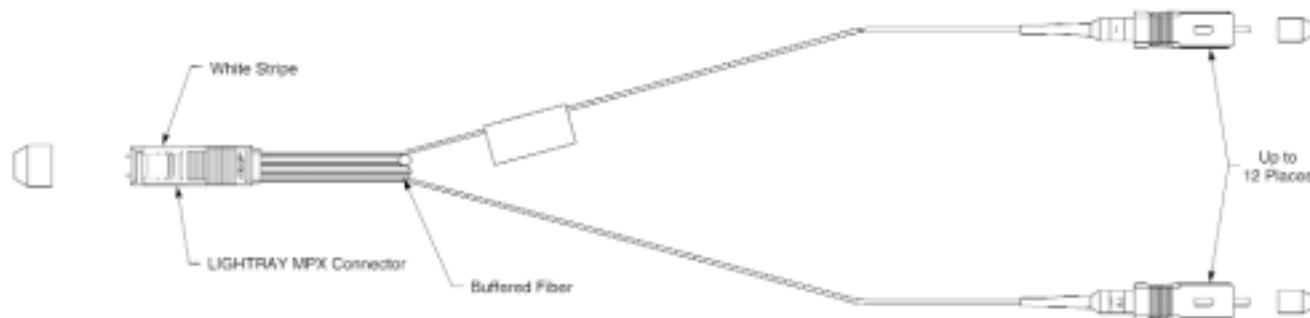
**LIGHTRAY MPX™ System Interconnects** (Continued)

**System Card Assemblies**  
(Continued)

**Optical Performance Characteristics**

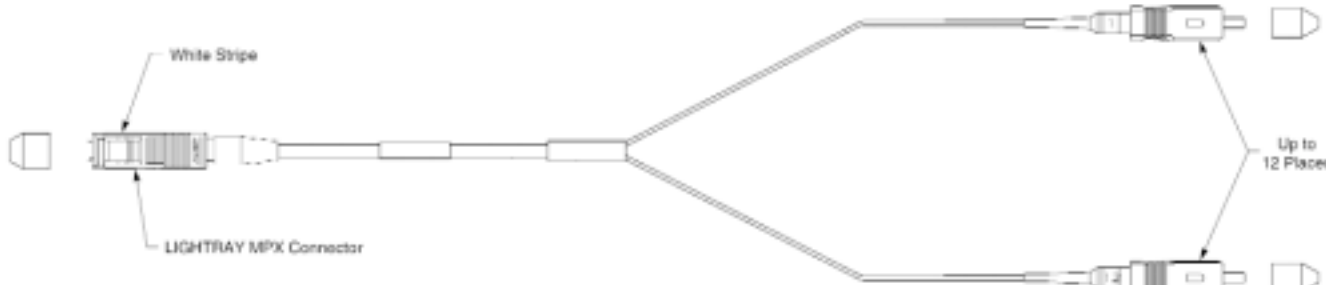
- Mean insertion loss of 0.35dB, with a maximum of 1.0dB for both multimode and singlemode
- Minimum return loss 45dB (8° APC interface for singlemode)

**LIGHTRAY MPX Fanout Assembly –900µm Buffered Fiber**



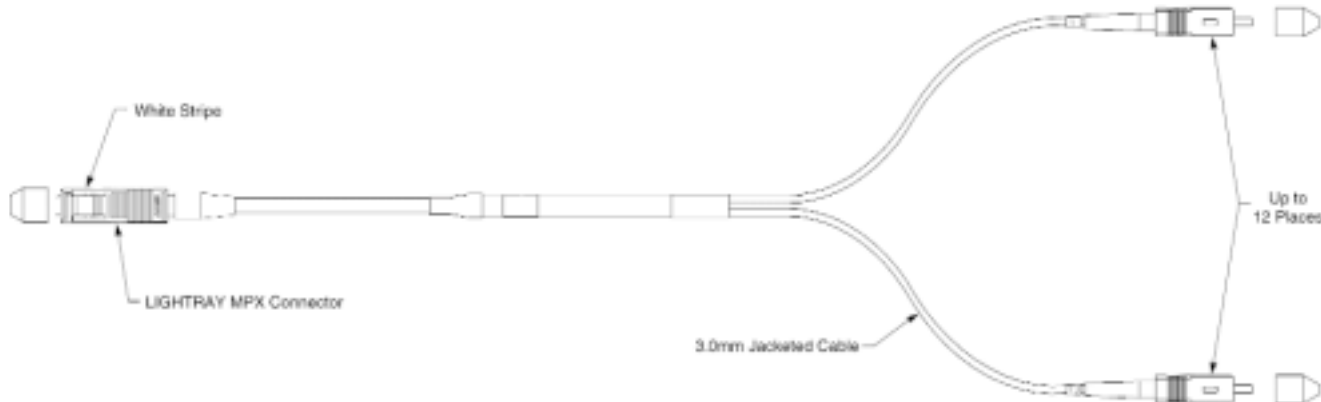
Part Number 492513

**LIGHTRAY MPX Fanout Assembly –Jacketed Cable**



Part Number 492514

**LIGHTRAY MPX Fanout Assembly –Ruggedized Cable**



Part Number 492512

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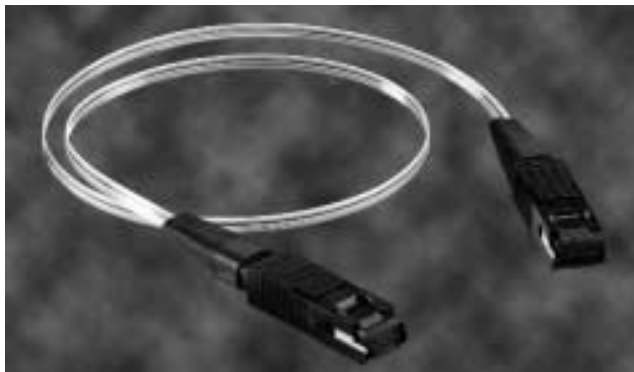
**LIGHTRAY MPX™ System Interconnects** (Continued)

Patch Cords

Cable Assembly Options

Product Facts

- Multimode and singlemode
- Up to 24 fibers
- Ribbon cable, ruggedized or unruggedized cable construction
- Custom lengths available



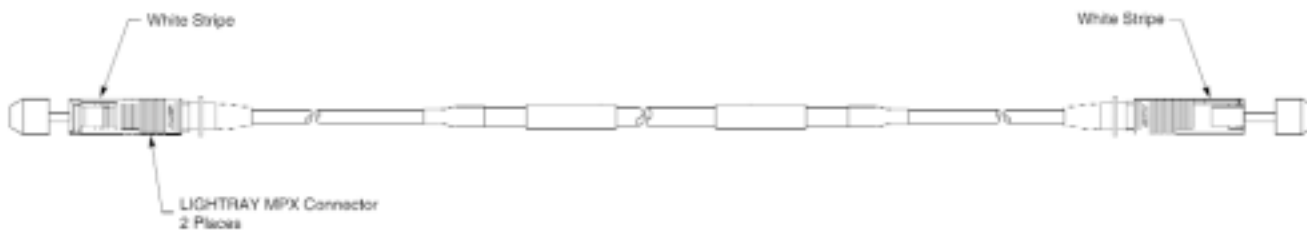
The LIGHTRAY MPX connector is pre-terminated onto fiber optic cable and pre-tested at the factory before being shipped. It can be used with either multimode or singlemode fiber and accepts a wide range of cable constructions, including ribbon fiber or "easy strip" fiber.

**LIGHTRAY MPX to LIGHTRAY MPX –Ribbon Fiber**



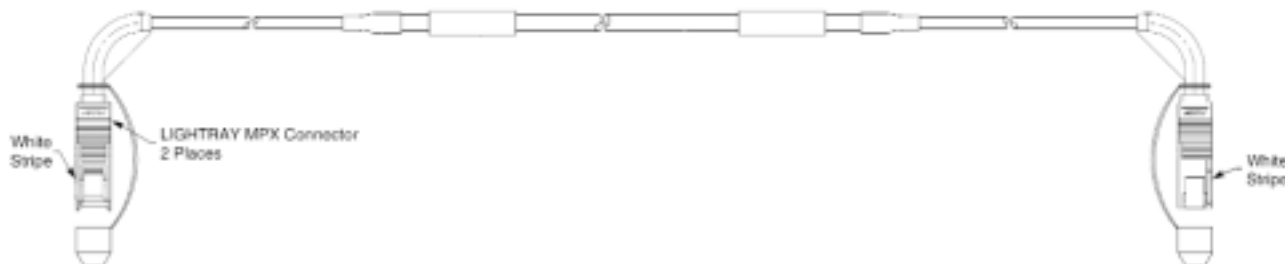
Part Number 1278088

**LIGHTRAY MPX to LIGHTRAY MPX –Jacketed Cable –Straight**



Part Number 1278110

**LIGHTRAY MPX to LIGHTRAY MPX –Jacketed Cable –Right Angle**



Part Number 1278150

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**LIGHTRAY MPX™ System Interconnects** (Continued)

**MPX Cable Assemblies**

Description	Part Number
<b>Singlemode</b>	
<b>Standard Loss MPX</b>	
4-fiber MPX (m) pigtail, 900µm buffered fibers	1457078-X
4-fiber MPX (f) pigtail, 900µm buffered fibers	1374899-X
4-fiber MPX (m) to MPX (m), bare ribbon	1457090-X
4-fiber MPX (f) to MPX (f), jacketed ribbon	1374898-X
8-fiber MPX (m) pigtail, bare ribbon	1374392-X
8-fiber MPX (f) pigtail, bare ribbon	1374539-X
8-fiber MPX (f) pigtail, 900µm buffered fibers	1374537-X
8-fiber MPX (m) pigtail, 900µm buffered fibers	1374538-X
8-fiber MPX (m) to MPX (m), bare ribbon	1457394-X
8-fiber MPX (f) to MPX (f), bare ribbon	1374600-X
8-fiber MPX (m) to MPX (m), jacketed ribbon	1374886-X
8-fiber MPX (f) to MPX (f), jacketed ribbon	1374887-X
8-fiber MPX (m) to MPX (f), jacketed ribbon	1374892-X
12-fiber MPX (m) to MPX (m), bare ribbon	1374743-X
12-fiber MPX (f) to MPX (f), bare ribbon	1374601-X
12-fiber MPX (f) to MPX (f), round cable	1278110-X
12-fiber MPX (m) to (12) SC, 900µm buffered fibers	492514-X
12-fiber MPX (m) to (12) SC, ruggedized	492515-X
<b>Low Loss MPX</b>	
4-fiber MPX (m) pigtail, bare ribbon	1457690-X
4-fiber MPX (m) to MPX (m), bare ribbon	1457398-X
4-fiber MPX (f) to MPX (f), bare ribbon	1457399-X
4-fiber MPX (f) to MPX (f), jacketed ribbon	1588273-X
8-fiber MPX (m) pigtail, bare ribbon	1374448-X
8-fiber MPX (f) pigtail, bare ribbon	1374639-X
8-fiber MPX (m) pigtail, 900µm buffered fibers	1457173-X
8-fiber MPX (f) pigtail, 900µm buffered fibers	1457174-X
8-fiber MPX (m) to MPX (m), bare ribbon	1374738-X
8-fiber MPX (f) to MPX (f), bare ribbon	1457310-X
8-fiber MPX (m) to MPX (f), bare ribbon	1457569-X
8-fiber MPX (f) to MPX (f), jacketed ribbon	1457738-X
8-fiber MPX (f) to MPX (m), jacketed ribbon	1588006-X
<b>Multimode (all parts listed are 62.5/125 fiber, but 50/125 is also available)</b>	
8-fiber MPX (m) pigtail, bare ribbon	1457366-X
8-fiber MPX (f) to MPX (f), bare ribbon	1457124-X
8-fiber MPX (m) to (8) SC, ruggedized	492519-X
8-fiber MPX (m) pigtail, jacketed ribbon	1457645-X
12-fiber MPX (f) pigtail, bare ribbon	1374788-X
12-fiber MPX (m) to MPX (m), bare ribbon	1278088-X
12-fiber MPX (f) to MPX (f), bare ribbon	1278206-X
12-fiber MPX (m) to (12) SC, ruggedized	492512-X
12-fiber MPX (m) to (12) SC, 900µm buffered fibers	492513-X

**Note:** All assemblies are custom built to customer's length specifications.

**LIGHTRAY MPX™ System Interconnects** (Continued)

Dust Covers

Description		Part Number
<b>Simplex</b>		
System Card	Board Side	1278201-1
	Backplane Side	492578-1
Backplane	Inside Cage	492575-1 (no insert)
		492576-1 (with insert)
		503967-5 (removal tool)
	Back of Cage	502871-1
<b>Duplex</b>		
System Card	Board Side	502871-1
	Backplane Side	1374674-1
Backplane	Inside Cage	1374671-1
	Back of Rack	502871-1
<b>Quad</b>		
System Card	Board Side	502871-1
	Backplane Side	1374547-1
Backplane	Inside Cage	1374548-1
	Back of Rack	502871-1
<b>Bulkhead</b>		
Cable		492577-1 (without strap)
		492577-2 (with strap)

Boots and Cable Directors

Description	Color	Part Number
Straight Boot	—	492588-2
Right Angle Boot	Black	492581-5
	Green	492581-6
	Blue	492581-7
	Red	492581-8

Cleaning Kit

Product Facts

- 2 re-useable cleaning kit assemblies
- 2 MPX bulkhead adapters
- 2 MPX backplane housings
- 1 pack of 24 cleaning tool inserts \*



Description	Part Number
LIGHTRAY MPX Cleaning Kit	1278498-1
Cleaning Inserts (24/pack)	1457019-3

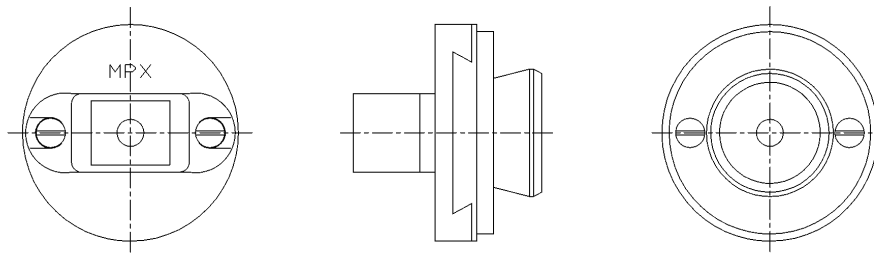
\*can be ordered separately

**LIGHTRAY MPX™ System Interconnects** (Continued)

**Connector Microscope Adapters**



**Straight for flat polished multimode LIGHTRAY MPX connectors**



Part Number 492526-1

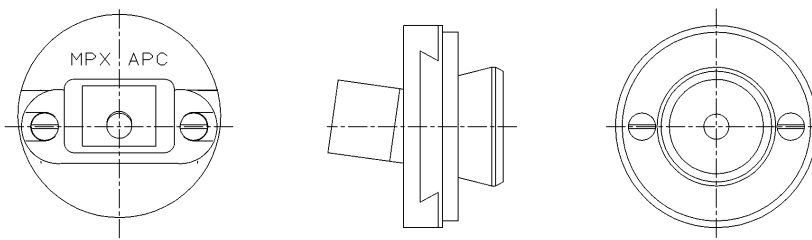
**Use**

- Snap adapter into microscope
- Push LIGHTRAY MPX connector in until it bottoms
- Examine Endface
- Remove LIGHTRAY MPX connector

**Advantages**

- Designed specifically for the LIGHTRAY MPX Connector
- Fits in standard Tyco Electronics microscope (Part Number 502978)
- 200 x power

**Tilted for angle polished singlemode LIGHTRAY MPX connectors**



Part Number 492527-1

Description	Part Number
Multimode Microscope Adapter	492526-1
Singlemode Microscope Adapter (angled)	492527-1

**LIGHTRAY MPX™ System Interconnects** (Continued)**Tooling and Accessories****Simplex Backplane Housing Tooling**

Part Number	Description
492356-3	System Card Mounting (Kit)
492356-2	Backplane Mounting (Kit)
492356-1	System Card & Backplane Mounting (Kits)
492493-1	Backplane Connector Side — Connector Support
1278315-1	Retention Clip Tool (Molded Plastic)
492578-1	Dust Cover — System Card Connector
492576-1	Dust Cover — Backplane Connector Mating Connector Side (System Card Side)
503967-5	Dust Cover Removal Tool — Backplane (System Card Side)
502871-1	Dust Cover — Backplane Connector Cable Side <sup>1</sup>
492740-2	Retention Clip

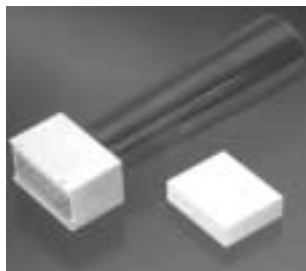
<sup>1</sup> Dust cover shown is flush mount. Same part with finger tabs is 1374678-1.

**Duplex Backplane Housing Tooling**

Part Number	Description
(Customer Supplied) <sup>2</sup>	System Card Seating Tool (Flat Rock on Housing)
(Customer Supplied) <sup>2</sup>	System Card Support Tool (Clearance for Attachment Posts)
1278944-2	Backplane Connector Side — Connector Support
1278945-4	Retention Clip Tool (with Handle)
1374674-1	Dust Cover — System Card Connector
1374671-1	Dust Cover — Backplane Connector Mating Connector Side (System Card Side)
503967-5	Dust Cover Removal Tool — Backplane (System Card Side)
502871-1	Dust Cover — Backplane Connector Cable Side <sup>1</sup>
1278530-2	Retention Clip

<sup>1</sup> Dust cover shown is flush mount. Same part with finger tabs is 1374678-1.

<sup>2</sup> System card tooling is "customer supplied" — suggested detail is defined in application specifications (contact Tyco Electronics for availability).

**Quad Backplane Housing Tooling**

Part Number	Description
(Customer Supplied) <sup>2</sup>	System Card Seating Tool (Flat Rock on Housing)
(Customer Supplied) <sup>2</sup>	System Card Support Tool (Clearance for Attachment Posts)
1278944-1	Backplane Connector Side — Connector Support
1278945-2	Retention Clip Tool (with Handle)
1374547-1	Dust Cover — System Card Connector
1374548-1	Dust Cover — Backplane Connector Mating Connector Side (System Card Side)
503967-5	Dust Cover Removal Tool — Backplane (System Card Side)
502871-1	Dust Cover — Backplane Connector Cable Side <sup>1</sup>
1278530-1	Retention Clip

<sup>1</sup> Dust cover shown is flush mount. Same part with finger tabs is 1374678-1.

<sup>2</sup> System card tooling is "customer supplied" — suggested detail is defined in application specifications (contact Tyco Electronics for availability).

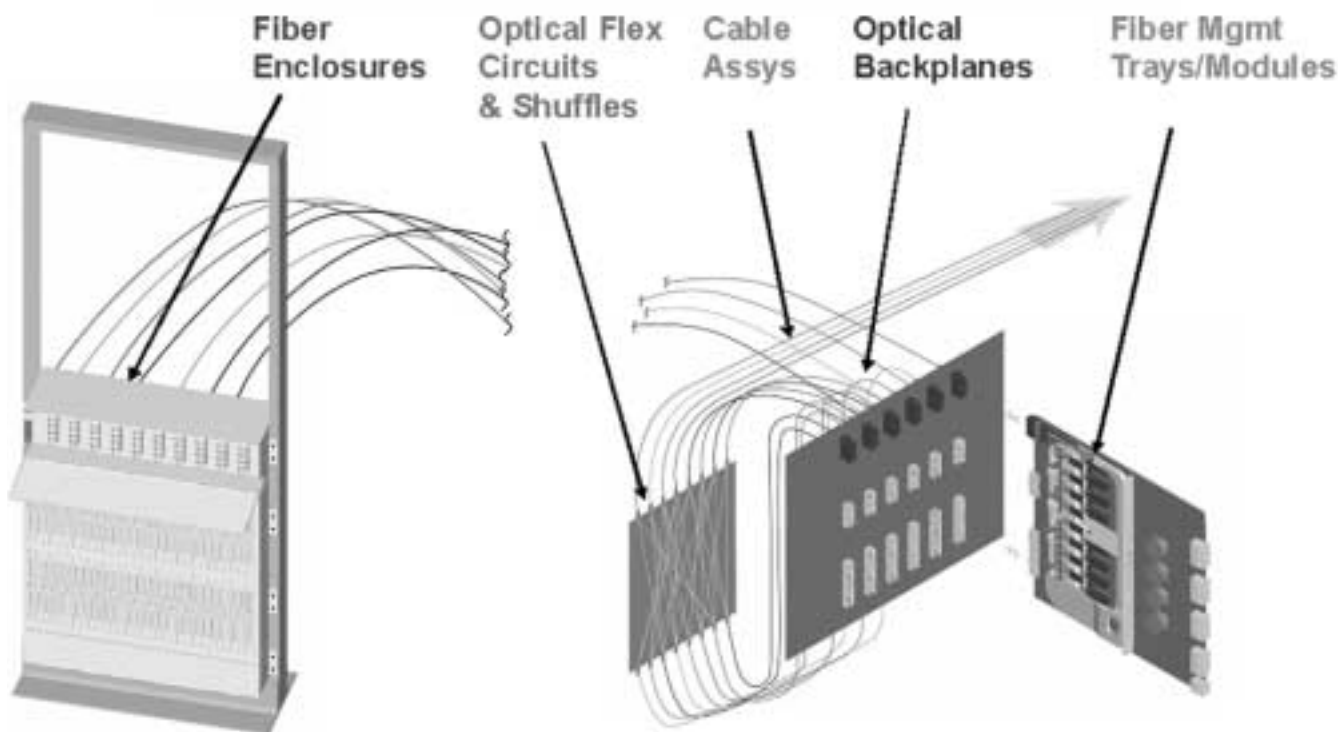
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**Fiber Management Systems**



Tyco Electronics' Fiber Optics Business Unit is recognized globally as a leader in Fiber Optics Interconnects. We also offer a complete line of integrated Packaged Solutions to meet most complex design challenges. Working directly with us, our designers can offer solutions that help reduce your time to market, simplify your manufacturing, and work with you so that your design requirements are met. We offer complete solutions to a variety of fiber management challenges.

**The products in this Fiber Management and Packaged Solutions section are custom designed products, specific to our customers' applications. Please call your local Tyco Electronics sales representative for design assistance.**

**LIGHTRAY OFX™ Optical Fiber Circuit Assemblies**

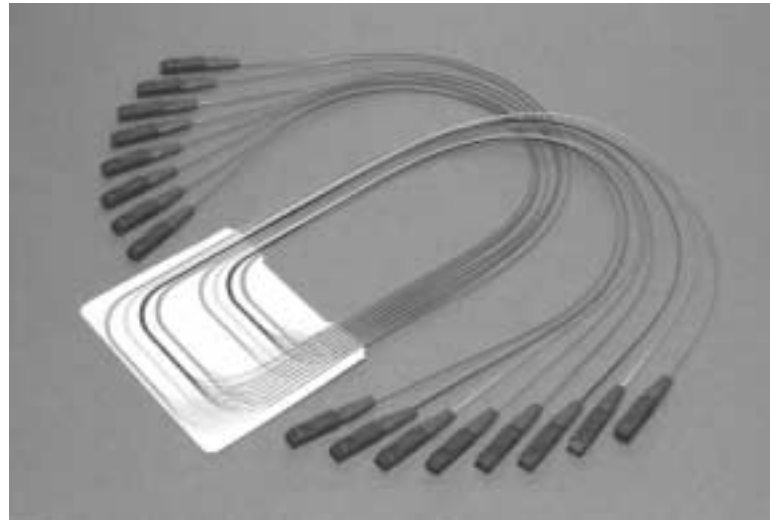
**LIGHTRAY OFX  
Optical Circuits**

**Product Facts**

- Singlemode and multimode product range
- Available in a range of symmetrical and asymmetrical designs
- Can be designed with a choice of protective film substrates (including V0 rated materials)
- Pre-terminated with LIGHTRAY MPX™ or any other industry standard connector
- Operates over a broad temperature range
- Fiber optic equivalent of a copper circuit
- Allows fiber "crossovers" without performance penalty
- Very low insertion loss
- Flat or cylindrical design

**Benefits**

- Easy routing and management of thousands of fibers on a single substrate
- Fully optical cross connect
- Lightweight
- Saves valuable space
- Significantly contributes to skew compensation
- Easy to install
- Offers flexibility in systems design



Tyco Electronics' LIGHTRAY OFX optical fiber circuit offers an innovative and flexible solution to precision fiber management in high fiber count applications. Designed using the latest fiber optic technology,

LIGHTRAY OFX consists of a number of optical fibers, which are encapsulated in thin protective film substrates. As well as saving valuable space in equipment and equipment racks, LIGHTRAY OFX also provides optimum optical performance.

Optical fiber "crossovers" allow the optical fibers to be routed in both regular and irregular designs. Fibers are routed on 250 µm center lines allowing LIGHTRAY MPX to be terminated on the fiber tails.

**Key Applications**

High Fiber Count Applications in Optical Transmission and Switching Equipment, in Equipment Racks or on the Printed Circuit Board.

- Provides a complete optical backplane, interconnecting multiple daughtercards
- Complex rack harnesses
- Simplified intra-rack fiber management and cabling
- Serves as a complete optical cross connect (64 x 64 or 128 x 128) in less than 500 x 500 mm of valuable space
- Can be used for the interconnection of optoelectronic devices on the printed circuit board

**Optical Performance (singlemode)**

**Maximum Insertion Loss\* (connector loss)** - <0.1dB max; <0.05dB typical

**Polarization Depending Loss** - <0.1dB

**Mechanical Characteristics**  
**Vibration (per IEC 61300-2-1)** - 10-55Hz

**Fiber Retention (per IEC 61300-2-4)** - 44 N max.

**Environmental Characteristics**

**Operating Temperature** - -40°C to + 85°C

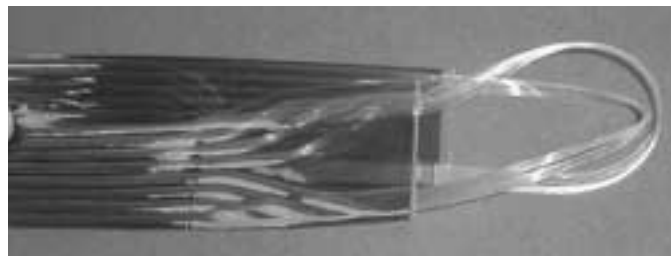
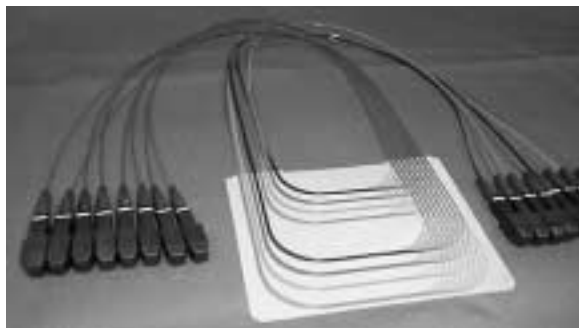
**Storage Temperature** - -40°C to + 85°C

**Humidity** - 95%

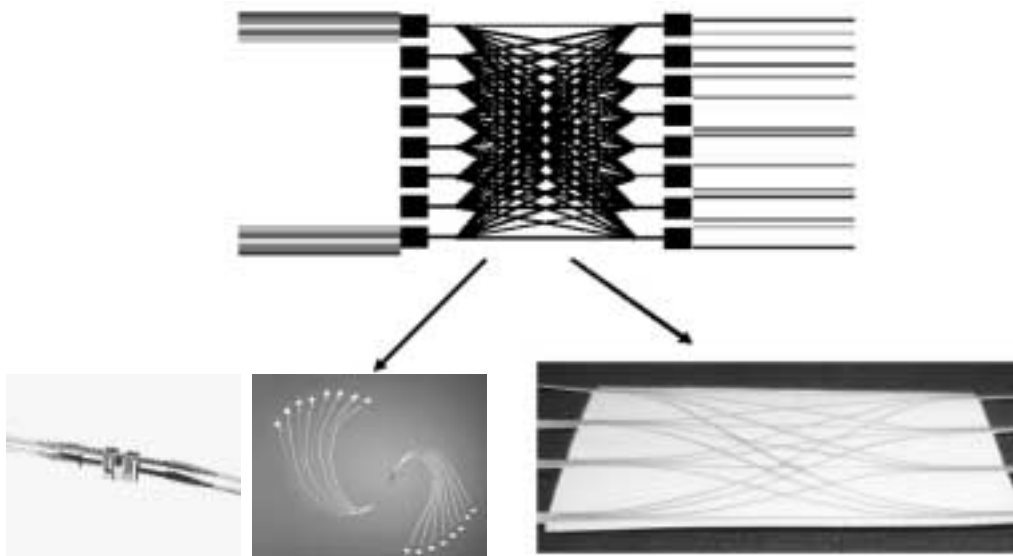
\* final loss depending on connector types

**LIGHTRAY OFX™ Optical Fiber Circuit Assemblies** (Continued)

**Optical Flex Circuits & Shuffles**



**Optical Shuffle (Perfect)**



Optical flex circuits offer unique solutions that can greatly simplify fiber routing, just as the printed circuit board simplified electrical wiring. We offer a broad range of Optical Flex Circuit solutions, so that even the most complex routing challenges can be efficiently resolved:

- Standard ribbon or single fiber terminations
- Custom point-to-point routing done by Numerically Controlled (NC) machine
- Attachment to rigid carrier or copper backplane
- Low loss: < 0.05 typ.
- Tube style “shuffles” for optimum density
- On board fiber management
- Stacked shuffles can be used as cross connects

### On Card Fiber Management

#### On Card Fiber Management

##### Product Facts

- Multimode or Singlemode
- Custom design
- 94-V0 rated materials

##### Benefits

- Easy management of on-board fibers
- Fiber protection and routing (allowing use of 250 micron fiber for added density)
- Pre-loaded and tested trays to facilitate manufacturing
- "Mezzanine" trays allow components to be mounted underneath the fiber tray – minimizing board real estate
- Splice management
- Maintaining minimum bend radius
- Eliminating long term performance degradation through "sag"
- Skew control

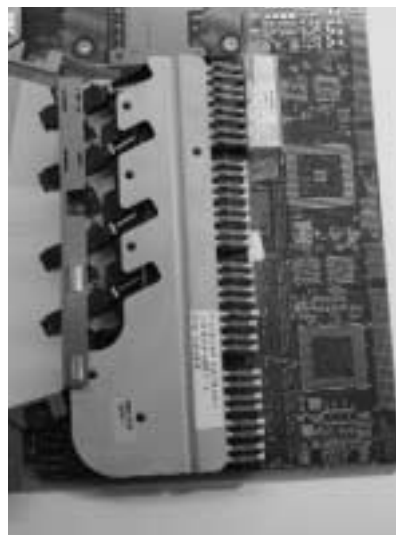
Before



After



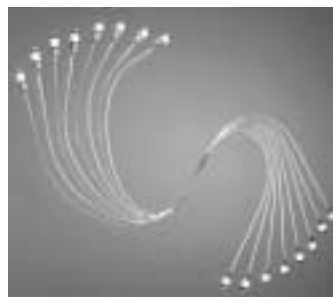
Thin modules designed to fit on your system card.



Plug and play — drop the module on your board and plug the connectors.



Non-planar circuits



**Optical Backplanes & Fiber Management Solutions**



LIGHTRAY MPX Optical Backplane



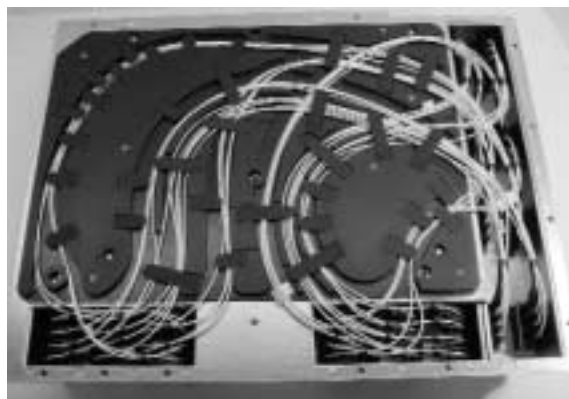
Backside of Optical Backplane with  
Fiber Management

**Fiber Management Solutions**

Before



After

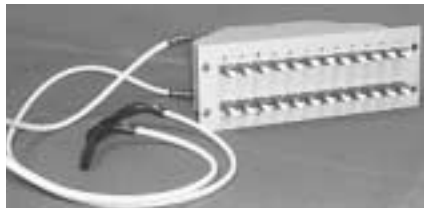
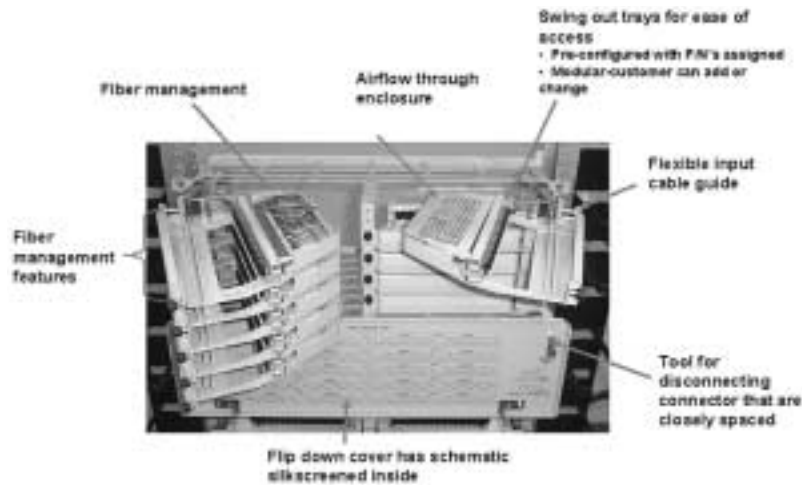


Customers' demands for scalability and adding optics functionality in the field can be satisfied with custom Optical Backplanes provided as complete modules by Tyco Electronics. Optical backplanes can be integrated with a variety of fiber management solutions to resolve most complex applications. Optical backplanes, using our LIGHTRAY MPX™ proven technology, offer several significant benefits:

- Backplane connector float in all planes
- Proven and reliable MT technology
- Singlemode and multimode
- Up to 24 fibers per MT ferrule available now; up to 72 fibers per ferrule in near future
- High density: up to 96 fibers in 50mm (using 24 fiber ferrule)
- Easily Upgradeable: start with all 12 fibers loaded in backplane cable and you can upgrade your system card from 4 to 8 to 12 fibers without changing the backplane cabling.
- Can be integrated with copper backplane, Optical Flex circuits, or specialized fiber management solutions

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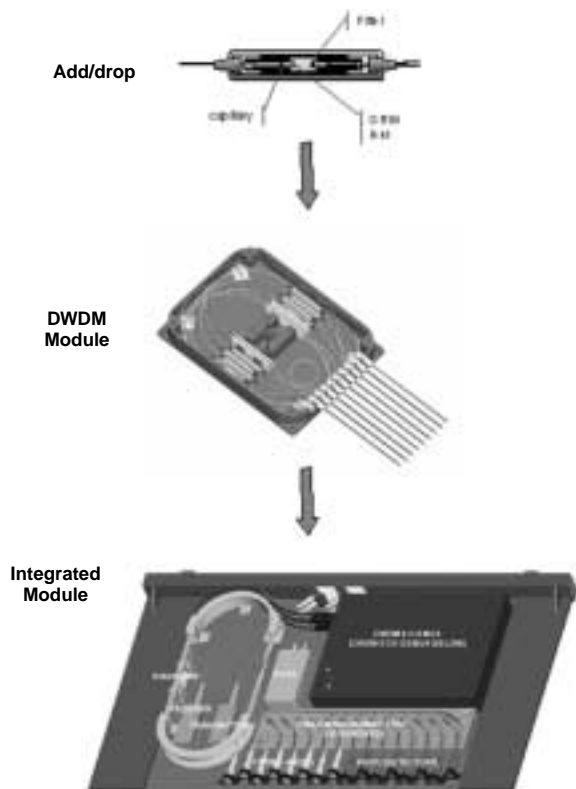
**Enclosures and Customer Interface Panels**



As customer interface panels and enclosures increase in fiber count and density, issues of fiber management, repairability, and scalability become increasingly complex. We offer complete solutions matched to the customers' individual program needs:

- High density, ease of access, flexibility
- Pre-loaded and tested cables
- Modular design approach for flexibility in I/O's needed, cable dress, and connector styles
- Accommodate airflow needs
- EMI Solutions

**xWDM & Integrated Modules**



**Standard Modules**



**Custom Module**



We offer standard and custom completed xWDM modules. Capabilities include:

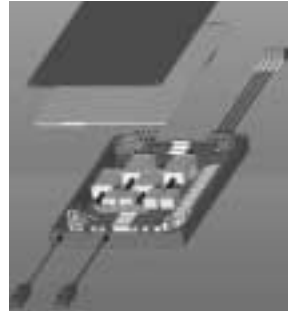
- Work with increasingly tighter specifications and higher density requirements
- 100 & 200 Ghz, C, Passband, AWG's, etc.
- Modules 100% tested with SWS
  - Small increments and narrow spectral width for optical performance over the entire operating range
  - Tested for PDL as well as IL
- Offer expertise in packaging and testing of add-drops. Will also source newest technology outside
- Custom and high density packaging can be provided, standard cassettes also available
- Will integrate into higher value add modules.

**See Attenuator, WDM's and Switches, Section #6, pages 224-232 for details on WDM products.**

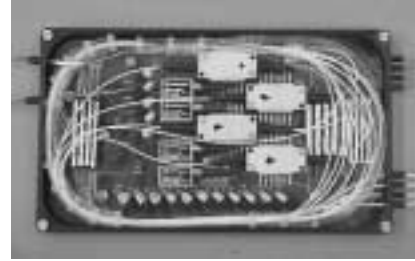
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**“NEW” Advanced Optical Modules**

Concept to Production



Concept

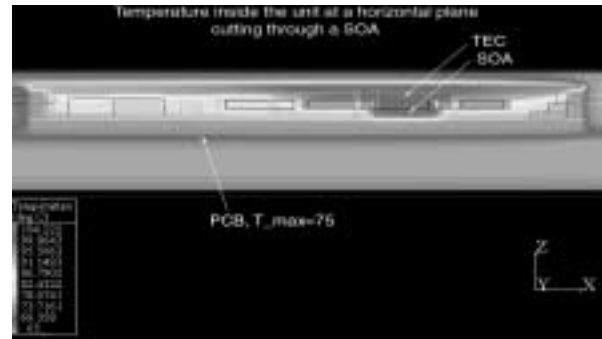


Production

Tyco Electronics offers fully designed optical modules for individual customer requirements. Modules can offer complete integration of passive, active, and electrical components. Solutions can incorporate:

- Amplifier technologies: EDFA, SOA, EDWA
- Protection circuitry
- Line balancing/equalization
- Amplification for transparent networks

- Fiber management, component placement/profiles and impact on thermals
- Design for manufacturability
- Reliability



Design for Manufacturability



From complex optics to packaging designs for specialized customer needs including:

- Electrical and optical design
- Scale to manufacturing; optimize costs and benefits of discrete vs integrated solutions

- Custom packaging of standard devices and increase density
- Integrated EO components
- Module layouts optimized to meet GR-63
- Standard modeling tools (Pro-E)

- Component layout to maintain bend radius compliance
- Design for repair-ability

**“NEW” Advanced Optical Modules** (Continued)

Turn-Key Solutions



Full turn-key packaging services offering customer print builds of electro-optical modules:

- Daughter card mezzanine modules
- Advanced fiber management solutions
- Channel and line cards
- Inventory management — customer, vendor

Advance Optical Module  
Qualification Capabilities



Tyco Electronics will qualify modules to various Industry Standards:

- GR326 singlemode connectors
- GR1435 MT connectors
- GR1380 splice integrity
- GR1209 branching components
- GR1221 reliability assurance
- GR63 environmental integrity for network systems
- Custom testing for module performance parameters

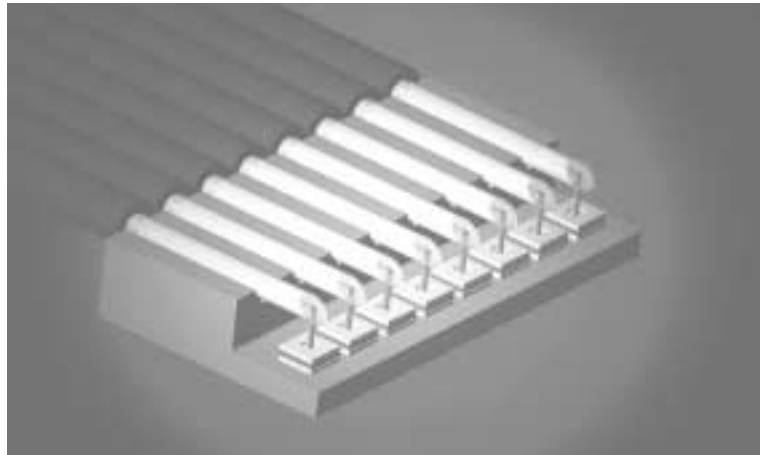
**“NEW” FIBERSHAPE™ Laser Process**



**“NEW” FIBERSHAPE  
Laser Processing of Fibers**

**Product Facts**

- Complete range of cleave angles
- Ultra High Precision measured @ core region (< ±0.5 degrees)
- Capable of providing domed end finish
- Angle cleaving of ribbons (incl. sawtooth)
- Angled cleaves in 0, 8, 45 and other custom degrees
- Ultra precise length control of cleaved endface versus ref. plane
- Capable of cleaving close to fiber coating
- High volume industrial solution for the opto electronic industry



90 degree VSCSEL array interface

Tyco Electronics' new FIBERSHAPE™ process, which uses the power of a laser beam to prepare fiber endfaces for termination in connector assemblies and optical devices, provides a state-of-the-art solution for opto electronic device pigtailing including:

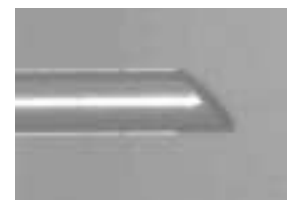
- Planar OEICs
- Array Devices
- Discrete Laser/LED/Receiver package
- Detachable pigtails

This ultra high precision process enables very compact designs and perpendicular fiber coupling.

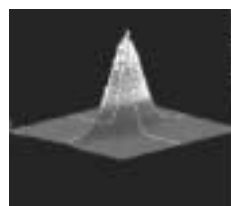
Please contact your local sales representative or Tyco Electronics for more in-depth product information.



Near Field Scan @ 1310nm



Straight and Angled Cleave



Wedge Fiber Characteristics



Laser processed subassembly



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**Engineering Notes**



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**Premises Wiring Products (AMP NETCONNECT™ Fiber Optic Solutions)**

Premises Wiring Products  
(AMP NETCONNECT™ Fiber  
Optic Solutions)



**MT-RJ SECURE Optical Fiber Cabling System**  
Section 2 - Pages 70-73



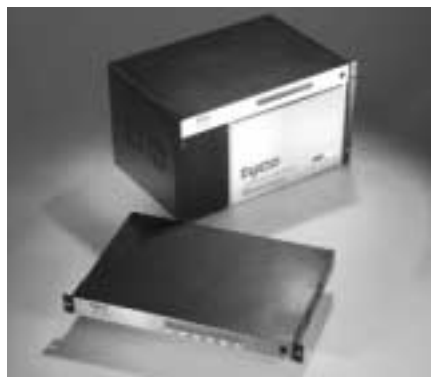
**AMP NETCONNECT MT-RJ Fiber Optic System**  
Section 1 - Pages 52-54



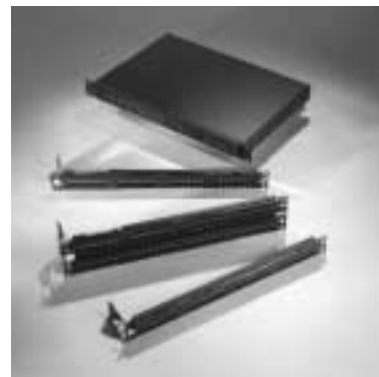
**25 Year Systems Warranty**



**AMP NETCONNECT Fiber Optic Cable**



**AMPTRAC™ Connectivity  
Management System**



**AMPTRAC™ Connectivity  
Management System**

The AMP NETCONNECT Group of Tyco Electronics offers a total AMP NETCONNECT fiber optic solution including fiber optic cable, connectivity and closet hardware; as well as network management through the new AMPTRAC Connectivity Management

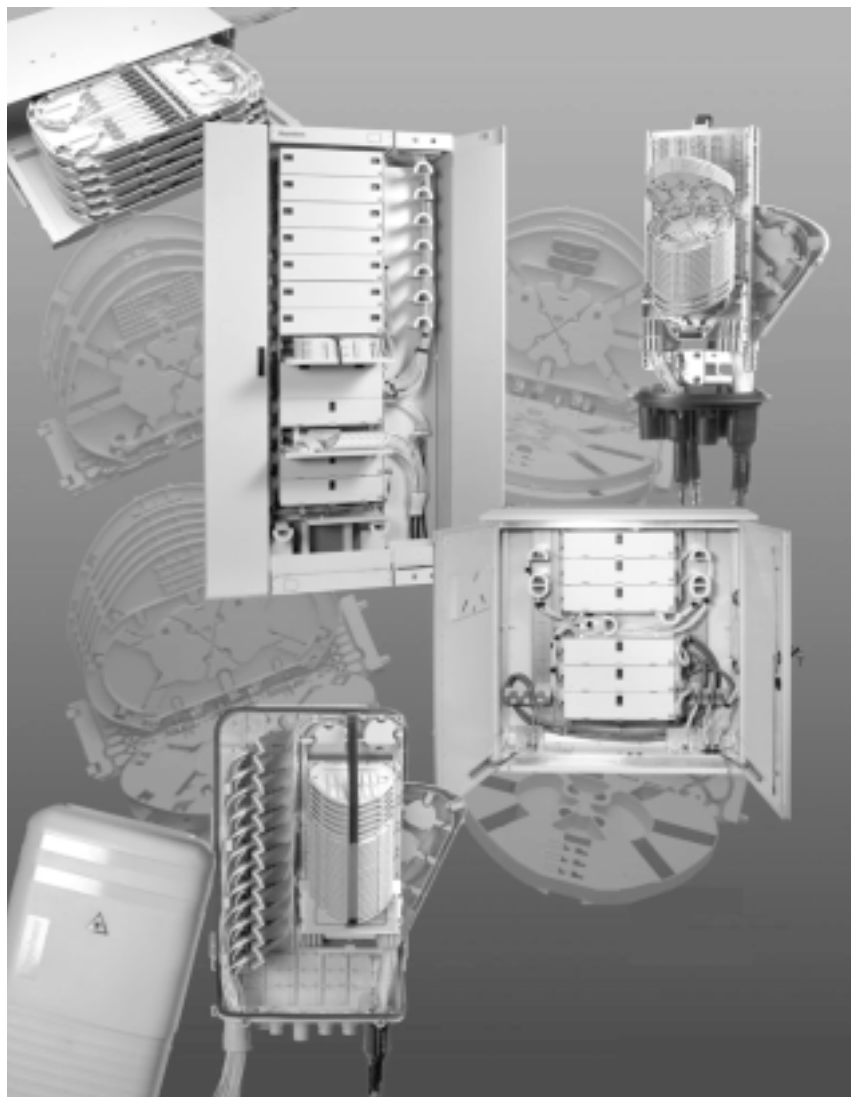
System. All systems are backed by a 25 year warranty to ensure your system will keep performing to industry standards.

For more information on any Premises Wiring products or systems, check out the website at [www.ampnetconnect.com](http://www.ampnetconnect.com)

or contact the customer service department at 1-800-553-0938. A full line AMP NETCONNECT Catalog (#82164) is also available through customer services or from your local Tyco Electronics sales representative.

**Telecom Outside Plant (Raychem) Products**

Telecom Outside Plant  
(Raychem) Products



The Telecom Outside Plant Business Unit of Tyco Electronics has been created from a family of companies with a long tradition of making quality components for telecommunications networks and providing innovative solutions for their evolving needs.

The FIST, FOSC, and FibrBoss families of modular fiber management products enhance the design, implementation, and maintenance of fiberoptic networks, from the central office/exchange to the customer's premises.

For more information on any Telecom Outside Plant

products or services, check out the website at <http://www.telecomosp.com> or contacting customer service at 1-888-557-8901. A full line Telecom Outside Plant Catalog (#1654451) is also available through customer service or your local Tyco Electronics sales representative.



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**Engineering Notes**

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**“NEW” High Speed Parallel Optics XTM Para-Optix Transceivers**

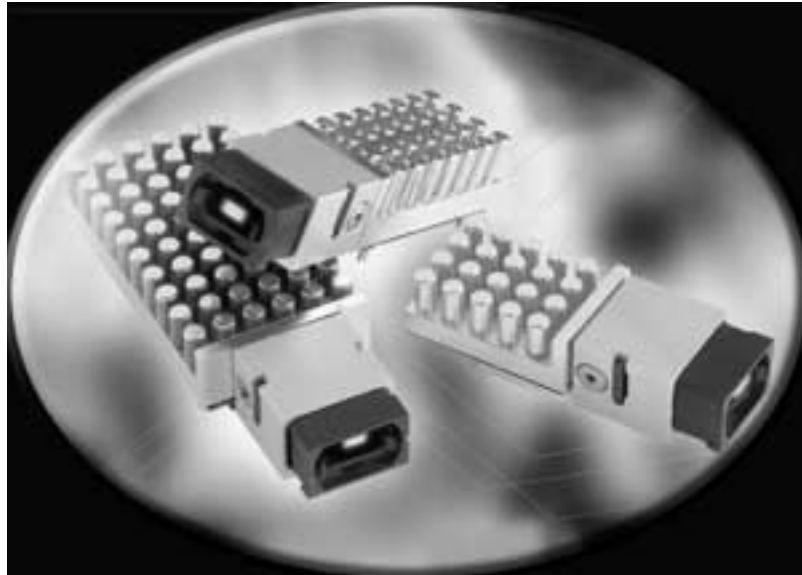


**Product Facts**

- Low power dissipation
- 1100m reach at 2.5 Gb/s channel speed
- Single MT-style multimode fiber connector
- CML data I/O
- Asynchronous, internal AC coupled inputs and DC coupled outputs
- Standard FCI electrical connector
- Passively cooled design
- Backward compatibility to current 1x12 @ 1.25/2.5/3.125/3.4 Gb/s multimode transceivers
- Up to 3.4 Gb/s per channel
- Up to 72 channels
- 60% power reduction
- 65% smaller footprint
- 5.5x higher card edge density
- 6x the bandwidth

**Applications**

- Chip-to-chip
- Board-to-board
- Rack-to-rack
- Floor-to-floor
- Building-to-building
- Telecommunications
- Data Communications
- Corporate Networking
- Computing
- Data Storage



Tyco Electronics, using the Xanoptix optically enabled integrated circuit technology, offers the XTM Series of high-speed parallel optic Para-Optix Transceivers. These transceivers offer unparalleled reliability, lifetime, and scalability for optical interconnect applications. The XTM Series has the flexibility to address a wide range of telecom, datacom, computing, and data storage applications and can be used in a variety of architectures from chip-to-chip to campus and enterprise solutions.

The Tyco Electronics' scalable product set is comprised of full-duplex modules (XTM-16, XTM-24, XTM-32, XTM-48, and XTM-72) and half-duplex (XTM-12 Tx and Rx) modules.

The units have aggregate bandwidth from just a few Gb/s to 245 Gb/s and channel speeds of up to 3.4 Gb/s. Each module uses only one single MTP-style multimode fiber connector.

Regardless of application size and depth, Tyco Electronics offers a solution that will dramatically increase the speed and efficiency of optical networks, while reducing system complexity, part count, and cost.

Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor Pluggable (SFP) transceivers for both singlemode and multimode applications.

**Please contact your local Tyco Electronics Sales Representative or Tyco Electronics for detailed performance characteristics and specifications.**

**For Tyco Electronics' “NEW” parallel optics high density Para-Optix cable assemblies, see the Cable Assemblies & Backplane Interconnects Section 2, pages 87, 88.**

**“NEW” High Speed Parallel Optics XTM Para-Optix Transceivers** (Continued)

**High Speed Parallel Optics Para-Optix Transceivers**

**XTM-12**  
**Part Numbers**  
**1511217-X (Tx)**  
**1511218-X (Rx)**

The XTM-12 is a 12-channel optical transmitter or receiver package with 12 Tx or 12 Rx channels.

Features include:

- 40 Gb/s optical transmitter/receiver (12 transmit or 12 receive channels at 3.4 Gb/s per channel)

- Typical power dissipation: 1.4 watts Rx and 0.7 watts Tx
- 1x12 MTP-style connector
- Compatible with 12 lane Infiniband interface ML data I/O
- Industry standard form factor, MSA compatible
- Dimensions: 44.7mm L x 12.5mm H x 17.5mm W



**High Speed Parallel Optics Para-Optix Transceivers**

**XTM-16**  
**Part Numbers**  
**1511219-X**

The XTM-16 is a 16-channel optical transceiver package with 8 Tx and 8 Rx channels.

Features include:

- 55 Gb/s optical transmitter (8 transmit and 8 receive channels at 3.4 Gb/s per channel)

- Typical power dissipation: 1.4 watts
- 2x8 MTP-style connector
- Dimensions: 56.4mm L x 12.5mm H x 17.5mm W



**High Speed Parallel Optics Para-Optix Transceivers**

**XTM-24**  
**Part Numbers**  
**1511220-X**

The XTM-24 is a 24-channel optical transceiver package with 12 Tx and 12 Rx channels.

Features include:

- 82 Gb/s optical transceiver (12 transmit and 12 receive channels at 3.4 Gb/s per channel)

- Typical power dissipation: 2.2 watts
- 2x12 MTP-style connector
- Dimensions: 56.4mm L x 12.5mm H x 17.5mm W



**Please contact your local Tyco Electronics Sales Representative or Tyco Electronics for detailed performance characteristics and specifications.**

**For Tyco Electronics’ “NEW” parallel optics high density Para-Optix cable assemblies, see the Cable Assemblies & Backplane Interconnects Section 2, pages 87, 88.**



**“NEW” High Speed Parallel Optics XTM Para-Optix Transceivers** (Continued)

**High Speed Parallel Optics Para-Optix Transceivers**

**XTM-32  
Part Numbers  
1511221-X**

The XTM-32 is a 32-channel optical transceiver package with 16 Tx and 16 Rx channels.

Features include:

- 109 Gb/s optical transceiver (16 transmit and 16 receive channels at 3.4 Gb/s per channel)

- Typical power dissipation: 3.2 watts
- 4x8 MTP-style connector
- Dimensions: 69.1mm L x 12.5mm H x 17.5mm W (without heat sink)



**High Speed Parallel Optics Para-Optix Transceivers**

**XTM-48  
Part Numbers  
1511222-X**

The XTM-48 is a 48-channel optical transceiver package with 24 Tx and 24 Rx channels.

Features include:

- 163 Gb/s optical transceiver (24 transmit and 24 receive channels at 3.4 Gb/s per channel)

- Typical power dissipation: 4.3 watts
- 4x12 MTP-style connector
- Dimensions: 69.1mm L x 12.5mm H x 17.5mm W (without heat sink)



**High Speed Parallel Optics Para-Optix Transceivers**

**XTM-72  
Part Numbers  
1511223-X**

The XTM-72 is a 72-channel optical transceiver package with 36 Tx and 36 Rx channels.

Features include:

- 245 Gb/s optical transceiver (36 transmit and 36 receive channels at 3.4 Gb/s per channel)

- Typical power dissipation: 6.4 watts
- 6x12 MTP-style connector
- Dimensions: 69.1mm L x 12.5mm H x 17.5mm W (without heat sink)



All XTM Series Modules are available without heat sink.

**Please contact your local Tyco Electronics Sales Representative or Tyco Electronics for detailed performance characteristics and specifications.**

**For Tyco Electronics’ “NEW” parallel optics high density Para-Optix cable assemblies, see the Cable Assemblies & Backplane Interconnects Section 2, pages 87, 88.**



“NEW” High Speed Parallel Optics XTM Para-Optix Transceivers (Continued)

Parallel Optics Test Selection Charts

<b>-X = Module Speed</b>
<b>-1 = 2.7 Gb/s</b>
<b>-2 = 3.125 Gb/s</b>
<b>-3 = 3.4 Gb/s</b>

Please contact your local Tyco Electronics Sales Representative or Tyco Electronics for detailed performance characteristics and specifications.

For Tyco Electronics’ “NEW” parallel optics high density Para-Optix cable assemblies, see the Cable Assemblies & Backplane Interconnects Section 2, pages 87, 88.

LINK TESTING			
FIBER	MODULES (QTY)	TEST BOARD (QTY)	OPTICAL CABLE ASSY (QTY)
12	1511217-X (1) 1511218-X (1)	1511224-1 (1) 1511225-1 (1)	1588930-3 (1)
16	1511219-X (1)	1511226-1 (2)	1588967-3 (1)
24	1511220-X (1)	1511226-1 (2)	1588967-3 (1)
32	1511221-X (1)	1511227-1 (2)	1588903-2 (1)
48	1511222-X (1)	1511227-1 (2)	1588903-2 (1)
72	1511223-X (1)	1511227-1 (2)	1588903-2 (1)

LOOPBACK TESTING BIT ERROR RATE (BER) & CROSSTALK				
FIBER	MODULES (QTY)	TEST BOARD (QTY)	OPTICAL CABLE ASSY (QTY)	ADAPTER (QTY)
12	1511217-X (1) 1511218-X (1)	1511224-1 (1) 1511225-1 (1)	1588930-3 (1)	—
16	1511219-X (1)	1511226-1 (1)	1693105-1 (1)	1588172-1 (2)
24	1511220-X (1)	1511226-1 (1)	1693105-1 (1)	1588172-1 (2)
32	1511221-X (1)	1511227-1 (1)	1693067-1 (1)	1588172-1 (2)
48	1511222-X (1)	1511227-1 (1)	1693067-1 (1)	1588172-1 (2)
72	1511223-X (1)	1511227-1 (1)	1693067-1 (1)	1588172-1 (3)

SENSITIVITY & OPTICAL EYE TESTING FC INTERFACE				
FIBER	MODULES (QTY)	TEST BOARD (QTY)	OPTICAL CABLE ASSY (QTY)	ADAPTER (QTY)
12	1511217-X (1) 1511218-X (1)	1511224-1 (1) 1511215-1 (1)	1693097-1 (2)	501506-1 (12)
16	1511219-X (1)	1511226-1 (1)	1693105-1 (1) 1693099-1 (1) 1693100-1 (1)	501506-1 (8) 1588172-1 (3)
24	1511220-X (1)	1511226-1 (1)	1693105-1 (1) 1693097-1 (1) 1693098-1 (1)	501506-1 (12) 1588172-1 (3)
32	1511221-X (1)	1511227-1 (1)	1693067-1 (1) 1693099-1 (1) 1693100-1 (1)	501506-1 (8) 1588172-1 (3)
48	1511222-X (1)	1511227-1 (1)	1693067-1 (1) 1693099-1 (1) 1693100-1 (1)	510506-1 (8) 1588172-1 (3)
72	1511223-X (1)	1511227-1 (1)	1693067-1 (1) 1693097-1 (1) 1693098-1 (1)	501506-1 (12) 1588172-1 (4)

SENSITIVITY & OPTICAL EYE TESTING SC INTERFACE				
FIBER	MODULES (QTY)	TEST BOARD (QTY)	OPTICAL CABLE ASSY (QTY)	ADAPTER (QTY)
12	1511217-X (1) 1511218-X (1)	1511224-1 (1) 1511225-1 (1)	1-1374571-0 (2)	1278348-3 (12)
16	1511219-X (1)	1511226-1 (1)	1693102-1 (1) 1693104-1 (1) 1693105-1 (1)	1278348-3 (8) 1588172-1 (3)
24	1511220-X (1)	1511226-1 (1)	1-1374571-0 (1) 1693103-1 (1) 1693105-1 (1)	1278348-3 (12) 1588172-1 (3)
32	1511221-X (1)	1511227-1 (1)	1693067-1 (1) 1693102-1 (1) 1693104-1 (1)	1278348-3 (8) 1588172-1 (3)
48	1511222-X (1)	1511227-1 (1)	1693067-1 (1) 1693102-1 (1) 1693104-1 (1)	1278348-3 (8) 1588172-1 (3)
72	1511223-X (1)	1511227-1 (1)	1-1374571-0 (1) 1693067-1 (1) 1693103-1 (1)	1278348-3 (12) 1588172-1 (4)

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**“NEW” Gigabit Ethernet Multimode SFP LC Transceivers****Product Facts**

- Complies with IEEE Standard 802.3z Gigabit Ethernet 1000BASE-SX PMD requirements
- Complies with Small Form-factor Pluggable (SFP) Multi-Source Agreement (MSA)
- High density LC connector interface
- Operates to 550 m with 50/125  $\mu\text{m}$  or 275 m with 62.5/125  $\mu\text{m}$  fiber
- Hot Pluggable
- Single +3.3-volt power supply
- PECL and LVPECL AC-coupled data Interface
- Transmitter uses 850nm vertical cavity surface emitting laser (VCSEL)
- Class 1 Laser Safe per FDA/CDRH and IEC 60825-1
- UL 60950 recognized
- Compatible with standard Gigabit Ethernet chipsets
- Units are supplied with dust plugs
- Mates to MSA compliant Host Connector and Cage Assembly

**Applications**

- Switches
- Repeaters
- Network Interface cards
- Hubs
- Routers



Tyco Electronics, recognizing the market need for higher optical port density, is developing an entire product platform of Tyco Electronics' Small Form-factor Pluggable (SFP) transceivers with the popular LC connector. These transceivers are less than half the width of the functionally similar GBICs and simply plug into an SFP compatible surface mount connector and cage on the customer board. The smaller size and 0.64-inch port-to-port centerline spacing enables equipment manufacturers to cost-effectively double the fiber optic port density of a given product. Tyco Electronics' LC connector footprint is equivalent to the RJ-45 electrical connector and the small size of the LC nose also allows for increased EMI shielding.

The Tyco Electronics' SFP Transceivers 1382392-X are short wavelength fiber optic transceiver modules for use in 1.25 Gb/s Gigabit Ethernet and high-speed proprietary

link applications. The transceivers send and receive pre-encoded data over a pair of 62.5 $\mu\text{m}$  or 50 $\mu\text{m}$  core multimode optical fibers. The modules, which operate from a single +3.3V power supply, contain separate AC-coupled transmitter and receiver sections that have PECL/LVPECL compatible data interfaces. Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor Pluggable (SFP) transceivers for both singlemode and multimode applications.

The Tyco Electronics' Gigabit Ethernet SFP LC Transceivers have been extensively tested to comply with the Gigabit Ethernet industry standard. The VCSEL-based transmitter is certified to be Class 1 laser safe, as defined by U.S. and international standards. The modules have been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with dust plugs.



### “NEW” Gigabit Ethernet Multimode SFP LC Transceivers (Continued)

#### Gigabit Ethernet Multimode SFP LC Transceiver

#### Part Numbers

1382392-1 (w/Push Button Actuator)

1382392-2 (w/Bail Latch)

#### Transmitter Performance Specifications:

( $T_C=0$  to  $70^\circ\text{C}$ ,  $V_{CC}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			-	-	1.25	Gb/s
Optical Output (avg.)	$P_{OUT}$	1,2	-9.5	-	-4	dBm
Extinction Ratio	-	3	9	-	-	dB
Transmit Disabled Optical Output (avg.)	$P_{OUT\ DIS}$	-	-	-	-30	dBm
Center Wavelength	$\lambda_{OUT}$	4	770	845	860	nm
Spectral Width (RMS)	$\Delta\lambda$	4	-	-	0.85	nm
Relative Intensity Noise	$RIN_{12}$	5	-	-	-117	dB/Hz
Deterministic Jitter	DJ	6	-	-	80	ps
Total Jitter	TJ	6	-	-	227	ps
Output Rise Time	$t_{TLH}$	7,8	-	-	260	ps
Output Fall Time	$t_{THL}$	7,8	-	-	260	ps
Pk-Pk Differential Input Voltage	$V_{DIFF}$	9	500	-	2500	mV
Transmit Fault Voltage Levels						
Tx_Fault_On		10	N/A	-	N/A	V
Tx_Fault_Off		10	0	-	0.8	V
Transmit Disable Voltage Levels						
Tx Disabled		-	2.0	-	3.465	V
Tx Enabled		-	0	-	0.8	V
Power Supply Voltage	$V_{CC} - V_{EE}$	-	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	-	-	-	60	mA
Operating Temperature	$T_C$	-	0	-	70	$^\circ\text{C}$
TX Disable Assert Time	$T\_Off$	11	-	-	10	$\mu\text{s}$
TX Disable Negate Time	$T\_On$	12	-	-	1	ms
Time to initialize, including reset of TX_Fault	$T\_Init$	13	-	-	300	ms
TX_Fault Assert Time	TX_Fault	14	-	-	100	$\mu\text{s}$
TX Disable to reset	T_Reset	15	10	-	-	$\mu\text{s}$
Serial ID Clock Rate	F_Serial_Clock	-	-	-	100	kHz

**Note:** All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

**Note:** For details on timing requirements of control and status I/O parameters, and module interface and data field descriptions, please refer to the SFP MSA, Appendix B Electrical Interface guidelines.

- Meets Class 1 laser safety requirements of IEC 60825-1 and IEC 60825-2 and U.S. Department of Health Services 21 CFR 1040.10 and 1040.11 when operated within the specified temperature and power supply ranges.
- Transmitter optical output power measured per TIA/EIA FOTP-95. Transmitter modulated with a valid 8b/10b data pattern. Specification applies for both 50  $\mu\text{m}$  and 62.5  $\mu\text{m}$  core multimode fiber.
- Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
- Center wavelength and spectral width measured per TIA/EIA FOTP-127 using optical spectrum analyzer with a valid 8b/10b data pattern.
- RIN measured per ANSI X.230-1994 annex A with valid 8b/10b data pattern. RF power meter and current meter test set replaced with microwave spectrum analyzer and calibrated high-speed photoreceiver. Singlemode fiber in test procedure replaced with multimode patch cable. Polarization rotator omitted.
- DJ and TJ measured per IEEE 802.3Z Gigabit Ethernet Standard.
- Measured from 20% to 80% points on rising and falling edge of transmitted waveform.
- Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with the eye diagram shown in this document. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.
- Compatible with 10 K, 10 KH and 100 K ECL, PECL and LVPECL.
- Open Collector/Drain output always in "Tx Fault Off" state.
- Time from rising edge of TX Disable to when the optical output falls below 10% of nominal.
- Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal.
- From power on or negation of TX\_Fault using TX Disable.
- Time from fault to TX\_Fault on.
- Time TX disable must be held high to reset TX\_Fault.

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For drawings, technical data or samples, contact your Tyco Electronics sales engineer, call 1-800-522-6752, or visit our Website at: <http://www.amp.com/fiberoptics>. Specifications subject to change. Consult Tyco Electronics for latest specifications.



“NEW” Gigabit Ethernet Multimode SFP LC Transceivers (Continued)

Gigabit Ethernet Multimode SFP LC Transceiver

Part Numbers  
1382392-1 (w/Push Button Actuator)  
1382392-2 (w/Bail Latch)

Receiver Performance Specifications:  
(TC=0 to 70°C, V<sub>CC</sub>-V<sub>EE</sub>=3.135 to 3.465V DC)

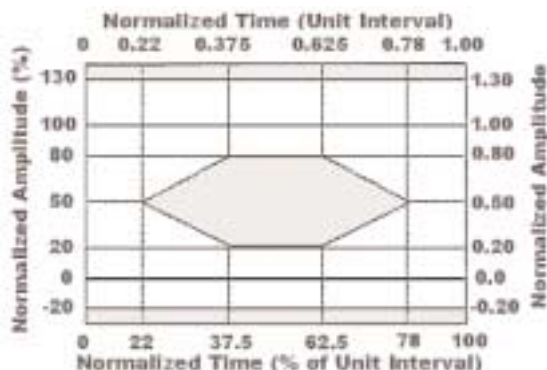
Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			-	-	1.25	Gb/s
Average Receive Power	P <sub>IN</sub>		-	-	0	dBm
Receive Sensitivity		1	-17	-	-	dBm
Stressed Receive Sensitivity						
50 μm Fiber	-	2	-13.5	-	-	dBm
62.5 μm Fiber	-	2	-12.5	-	-	dBm
Electrical 3 dB Cut-Off	3 dB f <sub>C</sub>	2	-	-	1.5	GHz
Optical wavelength	λ <sub>IN</sub>	-	770	-	860	nm
Deterministic Jitter	DJ	5	-	-	170	ps
Total Jitter	TJ	5	-	-	266	ps
Return Loss	-	3	12	-	-	dB
Receiver Loss of Signal	LOS					
Output Voltage						
Assert	V <sub>A</sub>	4	2	-	V <sub>CC</sub> + .3	V
Deassert	V <sub>D</sub>	4	0	-	0.8	V
Rx LOS Power Levels (avg.)						
Assert	P <sub>A</sub>	-	-30	-	-	dBm
Deassert	P <sub>D</sub>	-	-	-	-17	dBm
Hysteresis	-	-	0.5	-	-	dB
Power Supply Voltage	V <sub>CC</sub> - V <sub>EE</sub>	-	3.135	3.3	3.465	V
Supply Current	I <sub>CC</sub>	-	-	-	100	mA
Operating Temperature	T <sub>C</sub>	-	0	-	70	°C
LOS Assert Time	T <sub>Loss_On</sub>	6	-	-	100	μs
LOS Deassert Time	T <sub>Loss_Off</sub>	7	-	-	100	μs
Serial ID Clock Rate	F <sub>Serial_Clock</sub>	-	-	-	100	kHz

**Note:** All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5 μm multimode fiber unless stated otherwise.

**Note:** For details on timing requirements of control and status I/O parameters, and module interface and data field descriptions, please refer to the SFP MSA< Appendix B Electrical Interface guidelines.

1. Minimum average optical input power (receive sensitivity) at which the BER is less than 10E-12 measured with a 1.25 G Baud Rate 2E7 - 1 NRZ PRBS data pattern.
2. Per IEEE 802.3Z Gigabit Ethernet Standard.
3. Return loss measured per TIA/EIA FOTP-107.
4. This is an open drain output that should be pulled up with a 4.7K ohm - 10K ohm resistor on the host board. Pull-up voltage level should be between 2.0 V and V<sub>CC</sub> + 0.3 V per the SFP MSA.
5. DJ and TJ measured per IEEE 802.3Z Gigabit Ethernet Standard.
6. Time from LOS state to LOS assert.
7. Time from non-LOS state to LOS deassert.

**“NEW” Gigabit Ethernet Multimode SFP LC Transceivers** (Continued)




NOTE: Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with this eye diagram. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.

**Absolute Maximum Ratings:**

Parameter	Symbol	Units	Min	Max
Storage Temperature	$T_s$	°C	-40	85
Data Input Voltage	$V_{INPUT}$	V	-0.5	$V_{CC}$
Differential Input Voltage	$V_{DIFF}$	V	-	2.4
Supply Voltage	$V_{CC}-V_{EE}$	V	-0.2	5.0

**Regulatory Compliance:**

Agency	Test Method	Listing Document
FDA	CDRH 21-CFR 1040 Class 1	Accession Number: 9122051-08
TUV	EN60825-1:1994+A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services Laser Class I Protection Class III TUV Certificate Number: B020546940003
UL /  US	UL60950	E208513

**ESD Testing:**

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A-114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, nose, right, and left). Each module is tested with both power ON and OFF

**NOTE** All products which contain a laser must comply with government regulations for laser safety. In the U.S., the applicable standard is FDA 21 CFR 1040. In other parts of the world, IEC 60825-1 applies. These transceivers were designed and tested to the requirements of the above standards and found to be in compliance with class 1 laser safety limits. When operated within the limits specified in this document, this product conforms to IEC 60825-1: 1993 + A1 : 1997 + A2: 2001, class 1 laser product, requirements.

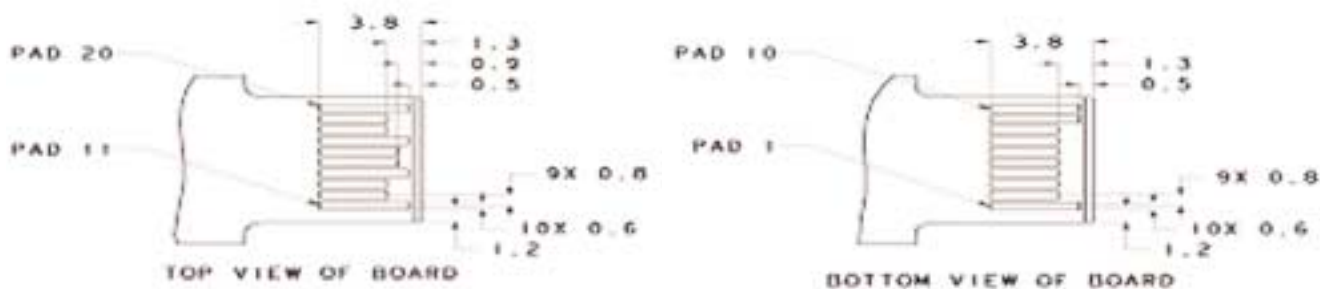
**CAUTION!** Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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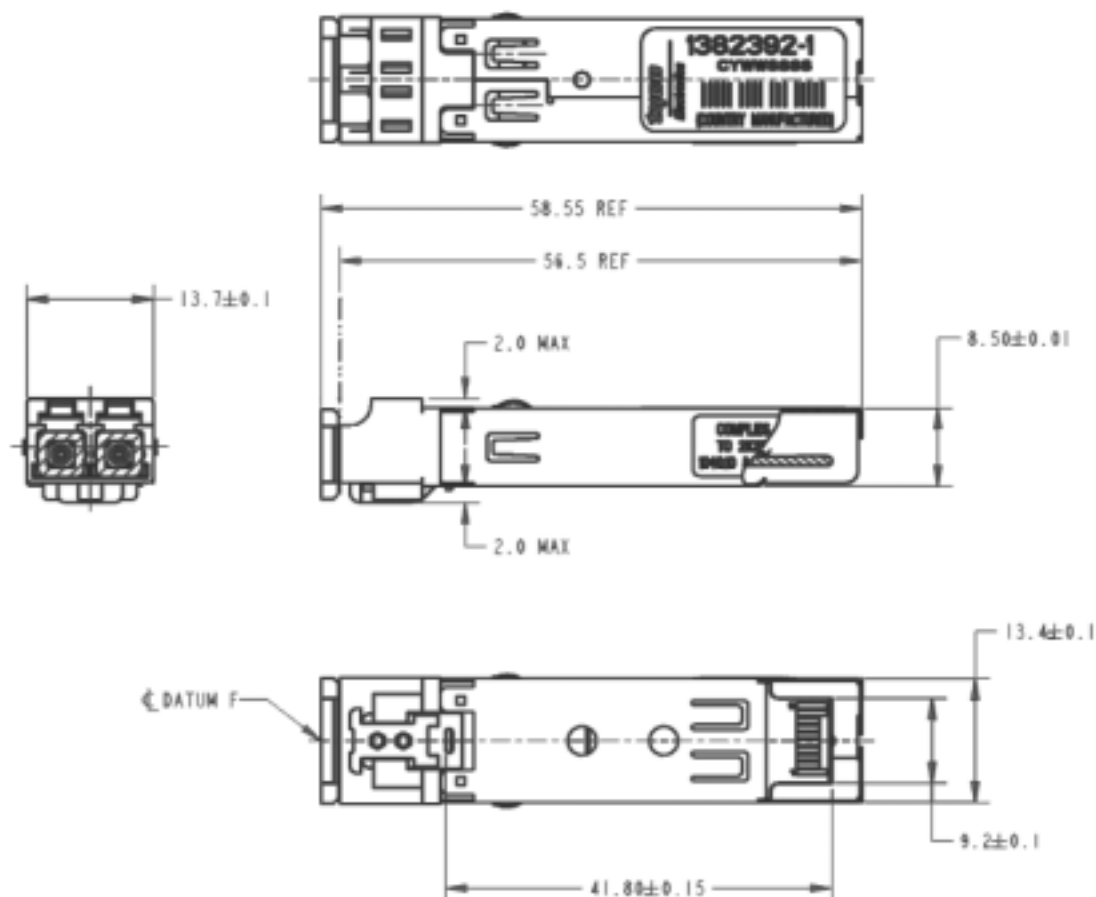
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**“NEW” Gigabit Ethernet Multimode SFP LC Transceivers** (Continued)

**Figure 2: Transceiver Pad Descriptions**



**Figure 2: Transceiver Outline Descriptions**



Note: All dimensions are in mm.

**IMPORTANT: PLEASE REFER TO THE TYCO ELECTRONICS CUSTOMER DRAWING 1382392 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. DRAWINGS CAN BE OBTAINED ON OUR WEBSITE AT: <http://www.tycoelectronics.com> OR CALL AMPFAX 1-800-522-6752 FOR 24HR FAX SERVICE.**

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**“NEW” Gigabit Fibre Channel & 2X Fibre Channel Multimode SFP LC Transceivers**



**Product Facts**

- Conforms to Fibre Channel FC-PI Specifications
- Complies with Small Form-factor Pluggable (SFP) Multi-Source Agreement (MSA)
- High density LC connector interface
- Dual data rate
- Operates to 300 m with 50/125 μm or 150 m with 62.5/125 μm fiber at double speed. Links lengths are to 500 m and 300 m at 1.06 Gb/s
- Hot pluggable
- Single +3.3-volt power supply
- PECL and LVPECL AC-coupled data Interface
- Transmitter uses 850nm vertical cavity surface emitting laser (VCSEL)
- Class 1 Laser Safe per FDA/CDRH and IEC 60825-1
- UL 60950 recognized
- Compatible with standard Fibre Channel chipsets.
- Units are supplied with dust plugs
- Mates to MSA compliant Host Connector and Cage Assembly

**Applications**

- Mass Storage
- High Speed Peripheral Interface
- RAID Systems
- High Bandwidth Intersystem and Intrasystem links
- Point-to-point links



Tyco Electronics, recognizing the market need for higher optical port density, is developing an entire product platform of Tyco Electronics' Small Form-factor Pluggable (SFP) transceivers with the popular LC connector. These transceivers are less than half the width of the functionally similar GBICs and simply plug into an SFP compatible surface mount connector and cage on the customer board. The smaller size and 0.64-inch port-to-port centerline spacing enables equipment manufacturers to cost-effectively double the fiber optic port density of a given product. The Tyco Electronics' LC connector footprint is equivalent to the RJ-45 electrical connector and the small size of the LC nose also allows for increased EMI shielding.

Tyco Electronics' SFP LC Transceivers 1382391-X and 1382393-X are short wavelength fiber optic transceiver modules for use in Fibre Channel and high-speed

proprietary link applications. These transceivers send and receive pre-encoded data over a pair of 62.5μm or 50μm core multimode optical fibers. The modules, which operate from a single +3.3V power supply, contain separate AC-coupled transmitter and receiver sections that have PECL/LVPECL compatible data interfaces. Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor Pluggable (SFP) transceivers for both singlemode and multimode applications.

These Tyco Electronics' SFP LC Transceivers have been extensively tested to comply with the Fibre Channel industry standard. The VCSEL-based transmitter is certified to be Class 1 laser safe, as defined by U.S. and international standards. The modules have been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with dust plugs.

Application	Data Rate	Part Number (w/Push Button Actuator)	Part Number (w/Bail Latch)
Fibre Channel	1.06 Gb/s	1382391-1	1382391-2
Dual Rate Fibre Channel	2.12/1.06 Gb/s	1382393-1	1382393-2

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For drawings, technical data or samples, contact your Tyco Electronics sales engineer, call 1-800-522-6752, or visit our Website at: <http://www.amp.com/fiberoptics>. Specifications subject to change. Consult Tyco Electronics for latest specifications.



## “NEW” Gigabit Fibre Channel & 2X Fibre Channel Multimode SFP LC Transceivers (Continued)

1.06 Gb/s Fibre Channel Multimode SFP LC Transceiver

Part Numbers  
1382391-1 (w/Push Button Actuator)

1382391-2 (w/Bail Latch)

### Transmitter Performance Specifications:

( $T_c=0$  to  $70^\circ\text{C}$ ,  $V_{CC}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			–	–	1.0625	Gb/s
Optical Output (avg.)	$P_{OUT}$	1,2	10	–	-4	dBm
Extinction Ratio	–	3	9	–	–	dB
Optical Modulation	OMA	4	0.156	–	–	mW
Transmit Disabled Optical Output (avg.)	$P_{OUT\ DIS}$		–	–	-30	dBm
Center Wavelength	$\lambda_{OUT}$	5	770	845	860	nm
Spectral Width (RMS)	$\Delta\lambda$	5	–	–	1.0	nm
Relative Intensity Noise	$RIN_{12}$	6	–	–	-116	dB/Hz
Deterministic Jitter	DJ	7,8	–	–	84.7	ps
Total Jitter	TJ	7	–	–	169.4	ps
Output Rise Time	$t_{TLH}$	8,9	–	–	300	ps
Output Fall Time	$t_{THL}$	8,9	–	–	300	ps
Pk-Pk Differential Input Voltage	$V_{DIFF}$	10	500	–	2500	mV
Transmit Fault Voltage Levels						
Tx_Fault_On		11	2.0	–	$V_{CC}$	V
Tx_Fault_Off		11	0	–	0.8	V
Transmit Disable Voltage Levels						
Tx Disabled		–	2.0	–	3.465	V
Tx Enabled		–	0	–	0.8	V
Power Supply Voltage	$V_{CC} - V_{EE}$	–	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	–	–	44	60	mA
Operating Temperature	$T_c$	–	0	–	70	$^\circ\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

1. Meets Class 1 laser safety requirements of IEC 60825-1 and IEC 60825-2 and U.S. Department of Health Services 21 CFR 1040.10 and 1040.11 when operated within the specified temperature and power supply ranges.
2. Transmitter optical output power measured per TIA/EIA FOTP-95. Transmitter modulated with a valid 8b/10b data pattern. Specification applies for both 50  $\mu\text{m}$  and 62.5  $\mu\text{m}$  core multimode fiber.
3. Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
4. Optical Modulation Amplitude (OMA) values are peak-to-peak measured per FC-PI Standard.
5. Center wavelength and spectral width measured per TIA/EIA FOTP-127 using optical spectrum analyzer with a valid 8b/10b data pattern.
6. RIN measured per ANSI X.230-1994 annex A with valid 8b/10b data pattern. RF power meter and current meter test set replaced with microwave spectrum analyzer and calibrated high-speed photoreceiver. Single mode fiber in test procedure replaced with multimode patch cable. Polarization rotator omitted.
7. DJ and TJ measured per FC-PI.
8. Measured from 20% to 80% points on rising and falling edge of transmitted waveform.
9. Transmitter optical waveform characteristics comply with the eye diagrams shown in this document.
10. Compatible with 10 K, 10 KH and 100 K ECL, PECL and LVPECL.
11. Open Collector/Drain output. Part number 1382391-1 is always in "Tx Fault Off" state



**“NEW” Gigabit Fibre Channel & 2X Fibre Channel Multimode SFP LC Transceivers** (Continued)

2.12 Gb/s  
Fibre Channel  
Multimode  
SFP LC  
Transceiver

Part Numbers  
1382393-1 (w/Push Button  
Actuator)  
1382393-2 (w/Bail Latch)

**Transmitter Performance Specifications:**

( $T_c=0$  to  $70^\circ\text{C}$ ,  $V_{CC}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			–	–	2.125	Gb/s
Optical Output (avg.)	$P_{OUT}$	1,2	10	–	-4	dBm
Extinction Ratio	–	3	9	–	–	dB
Optical Modulation Amplitude (pk-pk)	OMA	4	0.196	–	–	mW
Transmit Disabled Optical Output (avg.)	$P_{OUT\ DIS}$		–	–	-30	dBm
Center Wavelength	$\lambda_{OUT}$	5	830	845	860	nm
Spectral Width (RMS)	$\Delta\lambda$	5	–	–	0.85	nm
Relative Intensity Noise	$RIN_{12}$	6	–	–	-117	dB/Hz
Deterministic Jitter	DJ	7,8	–	–	56.4	ps
Total Jitter	TJ	7	–	–	84.7	ps
Output Rise Time	$t_{TLH}$	8,9	–	–	150	ps
Output Fall Time	$t_{THL}$	8,9	–	–	150	ps
Pk-Pk Differential Input Voltage	$V_{DIFF}$	10	500	–	2500	mV
Transmit Fault Voltage Levels						
Tx_Fault_On		11	2.0	–	$V_{CC}$	V
Tx_Fault_Off		11	0	–	0.8	V
Transmit Disable Voltage Levels						
Tx Disabled		–	2.0	–	3.465	V
Tx Enabled		–	0	–	0.8	V
Power Supply Voltage	$V_{CC} - V_{EE}$	–	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	–	–	44	60	mA
Operating Temperature	$T_c$	–	0	–	70	$^\circ\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

- Meets Class 1 laser safety requirements of IEC 60825-1 and IEC 60825-2 and U.S. Department of Health Services 21 CFR 1040.10 and 1040.11 when operated within the specified temperature and power supply ranges.
- Transmitter optical output power measured per TIA/EIA FOTP-95. Transmitter modulated with a valid 8b/10b data pattern. Specification applies for both 50  $\mu\text{m}$  and 62.5  $\mu\text{m}$  core multimode fiber.
- Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
- Optical Modulation Amplitude (OMA) values are peak-to-peak measured per FC-PI Standard.
- Center wavelength and spectral width measured per TIA/EIA FOTP-127 using optical spectrum analyzer with a valid 8b/10b data pattern.
- RIN measured per ANSI X.230-1994 annex A with valid 8b/10b data pattern. RF power meter and current meter test set replaced with microwave spectrum analyzer and calibrated high-speed photoreceiver. Single mode fiber in test procedure replaced with multimode patch cable. Polarization rotator omitted.
- DJ and TJ measured per FC-PI.
- Measured from 20% to 80% points on rising and falling edge of transmitted waveform.
- Transmitter optical waveform characteristics comply with the eye diagrams shown in this document.
- Compatible with 10 K, 10 KH and 100 K ECL, PECL and LVPECL.
- Open Collector/Drain output. Part number 1382391-1 is always in "Tx Fault Off" state



### “NEW” Gigabit Fibre Channel & 2X Fibre Channel Multimode SFP LC Transceivers (Continued)

1.06 Gb/s Fibre Channel Multimode SFP LC Transceiver

Part Numbers  
1382391-1 (w/Push Button Actuator)

1382391-2 (w/Bail Latch)

#### Receiver Performance Specifications:

( $T_C=0$  to  $70^\circ\text{C}$ ,  $V_{CC}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			–	–	1.0625	Gb/s
Average Received Power	$P_{IN}$	–	–	–	0	dBm
Optical Modulation Amplitude	OMA	1	0.031	–		mW
Stressed Receiver Sensitivity (OMA)						
50 $\mu\text{m}$ Fiber	–	2	0.055	–	–	mW
62.5 $\mu\text{m}$ Fiber	–	2	0.067	–	–	mW
Electrical 3 dB Cut-Off	3 dB $f_C$	2	–	–	1.5	GHz
Electrical 10 dB Cut-Off	10 dB $f_C$	2	–	–	3	GHz
Optical wavelength	$\lambda_{IN}$	–	770	–	860	nm
Return Loss	–	3	12	–	–	dB
Receiver Loss of Signal Output Voltage						
Assert	$V_A$	4	2	–	$V_{CC} + .3$	V
Deassert	$V_D$	4	0	–	0.8	V
Rx LOS Power Levels (avg.)						
Assert	$P_A$	–	-31	–	–	dBm
Deassert	$P_D$	–	–	–	-17	dBm
Hysteresis	–	–	0.5	–	–	dB
Power Supply Voltage	$V_{CC} - V_{EE}$	–	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	–	–	85	100	mA
Operating Temperature	$T_C$	–	0	–	70	$^\circ\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

- Optical Modulation Amplitude values are Peak-to-Peak.
- Per FC-PI Standard.
- Return loss measured per TIA/EIA FOTP-107.
- This is an open drain output that should be pulled up with a 4.7K ohm - 10K ohm resistor on the host board. Pull-up voltage level should be between 2.0 V and  $V_{CC} + 0.3$  V per the SFP MSA.



**“NEW” Gigabit Fibre Channel & 2X Fibre Channel Multimode SFP LC Transceivers** (Continued)

2.12 Gb/s Fibre Channel Multimode SFP LC Transceiver

Part Numbers  
1382393-1 (w/Push Button Actuator)  
1382393-2 (w/Bail Latch)

Receiver Performance Specifications:

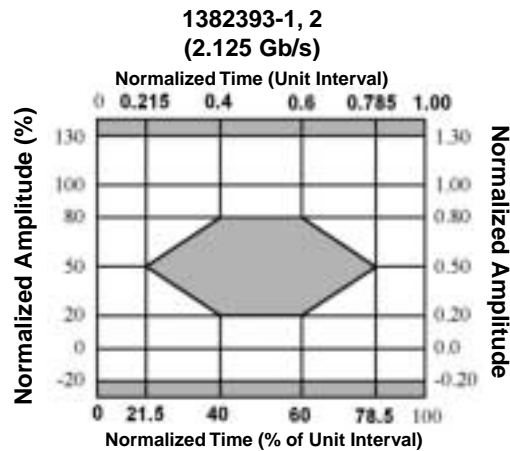
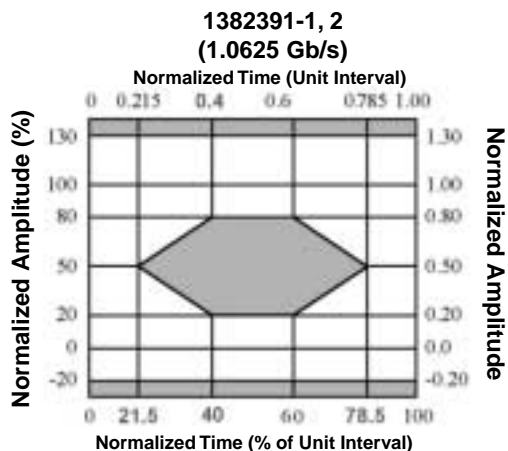
( $T_c=0$  to  $70^\circ\text{C}$ ,  $V_{CC}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			–	–	2.125	Gb/s
Average Received Power	$P_{IN}$	–	–	–	0	dBm
Optical Modulation Amplitude	OMA	1	0.049	–		mW
Stressed Receiver Sensitivity (OMA)						
50 $\mu\text{m}$ Fiber	–	2	0.096	–	–	mW
62.5 $\mu\text{m}$ Fiber	–	2	0.109	–	–	mW
Electrical 3 dB Cut-Off	3 dB $f_C$	2	–	–	2.5	GHz
Electrical 10 dB Cut-Off	10 dB $f_C$	2	–	–	6	GHz
Optical wavelength	$\lambda_{IN}$	–	830	–	860	nm
Return Loss	–	3	12	–	–	dB
Receiver Loss of Signal Output Voltage						
Assert	$V_A$	4	2	–	$V_{CC} + .3$	V
Deassert	$V_D$	4	0	–	0.8	V
Rx LOS Power Levels (avg.)						
Assert	$P_A$	–	-31	–	–	dBm
Deassert	$P_D$	–	–	–	-15	dBm
Hysteresis	–	–	0.5	–	–	dB
Power Supply Voltage	$V_{CC} - V_{EE}$	–	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	-	-	95	120	mA
Operating Temperature	$T_C$	-	0	-	70	$^\circ\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

- Optical Modulation Amplitude values are Peak-to-Peak.
- Per FC-PI Standard.
- Return loss measured per TIA/EIA FOTP-107.
- This is an open drain output that should be pulled up with a 4.7K ohm - 10K ohm resistor on the host board. Pull-up voltage level should be between 2.0 V and  $V_{CC} + 0.3$  V per the SFP MSA.

**“NEW” Gigabit Fibre Channel & 2X Fibre Channel Multimode SFP LC Transceivers** (Continued)



NOTE: Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with these eye diagrams. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.

**Timing Requirements of Control and Status I/O**

Parameter	Symbol	Min	Max	Unit	Condition
TX Disable Assert Time	T_Off		10	μs	Time from rising edge of TX Disable to when the optical output falls below 10% of nominal
TX Disable Negate Time	T_On		1	ms	Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal
Time to initialize, including reset of TX_Fault	T_Init		300	ms	From power on or negation of TX_Fault using TX Disable
TX_Fault Assert Time	TX_Fault		100	μs	Time from fault to TX-Fault on.
TX Disable to reset	T_Reset	10		μs	Time TX Disable must be held high to reset TX-Fault
LOS Assert Time	T_Loss_On		100	μs	Time from LOS state to LOS assert
LOS Deassert Time	T_Loss_Off		100	μs	Time from non-LOS state to LOS deassert
Serial ID Clock Rate	F_Serial_Clock		100	kHz	


**Absolute Maximum Ratings:**

Parameter	Symbol	Units	Min	Max
Storage Temperature	T <sub>s</sub>	°C	-40	85
Data Input Voltage	V <sub>INPUT</sub>	V	-0.5	V <sub>CC</sub>
Differential Input Voltage	V <sub>DIFF</sub>	V	–	2.4
Supply Voltage	V <sub>CC</sub> -V <sub>EE</sub>	V	-0.2	5.0



**“NEW” Gigabit Fibre Channel & 2X Fibre Channel Multimode SFP LC Transceivers** (Continued)

**Regulatory Compliance:**

Agency	Test Method	Listing Document
FDA	CDRH 21-CFR 1040 Class 1	Accession Numbers: 9122051-08, 9122051-09
TUV	EN60825-1:1994+A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services Laser Class I Protection Class III TUV Certificate Number: B020546940003
UL/  US	UL60950	E141081

**ESD Testing:**

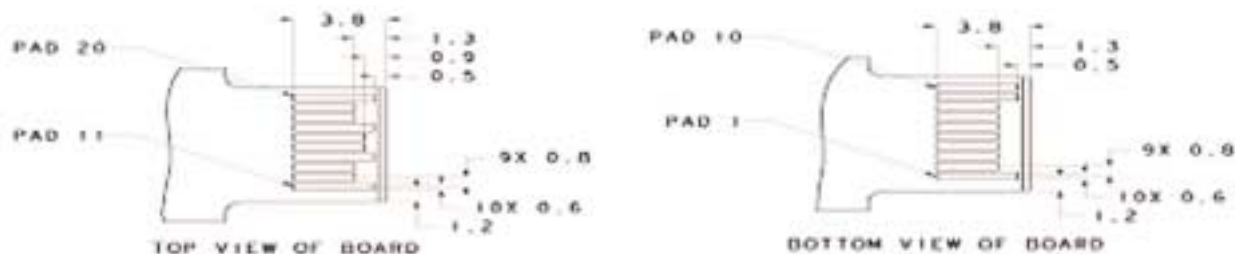
Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A-114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, nose, right, and left). Each module is tested with both power ON and OFF

**NOTE** All products which contain a laser must comply with government regulations for laser safety. In the U.S., the applicable standard is FDA 21 CFR 1040. In other parts of the world, IEC 60825-1 applies. These transceivers were designed and tested to the requirements of the above standards and found to be in compliance with class 1 laser safety limits. When operated within the limits specified in this document, this product conforms to IEC 60825-1: 1993 + A1 : 1997 + A2: 2001, class 1 laser product, requirements.

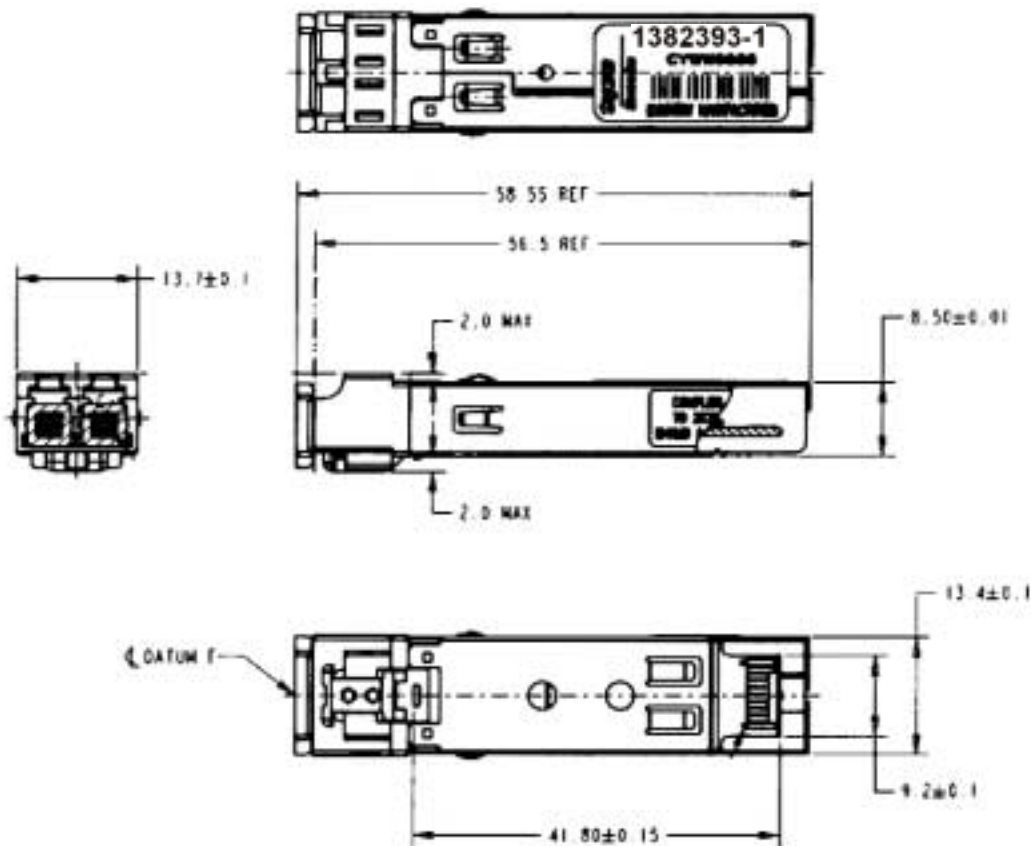
**CAUTION!** Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

**“NEW” Gigabit Fibre Channel & 2X Fibre Channel Multimode SFP LC Transceivers** (Continued)

**Figure 2: Transceiver Pad Descriptions**



**Figure 2: Transceiver Outline Descriptions**



Note: All dimensions are in mm.

**IMPORTANT: PLEASE REFER TO THE TYCO ELECTRONICS CUSTOMER DRAWING 1382391 OR 1382393 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. DRAWINGS CAN BE OBTAINED ON OUR WEBSITE AT: <http://www.tycoelectronics.com>. OR CALL AMPFAX AT 1-800-522-6752 FOR 24 HR FAX SERVICE.**

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**“NEW” OC-48 Singlemode SFP LC Transceivers**



**Product Facts**

- Complies with OC-48 requirements
- Complies with Small Form-factor Pluggable (SFP) Multi-Source Agreement (MSA)
- High density LC connector interface
- Operates to 12km with singlemode fiber
- Hot Pluggable
- Single +3.3-volt power supply
- PECL and LVPECL AC-coupled data Interface
- Transmitter uses 1300nm FP Laser
- Class 1 Laser Safe per FDA/CDRH and IEC 60825-1
- UL 60950 recognized
- Compatible with standard OC-48 chipsets
- Units are supplied with dust plugs
- Mates to MSA compliant Host Connector and Cage Assembly

**Applications**

- Switched Backplanes
- Switch to Switch Links
- Switches
- Repeaters
- Network Interface cards



Tyco Electronics, recognizing the market need for higher optical port density, is developing an entire product platform of Tyco Electronics' Small Form-factor Pluggable (SFP) transceivers with the popular LC connector. These transceivers are less than half the width of the functionally similar GBICs and simply plug into a SFP compatible surface mount connector and cage on the customer board. The smaller size and 0.64-inch port-to-port centerline spacing enables equipment manufacturers to cost-effectively double the fiber optic port density of a given product. Tyco Electronics' LC connector footprint is equivalent to the RJ-45 electrical connector and the small size of the LC nose also allows for increased EMI shielding.

Tyco Electronics' SFP LC Transceivers 1511093-X and 1511202-X are 1300nm FP LASER-based fiber optic transceiver modules for use in OC-48 and high-speed proprietary link applications. These transceivers send and receive pre-encoded data

over a singlemode optical fiber. The modules, which operate from a single +3.3V power supply, contain separate AC-coupled transmitter and receiver sections that have PECL/LVPECL compatible data interfaces. The transceiver provides diagnostic and alarm features such as temperature, bias, current and output power.

Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor Pluggable (SFP) transceivers for both single-mode and multimode applications.

Tyco Electronics' SFP OC-48 SFP LC Transceivers have been extensively tested to comply with the OC-48 industry standard. The FP LASER-based transmitter is certified to be Class 1 laser safe, as defined by U.S. and international standards. The modules have been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with dust plugs.


**“NEW” OC-48 Singlemode SFP LC Transceivers** (Continued)

**OC-48 Singlemode  
SFP LC Transceivers**
**Part Numbers**
**1511093-1 (w/Push Button  
Actuator)**
**1511093-2 (w/Bail Latch)**
**1511202-1 (w/Push Button  
Actuator)**
**1511202-2 (w/Bail Latch)**
**Transmitter Performance Specifications:**

 (T<sub>C</sub>=0 to 70°C, V<sub>CC</sub>-V<sub>EE</sub>=3.135 to 3.465V DC)

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate		1	–	–	2.488	Gb/s
Optical Output (avg.) SM	P <sub>OUT</sub>	1,2	-10	–	-3	dBm
Extinction Ratio	–	3	8.2	–	–	dB
Transmit Disabled Optical Output (avg.)	P <sub>OUT DIS</sub>	–	–	–	0	mw
Center Wavelength	λ <sub>OUT</sub>	4	1260	1310	1350	nm
Spectral Width (RMS)	Δλ	4	–	1	4	nm (RMS)
Relative Intensity Noise*	RIN <sub>12</sub>	5	–	–	-132	dB/Hz
Pk-Pk Differential Input Voltage	V <sub>DIFF</sub>	6	500	–	2000	mV
Transmit Fault Voltage Levels						
Tx_Fault_On		7	2	–	V <sub>CC</sub>	V
Tx_Fault_Off		7	0	–	0.8	V
Transmit Disable Voltage Levels						
Tx Disabled		–	1.835	–	V <sub>CC</sub> +0.2	V
Tx Enabled		–	0	–	0.8	V
Power Supply Voltage	V <sub>CC</sub> - V <sub>EE</sub>	–	3.135	3.3	3.465	V
Supply Current	I <sub>CC</sub>	–	–	100	160	mA
Operating Temperature	T <sub>C</sub>	–	0	–	70	°C
TX Disable Assert time	T <sub>Off</sub>				10	μs
TX Disable Negate Time	T <sub>On</sub>				1	ms
Time to initialize including reset of TX_Fault	T <sub>Init</sub>				300	ms
TX_Fault Assert Time	TX_Fault				100	μs
TX_Disable to reset	TX_Reset		10			μs

**Note:** All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 10μm singlemode fiber unless stated otherwise.

**Note:** For details on timing requirements of control and status I/O parameters, and module interface and data field descriptions, please refer to the SFP MSA, Appendix B Electrical Interface guidelines.

1. Meets Class 1 laser safety requirements of IEC 60825-1 and IEC 60825-2 and U.S. Department of Health Services 21 CFR 1040.10 and 1040.11 when operated within the specified temperature and power supply ranges.
2. Transmitter optical output power measured per TIA/EIA FOTP-95. Transmitter modulated with a valid 8b/10b data pattern.
3. Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
4. Center wavelength and spectral width measured per TIA/EIA FOTP-127 using optical spectrum analyzer with a valid 8b/10b data pattern.
5. RIN measured per ANSI X.230-1994 annex A with valid 8b/10b data pattern. RF power meter and current meter test set replaced with microwave spectrum analyzer and calibrated high-speed photoreceiver. Polarization rotator omitted.
6. DJ and TJ measured per OC-48 Standard.
7. Compatible with 10 K, 10 KH and 100 K ECL, PECL and LVPECL.
8. Open Collector/Drain output.
9. Time from rising edge of TX Disable to when the optical output falls below 10% of nominal.
10. Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal.

\* Measured @ 500 MHz

**Note: See chart on  
page 143 for Part Number  
difference.**



“NEW” OC-48 Singlemode SFP LC Transceivers (Continued)

OC-48 Singlemode SFP LC Transceivers

Part Numbers

1511093-1 w/Push Button Actuator

1511093-2 w/Bail Latch

1511202-1 w/Push Button Actuator

1511202-2 w/Bail Latch

Receiver Performance Specifications:

(TC=0 to 70°C, V<sub>CC</sub>-V<sub>EE</sub>=3.135 to 3.465V DC)

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate	B	1	–	–	2.488	Gb/s
Optical Input Sensitivity	P <sub>IN</sub>	1	–	–	-18	dBm
Average Receive Power		–	–	–	-3	dBm
Optical wavelength SONET/SDH Wavelength window	λ <sub>IN</sub>	–	1260	–	1360	Nm
Receiver Reflectance	–				<b>See Table Below</b>	
Receiver Loss of Signal Output Voltage	LOS					
Assert	V <sub>A</sub>	4	2	2	V <sub>CC</sub> + .3	V
Deassert	V <sub>D</sub>	4	0	–	0.8	V
Rx LOS Power Levels (avg.)						
Assert	P <sub>A</sub>	–	-31	–	–	dBm
Deassert	P <sub>D</sub>	–	–	–	-18	dBm
Hysteresis	–	–	0.5	–	–	dB
Power Supply Voltage	V <sub>CC</sub> - V <sub>EE</sub>	–	3.135	3.3	3.465	V
Supply Current	I <sub>CC</sub>	–	–	95	115	mA
Operating Temperature	T <sub>C</sub>	–	0	–	70	°C
LOS Assert Time	T <sub>Loss_On</sub>				100	μs
LOS Deassert Time	T <sub>Loss_Off</sub>				100	μs
Serial ID Clock Rate	F <sub>Serial_Clock</sub>				100	kHz

**Note:** All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 10μm singlemode fiber unless stated otherwise.

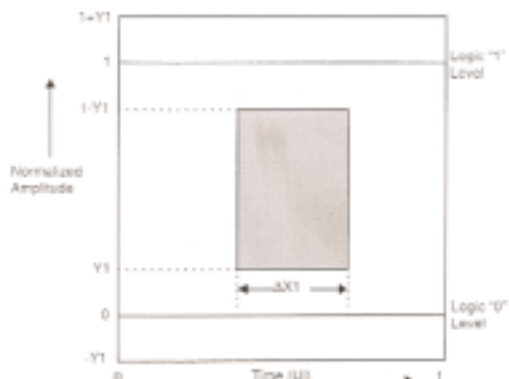
**Note:** For details on timing requirements of control and status I/O parameters, and module interface and data field descriptions, please refer to the SFP MSA< Appendix B Electrical Interface guidelines.

1. Minimum average optical input power (receive sensitivity) at which the BER is less than 10E-10 measured with a 2.488 G Baud Rate 2E7 — 1 NRZ PRBS data pattern.
2. Per IEEE 802.3Z Gigabit Ethernet Standard.
3. Return loss measured per TIA/EIA FOTP-107.
4. This is an open drain output that should be pulled up with a 4.7K ohm - 10K ohm resistor on the host board. Pull-up voltage level should be between 2.0 V and V<sub>CC</sub> + 0.3 V per the SFP MSA.

Receiver Reflectance:

1511093-1, -2	-27 dB
1511202-1, -2	-14 dB

**“NEW” OC-48 Singlemode SFP LC Transceivers** (Continued)




Rate	$\Delta X1$	Y1
OC-48	0.20	0.25

**NOTE:** Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with this eye diagram. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.

**Absolute Maximum Ratings:**

Parameter	Symbol	Units	Min	Max
Storage Temperature	$T_S$	°C	-40	85
Data Input Voltage	$V_{INPUT}$	V	-0.5	$V_{CC}$
Differential Input Voltage	$V_{DIFF}$	V	–	2.4
Supply Voltage	$V_{CC}-V_{EE}$	V	-0.2	5.0

**Regulatory Compliance:**

Agency	Test Method	Listing Document
FDA	CDRH 21-CFR 1040 Class 1	Accession Number: 9122051-XX
TUV	EN60825-1:1994+A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services Laser Class I Protection Class III TUV Certificate Number: B020546940001
UL /  US	UL60950	E208513

**ESD Testing:**

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A-114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, nose, right, and left). Each module is tested with both power ON and OFF

**NOTE**

All products which contain a laser must comply with government regulations for laser safety. In the U.S., the applicable standard is FDA 21 CFR 1040. In other parts of the world, IEC 60825-1 applies. These transceivers were designed and tested to the requirements of the above standards and found to be in compliance with class 1 laser safety limits. When operated within the limits specified in this document, this product conforms to IEC 60825-1: 1993 + A1 : 1997 + A2: 2001, class 1 laser product, requirements.

**CAUTION!**

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

“NEW” OC-48 Singlemode SFP LC Transceivers (Continued)

Figure 2: Transceiver Pad Descriptions

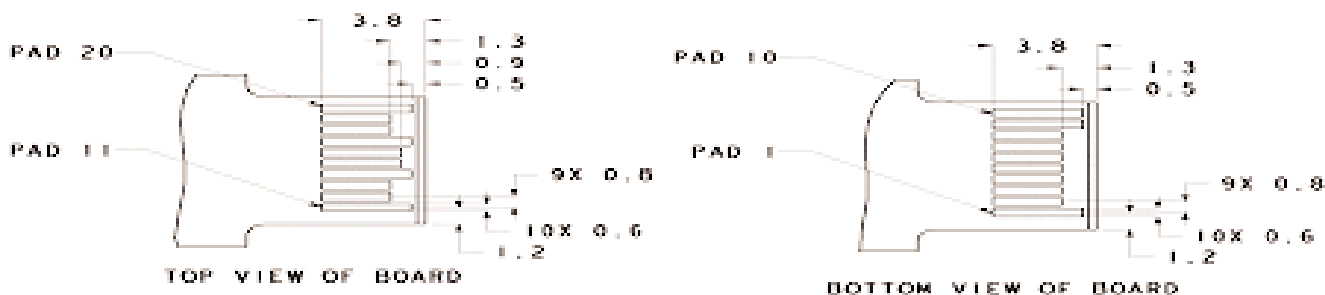
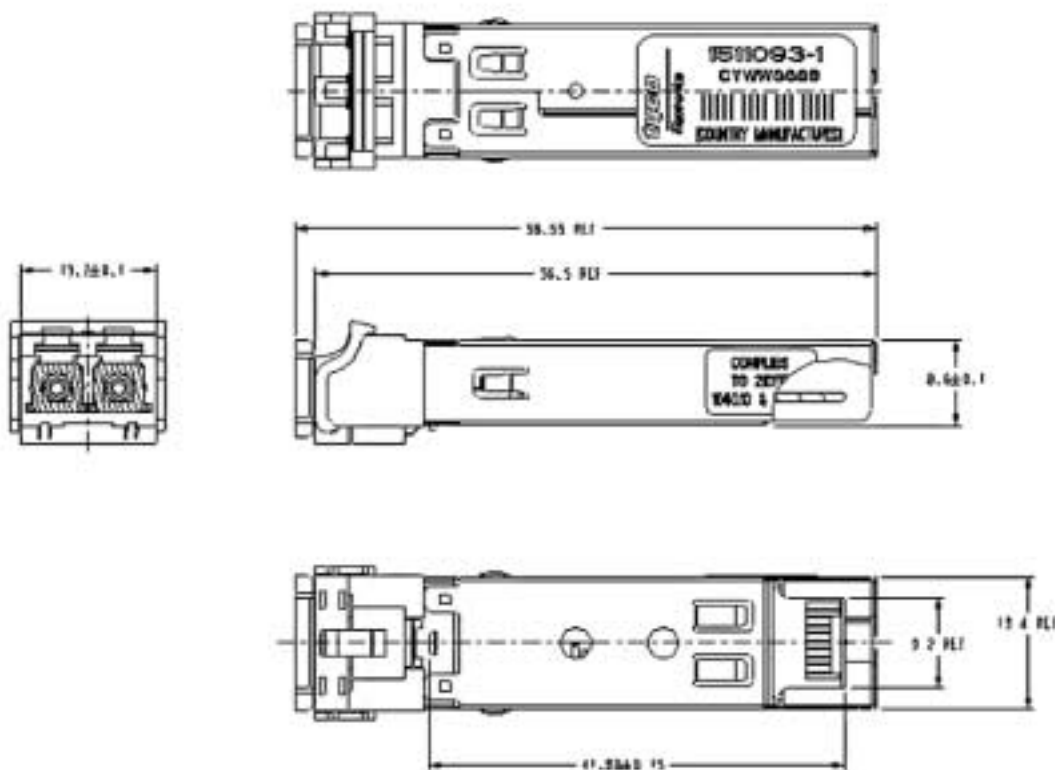


Figure 2: Transceiver Outline Descriptions



Note: All dimensions are in mm.

**IMPORTANT: PLEASE REFER TO THE TYCO ELECTRONICS CUSTOMER DRAWING 1511093 & 1511202 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. DRAWINGS CAN BE OBTAINED ON OUR WEBSITE AT: <http://www.tycoelectronics.com> OR CALL AMPFAX 1-800-522-6752 FOR 24HR FAX SERVICE.**

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**“NEW” Gigabit Ethernet Singlemode SFP LC Transceivers****Product Facts**

- Complies with IEEE Standard 802.3z Gigabit Ethernet 1000BASE-LX PMD requirements
- Complies with Small Form-factor Pluggable (SFP) Multi-Source Agreement (MSA)
- High density LC connector interface
- Operates to 5000m with singlemode fiber
- Hot Pluggable
- Single +3.3-volt power supply
- PECL and LVPECL AC-coupled data Interface
- Transmitter uses 1300nm FP Laser
- Class 1 Laser Safe per FDA/CDRH and IEC 60825-1
- UL 60950 recognized
- Compatible with standard Gigabit Ethernet chipsets
- Units are supplied with dust plugs
- Mates to MSA compliant Host Connector and Cage Assembly

**Applications**

- Switched Backplanes
- Switch to Switch Links
- Network Interface cards
- Hubs
- Routers



Tyco Electronics, recognizing the market need for higher optical port density, is developing an entire product platform of Tyco Electronics' Small Form-factor Pluggable (SFP) transceivers with the popular LC connector. These transceivers are less than half the width of the functionally similar GBICs and simply plug into a SFP compatible surface mount connector and cage on the customer board. The smaller size and 0.64-inch port-to-port centerline spacing enables equipment manufacturers to cost-effectively double the fiber optic port density of a given product. Tyco Electronics' LC connector footprint is equivalent to the RJ-45 electrical connector and the small size of the LC nose also allows for increased EMI shielding.

The Tyco Electronics' SFP LC Transceivers 1511094-X are 1300nm FP LASER-based fiber optic transceiver modules for use in 1.25 Gb/s Gigabit Ethernet and high-speed proprietary link applications. The transceivers send and receive pre-encoded data over a singlemode optical fiber. The

modules, which operate from a single +3.3V power supply, contain separate AC-coupled transmitter and receiver sections that have PECL/LVPECL compatible data interfaces. The transceiver provides diagnostic and alarm features such as temperature, bias, current and output power. Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor Pluggable (SFP) transceivers for both single-mode and multimode applications.

The Tyco Electronics' Gigabit Ethernet SFP LC Transceivers have been extensively tested to comply with the Gigabit Ethernet industry standard. The FP LASER-based transmitter is certified to be Class 1 laser safe, as defined by U.S. and international standards. The modules have been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with dust plugs.



### “NEW” Gigabit Ethernet Singlemode SFP LC Transceivers (Continued)

Gigabit Ethernet  
Singlemode SFP LC  
Transceivers

Part Numbers  
1511094-1 w/Push Button  
Actuator  
1511094-2 w/Bail Latch

#### Transmitter Performance Specifications:

( $T_C=0$  to  $70^\circ\text{C}$ ,  $V_{CC}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			.1	–	1.25	Gb/s
Optical Output (avg.) SM	$P_{OUT}$	1,2	-11	–	-3	dBm
Extinction Ratio	–	3	9	–	–	dB
Transmit Disabled Optical Output (avg.)	$P_{OUT\ DIS}$	–	–	–	0	mw
Center Wavelength	$\lambda_{OUT}$	4	1270	1310	1355	nm
Spectral Width (RMS)	$\Delta\lambda$	4	–	–	4	nm (RMS)
Relative Intensity Noise*	$RIN_{12}$	5	–	–	120	dB/Hz
Deterministic Jitter	DJ	6	–	–	80	ps
Total Jitter	TJ	6	–	–	227	ps
Output Rise Time	$t_{TLH}$	7,8	–	–	260	ps
Output Fall Time	$t_{THL}$	7,8	–	–	260	ps
Pk-Pk Differential Input Voltage	$V_{DIFF}$	9	500	–	2000	mV
Transmit Fault Voltage Levels						
Tx_Fault_On		10	2	–	$V_{CC}$	V
Tx_Fault_Off		10	0	–	0.8	V
Transmit Disable Voltage Levels						
Tx Disabled		–	1.835	–	$V_{CC}+0.2$	V
Tx Enabled		–	0	–	0.8	V
Power Supply Voltage	$V_{CC} - V_{EE}$	–	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	–	–	100	160	mA
Operating Temperature	$T_C$	–	0	–	70	$^\circ\text{C}$
TX Disable Assert time	$T\_Off$				10	$\mu\text{s}$
TX Disable Negate Time	$T\_On$				1	ms
Time to initialize including reset of TX_Fault	$T\_Init$				300	ms
TX_Fault Assert Time	TX_Fault				100	$\mu\text{s}$
TX_Disable to reset	TX_Reset		10			$\mu\text{s}$

**Note:** All optical measurements made through a short patch cable, between 2 and 5 meters in length, using  $10\mu\text{m}$  Singlemode fiber unless stated otherwise.

**Note:** For details on timing requirements of control and status I/O parameters, and module interface and data field descriptions, please refer to the SFP MSA, Appendix B Electrical Interface guidelines.

- Meets Class 1 laser safety requirements of IEC 60825-1 and IEC 60825-2 and U.S. Department of Health Services 21 CFR 1040.10 and 1040.11 when operated within the specified temperature and power supply ranges.
- Transmitter optical output power measured per TIA/EIA FOTP-95. Transmitter modulated with a valid 8b/10b data pattern.
- Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
- Center wavelength and spectral width measured per TIA/EIA FOTP-127 using optical spectrum analyzer with a valid 8b/10b data pattern.
- RIN measured per ANSI X.230-1994 annex A with valid 8b/10b data pattern. RF power meter and current meter test set replaced with microwave spectrum analyzer and calibrated high-speed photoreceiver. Polarization rotator omitted.
- DJ and TJ measured per OC-48 Standard.
- Measured from 20% to 80% points on rising and falling edge of transmitted waveform.
- Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with the eye diagram shown in this document. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.
- Compatible with 10 K, 10 KH and 100 K ECL, PECL and LVPECL.
- Open Collector/Drain output.
- Time from rising edge of TX Disable to when the optical output falls below 10% of nominal.
- Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal.
- From power on or negation of TX\_Fault using TX Disable.
- Time from fault to TX\_Fault on.
- Time TX Disable must be held high to reset TX\_Fault.

\* Measured @ 500 MHz

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**“NEW” Gigabit Ethernet Singlemode SFP LC Transceivers** (Continued)

Gigabit Ethernet  
Singlemode SFP LC  
Transceivers

Part Numbers  
1511094-1 w/Push  
Button Actuator  
1511094-2 w/Bail Latch

**Receiver Performance Specifications:**

 (TC=0 to 70°C, V<sub>CC</sub>-V<sub>EE</sub>=3.135 to 3.465V DC)

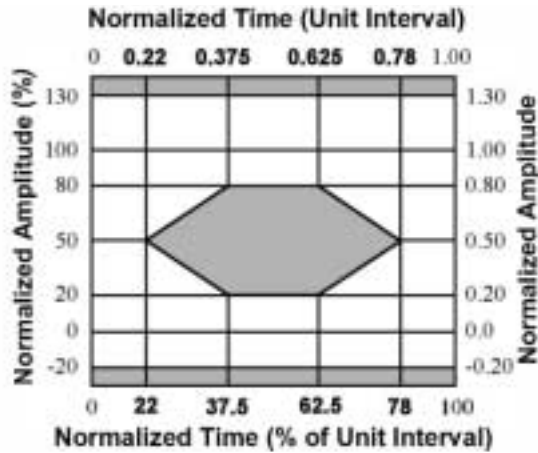
Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate	B	0.1	.1	–	1.25	Gb/s
Optical Input Sensitivity	P <sub>IN</sub>	1	–	–	-19	dBm
Average Receive Power		–	–	–	-3	dBm
Optical wavelength	λ <sub>IN</sub>	–	1270	1310	13550	Nm
Receiver Reflectance	–				-14	dB
Receiver Loss of Signal	LOS					
Output Voltage						
Assert	V <sub>A</sub>	4	2	2	V <sub>CC</sub> + .3	V
Deassert	V <sub>D</sub>	4	0	–	0.8	V
Rx LOS Power Levels (avg.)						
Assert	P <sub>A</sub>	–	-31	–	–	dBm
Deassert	P <sub>D</sub>	–	–	–	-19	dBm
Hysteresis	–	–	0.5	–	–	dB
Power Supply Voltage	V <sub>CC</sub> - V <sub>EE</sub>	–	3.135	3.3	3.465	V
Supply Current	I <sub>CC</sub>	–	–	95	115	mA
Operating Temperature	T <sub>C</sub>	–	0	–	70	°C
LOS Assert Time	T <sub>Loss_On</sub>				100	μs
LOS Deassert Time	T <sub>Loss_Off</sub>				100	μs
Serial ID Clock Rate	F <sub>Serial_Clock</sub>				100	kHz

**Note:** All optical measurements made through a short patch cable, between 2 and 5 meters in length, using singlemode fiber unless stated otherwise.

**Note:** For details on timing requirements of control and status I/O parameters, and module interface and data field descriptions, please refer to the SFP MSA< Appendix B Electrical Interface guidelines.

1. Minimum average optical input power (receive sensitivity) at which the BER is less than 10E-10 measured with a 1.25 G Baud Rate 2E7 — 1 NRZ PRBS data pattern.
2. Per IEEE 802.3Z Gigabit Ethernet Standard.
3. Return loss measured per TIA/EIA FOTP-107.
4. This is an open drain output that should be pulled up with a 4.7K ohm - 10K ohm resistor on the host board. Pull-up voltage level should be between 2.0 V and V<sub>CC</sub> + 0.3 V per the SFP MSA.

“NEW” Gigabit Ethernet Singlemode SFP LC Transceivers (Continued)




NOTE: Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with this eye diagram. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.

Absolute Maximum Ratings:

Parameter	Symbol	Units	Min	Max
Storage Temperature	$T_S$	°C	-40	85
Data Input Voltage	$V_{INPUT}$	V	-0.5	$V_{CC}$
Differential Input Voltage	$V_{DIFF}$	V	–	2.4
Supply Voltage	$V_{CC}-V_{EE}$	V	-0.2	5.0

Regulatory Compliance:

Agency	Test Method	Listing Document
FDA	CDRH 21-CFR 1040 Class 1	Accession Number: 9122051-XX
TUV	EN60825-1:1994+A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services Laser Class I Protection Class III TUV Certificate Number: B020546940001
UL /  us	UL60950	E208513

ESD Testing:

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A-114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, nose, right, and left). Each module is tested with both power ON and OFF

**NOTE**

All products which contain a laser must comply with government regulations for laser safety. In the U.S., the applicable standard is FDA 21 CFR 1040. In other parts of the world, IEC 60825-1 applies. These transceivers were designed and tested to the requirements of the above standards and found to be in compliance with class 1 laser safety limits. When operated within the limits specified in this document, this product conforms to IEC 60825-1: 1993 + A1 : 1997 + A2: 2001, class 1 laser product, requirements.

**CAUTION!**

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

“NEW” Gigabit Ethernet Singlemode SFP LC Transceivers (Continued)

Figure 2: Transceiver Pad Descriptions

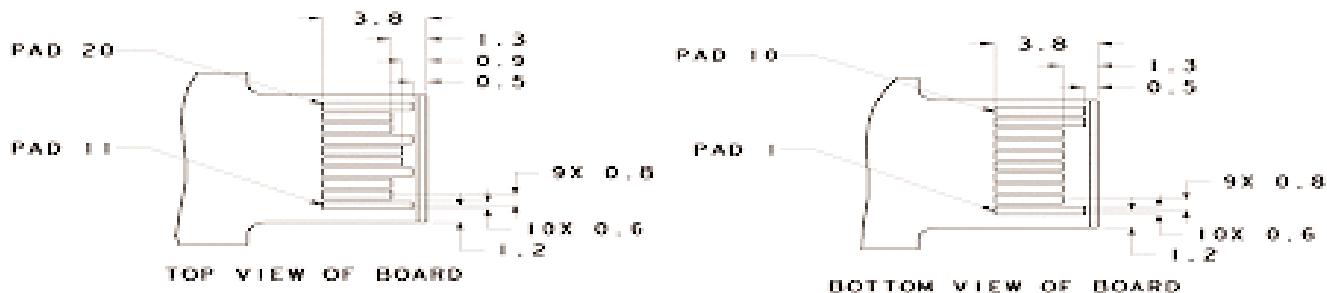
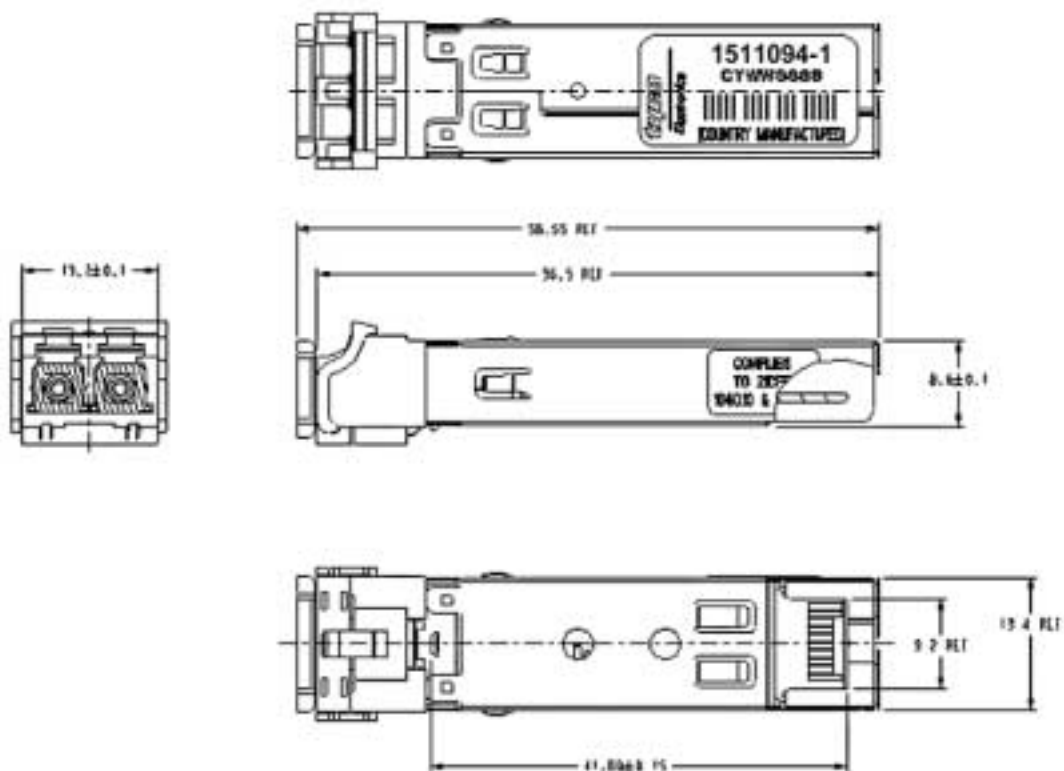


Figure 2: Transceiver Outline Descriptions



Note: All dimensions are in mm.

**IMPORTANT: PLEASE REFER TO THE TYCO ELECTRONICS CUSTOMER DRAWING 1511094 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. DRAWINGS CAN BE OBTAINED ON OUR WEBSITE AT: <http://www.tycoelectronics.com> OR CALL AMPFAX 1-800-522-6752 FOR 24HR FAX SERVICE.**

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**Gigabit Ethernet Multimode SFP MT-RJ Transceiver**

**Product Facts**

- Complies with IEEE Standard 802.3z Gigabit Ethernet 1000BASE-SX PMD requirements
- Complies with Small Form-factor Pluggable (SFP) Multi-Source Agreement (MSA)
- High density MT-RJ connector interface
- Operates to 550 m with 50/125  $\mu$ m or 275 m with 62.5/125  $\mu$ m fiber
- Hot Pluggable
- Single +3.3-volt power supply
- PECL and LVPECL AC-coupled data Interface
- Transmitter uses 850nm vertical cavity surface emitting laser (VCSEL)
- Class 1 Laser Safe per FDA/CDRH and IEC 60825-1
- UL 60950 recognized
- Compatible with standard Gigabit Ethernet chipsets.
- Units are supplied with dust plugs
- Mates to MSA compliant Host Connector and Cage Assembly

**Applications**

- Switches
- Repeaters
- Network Interface cards
- Hubs
- Routers



Tyco Electronics, recognizing the market need for higher optical port density, is developing an entire product platform of Tyco Electronics' Small Form-factor Pluggable (SFP) transceivers with the popular MT-RJ connector. These transceivers are less than half the width of the functionally similar GBICs and simply plug into a SFP compatible surface mount connector and cage on the customer board. The smaller size and 0.64-inch port-to-port centerline spacing enables equipment manufacturers to cost-effectively double the fiber optic port density of a given product.

The Tyco Electronics' Gigabit Ethernet SFP MT-RJ Transceiver 1382350-1 is a short wavelength fiber optic transceiver module for use in 1.25 Gb/s Gigabit Ethernet and high-speed proprietary link applications. The transceiver sends and receives pre-encoded data over a pair of 62.5 $\mu$ m or 50 $\mu$ m core

multimode optical fibers. The module, which operates from a single +3.3V power supply, contains separate AC-coupled transmitter and receiver sections that have PECL/LVPECL compatible data interfaces. Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor Pluggable (SFP) transceivers for both singlemode and multimode applications.

The Tyco Electronics' Gigabit Ethernet SFP MT-RJ Transceiver has been extensively tested to comply with the Gigabit Ethernet industry standard. The VCSEL-based transmitter is certified to be Class 1 laser safe, as defined by U.S. and international standards. The module has been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with dust plugs.


**Gigabit Ethernet Multimode SFP MT-RJ Transceiver** (Continued)

**Gigabit Ethernet Multimode SFP MT-RJ Transceiver**

Part Number 1382350-1

**Transmitter Performance Specifications:**
 $(T_c=0$  to  $70^{\circ}\text{C}$ ,  $V_{CC}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			–	–	1.25	Gb/s
Optical Output (avg.)	$P_{OUT}$	1,2	-9.5	–	-4	dBm
Extinction Ratio	–	3	9	–	–	dB
Transmit Disabled Optical Output (avg.)	$P_{OUT\ DIS}$	–	–	–	-30	dBm
Center Wavelength	$\lambda_{OUT}$	4	770	845	860	nm
Spectral Width (RMS)	$\Delta\lambda$	4	–	–	0.85	nm
Relative Intensity Noise	$RIN_{12}$	5	–	–	-117	dB/Hz
Deterministic Jitter	DJ	6	–	–	80	ps
Total Jitter	TJ	6	–	–	227	ps
Output Rise Time	$t_{TLH}$	7,8	–	–	260	ps
Output Fall Time	$t_{THL}$	7,8	–	–	260	ps
Pk-Pk Differential Input Voltage	$V_{DIFF}$	9	500	–	2500	mV
Transmit Fault Voltage Levels						
Tx_Fault_On		10	N/A	–	N/A	V
Tx_Fault_Off		10	0	–	0.8	V
Transmit Disable Voltage Levels						
Tx Disabled		–	2.0	–	3.465	V
Tx Enabled		–	0	–	0.8	V
Power Supply Voltage	$V_{CC} - V_{EE}$	–	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	–	–	–	60	mA
Operating Temperature	$T_c$	–	0	–	70	$^{\circ}\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

1. Meets Class 1 laser safety requirements of IEC 60825-1 and IEC 60825-2 and U.S. Department of Health Services 21 CFR 1040.10 and 1040.11 when operated within the specified temperature and power supply ranges.
2. Transmitter optical output power measured per TIA/EIA FOTP-95. Transmitter modulated with a valid 8b/10b data pattern. Specification applies for both 50  $\mu\text{m}$  and 62.5  $\mu\text{m}$  core multimode fiber.
3. Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
4. Center wavelength and spectral width measured per TIA/EIA FOTP-127 using optical spectrum analyzer with a valid 8b/10b data pattern.
5. RIN measured per ANSI X.230-1994 annex A with valid 8b/10b data pattern. RF power meter and current meter test set replaced with microwave spectrum analyzer and calibrated high-speed photoreceiver. Single mode fiber in test procedure replaced with multimode patch cable. Polarization rotator omitted.
6. DJ and TJ measured per IEEE 802.3Z Gigabit Ethernet Standard.
7. Measured from 20% to 80% points on rising and falling edge of transmitted waveform.
8. Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with the eye diagram shown in this document. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.
9. Compatible with 10 K, 10 KH and 100 K ECL, PECL and LVPECL.
10. Open Collector/Drain output always in "Tx Fault Off" state.



**Gigabit Ethernet Multimode SFP MT-RJ Transceiver** (Continued)

Gigabit Ethernet Multimode SFP MT-RJ Transceiver

Part Number 1382350-1

**Receiver Performance Specifications:**

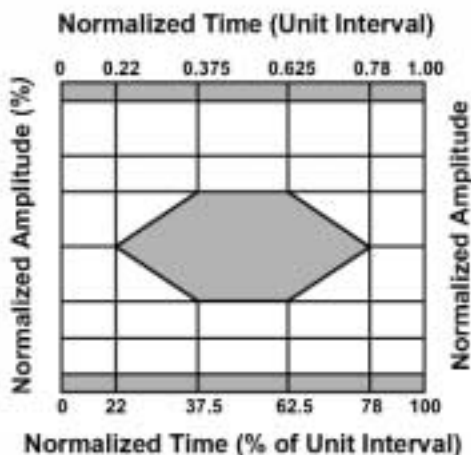
(TC=0 to 70°C, V<sub>CC</sub>-V<sub>EE</sub>=3.135 to 3.465V DC)

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			–	–	1.25	Gb/s
Average Receive Power	P <sub>IN</sub>		–	–	0	dBm
Receive Sensitivity		1	-17	–	–	dBm
Stressed Receive Sensitivity						
50 μm Fiber	–	2	-13.5	–	–	dBm
62.5 μm Fiber	–	2	-12.5	–	–	dBm
Electrical 3 dB Cut-Off	3 dB f <sub>C</sub>	2	–	–	1.5	GHz
Optical wavelength	λ <sub>IN</sub>	–	770	–	860	nm
Deterministic Jitter	DJ	5	–	–	170	ps
Total Jitter	TJ	5	–	–	266	ps
Return Loss	–	3	12	–	–	dB
Receiver Loss of Signal Output Voltage						
Assert	V <sub>A</sub>	4	2	–	V <sub>CC</sub> + .3	V
Deassert	V <sub>D</sub>	4	0	–	0.8	V
Rx LOS Power Levels (avg.)						
Assert	P <sub>A</sub>	–	-30	–	–	dBm
Deassert	P <sub>D</sub>	–	–	–	-17	dBm
Hysteresis	–	–	0.5	–	–	dB
Power Supply Voltage	V <sub>CC</sub> - V <sub>EE</sub>	–	3.135	3.3	3.465	V
Supply Current	I <sub>CC</sub>	–	–	–	100	mA
Operating Temperature	T <sub>C</sub>	–	0	–	70	°C

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5 μm multimode fiber unless stated otherwise.

1. Minimum average optical input power (receive sensitivity) at which the BER is less than 10E-12 measured with a 1.25 G Baud Rate 2E7 - 1 NRZ PRBS data pattern.
2. Per IEEE 802.3Z Gigabit Ethernet Standard.
3. Return loss measured per TIA/EIA FOTP-107.
4. This is an open drain output that should be pulled up with a 4.7K ohm - 10K ohm resistor on the host board. Pull-up voltage level should be between 2.0 V and V<sub>CC</sub> + 0.3 V per the SFP MSA.
5. DJ and TJ measured per IEEE 802.3Z Gigabit Ethernet Standard.

**Gigabit Ethernet Multimode SFP MT-RJ Transceiver** (Continued)



NOTE: Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with this eye diagram. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.

**Timing Requirements of Control and Status I/O**

Parameter	Symbol	Min	Max	Unit	Condition
TX Disable Assert Time	T_Off		10	μs	Time from rising edge of TX Disable to when the optical output falls below 10% of nominal
TX Disable Negate Time	T_On		1	ms	Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal
Time to initialize, including reset of TX_Fault	T_Init		300	ms	From power on or negation of TX_Fault using TX Disable
TX_Fault Assert Time	TX_Fault		100	μs	Time from fault to TX-Fault on.
TX Disable to reset	T_Reset		10	μs	Time TX Disable must be held high to reset TX-Fault
LOS Assert Time	T_Loss_On		100	μs	Time from LOS state to LOS assert
LOS Deassert Time	T_Loss_Off		100	μs	Time from non-LOS state to LOS deassert
Serial ID Clock Rate	F_Serial_Clock		100	kHz	

NOTE: For details on timing requirements of control and status I/O parameters, and module interface and data field descriptions, please refer to the SFP MSA, Appendix B Electrical Interface guidelines.


**Absolute Maximum Ratings:**

Parameter	Symbol	Units	Min	Max
Storage Temperature	T <sub>s</sub>	°C	-40	85
Data Input Voltage	V <sub>INPUT</sub>	V	-0.5	V <sub>CC</sub>
Differential Input Voltage	V <sub>DIFF</sub>	V	–	2.4
Supply Voltage	V <sub>CC</sub> -V <sub>EE</sub>	V	-0.2	5.0



**Gigabit Ethernet Multimode SFP MT-RJ Transceiver** (Continued)

Regulatory Compliance:

Agency	Test Method	Listing Document
FDA	CDRH 21-CFR 1040 Class 1	Accession Number: 9122051-08
TUV	EN60825-1:1994+A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services Laser Class I Protection Class III TUV Certificate Number: B020546940003
UL /  US	UL60950	E208513

ESD Testing:

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A-114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, nose, right, and left). Each module is tested with both power ON and OFF

**NOTE**

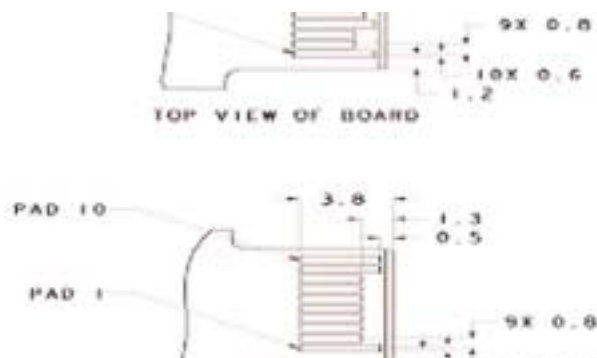
All products which contain a laser must comply with government regulations for laser safety. In the U.S., the applicable standard is FDA 21 CFR 1040. In other parts of the world, IEC 60825-1 applies. These transceivers were designed and tested to the requirements of the above standards and found to be in compliance with class 1 laser safety limits. When operated within the limits specified in this document, this product conforms to IEC 60825-1: 1993 + A1 : 1997 + A2: 2001, class 1 laser product, requirements.

**CAUTION!**

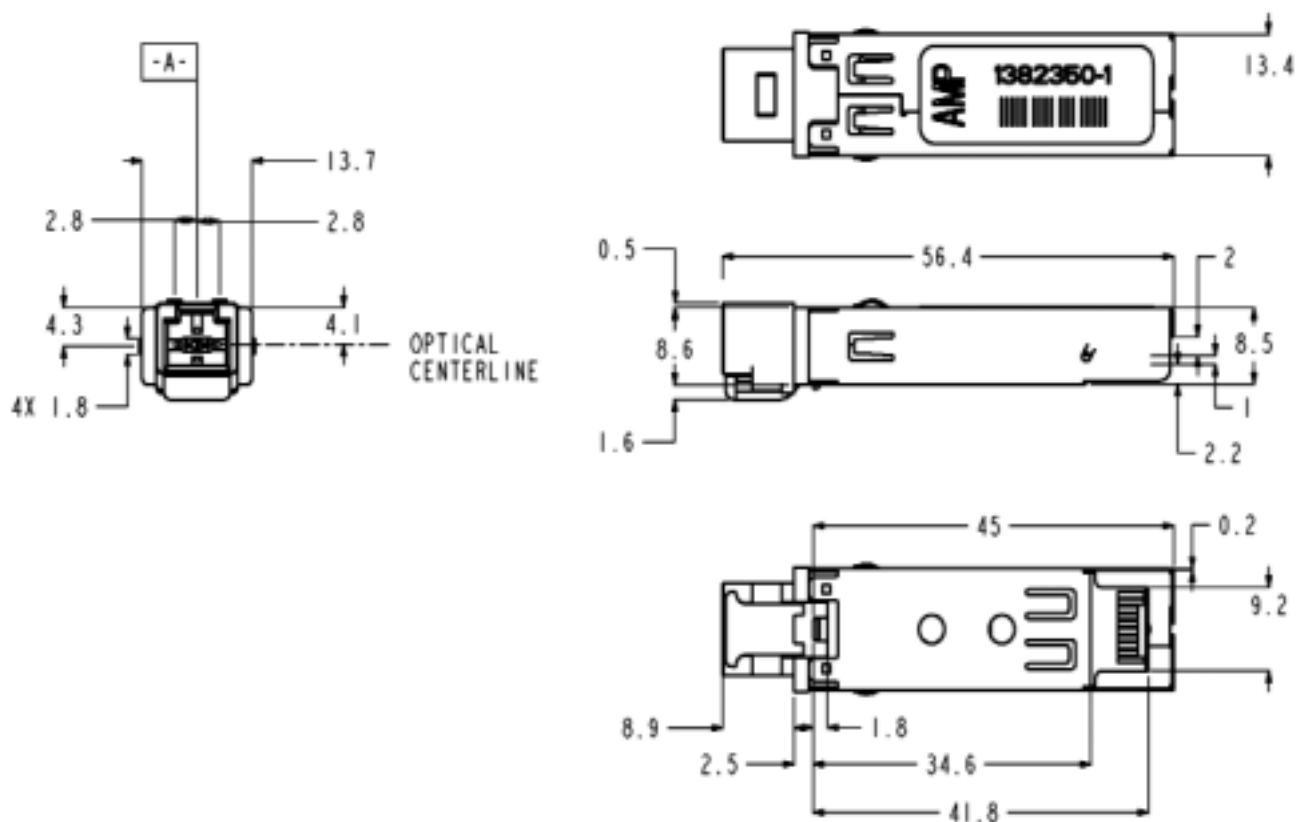
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

**Gigabit Ethernet Multimode SFP MT-RJ Transceiver** (Continued)

**Figure 2: Transceiver Pad Descriptions**



**Figure 2: Transceiver Outline Descriptions**



Note: All dimensions are in mm.

**IMPORTANT: PLEASE REFER TO THE TYCO ELECTRONICS CUSTOMER DRAWING 1382350-1 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. CALL 1-800-522-6752 FOR 24HR FAX OR ON LINE AT: <http://www.tycoelectronics.com>.**

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**Gigabit Fibre Channel Multimode SFP MT-RJ Transceiver**

**Product Facts**

- Conforms to Fibre Channel FC-PI Specifications
- Complies with Small Form-factor Pluggable (SFP) Multi-Source Agreement (MSA)
- High density MT-RJ connector interface
- Dual data rate
- Operates to 500 m with 50/125  $\mu$ m or 300 m with 62.5/125  $\mu$ m fiber
- Hot pluggable
- Single +3.3-volt power supply
- PECL and LVPECL AC-coupled data Interface
- Transmitter uses 850nm vertical cavity surface emitting laser (VCSEL)
- Class 1 Laser Safe per FDA/CDRH and IEC 60825-1
- UL 60950 recognized
- Compatible with standard Fibre Channel chipsets.
- Units are supplied with dust plugs
- Mates to MSA compliant Host Connector and Cage Assembly

**Applications**

- Mass Storage
- High Speed Peripheral Interface
- RAID Systems
- High Bandwidth Intersystem and Intrasystem links
- Point-to-point links



Tyco Electronics, recognizing the market need for higher optical port density, is developing an entire product platform of Tyco Electronics' Small Form-factor Pluggable (SFP) transceivers with the popular MT-RJ connector. These transceivers are less than half the width of the functionally similar GBICs and simply plug into a SFP compatible surface mount connector and cage on the customer board. The smaller size and 0.64-inch port-to-port centerline spacing enables equipment manufacturers to cost-effectively double the fiber optic port density of a given product.

Tyco Electronics' Fibre Channel SFP MT-RJ Transceiver 1382349-1 is a short wavelength fiber optic transceiver module for use in Fibre Channel and high-speed proprietary link applications. This transceiver sends and receives pre-encoded data over a pair of 62.5 $\mu$ m or 50 $\mu$ m

core multimode optical fibers. The module, which operates from a single +3.3V power supply, contains separate AC-coupled transmitter and receiver sections that have PECL/LVPECL compatible data interfaces. Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor Pluggable (SFP) transceivers for both singlemode and multimode applications.

Tyco Electronics' Fibre Channel SFP MT-RJ Transceiver has been extensively tested to comply with the Fibre Channel industry standard. The VCSEL-based transmitter is certified to be Class 1 laser safe, as defined by U.S. and international standards. The modules have been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with dust plugs.


**Gigabit Fibre Channel Multimode SFP MT-RJ Transceiver** (Continued)

 Fibre Channel Multimode  
SFP MT-RJ Transceiver

Part Number 1382349-1

**Transmitter Performance Specifications:**

 ( $T_C=0$  to  $70^\circ\text{C}$ ,  $V_{CC}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			–	–	1.0625	Gb/s
Optical Output (avg.)	$P_{OUT}$	1,2	10	–	-4	dBm
Extinction Ratio	–	3	9	–	–	dB
Optical Modulation	OMA	4	0.156	–	–	mW
Transmit Disabled Optical Output (avg.)	$P_{OUT\ DIS}$		–	–	-30	dBm
Center Wavelength	$\lambda_{OUT}$	5	770	845	860	nm
Spectral Width (RMS)	$\Delta\lambda$	5	–	–	1.0	nm
Relative Intensity Noise	$RIN_{12}$	6	–	–	-116	dB/Hz
Deterministic Jitter	DJ	7,8	–	–	84.7	ps
Total Jitter	TJ	7	–	–	169.4	ps
Output Rise Time	$t_{TLH}$	8,9	–	–	300	ps
Output Fall Time	$t_{THL}$	8,9	–	–	300	ps
Pk-Pk Differential Input Voltage	$V_{DIFF}$	10	500	–	2500	mV
Transmit Fault Voltage Levels						
Tx_Fault_On		11	N/A	–	N/A	V
Tx_Fault_Off		11	0	–	0.8	V
Transmit Disable Voltage Levels						
Tx Disabled		–	2.0	–	3.465	V
Tx Enabled		–	0	–	0.8	V
Power Supply Voltage	$V_{CC} - V_{EE}$	–	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	–	–	44	60	mA
Operating Temperature	$T_C$	–	0	–	70	$^\circ\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

1. Meets Class 1 laser safety requirements of IEC 60825-1 and IEC 60825-2 and U.S. Department of Health Services 21 CFR 1040.10 and 1040.11 when operated within the specified temperature and power supply ranges.
2. Transmitter optical output power measured per TIA/EIA FOTP-95. Transmitter modulated with a valid 8b/10b data pattern. Specification applies for both 50  $\mu\text{m}$  and 62.5  $\mu\text{m}$  core multimode fiber.
3. Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
4. Optical Modulation Amplitude (OMA) values are peak-to-peak measured per FC-PI Standard.
5. Center wavelength and spectral width measured per TIA/EIA FOTP-127 using optical spectrum analyzer with a valid 8b/10b data pattern.
6. RIN measured per ANSI X.230-1994 annex A with valid 8b/10b data pattern. RF power meter and current meter test set replaced with microwave spectrum analyzer and calibrated high-speed photoreceiver. Single mode fiber in test procedure replaced with multimode patch cable. Polarization rotator omitted.
7. DJ and TJ measured per FC-PI.
8. Measured from 20% to 80% points on rising and falling edge of transmitted waveform.
9. Transmitter optical waveform characteristics comply with the eye diagrams shown in this document.
10. Compatible with 10 K, 10 KH and 100 K ECL, PECL and LVPECL.
11. Open Collector/Drain output always in "Tx Fault Off" state



**Gigabit Fibre Channel Multimode SFP MT-RJ Transceiver** (Continued)

Fibre Channel Multimode  
SFP MT-RJ Transceiver

Part Number 1382349-1

**Receiver Performance Specifications:**

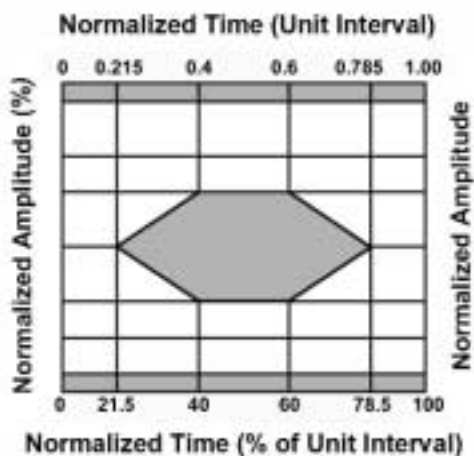
(TC=0 to 70°C, V<sub>CC</sub>-V<sub>EE</sub>=3.135 to 3.465V DC)

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate			-	-	1.0625	Gb/s
Average Received Power	P <sub>IN</sub>	-	-	-	0	dBm
Optical Modulation Amplitude	OMA	1	0.031	-		mW
Stressed Receiver Sensitivity (OMA)						
50 μm Fiber	-	2	0.055	-	-	mW
62.5 μm Fiber	-	2	0.067	-	-	mW
Electrical 3 dB Cut-Off	3 dB f <sub>c</sub>	2	-	-	1.5	GHz
Electrical 10 dB Cut-Off	10 dB f <sub>c</sub>	2	-	-	3	GHz
Optical wavelength	λ <sub>IN</sub>	-	770	-	860	nm
Return Loss	-	3	12	-	-	dB
Receiver Loss of Signal Output Voltage						
Assert	V <sub>A</sub>	4	2	-	V <sub>CC</sub> + .3	V
Deassert	V <sub>D</sub>	4	0	-	0.8	V
Rx LOS Power Levels (avg.)						
Assert	P <sub>A</sub>	-	-31	-	-	dBm
Deassert	P <sub>D</sub>	-	-	-	-17	dBm
Hysteresis	-	-	0.5	-	-	dB
Power Supply Voltage	V <sub>CC</sub> - V <sub>EE</sub>	-	3.135	3.3	3.465	V
Supply Current	I <sub>CC</sub>	-	-	85	100	mA
Operating Temperature	T <sub>C</sub>	-	0	-	70	°C

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5 μm multimode fiber unless stated otherwise.

1. Optical Modulation Amplitude values are Peak-to-Peak.
2. Per FC-Pi Standard.
3. Return loss measured per TIA/EIA FOTP-107.
4. This is an open drain output that should be pulled up with a 4.7K ohm - 10K ohm resistor on the host board. Pull-up voltage level should be between 2.0 V and V<sub>CC</sub> + 0.3 V per the SFP MSA.

**Gigabit Fibre Channel Multimode SFP MT-RJ Transceiver** (Continued)



**NOTE:** Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with this eye diagram. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.

Parameter	Symbol	Min	Max	Unit	Condition
TX Disable Assert Time	T_Off		10	μs	Time from rising edge of TX Disable to when the optical output falls below 10% of nominal
TX Disable Negate Time	T_On		1	ms	Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal
Time to initialize, including reset of TX_Fault	T_Init		300	ms	From power on or negation of TX_Fault using TX Disable
TX_Fault Assert Time	TX_Fault		100	μs	Time from fault to TX-Fault on.
TX Disable to reset	T_Reset	10		μs	Time TX Disable must be held high to reset TX-Fault
LOS Assert Time	T_Loss_On		100	μs	Time from LOS state to LOS assert
LOS Deassert Time	T_Loss_Off		100	μs	Time from non-LOS state to LOS deassert
Serial ID Clock Rate	F_Serial_Clock		100	kHz	

NOTE: For details on timing requirements of control and status I/O parameters, and module interface and data field descriptions, please refer to the SFP MSA, Appendix B Electrical Interface guidelines.


**Absolute Maximum Ratings:**

Parameter	Symbol	Units	Min	Max
Storage Temperature	T <sub>s</sub>	°C	-40	85
Data Input Voltage	V <sub>INPUT</sub>	V	-0.5	V <sub>CC</sub>
Differential Input Voltage	V <sub>DIFF</sub>	V	–	2.4
Supply Voltage	V <sub>CC</sub> -V <sub>EE</sub>	V	-0.2	5.0



**Gigabit Fibre Channel Multimode SFP MT-RJ Transceiver** (Continued)

Regulatory Compliance:

Agency	Test Method	Listing Document
FDA	CDRH 21-CFR 1040 Class 1	Accession Number: 9122051-08
TUV	EN60825-1:1994+A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services Laser Class I Protection Class III TUV Certificate Number: B020546940003
UL / 	UL60950	E141081

ESD Testing:

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A-114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, nose, right, and left). Each module is tested with both power ON and OFF

**NOTE**

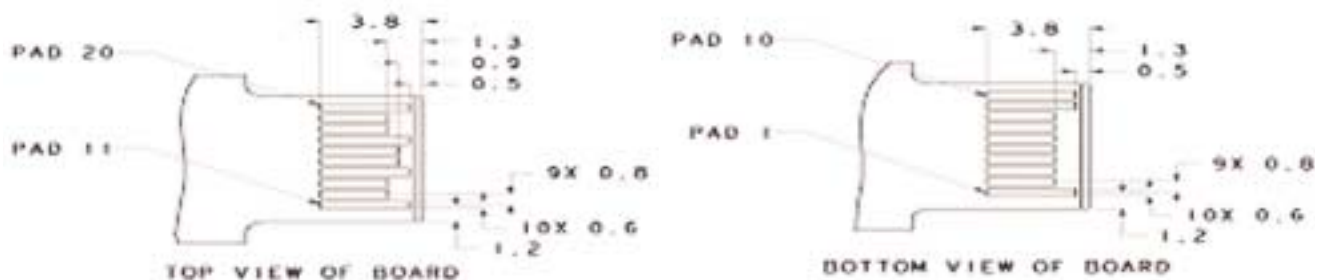
All products which contain a laser must comply with government regulations for laser safety. In the U.S., the applicable standard is FDA 21 CFR 1040. In other parts of the world, IEC 60825-1 applies. These transceivers were designed and tested to the requirements of the above standards and found to be in compliance with class 1 laser safety limits. When operated within the limits specified in this document, this product conforms to IEC 60825-1: 1993 + A1 : 1997 + A2: 2001, class 1 laser product, requirements.

**CAUTION!**

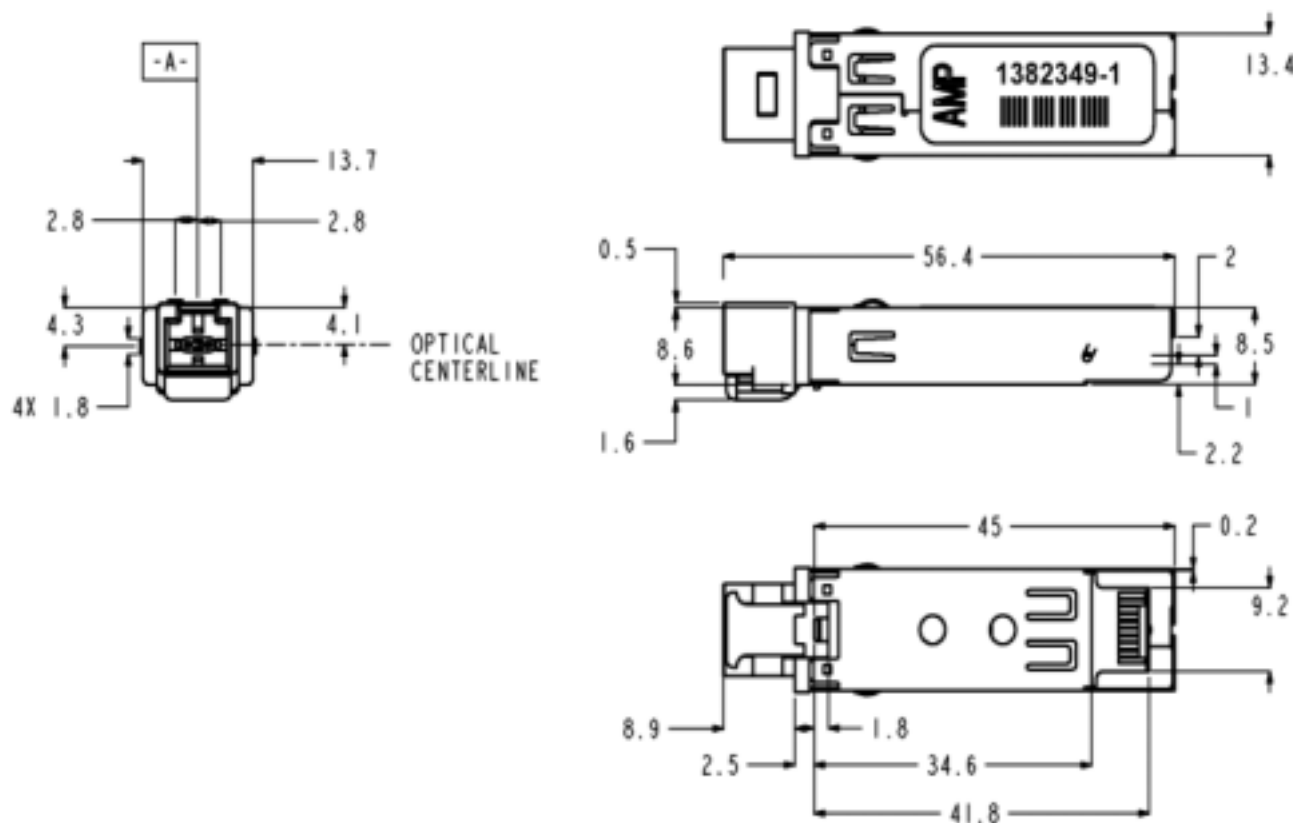
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

**Gigabit Fibre Channel Multimode SFP MT-RJ Transceiver** (Continued)

**Figure 2: Transceiver Pad Descriptions**



**Figure 2: Transceiver Outline Descriptions**



Note: All dimensions are in mm.

**IMPORTANT: PLEASE REFER TO THE TYCO ELECTRONICS CUSTOMER DRAWING 1382349-1 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. CALL 1-800-522-6752 FOR 24HR FAX OR GO ON LINE AT: <http://www.tycoelectronics.com>.**

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**OC-3 Multimode SFF MT-RJ Transceiver****Product Facts**

- Fully compliant with ATM SONET STS-3c (OC-3) Physical Layer Interface Specification
- Single +3.3V power supply
- Complies with Small Form Factor (SFF) Multi-Source Agreement (MSA)
- High-density MT-RJ connector interface
- High reliability 1300 nm optics
- PECL and LVPECL compatible data interface
- Wave Solder and Aqueous Wash compatible
- UL 60950 recognized

**Applications**

- ATM 155 Mb/s links
- SDH STM-1 links
- Switches
- Hubs
- Routers



Tyco Electronics' OC-3 SFF MT-RJ Transceiver 269146-3 is an LED based 1300 nm fiberoptic transceiver module intended for use in SONET OC-3 (SDH STM-1) multimode fiber physical layers that provide ATM and other data communications services. The transceiver sends and receives pre-encoded data over a pair of 62.5  $\mu\text{m}$  or 50  $\mu\text{m}$  core multimode optical fibers. The module, which operates from a single +3.3V power supply, contains separate transmitter and receiver sections with PECL and LVPECL compatible data interfaces.

Technological advancements in precision optical design and ASIC design have enabled Tyco Electronics to produce low cost SFF transceivers. Package style is the multi-sourced 2 x 5 DIP style with integral MT-RJ connector interface. This new small form factor is approximately half the width of a duplex SC 1 x 9 module, providing an effective center line

spacing of 0.55-inches from port to port, allowing the equipment designer to double the port density of a given product. The transceiver has a DC-coupled data interface that provides the highest degree of flexibility for use in a wide variety of circuit architectures. It has been extensively tested to comply with the ATM Forum User-Network Interface SONET OC-3 Multimode Fiber Physical Layer Specification. This ATM document references the ANSI T1.416.01-1999 specification for transmission distances up to 2km over multimode fiber links.

The transceiver module meets Class 1 Eye Safety requirements, as defined by IEC 60825-1. The module has been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with process plugs.


**OC-3 Multimode SFF MT-RJ Transceiver** (Continued)

**OC-3 Multimode  
SFF MT-RJ Transceiver**
**Part Number  
269146-3**
**Transmitter Performance Specifications:**
 $(T_C=0 \text{ to } 70^\circ\text{C}, V_{CC}-V_{EE}=3.135 \text{ to } 3.465\text{V DC})$ 

Parameter	Symbol	Notes	Min	Typ	Max	Units
Data Rate (NRZ)	B	—	10	—	156	Mb/s
Optical Output (avg.)	$P_{OUT}$	1,2	-20	—	-14	dBm
Extinction Ratio	—	3	10	—	—	dB
Optical Power at Logic Low "0" State	$P_{OUT}("0")$	—	—	—	-45	dBm
Center Wavelength	$\lambda_{OUT}$	4	1270	1320	1380	nm
Spectral Width (FWHM)	$\Delta\lambda$	4	—	130	200	nm
Systematic Jitter	$t_{SJ}$	5	—	—	1.6	ns
Random Jitter	$t_{RJ}$	5	—	—	0.6	ns
Output Rise Time	$t_{TLH}$	4,6	0.6	1.2	3.0	ns
Output Fall Time	$t_{THL}$	4,6	0.6	1.2	3.0	ns
Data Input Voltage Levels	$V_{IL}$ $V_{IH}$	7,8 7,8	$V_{CC}-1.810$ $V_{CC}-1.165$	—	$V_{CC}-1.475$ $V_{CC}-0.880$	V V
Data Input Current Levels	$I_{IL}$ $I_{IH}$	— —	-400 —	—	— 400	$\mu\text{A}$ $\mu\text{A}$
Power Supply Voltage	$V_{CC} - V_{EE}$	—	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	—	—	—	120	mA
Operating Temperature	$T_C$	—	0	—	70	$^\circ\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

1. Meets Class I LED safety requirements of IEC 60825-1 when operated within the specified temperature and power supply ranges.
2. Specification applies to 0.275 NA 62.5/125  $\mu\text{m}$  multimode fiber.
3. Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
4. The output rise and fall time and spectral performance conform to ANSI T1.416.01-1999.
5. Driven with a differential signal.
6. Measured from 10% to 90% points on rising and falling edge of transmitted waveform.
7. When  $V_{BB}$  is used as the reference voltage.
8. Configured for LVPECL. Compatible with 10 K, 10 KH and 100 K ECL and PECL.


**OC-3 Multimode SFF MT-RJ Transceiver** (Continued)

 OC-3 Multimode  
SFF MT-RJ Transceiver

Part Number 269146-3

**Receiver Performance Specifications:**

 ( $T_c=0$  to  $70^\circ\text{C}$ ,  $V_{CC}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Data Rate (NRZ)	B	—	10	—	156	Mb/s
Optical Input (avg.) Sensitivity	$P_{IN}$	1	-30	—	-14.0	dBm
Optical Wavelength	$\lambda_{IN}$	—	1270	—	1380	nm
Systematic Jitter	$t_{SJ}$	—	—	—	2	ns
Random Jitter	$t_{RJ}$	—	—	—	0.6	ns
Output Rise Time	$t_{TLH}$	2	0.5	—	5	ns
Output Fall Time	$t_{THL}$	2	0.5	—	5	ns
Output Voltage Levels	$V_{OH}$ $V_{OL}$	3 3	$V_{CC}-1.025$ $V_{CC}-1.810$	—	$V_{CC}-0.880$ $V_{CC}-1.620$	V V
Signal Detect Output Voltage	SD					
Assert	$V_A$	3	$V_{CC}-1.025$	—	$V_{CC}-0.880$	V
Deassert	$V_D$	3	$V_{CC}-1.810$	—	$V_{CC}-1.620$	V
SD Power Levels (avg.)						
Assert	$P_A$	—	—	—	-31	dBm
Deassert	$P_D$	—	-45	—	—	dBm
Hysteresis	—	—	1.5	—	—	dB
SD Delay Time						
Assert	—	—	0	—	100	$\mu\text{s}$
Deassert	—	—	0	—	350	$\mu\text{s}$
Power Supply Voltage	$V_{CC}$ - $V_{EE}$	—	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	—	—	—	110	mA
Operating Temperature	$T_c$	—	0	—	70	$^\circ\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

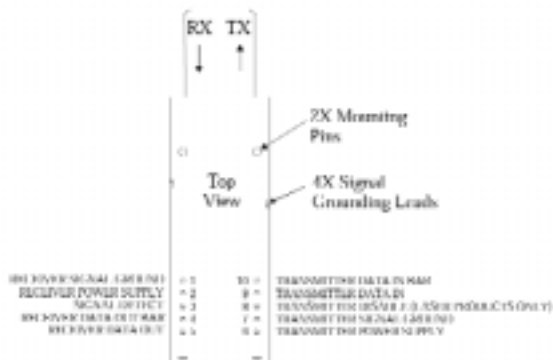
1. Measurement made at center of the eye. Input is 155.52 Mb/s, 2E23-1 PRBS data pattern with 72 "1"s and 72 "0"s inserted per ITU-T G.958 Appendix 1. BER =  $10\text{E}-10$ .
2. Receiver electrical output rise and fall times measured from 10 to 90% points on rising and falling edge of waveform with 50 ohm load to  $V_{CC} -2\text{V}$ .
3. Measured with a 50 ohm load to  $V_{CC} -2\text{V}$ .

**Absolute Maximum Ratings:**

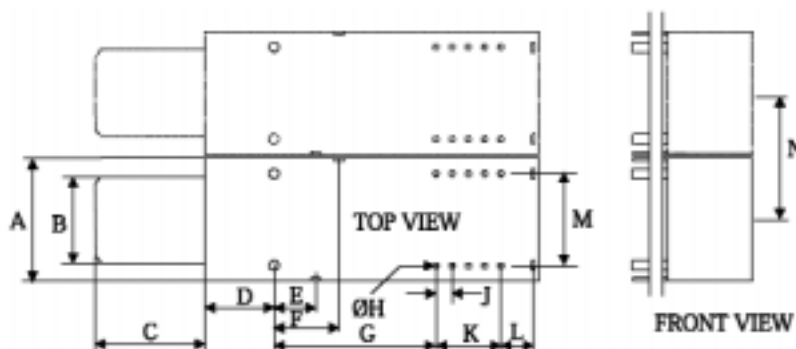
Parameter	Symbol	Units	Min	Max
Storage Temperature	$T_S$	$^\circ\text{C}$	-40	85
Lead Soldering Limits/Time	—	$^\circ\text{C}/\text{s}$	—	240/10
Data Input Voltage	$V_{INPUT}$	V	-0.5	$V_{CC}$
Differential Input Voltage	$V_{DIFF}$	V	—	2.0
Supply Voltage	$V_{CC}-V_{EE}$	V	-0.2	5.0

**OC-3 Multimode SFF MT-RJ Transceiver** (Continued)

Transceiver Pin Descriptions



Package Outline Drawing



Notes:

1. This figure describes the package outline, mounting studs, pins and their relationships to each other.
2. Toleranced to accommodate round or rectangular leads.
3. All 12 pins and posts are to be treated as a single pattern.
4. The MT-RJ optical connector has a 750 µm fiber spacing.
5. Refer to the MT-RJ Transceiver Pin Out Diagram for additional information.
6. This transceiver is supplied with an EMI gasket that fits onto the nose-piece and ensures an intimate fit between the nose-piece and the MSA defined customer front panel cut-out shown in Figure 4. Please refer to the Tyco Electronics' Customer Drawing number 269146-3 for additional details on these gasket dimensions.

	Millimeters			Inches				Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.		Min.	Typ.	Max.	Min.	Typ.	Max.
A			13.59			0.535	L	3.56			0.140		
B		9.53			0.375		M	10.16			0.400		
C		12.40			0.488		N	13.97		0.550			
D		7.59			0.299		P	9.53			0.375		
E		4.57			0.180		Q	48.72			1.918		
F		7.11			0.280		R	36.42			1.434		
G		17.78			0.700		ØS	0.97		1.07	0.038		0.042
ØH	0.41		0.61	0.016		0.024	T	1.02			0.040		
J		1.78			0.070		U	0.25			0.010		
K		7.12			0.280		V	3.30			0.130		

**IMPORTANT:** PLEASE SEE THE TYCO ELECTRONICS' CUSTOMER DRAWING 269146 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. DRAWINGS CAN BE OBTAINED ON OUR WEBSITE AT: <http://www.tycoelectronics.com> OR CALL AMPFAX AT 1-800-522-6752 FOR 24HR FAX SERVICE.

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**OC-3 Multimode SFF MT-RJ Transceiver** (Continued)


**Pin-Out Description:**

Symbol	Pin No.	Function
Two Front Mounting Studs		Provided for mechanical attachment to the PCB and ensure mechanical strength. The holes on the PCB that they attach to must be connected to chassis ground.
Four Holes for Signal Grounding Leads		Connect to signal ground.
V <sub>EEr</sub>	1	Receiver Signal Ground. Connect to receiver signal ground plane.
V <sub>CCr</sub>	2	Receiver Power Supply.
SD	3	Signal detect. Normal Operation: Logic "1" Output. Fault Condition: Logic "0" Output.
RD-	4	Received Data Out Bar. No internal terminations are provided.
RD+	5	Received Data Out. No internal terminations are provided.
V <sub>CCt</sub>	6	Transmitter Power Supply.
V <sub>EEt</sub>	7	Transmitter Signal Ground.
V <sub>Dis</sub>	8	No internal connection is provided. Transmitter Disable Input. Optional feature for laser based products only.
TD+	9	Transmitter Data In and Data In Bar. No internal terminations are provided. See recommended circuit schematic.
TD-	10	Transmitter Data In Bar. No internal terminations are provided. See recommended circuit schematic.

**Note:**

1. V<sub>EEr</sub> and V<sub>EEt</sub> are connected together inside the transceiver module.

**Regulatory Compliance:**

Agency	Test Method	Listing Document
TUV	EN60825-1:1994_A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services LED Class I Protection Class III TUV Certification Number: B020546940002
UL/  US	UL60950	E141081

**ESD Testing:**

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, nose, right, and left). Each module is tested with both power ON and OFF.

**Related Documents:**

OC-3 Multimode SFF MT-RJ Transceiver Application Specification #114-1307144

**ESCON/SBCON Multimode SFF MT-RJ Transceiver**

**Product Facts**

- Fully compliant with ANSI X3.296-1997 SBCON
- Complies with IBM Enterprise Systems Connection (ESCON) architecture
- Single +3.3V power supply
- Complies with Small Form Factor (SFF) Multi-Source Agreement (MSA)
- High-density MT-RJ connector interface
- High reliability 1300 nm optics
- PECL and LVPECL compatible data interface
- Wave Solder and Aqueous Wash compatible
- UL 60950 recognized



Tyco Electronics' ESCON/SBCON SFF MT-RJ Transceiver 1382345-1 is an LED based 1300 nm fiberoptic transceiver module intended for use in ESCON and SBCON applications. The transceiver sends and receives pre-encoded data over a pair of 62.5  $\mu\text{m}$  or 50  $\mu\text{m}$  core multimode optical fibers. The module, which operates from a single +3.3V power supply, contains separate transmitter and receiver sections with PECL and LVPECL compatible data interfaces.

Technological advancements in precision optical design and ASIC design have enabled Tyco Electronics to produce low cost SFF transceivers. Package style is the multi-sourced 2 x 5 DIP style with integral MT-RJ connector interface. This new small form factor is approximately half the width of a duplex SC 1 x 9 module,

providing an effective center line spacing of 0.55-inches from port to port, allowing the equipment designer to double the port density of a given product. The transceiver has a DC-coupled data interface that provides the highest degree of flexibility for use in a wide variety of circuit architectures. It has been extensively tested to comply with ANSI X3.296-1997 SBCON. Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor (SFP) transceivers in both singlemode and multimode.

The transceiver module meets Class 1 Eye Safety requirements, as defined by IEC 60825-1. The module has been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with process plugs.



**ESCON/SBCON Multimode SFF MT-RJ Transceiver** (Continued)

ESCON/SBCON Multimode  
SFF MT-RJ Transceiver

**Transmitter Performance Specifications:**

( $T_c=0$  to  $70^\circ\text{C}$ ,  $V_{cc}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Part Number  
1382345-1

Parameter	Symbol	Notes	Min	Typ	Max	Units
Data Rate (NRZ)	B	—	8	—	200	Mb/s
Optical Output (avg.)	$P_{OUT}$	1,2	-19.5	—	-15	dBm
Extinction Ratio	—	3	8	—	—	dB
Optical Power at Logic Low "0" State	$P_{OUT}("0")$	—	—	—	-45	dBm
Center Wavelength	$\lambda_{OUT}$	4	1280	1320	1380	nm
Spectral Width (FWHM)	$\Delta\lambda$	4	—	130	175	nm
Total Jitter	$t_{TJ}$	5	—	—	.8	ns
Output Rise Time	$t_{TLH}$	4,6	—	1.2	1.7	ns
Output Fall Time	$t_{THL}$	4,6	—	1.2	1.7	ns
Data Input Voltage Levels	$V_{IL}$ $V_{IH}$	7,8 7,8	$V_{CC}-1.84$ $V_{CC}-1.17$	—	$V_{CC}-1.45$ $V_{CC}-0.880$	V V
Data Input Current Levels	$I_{IL}$ $I_{IH}$	— —	-350 -10	—	10 350	$\mu\text{A}$ $\mu\text{A}$
Power Supply Voltage	$V_{CC} - V_{EE}$	—	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	—	—	—	120	mA
Operating Temperature	$T_c$	—	0	—	70	$^\circ\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

1. Meets Class I LED safety requirements of IEC 60825-1 when operated within the specified temperature and power supply ranges. Transmitter optical output power measured per TIA/EIA FOTP-95.
2. Specification applies to 0.275 NA 62.5/125  $\mu\text{m}$  multimode fiber.
3. Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
4. The output rise and fall time and spectral performance conform to ANSI X3.296-1997 SBCON.
5. Driven with a differential signal.
6. Measured from 20% to 80% points on rising and falling edge of transmitted waveform.
7. When  $V_{BB}$  is used as the reference voltage.
8. Configured for LVPECL. Compatible with 10 K, 10 KH and 100 K ECL and PECL.


**ESCON/SBCON Multimode SFF MT-RJ Transceiver** (Continued)

**ESCON/SBCON Multimode  
SFF MT-RJ Transceiver**
**Receiver Performance Specifications:**
 $(T_c=0$  to  $70^{\circ}\text{C}$ ,  $V_{cc}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

**Part Number**  
1382345-1

Parameter	Symbol	Notes	Min	Typ	Max	Units
Data Rate (NRZ)	B	—	8	—	200	Mb/s
Optical Input (avg.) Sensitivity	$P_{IN}$	1	—	—	-33	dBm
Saturation Level	—	—	—	—	-14	dBm
Optical Wavelength	$\lambda_{IN}$	—	1280	—	1380	nm
Systematic Jitter	$t_{SJ}$	—	—	—	2	ns
Random Jitter	$t_{RJ}$	—	—	—	0.6	ns
Output Rise Time	$t_{TLH}$	2	—	—	1.3	ns
Output Fall Time	$t_{THL}$	2	—	—	1.3	ns
Output Voltage Levels	$V_{OH}$ $V_{OL}$	3 3	$V_{cc}-1.1$ $V_{cc}-1.86$	—	$V_{cc}-0.86$ $V_{cc}-1.620$	V V
Signal Detect Output Voltage	SD					
Assert	$V_A$	3	$V_{cc}-1.1$	—	$V_{cc}-0.86$	V
Deassert	$V_D$	3	$V_{cc}-1.86$	—	$V_{cc}-1.620$	V
SD Power Levels (avg.)						
Assert	$P_A$	—	—	—	-36	dBm
Deassert	$P_D$	—	-45	—	—	dBm
Hysteresis	—	—	.5	—	4	dB
SD Delay Time						
Assert	—	—	0	—	100	$\mu\text{s}$
Deassert	—	—	0	—	350	$\mu\text{s}$
Power Supply Voltage	$V_{CC} - V_{EE}$	—	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	—	—	—	110	mA
Operating Temperature	$T_c$	—	0	—	70	$^{\circ}\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

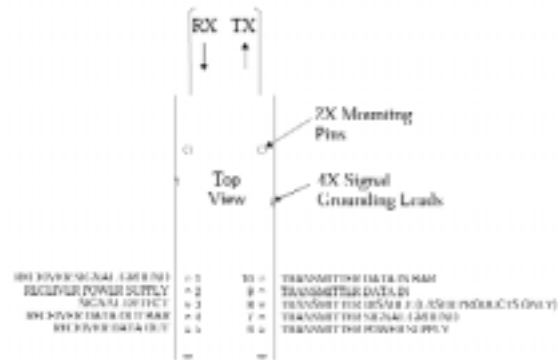
1. Receive Sensitivity measured at, or extrapolated to, 10E - 12 BER using a 200 MBd input signal with a 27-1 code pattern.
2. Receiver electrical output rise and fall times measured from 20 to 80% points on rising and falling edge of waveform with 50 ohm load to  $V_{cc} - 2\text{V}$ .
3. Measured with a 50 ohm load to  $V_{cc} - 2\text{V}$ .

**Absolute Maximum Ratings:**

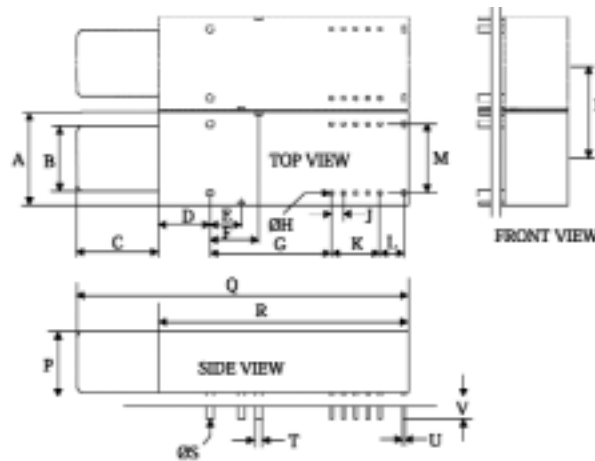
Parameter	Symbol	Units	Min	Max
Storage Temperature	$T_s$	$^{\circ}\text{C}$	-40	85
Lead Soldering Limits/Time	—	$^{\circ}\text{C}/\text{s}$	—	240/10
Data Input Voltage	$V_{INPUT}$	V	-0.5	$V_{cc}$
Differential Input Voltage	$V_{DIFF}$	V	—	2.0
Supply Voltage	$V_{CC}-V_{EE}$	V	-0.2	5.0

**ESCON/SBCON Multimode SFF MT-RJ Transceiver (Continued)**

Transceiver Pin Descriptions



Package Outline Drawing



Notes:

1. This figure describes the package outline, mounting studs, pins and their relationships to each other.
2. Toleranced to accommodate round or rectangular leads.
3. All 12 pins and posts are to be treated as a single pattern.
4. The MT-RJ optical connector has a 750 µm fiber spacing.
5. Refer to the MT-RJ Transceiver Pin Out Diagram for additional information.
6. This transceiver is supplied with an EMI gasket that fits onto the nose-piece and ensures an intimate fit between the nose-piece and the MSA defined customer front panel cut-out shown in Figure 4. Please refer to the Tyco Electronics' Customer Drawing number 1382345-1 for additional details on these gasket dimensions.

	Millimeters			Inches				Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.		Min.	Typ.	Max.	Min.	Typ.	Max.
A			13.59			0.535	L		3.56			0.140	
B		9.53			0.375		M		10.16			0.400	
C		12.40			0.488		N	13.97			0.550		
D		7.59			0.299		P		9.53			0.375	
E		4.57			0.180		Q		48.72			1.918	
F		7.11			0.280		R		36.42			1.434	
G		17.78			0.700		ØS	0.97		1.07	0.038		0.042
ØH	0.41		0.61	0.016		0.024	T		1.02			0.040	
J		1.78			0.070		U		0.25			0.010	
K		7.12			0.280		V		3.30			0.130	

**Important:** PLEASE SEE THE TYCO ELECTRONICS' CUSTOMER DRAWING 1382345-1 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. DRAWINGS CAN BE OBTAINED ON OUR WEBSITE AT: <http://www.tycoelectronics.com> OR CALL AMP FAX at 1-800-522-6752 FOR 24HR FAX SERVICE.

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For drawings, technical data or samples, contact your Tyco Electronics sales engineer, call 1-800-522-6752, or visit our Website at: <http://www.amp.com/fiberoptics>. Specifications subject to change. Consult Tyco Electronics for latest specifications.



**ESCON/SBCON Multimode SFF MT-RJ Transceiver** (Continued)


**Pin-Out Description:**

Symbol	Pin No.	Function
Two Front Mounting Studs		Provided for mechanical attachment to the PCB and ensure mechanical strength. The holes on the PCB that they attach to must be connected to chassis ground.
Four Holes for Signal Grounding Leads		Connect to signal ground.
V <sub>EEr</sub>	1	Receiver Signal Ground. Connect to receiver signal ground plane.
V <sub>CCr</sub>	2	Receiver Power Supply.
SD	3	Signal detect. Normal Operation: Logic "1" Output. Fault Condition: Logic "0" Output.
RD-	4	Received Data Out Bar. No internal terminations are provided.
RD+	5	Received Data Out. No internal terminations are provided.
V <sub>CCt</sub>	6	Transmitter Power Supply.
V <sub>EEt</sub>	7	Transmitter Signal Ground.
V <sub>DIS</sub>	8	No internal connection is provided. Transmitter Disable Input. Optional feature for laser based products only.
TD+	9	Transmitter Data In and Data In Bar. No internal terminations are provided. See recommended circuit schematic.
TD-	10	Transmitter Data In Bar. No internal terminations are provided. See recommended circuit schematic.

**Note:**

1. V<sub>EEr</sub> and V<sub>EEt</sub> are connected together inside the transceiver module.

**Regulatory Compliance:**

Agency	Test Method	Listing Document
TUV	EN60825-1:1994_A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services LED Class I Protection Class III TUV Certification Number: B020546940002
UL/  US	UL60950	E141081

**ESD Testing:**

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, nose, right, and left). Each module is tested with both power ON and OFF.

**Related Documents:**

ESCON/SBCON Multimode SFF MT-RJ Transceiver Application Specification #114-13083

**Fast Ethernet Multimode SFF MT-RJ Transceivers**

**Product Facts**

- Compliant with FDDI PMD Standard
- Compliant with ATM 100 Mb/s Physical Layer performance specifications
- Compliant with 100 Base-FX version of the IEEE 802.3, 2002 performance specifications
- Single +3.3V power supply
- Data rates of 10 Mb/s to 125 Mb/s
- Complies with Small Form Factor (SFF) Multi-Source Agreement (MSA)
- High-density MT-RJ connector interface
- High reliability 1300 nm optics
- PECL and LVPECL compatible data interface
- Wave Solder and Aqueous Wash compatible
- UL 60950 recognized

**Applications**

- ATM 100 Mb/s links
- Fast Ethernet links
- FDDI links
- Switches
- Repeaters
- Network interface cards
- Hubs
- Routers



Tyco Electronics' Fast Ethernet SFF MT-RJ Transceivers 269147-X are LED based 1300 nm fiberoptic transceiver modules intended for use in FDDI, ATM and Fast Ethernet multimode fiber physical layers. The transceiver sends and receives pre-encoded data over a pair of 62.5 µm or 50 µm core multimode optical fibers. The modules, which operate from a single +3.3V power supply, contain separate transmitter and receiver sections with PECL and LVPECL compatible data interfaces.

Technological advancements in precision optical design and ASIC design have enabled Tyco Electronics to produce low cost SFF transceivers. Package style is the multi-sourced 2 x 5 DIP style with an integral MT-RJ connector interface. This new small form factor is approximately half the width of a duplex SC 1 x 9 module, providing an effective center line

spacing of 0.55-inches from port to port, allowing the equipment designer to double the port density of a given product. These transceivers have a DC-coupled data interface that provides the highest degree of flexibility for use in a wide variety of circuit architectures. They have been extensively tested to comply with the FDDI LCF-PMD Standard. The FDDI PMD Standard is ISO/IEC 9314-3: 1990 and ANSI X3.166-1990. The 269147-X transceivers are intended for transmission distances up to 2 km over multimode fiber links.

The transceiver modules meet Class 1 Eye Safety requirements, as defined by IEC 60825-1. The modules have been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with process plugs.

Application	Part Number	Ground Tabs	EMI Gasket
Fast Ethernet	269147-3	Yes	Yes
Fast Ethernet	269147-4	No	Yes
Fast Ethernet	269147-5	No	No
Fast Ethernet	269147-6	Yes	No

**Fast Ethernet Multimode SFF MT-RJ Transceivers** (Continued)Fast Ethernet Multimode  
SFF MT-RJ Transceivers

## Part Numbers

269147-3  
269147-4  
269147-5  
269147-6

## Transmitter Performance Specifications:

(T<sub>c</sub>=0 to 70°C, V<sub>cc</sub>-V<sub>EE</sub>=3.135 to 3.465V DC)

Parameter	Symbol	Notes	Min	Typ	Max	Units
Data Rate (NRZ)	B	—	10	—	125	Mb/s
Optical Output (avg.)	P <sub>OUT</sub>	1,2	-20	—	-14	dBm
Extinction Ratio	—	3	—	0.05	10	%
Optical Power at Logic Low "0" State	P <sub>OUT</sub> ("0")	—	—	—	-45	dBm
Center Wavelength	λ <sub>OUT</sub>	4	1270	1320	1380	nm
Spectral Width (FWHM)	Δλ	4	—	130	—	nm
Duty Cycle Distortion	—	—	0	—	1	ns
Data Dependent Jitter	t <sub>DDJ</sub>	5	—	—	0.6	ns
Random Jitter	t <sub>RJ</sub>	5	—	—	0.76	ns
Output Rise Time	t <sub>TLH</sub>	4,6	0.6	1.2	3.5	ns
Output Fall Time	t <sub>THL</sub>	4,6	0.6	1.2	3.5	ns
Data Input Voltage Levels	V <sub>IL</sub> V <sub>IH</sub>	7,8 7,8	V <sub>CC</sub> -1.810 V <sub>CC</sub> -1.165	—	V <sub>CC</sub> -1.475 V <sub>CC</sub> -0.880	V V
Data Input Current Levels	I <sub>IL</sub> I <sub>IH</sub>	— —	-400 —	—	— 400	μA μA
Power Supply Voltage	V <sub>CC</sub> - V <sub>EE</sub>	—	3.135	3.3	3.465	V
Supply Current	I <sub>CC</sub>	—	—	—	120	mA
Operating Temperature	T <sub>c</sub>	—	0	—	70	°C

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5 μm multimode fiber unless stated otherwise.

1. Meets Class I LED safety requirements of IEC 60825-1 when operated within the specified temperature and power supply ranges. Transmitter optical output power measured per TIA/EIA FOTP-95.
2. Specification applies to 0.275 NA 62.5/125 μm multimode fiber.
3. (POL/POH) x 100%.
4. The output rise and fall time and spectral performance conform to ANSI X3.166 - 1990 (ISO / IEC 9314-3: 1990).
5. Driven with a differential signal.
6. Measured from 10% to 90% points on rising and falling edge of transmitted waveform.
7. When V<sub>BB</sub> is used as the reference voltage.
8. Configured for LVPECL. Compatible with 10 K, 10 KH and 100 K ECL and PECL.



**Fast Ethernet Multimode SFF MT-RJ Transceivers** (Continued)

Fast Ethernet Multimode  
SFF MT-RJ Transceivers

Part Numbers

269147-3  
269147-4  
269147-5  
269147-6

Receiver Performance Specifications:

( $T_c=0$  to  $70^\circ\text{C}$ ,  $V_{cc}-V_{EE}=3.135$  to  $3.465\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Data Rate (NRZ)	B	—	10	—	125	Mb/s
Optical Input (avg.) Sensitivity	$P_{IN}$	1,2,3	-31	—	-14.0	dBm
Optical Wavelength	$\lambda_{IN}$	—	1270	—	1380	nm
Duty Cycle Distortion	—	—	0	—	1	ns
Data Dependent Jitter	$t_{DDJ}$	—	0	—	1.2	ns
Random Jitter	$t_{RJ}$	—	0	—	.76	ns
Output Rise Time	$t_{TLH}$	4	0.6	—	5	ns
Output Fall Time	$t_{THL}$	4	0.6	—	5	ns
Output Voltage Levels	$V_{OH}$ $V_{OL}$	5 5	$V_{cc}-1.025$ $V_{cc}-1.810$	—	$V_{cc}-0.880$ $V_{cc}-1.620$	V V
Signal Detect Output	$V_A$ $V_D$	5 5	$V_{cc}-1.025$ $V_{cc}-1.810$	—	$V_{cc}-0.880$ $V_{cc}-1.620$	V V
SD Power Levels (avg.)	$P_A$ $P_D$ Hysteresis	— — —	— -45 1.5	— — —	-31 — —	dBm dBm dB
SD Delay Time	Assert Deassert	— —	0 0	— —	100 350	$\mu\text{s}$ $\mu\text{s}$
Power Supply Voltage	$V_{CC}$ - $V_{EE}$	—	3.135	3.3	3.465	V
Supply Current	$I_{CC}$	—	—	—	110	mA
Operating Temperature	$T_c$	—	0	—	70	$^\circ\text{C}$

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 62.5  $\mu\text{m}$  multimode fiber unless stated otherwise.

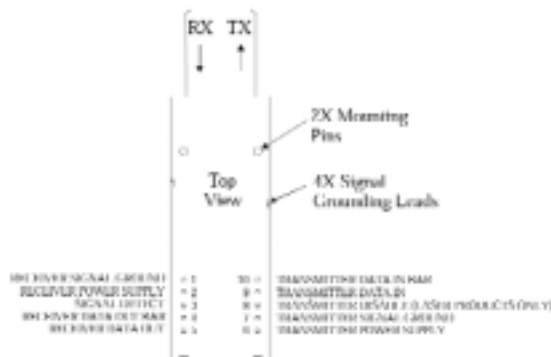
1. Measurement made at center of the eye.
2. Measured using the FDDI test signal format in ANSI X3.166 - 1990.
3. BER =  $2.5 \times 10^{-10}$ .
4. Receiver electrical output rise and fall times measured from 10 to 90% points on rising and falling edge of waveform with 50 ohm load to  $V_{cc}-2\text{V}$ .
5. Measured with a 50 ohm load to  $V_{cc}-2\text{V}$ .

Absolute Maximum Ratings:

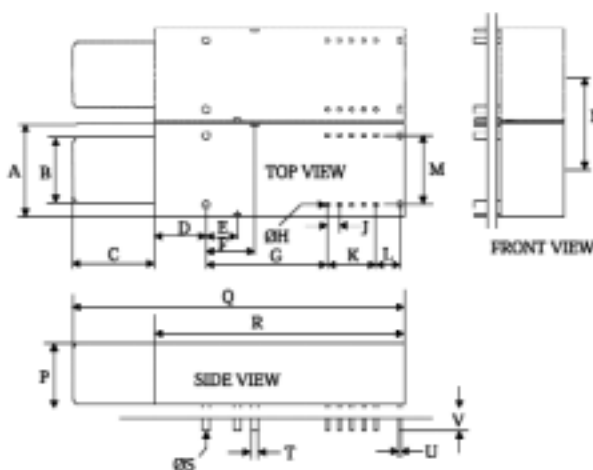
Parameter	Symbol	Units	Min	Max
Storage Temperature	$T_s$	$^\circ\text{C}$	-40	85
Lead Soldering Limits/Time	—	$^\circ\text{C/s}$	—	240/10
Data Input Voltage	$V_{INPUT}$	V	-0.5	$V_{CC}$
Differential Input Voltage	$V_{DIFF}$	V	—	2.0
Supply Voltage	$V_{CC}-V_{EE}$	V	-0.2	5.0

**Fast Ethernet Multimode SFF MT-RJ Transceivers** (Continued)

Transceiver Pin Descriptions



Package Outline Drawing



Notes:

1. This figure describes the package outline, mounting studs, pins and their relationships to each other.
2. Toleranced to accommodate round or rectangular leads.
3. All 12 pins and posts are to be treated as a single pattern.
4. The MT-RJ optical connector has a 750 μm fiber spacing.
5. Refer to the MT-RJ Transceiver Pin Out Diagram for additional information.
6. This transceiver is supplied with an EMI gasket that fits onto the nose-piece and ensures an intimate fit between the nose-piece and the MSA defined customer front panel cut-out shown in Figure 4. Please refer to the Tyco Electronics' Customer Drawing number 269147 for additional details on these gasket dimensions.

	Millimeters			Inches				Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.		Min.	Typ.	Max.	Min.	Typ.	Max.
A			13.59			0.535	L		3.56			0.140	
B		9.53			0.375		M		10.16			0.400	
C		12.40			0.488		N	13.97			0.550		
D		7.59			0.299		P		9.53			0.375	
E		4.57			0.180		Q		48.72			1.918	
F		7.11			0.280		R		36.42			1.434	
G		17.78			0.700		ØS	0.97		1.07	0.038		0.042
ØH	0.41		0.61	0.016		0.024	T		1.02			0.040	
J		1.78			0.070		U		0.25			0.010	
K		7.12			0.280		V		3.30			0.130	

**IMPORTANT:** PLEASE SEE THE TYCO ELECTRONICS' CUSTOMER DRAWING 269147 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. DRAWINGS CAN BE OBTAINED ON OUR WEBSITE AT: <http://www.tycoelectronics.com> OR CALL AMPFAX AT 1-800-522-6752 FOR 24HR FAX SERVICE.

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**Fast Ethernet Multimode SFF MT-RJ Transceivers** (Continued)



**Pin-Out Description:**

Symbol	Pin No.	Function
Two Front Mounting Studs		Provided for mechanical attachment to the PCB and ensure mechanical strength. The holes on the PCB that they attach to must be connected to chassis ground.
Four Holes for Signal Grounding Leads		Connect to signal ground.
V <sub>EEr</sub>	1	Receiver Signal Ground. Connect to receiver signal ground plane.
V <sub>CCr</sub>	2	Receiver Power Supply.
SD	3	Signal detect. Normal Operation: Logic "1" Output. Fault Condition: Logic "0" Output.
RD-	4	Received Data Out Bar. No internal terminations are provided.
RD+	5	Received Data Out. No internal terminations are provided.
V <sub>CCt</sub>	6	Transmitter Power Supply.
V <sub>EEt</sub>	7	Transmitter Signal Ground.
V <sub>Dis</sub>	8	No internal connection is provided. Transmitter Disable Input. Optional feature for laser based products only.
TD+	9	Transmitter Data In and Data In Bar. No internal terminations are provided. See recommended circuit schematic.
TD-	10	Transmitter Data In Bar. No internal terminations are provided. See recommended circuit schematic.

**Note:**

1. V<sub>EEr</sub> and V<sub>EEt</sub> are connected together inside the transceiver module.

**Regulatory Compliance:**

Agency	Test Method	Listing Document
TUV	EN60825-1:1994_A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services LED Class I Protection Class III TUV Certification Number: B020546940002
UL/  	UL 60950	E141081

**ESD Testing:**

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, nose, right, and left). Each module is tested with both power ON and OFF.

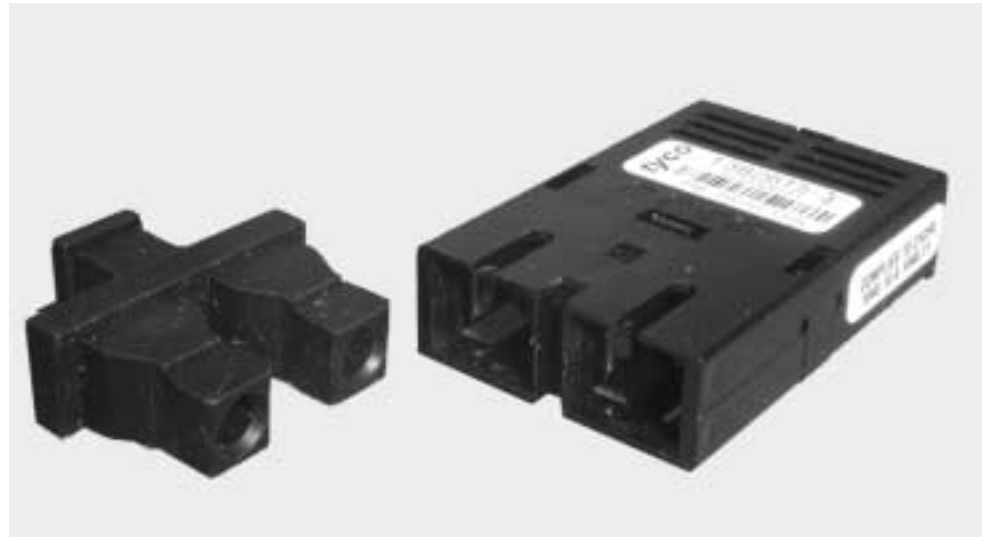
**Related Documents:**

Fast Ethernet Multimode SFF MT-RJ Transceivers Application Specification #114-1307144

**OC-3 Singlemode 9 PIN SC Transceiver - Long Reach**

**Product Facts**

- Complies with SONET OC-3 SDH STM1 S-1.1 or STM1 L-1.1
- Conforms to the 9-Pin Industry Standard Form Factor
- Single power supply (either 3.3V or 5V)
- PECL and LVPECL data Interface
- Transmitter uses 1300nm FP laser
- Class 1 Laser Safe per FDA/CDRH and IEC 60825-1
- UL 60950 recognized



**Applications**

- ATM 155 Mb/s Links
- SDH STM-1 Links
- Switches
- Hubs
- Routers

Tyco Electronics' Transceiver 1382615-3, a Fabry Perot based 1300 nm singlemode fiber optic transceiver, is specified for use in SONET OC-3 Long Reach (LR) applications. Tyco Electronics, recognizing the market need for a 9-pin transceiver, has developed this transceiver with an SC duplex optical interface.

This transceiver is designed to send and receive pre-encoded data over either singlemode or multimode optical fibers and operates from either a +3.3V or +5V power supply. It also contains separate DC-coupled transmitter and receiver sections that have PECL/LVPECL compatible data interfaces.

Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor Pluggable (SFP) transceivers for both singlemode and multimode applications.

This Tyco Electronics' OC-3 9-Pin transceiver has been extensively tested to comply with SONET OC-3 SDH STM1 S-1.1 or SONET OC-3 SDH STM1 L-1.1. The Fabry Perot based transmitter is certified to be Class 1 laser safe, as defined by U.S. and international standards. Units are supplied with process plugs.



**OC-3 Singlemode 9 PIN SC Transceiver - Long Reach** (Continued)

OC-3 Singlemode  
9-Pin SC Transceiver -  
Long Reach

Part Number  
1382615-3

**Transmitter Performance Specifications: (Long Reach)**

( $T_c = 0$  to  $70^\circ\text{C}$ ,  $V_{CC}-V_{EE} = 3.135$  to  $5.25\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Data Rate			2		156	Mb/s
Optical Output (avg.)	$P_{OUT}$	1,2	-5	—	-0	dBm
Extinction Ratio	—	3	10	—	—	dB
Center Wavelength	$\lambda_{OUT}$	4	1263	1310	1360	nm
Spectral Width (RMS)	$\Delta\lambda$	4	—	—	4	nm
Data Inputs-Voltage	$V_{IL}$ $V_{IH}$	5	$V_{CC} - 1.81$ $V_{CC} - 1.165$	—	$V_{CC} - 1.475$ $V_{CC} - 0.88$	V
Data Inputs-Current	$I_{IL}$ $I_{IH}$	5	-400	—	— 400	$\mu\text{A}$
Power Supply Voltage (3.3V operation)	$V_{CC} -$ $V_{EE}$	—	3.135	3.3	3.465	V
Power Supply Voltage (5V operation)	$V_{CC} -$ $V_{EE}$	—	4.75	5.0	5.25	V
Supply Current	$I_{CC}$ or $I_{EE}$	—	—	—	140	mA
Operating Temperature	$T_c$	—	0	—	70	$^\circ\text{C}$

Note: All optical measurements made with a 3 meter patch cable using ITU-T Recommendation G.652 compliant singlemode fiber.

1. Meets Class I laser safety requirements of IEC 60825-1 and IEC 60825-2 and U.S. Department of Health Services FDA 21 CFR 1040.11 when operated within the specified temperature and power supply ranges.
2. Transmitter optical output power measured per TIA/EIA FOTP-95. Transmitter modulated with a valid 8b/10b data pattern.
3. Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
4. Center wavelength and spectral width measured per TIA/EIA FOTP-127 using optical spectrum analyzer with a valid 8b/10b data pattern.
5. Compatible with 10 K, 10 KH and 100 K ECL, PECL and LVPECL.


**OC-3 Singlemode 9 PIN SC Transceiver - Long Reach** (Continued)

OC-3 Singlemode  
9-Pin SC Transceiver -  
Long Reach

Part Number  
1382615-3

**Receiver Performance Specifications: (Long Reach)**

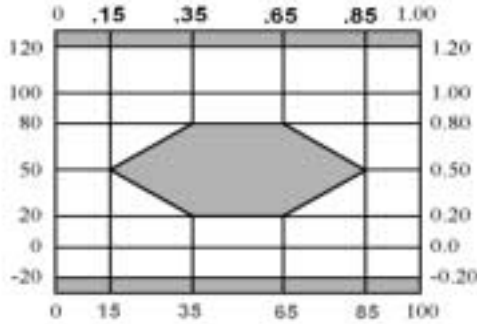
( $T_c = 0$  to  $70^\circ\text{C}$ ,  $V_{CC}-V_{EE} = 3.135$  to  $5.25\text{V DC}$ )

Parameter	Symbol	Notes	Min	Typ	Max	Units
Data Rate			10		156	Mb/s
Optical Input Sensitivity (avg.)	$P_{IN}$	1	-34	—	—	dBm
Receiver Overload			-10	—	—	dBm
Optical Wavelength	$\lambda_{IN}$	—	1261	—	1360	nm
Output Voltage Levels	$V_{OH}$ $V_{OL}$		$V_{CC} - 1.025$ $V_{CC} - 1.810$		$V_{CC} - 0.880$ $V_{CC} - 1.62$	V V
Signal Detect Output Voltage	SD					
Assert	$V_A$	2	$V_{CC} - 1.025$		$V_{CC} - 0.880$	V
Deassert	$V_D$	2	$V_{CC} - 1.810$		$V_{CC} - 1.62$	V
SD Power Levels (avg)						
Assert	$P_A$	—		—	-34	dBm
Deassert	$P_D$	—	-42	—	—	dBm
Hysteresis	—	—	1.5	—	—	dB
SD Delay Time						
Assert		—		—	50	$\mu\text{s}$
Deassert		—		—	250	$\mu\text{s}$
Power Supply Voltage (3.3V operation)	$V_{CC} -$ $V_{EE}$	—	3.135	3.3	3.465	V
Power Supply Voltage (5V operation)	$V_{CC} -$ $V_{EE}$	—	4.75	5.0	5.25	V
Supply Current	$I_{CC}$	—	—	—	150	mA
Operating Temperature	$T_c$	—	0	—	70	$^\circ\text{C}$

Note: All optical measurements made with a 3 meter patch cable using ITU-T Recommendation G.652 compliant singlemode fiber.

1. Measured per ITU-T Recommendation G-957.
2. Compatible with 10 K, 10 KH and 100 K ECL and PECL.

**OC-3 Singlemode 9 PIN SC Transceiver - Long Reach** (Continued)




NOTE: Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with this eye diagram. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver compliant with ITU-T Recommended G.957.

**Absolute Maximum Ratings:**

Parameter	Symbol	Units	Min	Max
Storage temperature	T <sub>s</sub>	°C	-40	100
Lead Soldering Limits/Time	—	°C/s	—	240/10
Supply Voltage	V <sub>CC</sub> -V <sub>EE</sub>	V	-0.2	7.0

**Regulatory Compliance:**

Agency	Test Method	Listing Document
FDA	CDRH 21-CFR 1040 Class 1	Accession Number: 9122051-10
TUV	EN60825-1:1994+A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services Laser Class I Protection Class III TUV Certificate Number: B 02 05 46940 001
UL /  us	UL60950	E141081
IECEE CB SCHEME	IEC 60950, 3rd Edition (1999) IEC 60825-1: 1993+A1: 1997+A2:2001	US/5838/UL

**ESD Testing:**

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A-114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT to the nose. Each module is tested with both power ON and OFF

**NOTE**

All products which contain a laser must comply with government regulations for laser safety. In the U.S., the applicable standard is FDA 21 CFR 1040. In other parts of the world, IEC 60825-1 applies. These transceivers were designed and tested to the requirements of the above standards and found to be in compliance with class 1 laser safety limits. When operated within the limits specified in this document, this product conforms to IEC 60825-1: 1993 + A1 : 1997 + A2: 2001, class 1 laser product, requirements.

**CAUTION!**

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

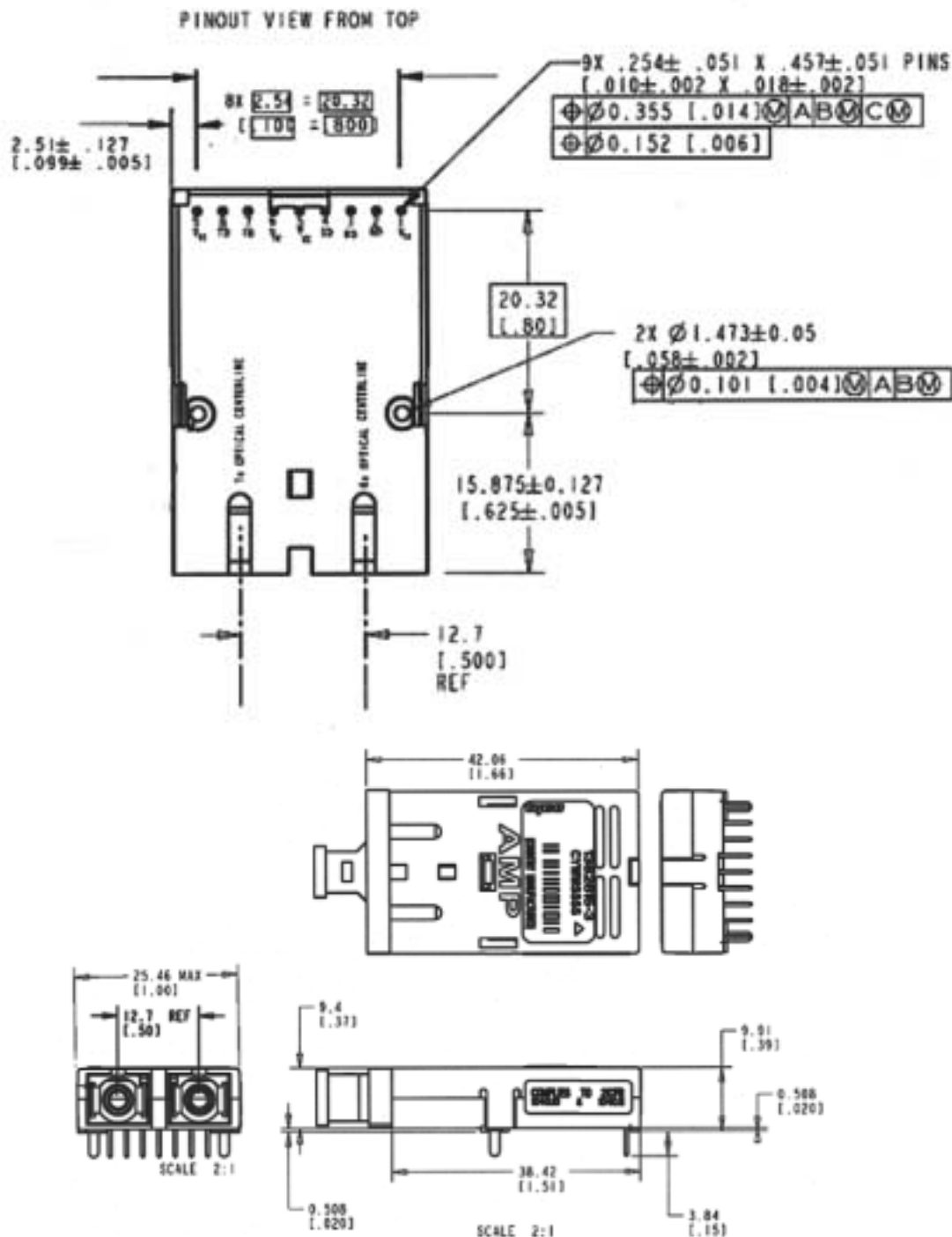
**Related Documents:**

OC-3 Singlemode, 9-Pin, SC Duplex Transceivers Application Specification #114-13077



OC-3 Singlemode 9 PIN SC Transceiver - Long Reach (Continued)

Package Outline Drawings



**IMPORTANT:** PLEASE SEE THE TYCO ELECTRONICS' CUSTOMER DRAWING 1382615 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. DRAWINGS CAN BE OBTAINED ON OUR WEBSITE AT: <http://www.tycoelectronics.com> OR CALL AMPFAX AT 1-800-522-6752 FOR 24HR FAX SERVICE.

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**OC-3 Singlemode 9 PIN SC Transceiver - Long Reach** (Continued)

Pin-Out Descriptions

Symbol	PIN#	Function
$V_{EE} R_x$	1	Receiver Signal Ground [See Note 1]
RD+	2	Receiver Data Out [See Note 3]
RD-	3	Receiver Data Out Bar [See Note 3]
SD	4	Signal Detect [See Note 3]
$V_{CC} R_x$	5	Receiver Power Supply [See Note 2]
$V_{CC} T_x$	6	Transmitter Power Supply [See Note 2]
TD-	7	Transmitter Data In Bar [See Note 3]
TD+	8	Transmitter Data In [See Note 3]
$V_{EE} T_x$	9	Transmitter Signal Ground [See Note 1]

Note 1: Transmitter and Receiver grounds are isolated inside the transceiver module.

Note 2:  $V_{CC} T_x$  and  $V_{CC} R_x$  are isolated inside the transceiver module. Use appropriate supply filtering (see application specification)

Note 3: This is a DC coupled connection. Provide appropriate termination (see application specification)

**OC-3 Singlemode 9 PIN SC Transceivers - Intermediate Reach**

**Product Facts**

- Intermediate Reach
- Complies with SONET OC-3 SDH STM1 S-1.1 or STM1 L-1.1
- Conforms to the 9-Pin Industry Standard Form Factor
- Single power supply (either 3.3V or 5V)
- PECL and LVPECL data Interface
- Transmitter uses 1300nm FP laser
- Class 1 Laser Safe per FDA/CDRH and IEC 60825-1
- UL 60950 recognized



**Applications**

- ATM 155 Mb/s Links
- SDH STM-1 Links
- Switches
- Hubs
- Routers

Tyco Electronics' Transceivers 269085-1, -2 and 1382615-1, -2, Fabry Perot based 1300 nm singlemode fiber optic transceivers, are specified for use in SONET OC-3 Intermediate Reach (IR) applications. Tyco Electronics, recognizing the market need for a 9-pin transceiver, has developed these transceivers with an SC duplex optical interface.

These transceivers are designed to send and receive pre-encoded data over either singlemode or multimode optical fibers and operates from either a +3.3V or +5V power supply. They also contain separate DC-coupled transmitter and receiver sections

that have PECL/LVPECL compatible data interfaces.

Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor Pluggable (SFP) transceivers for both singlemode and multimode applications.

These Tyco Electronics' OC-3 9-Pin transceivers have been extensively tested to comply with SONET OC-3 SDH STM1 S-1.1 or SONET OC-3 SDH STM1 L-1.1. The Fabry Perot based transmitter is certified to be Class 1 laser safe, as defined by U.S. and international standards. Units are supplied with process plugs.

Application	Part Number	
	5 Volt Only	3.3 or 5 Volt
Intermediate Reach	269085-1	1382615-1
Intermediate Reach (blue shroud)	269085-2	1382615-2



**OC-3 Singlemode 9 PIN SC Transceivers - Intermediate Reach** (Continued)

OC-3 Singlemode  
9-Pin SC Transceiver -  
Intermediate Reach

Part Numbers  
269085-1  
269085-2  
1382615-1  
1382615-2

**Transmitter Performance Specifications: (Intermediate Reach)**

( $T_C = 0$  to  $70^\circ\text{C}$ ,  $V_{CC} - V_{EE} = 4.75$  to  $5.25\text{V DC}$ )

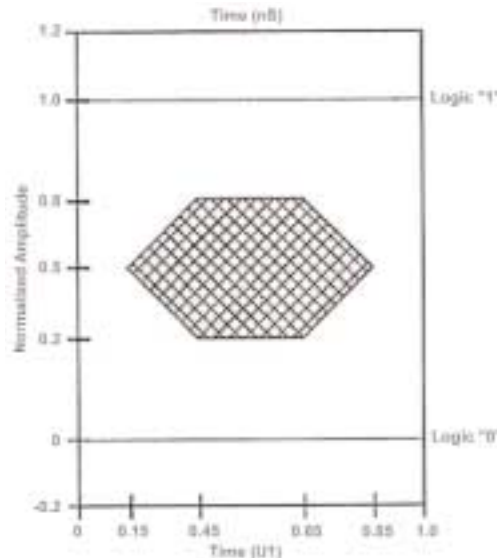
Parameter	Symbol	Notes	Min	Typ	Max	Units
Data Rate (NRZ)	B		2		156	Mb/s
Optical Output (avg.)(9/125 $\mu\text{m}$ )	$P_{OH}$	1,2	-14	—	-8	dBm
Extinction Ratio (POL/POH) x 100%	—	3	8.2	—	—	%
Optical Wavelength	$\lambda_{OUT}$	4	1261	1310	1360	nm
Spectral Width (RMS)	$\Delta\lambda$	4	—	—	7.7	nm
Output Risetime	$t_{TLH}$	—	.6	1.2	2.5	ns
Output Falltime	$t_{THL}$	—	.6	1.2	2.5	ns
Data (3) (4)	$V_{IL}$ $V_{IH}$	5	$V_{CC} - 1.81$ $V_{CC} - 1.165$	—	$V_{CC} - 1.475$ $V_{CC} - 0.88$	V V
Inputs	$I_{IL}$ $I_{IH}$	5	-2 —	— —	— 400	$\mu\text{A}$ $\mu\text{A}$
Power Supply Voltage	$V_{CC} - V_{EE}$	—	4.75	5.0	5.25	V
Supply Current	$I_{CC}$ or $I_{EE}$	—	—	—	140	mA
Operating Temperature	$T_A$	—	0	—	70	$^\circ\text{C}$

Note: All optical measurements made with a 3 meter patch cable using ITU-T Recommendation G.652 compliant singlemode fiber.

1. Transmitter pulse shape characteristics including Rise Time, Overshoot, Jitter, and Ringing are specified in the form of an eye diagram below. Conformance to eye mask is evaluated using an optical reference receiver and filter as recommended in T1E, 2/93-020R3 Annex A and ITUT G.957.
2. PIN Plating: 150 microinches min. 93.7 TIN lead over 50/150 microinches NI.
3. Ons clock offset,  $V_{CC} = 5\text{V}$ ,  $25^\circ\text{C}$ ,  $2^{23} - 1$  PRBS. 2dB is budgeted to open the eye from 0-2ns.
4. Mates with optical connectors meeting JIS C 5973.
5. Unit provided with process plug to protect optical parts during soldering and cleaning processes.
6. Meets Class 1 safety requirements for each of the following: IED 825-1 and IEC 825-2: 1994, CENELEC EN 60825-1/03.94 and EN 60825-2/01.94 and U. S. Department of Health Services 21 CFR 1040.10 and 1040.11 when operated within the specified temperature, power supply, and duty cycle ranges.
7. Case Material UL 94 V0 rated.
8. Caution: the use of optical instruments will increase eye hazard. Optical instruments should not be used to view the laser output.
9. Ground pins #1 and #9 are not internally connected.

**Absolute Maximum Ratings:**

Parameter	Symbol	Min.	Typical	Max.	Units
Storage temperature	—	-40	—	100	$^\circ\text{C}$
Lead soldering limits	—	—	—	240/10	$^\circ\text{C/s}$
Supply voltage	$V_{CC} - V_{EE}$	-2	—	7.00	V




**OC-3 Singlemode 9 PIN SC Transceivers - Intermediate Reach** (Continued)

**OC-3 Singlemode  
9-Pin SC Transceiver -  
Intermediate Reach**
**Part Numbers**

269085-1

269085-2

1382615-1

1382615-2

**Receiver Performance Specifications: (Intermediate Reach)**
**(T<sub>C</sub> = 0 to 70°C, V<sub>CC</sub>-V<sub>EE</sub> = 4.75 to 5.25V DC)**

Parameter	Symbol	Notes	Min	Typ	Max	Units
Data Rate (NRZ)	B		10	—	156	Mb/s
Optical Input Sensitivity (avg.)(3)	P <sub>IN</sub>	1	-32.5	—	-8.0	dBm
Optical Wavelength	λ <sub>MIN</sub>	—	1261	—	1360	nm
Duty Cycle	—		40	50	60	%
Output Risetime	t <sub>TLH</sub>		.5	—	2.5	ns
Output Falltime	t <sub>THL</sub>		.5	—	2.5	ns
Data Output	V <sub>OH</sub> V <sub>OL</sub>		V <sub>CC</sub> -1.025 V <sub>CC</sub> -1.81	—	V <sub>CC</sub> -0.88 V <sub>CC</sub> -1.62	V V
Signal Detect (output)	V <sub>A</sub> V <sub>D</sub>	2 2	V <sub>CC</sub> -1.025 V <sub>CC</sub> -1.81	—	V <sub>CC</sub> -0.88 V <sub>CC</sub> -1.62	V V
PIN Power Levels (avg)						
Deassert	P <sub>D</sub>	—	-42.0	—	-32.5	dBm
Assert	P <sub>A</sub>	—	-41.0	—	-31.0	dBm
Hysteresis	—	—	1.5	2.0	—	dB
SD Delay Time						
Deassert	—	—	—	—	500	μs
Assert	—	—	—	—	50	μs
Power Supply Voltage	V <sub>CC</sub> - V <sub>EE</sub>	—	4.75	5.0	5.25	V
Supply Current	I <sub>CC</sub> or I <sub>EE</sub>	—	—	—	150	mA
Operating Temperature	T <sub>A</sub>	—	0	—	70	°C

Note: All optical measurements made with a 3 meter patch cable using ITU-T Recommendation G.652 compliant singlemode fiber.

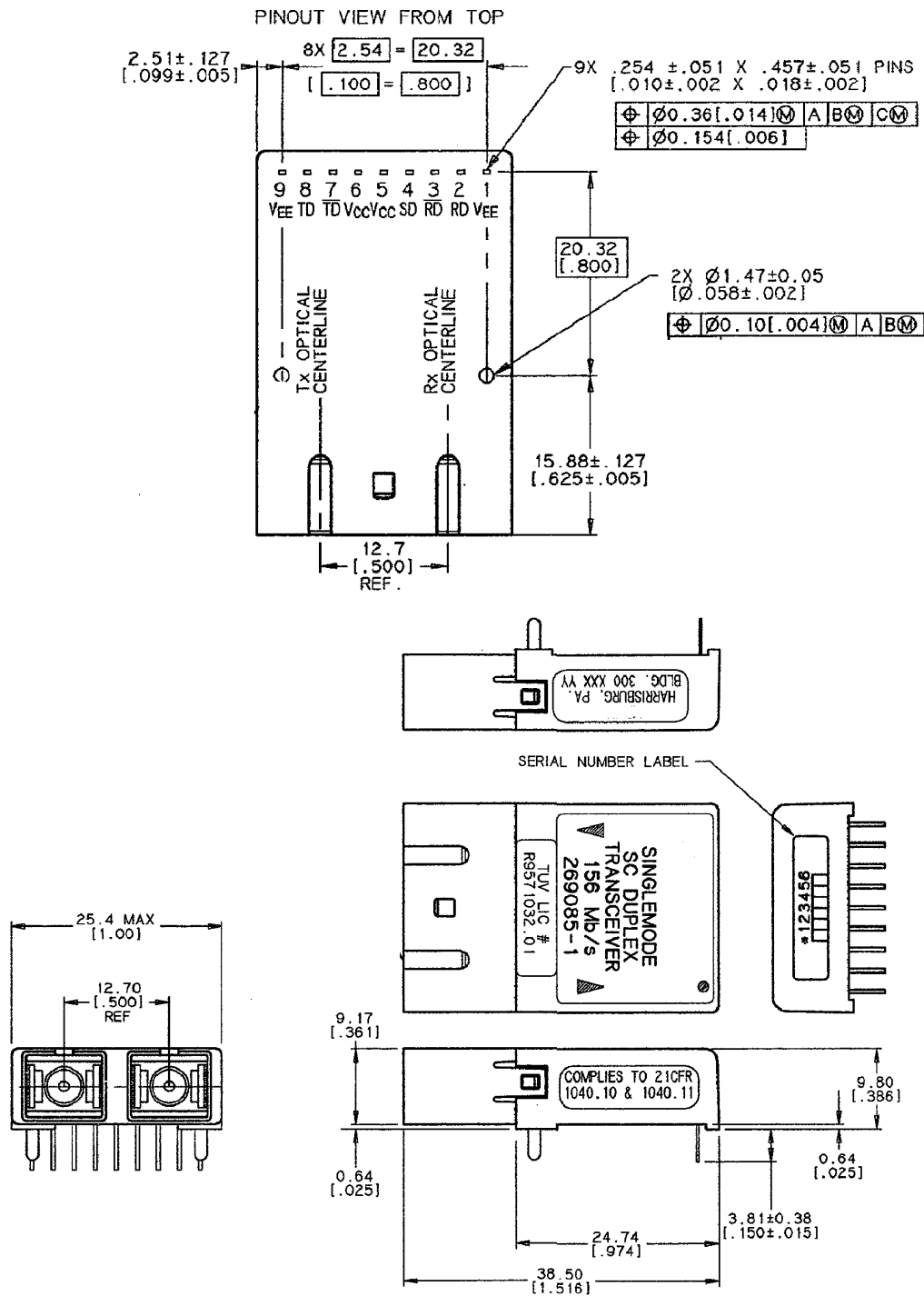
- Transmitter pulse shape characteristics including Rise Time, Overshoot, Jitter, and Ringing are specified in the form of an eye diagram. Conformance to eye mask is evaluated using an optical reference receiver and filter as recommended in T1E, 2/93-020R3 Annex A.
- PIN Plating: 150 microinches min. 93.7 TIN lead over 50/150 microinches NI.
- Ons clock offset, V<sub>CC</sub> = 5V, 25° C, 2<sup>23</sup> -1 PRBS. 2dB is budgeted to open the eye from 0-2ns.
- Mates with optical connectors meeting JIS C 5973.
- Unit provided with process plug to protect optical parts during soldering and cleaning processes.
- Meets Class 1 safety requirements for each of the following: IED 825-1 and IEC 825-2: 1994, CENELEC EN 60825-1/03.94 and EN 60825-2/01.94 and U. S. Department of Health Services 21 CFR 1040.10 and 1040.11 when operated within the specified temperature, power supply, and duty cycle ranges.
- Case Material UL 94 V0 rated.
- Caution: the use of optical instruments will increase eye hazard. Optical instruments should not be used to view the laser output.

**Absolute Maximum Ratings:  
(Transmitter & Receiver)**

Parameter	Symbol	Min.	Typical	Max.	Units
Storage temperature	—	-40	—	100	°C
Lead soldering limits	—	—	—	240/10	°C/s
Supply voltage	V <sub>CC</sub> - V <sub>EE</sub>	-.2	—	7.00	V

**OC-3 Singlemode 9 PIN SC Transceivers - Intermediate Reach** (Continued)

Package Outline Drawings



**IMPORTANT:** PLEASE SEE THE TYCO ELECTRONICS' CUSTOMER DRAWING 269085-1 AND 269085-2 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. DRAWINGS CAN BE OBTAINED ON OUR WEBSITE AT: <http://www.tycoelectronics.com> OR CALL AMPFAX AT 1-800-522-6752 FOR 24HR FAX SERVICE.

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For drawings, technical data or samples, contact your Tyco Electronics sales engineer, call 1-800-522-6752, or visit our Website at: <http://www.amp.com/fiberoptics>. Specifications subject to change. Consult Tyco Electronics for latest specifications.

**OC-3 Singlemode 9 PIN SC Transceivers - Intermediate Reach** (Continued)

## Pin-Out Descriptions

Symbol	PIN#	Function
$V_{EE} R_x$	1	Receiver Signal Ground [See Note 1]
RD+	2	Receiver Data Out [See Note 3]
RD-	3	Receiver Data Out Bar [See Note 3]
SD	4	Signal Detect [See Note 3]
$V_{CC} R_x$	5	Receiver Power Supply [See Note 2]
$V_{CC} T_x$	6	Transmitter Power Supply [See Note 2]
TD-	7	Transmitter Data In Bar [See Note 3]
TD+	8	Transmitter Data In [See Note 3]
$V_{EE} T_x$	9	Transmitter Signal Ground [See Note 1]

Note 1: Transmitter and Receiver grounds are isolated inside the transceiver module.


Note 2:  $V_{CC} T_x$  and  $V_{CC} R_x$  are isolated inside the transceiver module. Use appropriate supply filtering (see application specification)

Note 3: This is a DC coupled connection. Provide appropriate termination (see application specification)



**OC-3 Singlemode 9 PIN SC Transceivers - Intermediate Reach** (Continued)

**Regulatory Compliance:**

Agency	Test Method	Listing Document
FDA	CDRH 21-CFR 1040 Class 1	Accession Number: 9122051-10
TUV	EN60825-1:1994+A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services Laser Class I Protection Class III TUV Certificate Number: B 02 05 46940 001
UL /  US	UL60950	E141081
IECEE CB SCHEME	IEC 60950, 3rd Edition (1999) IEC 60825-1: 1993+A1: 1997+A2:2001	US/5838/UL

**ESD Testing:**

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A-114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT to the nose. Each module is tested with both power ON and OFF

**NOTE**

All products which contain a laser must comply with government regulations for laser safety. In the U.S., the applicable standard is FDA 21 CFR 1040. In other parts of the world, IEC 60825-1 applies. These transceivers were designed and tested to the requirements of the above standards and found to be in compliance with class 1 laser safety limits. When operated within the limits specified in this document, this product conforms to IEC 60825-1: 1993 + A1 : 1997 + A2: 2001, class 1 laser product, requirements.

**CAUTION!**

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

**Related Documents:**

OC-3 Singlemode, 9-Pin, SC Duplex Transceivers Application Specification #114-13077

**1.3 μm LED**

**Product Facts**

- High coupled power, typically 75 μW into 62.5 μm fiber
- High reliability MTTW 2.3 x 10<sup>8</sup> hours
- Wavelength centered at 1320 nm
- Hermetically sealed TO-18 style package installed in industry standard ADMs
- Functional over -40°C to 85°C operating temperature range



TO



ST Style

Tyco Electronics' InGaAsP SLED products offer high coupled powers for digital fiber optic transmission applications.

Compatible with industry standards, the Tyco Electronics LED ADMs consist of hermetically sealed TO-18 style SLEDs which have been actively aligned for maximum coupled power. The devices are permanently fixed in place to assure stable performance over all operating conditions.

The ST connectors are suitable for both panel/bulk-head and PC board mounting.

Each unit is burned-in. Coupled power, capacitance, leakage current and spectral characteristics are measured on each unit. No data is supplied with the unit. A lot code is used for traceability. Box label marked with date code on TO's and pigtail ADM parts are physically marked.

For additional information on product qualification, reference Product Specification 108-55008.

**Specifications: 100mA Forward Current, 25°C**

Parameter	Part No. Suffix	Test Conditions	Units	Min.	Typ.	Max.
Coupled power 50 μm fiber	-1	—	μW dBm	10 -20	20 -17	—
62.5 μm fiber	-1	—	μW dBm	30 -15	45 -13	—
50 μm fiber	-2	—	μW dBm	20 -17	30 -15	—
62.5 μm fiber	-2	—	μW dBm	50 -13	75 -11	—
Wavelength	—	—	nm	1290	—	1350
Spectral FWHM	—	—	nm	—	—	170
Forward voltage	—	—	V	—	1.4	1.7
Capacitance	—	f=1MHz, 0V	pF	—	15	50
Leakage current	—	-2V	μA	—	—	2
Rise/fall time	—	100mA 50% duty cycle 12.5 MHz	ns	—	2.5	4
Bandwidth	—	—	MHz	—	115	—
Δλ/ΔT	—	-40 to +85°C	nm/°C	—	.38	—
ΔP <sub>out</sub> /ΔT	—	—	dB/°C	—	-.03	—
Reliability MTTW	—	-1.5dB EOL	hrs	—	2.3 x 10 <sup>8</sup>	—

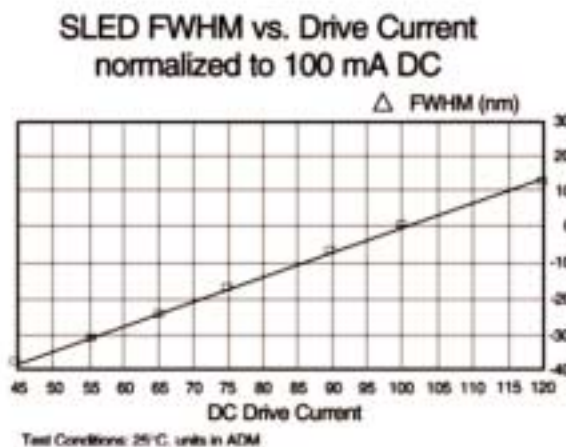
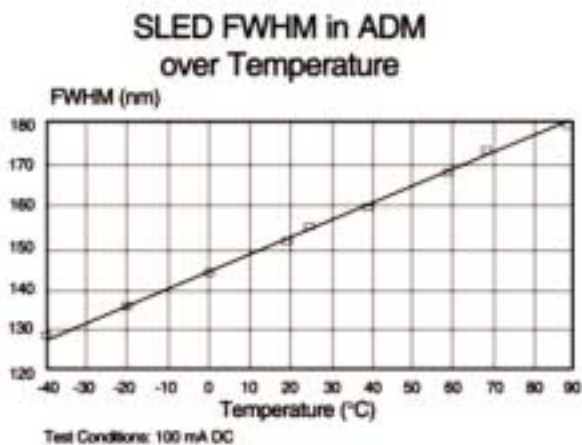
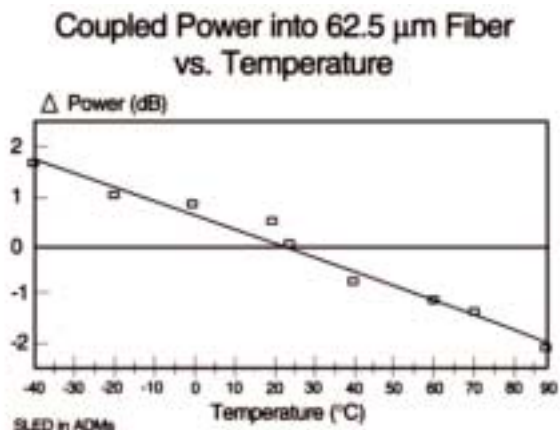
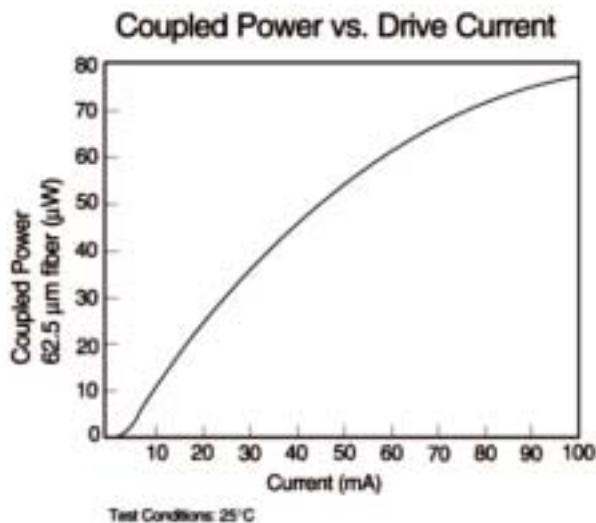
**Note:** dBm is rounded to nearest integer value.

**Part Numbers**

	Connector Interface	
	TO	ST Style
Standard	259006-1	259012-1
Premium	259006-2	259012-2

**Note:** Coupled power in specifications.

1.3 μm LED (Continued)



Absolute Maximum Rating

	Units	Min.	Max.
Operating temperature	C	-40	85
Storage temperature	C	-40	125
Reverse voltage	V	—	2
Forward current	mA	—	150

Mechanical Dimension Reference

Figure #	1	2	3
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**“NEW” 1310nm Fabry-Perot Lasers (TO-56)**



TO-56 Laser  
Low Speed Device

**Product Facts**

- 1310nm typical emission wavelength
- Low threshold, low operating current
- High-power, wide temperature range operation
- High reliability, long operational life
- Available in two pin-out configurations

**Part Numbers**

1382568-2 (Case Anode)  
1382675-2 (Common Anode)



Tyco Electronics' TO-56 Laser is an InGaAsP/InP-based Strained Multi-Quantum Well (SMQW) device that provides stable, single transverse mode oscillation with emission wavelength of 1310nm.

The Laser packages are uncooled, hermetically sealed for high reliability and incorporate a photodiode for monitoring optical output.

**Absolute Maximum Ratings**

Symbol	Parameter	Conditions	Ratings	Unit
P <sub>o</sub>	Light output power	-	8	mW
V <sub>RL</sub>	Reverse Voltage (Laser diode)	-	2	V
V <sub>RD</sub>	Reverse Voltage (Photodiode)	-	20	V
I <sub>FD</sub>	Forward current (Photodiode)	-	2	mA
T <sub>C</sub>	Case Temperature	-	-40 to +85	°C
T <sub>stg</sub>	Storage Temperature	-	-40 to +85	°C

**Electrical/Optical Characteristics**

	Symbol	Parameter	Limits			Unit
			Min	Typ.	Max.	
Optical Spectrum	λ <sub>c</sub>	Center Wavelength (25 °C)	1280	-	1320	nm
	λ <sub>ct</sub>	Center Wavelength (-40°C to +85°C)	1260	-	1350	nm
	Δλ	Spectral Width @ P <sub>o</sub> = 4mW(-40°C to +85°C)	-	1	2.0	nm
	λ <sub>cT</sub>	Wavelength temperature coefficient	-	0.4	0.5	nm/°C
Light-Current Curve	I <sub>th</sub>	Threshold current @ 25°C	-	6	10	mA
	I <sub>thOT</sub>	Threshold current over temperature (-40°C to +85°C)	1	-	32	mA
Modulation	V <sub>F</sub>	Forward Voltage	-	1.2	2.0	V
	η	Slope Efficiency @ 25°C	0.2	0.26	0.4	mW/mA
	I <sub>DR</sub>	Drive current above I <sub>th</sub> for 5 mW (-40°C to +85°C)	7	-	20	mA
	P <sub>th</sub>	Optical Power @ I <sub>th</sub> -3 mA	-	-	20	μW
	t <sub>r</sub> , t <sub>f</sub>	Rise & Fall Times	-	-	1.5	ns
Far Field	θ <sub>  </sub>	Beam Divergence (Parallel)	-	18	40	Deg
	θ <sub>⊥</sub>	Beam Divergence (Perpendicular)	-	26	40	Deg
Monitor Diode	I <sub>m</sub>	Current @ 5 mW (-40°C to +85°C)	0.3	-	0.7	mA
	I <sub>d</sub>	Dark current (25°C, V <sub>RD</sub> = 5V)	-	0.01	0.1	μA
	C <sub>D</sub>	Capacitance (V <sub>RD</sub> = 5V, f = 1MHz)	-	1.2	20	PF

**“NEW” 1310nm Fabry-Perot Lasers (TO-56)** (Continued)



**TO-56 Laser  
High Speed Device**

**Product Facts**

- 1310nm typical emission wavelength
- Low threshold, low operating current
- High-power, wide temperature range operation
- High reliability, long operational life
- Available in two pin-out configurations

**Part Numbers**

- 1382585-2 (Case Anode)
- 1382676-2 (Common Anode)



Tyco Electronics' TO-56 Laser is an InGaAsP/InP-based Strained Multi-Quantum Well (SMQW) device that provides stable, single transverse mode oscillation with emission wavelength of 1310nm.

The Laser packages are uncooled, hermetically sealed for high reliability and incorporate a photodiode for monitoring optical output.

**Absolute Maximum Ratings**

Symbol	Parameter	Conditions	Ratings	Unit
P <sub>o</sub>	Light output power	-	8	mW
V <sub>RL</sub>	Reverse Voltage (Laser diode)	-	2	V
V <sub>RD</sub>	Reverse Voltage (Photodiode)	-	20	V
I <sub>FD</sub>	Forward current (Photodiode)	-	2	mA
T <sub>C</sub>	Case Temperature	-	-40 to +85	°C
T <sub>stg</sub>	Storage Temperature	-	-40 to +85	°C

**Electrical/Optical Characteristics**

	Symbol	Parameter	Limits			Unit
			Min	Typ.	Max.	
Optical Spectrum	λ <sub>c</sub>	Center Wavelength (25 °C)	1280	-	1320	nm
	λ <sub>ct</sub>	Center Wavelength (-40°C to +85°C)	1260	-	1350	nm
	Δλ	Spectral Width @ P <sub>o</sub> = 4mW(-40°C to +85°C)	-	1	3.0	nm
	λ <sub>cT</sub>	Wavelength temperature coefficient	-	0.4	0.5	nm/°C
Light-Current Curve	I <sub>th</sub>	Threshold current @ 25°C	-	6	10	mA
	I <sub>thOT</sub>	Threshold current over temperature (-40°C to +85°C)	1	-	40	mA
Modulation	V <sub>F</sub>	Forward Voltage	-	1.2	2.0	V
	η	Slope Efficiency @ 25°C I <sub>th</sub> +10 mA	0.2	0.26	0.4	mW/mA
	I <sub>DR</sub>	Drive current above I <sub>th</sub> for 5 mW (-40°C to +85°C)	9	-	25	mA
	P <sub>th</sub>	Optical Power @ I <sub>th</sub> +3 mA	-	-	20	μW
Far Field	t <sub>r</sub> , t <sub>f</sub>	Rise & Fall Times	-	-	0.2	ns
	θ <sub>  </sub>	Beam Divergence (Parallel)	-	18	40	Deg
Monitor Diode	θ <sub>⊥</sub>	Beam Divergence (Perpendicular)	-	26	40	Deg
	I <sub>m</sub>	Current @ 5 mW (-40°C to +85°C)	0.3	-	0.7	mA
	I <sub>d</sub>	Dark current (25°C, V <sub>RD</sub> = 5V)	-	0.01	0.1	μA
	C <sub>D</sub>	Capacitance (V <sub>RD</sub> = 5V, f = 1MHz)	-	1.2	20	PF

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**“NEW” Singlemode Receptacle Transmitters**



SC Receptacle Transmitter  
Optical Subassembly  
Low Speed

**Product Facts**

- 156 Gb/s data rates
- 1310nm typical emission wavelength
- Low threshold, low operating current
- Singlemode fiber stub with split sleeve
- Wide temperature range operation
- High reliability, long operational life
- Telecordia GR-468 qualified

**Part Numbers**

- 1382459-1 (Case Anode - 0 to -5 dBm)
- 1382459-2 (Common Anode - 0 to -5 dBm)
- 1382461-1 (Case Anode - -8 to -14 dBm)
- 1382461-2 (Common Anode - -8 to -14 dBm)



Tyco Electronics' SC Receptacle Transmitter Optical Subassembly (OSA), with InGaAsP/InP-based Strained Multi-Quantum Well (SMQW) device, provides stable, single transverse mode oscillation with emission wavelength of 1310nm.

The OSAs are uncooled, hermetically sealed, high reliability and incorporate a photodiode for monitoring optical output.

**Absolute Maximum Ratings - 1382459-1, -2**

Symbol	Parameter	Conditions	Limits		Unit
			Min	Max	
$I_f$	Laser Forward Current	DC	-	150	mA
$I_r$	Laser Reverse Current	DC	-	100	uA
$V_{RL}$	Reverse Voltage (Laser diode)	DC	-	2	V
$V_{RD}$	Reverse Voltage (Photodiode)	DC	-	20	V
$I_{FD}$	Forward current (Photodiode)	-	-	2	mA
$T_C$	Operating Case Temperature	-	0	+70	°C
$T_{std}$	Storage Temperature	-	-40	+85	°C

**Electrical/Optical Characteristics - 1382459-1, -2**

	Symbol	Parameter	Test Condition	Limits			Unit
				Min	Typ.	Max.	
Optical Spectrum	$P_o$	Optical Output Power (CW)	Reference Grade Cable $T_c=0^{\circ}C$ to $+70^{\circ}C$	-5	-	0	dB
				0.312		1.0	$\mu W$
	$\lambda_c$	Central Wavelength	$T_c=25^{\circ}C$	1290	-	1315	nm
			$T_c=0^{\circ}C$ to $+70^{\circ}C$	1280		1335	
	$\Delta\lambda$	Spectral Width ( $0^{\circ}C$ to $+70^{\circ}C$ )	One Sigma, RMS	-	1	2.5	nm
	$\lambda_{cT}$	Wavelength temperature coefficient		-	0.4	0.5	nm/ °C
Light-Current Curve	$I_{th}$	Threshold current	$T_c=25^{\circ}C$	3	6	10	mA
			$T_c=0^{\circ}C$ to $+70^{\circ}C$	1.5		25	mA
	$V_F$	Forward Voltage		-	1.2	2.0	V
	$\eta$	Slope Efficiency	$T_c=25^{\circ}C$	32	48	60	$\mu W/mA$
	$I_d$	Drive Current above $I_{th}$ @ $P_{oMAX}$ (CW)	$T_c=25^{\circ}C$	17	-	32	mA
		$T_c=0^{\circ}C$ to $+70^{\circ}C$	17	-	40	mA	
	$P_{th}$	Coupled Power in "off" state	$I = I_{th} - 2mA$	-	-	12	$\mu W$
Modulation	$t_r, t_f$	Rise & Fall Times	20% - 80%	-	-	1.5	ns
Monitor	$I_m$	Monitor Output current @ $P_{oMAX}$	$T_c=0^{\circ}C$ to $+70^{\circ}C$	0.5	-	1.3	mA
Diode		Dark current, Photodiode	$V_{RD} = 5V$ $T_c=0^{\circ}C$ to $+70^{\circ}C$	-	0.01	0.1	mA
	$C_D$	Capacitance, Photodiode	$V_{RD} = 5V, 1MHz$ $T_c=0^{\circ}C$ to $+70^{\circ}C$	-	1.2	20	pF
	$\Delta R$	Tracking Error @ $P_{oMAX}$	$T_c=0^{\circ}C$ to $+70^{\circ}C$			$\pm 1.0$	dB

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“NEW” Singlemode Receptacle Transmitters (Continued)

SC Receptacle Transmitter  
Optical Subassembly  
Low Speed (Continued)

Part Numbers

- 1382459-1 (Case Anode - 0 to -5 dBm)
- 1382459-2 (Common Anode - 0 to -5 dBm)
- 1382461-1 (Case Anode - -8 to -14 dBm)
- 1382461-2 (Common Anode - -8 to -14 dBm)

Absolute Maximum Ratings - 1382461-1, -2

Symbol	Parameter	Conditions	Limits		Unit
			Min	Max	
$I_f$	Laser Forward Current	DC	-	150	mA
$I_r$	Laser Reverse Current	DC	-	100	uA
$V_{RL}$	Reverse Voltage (Laser diode)	DC	-	2	V
$V_{RD}$	Reverse Voltage (Photodiode)	DC	-	20	V
$I_{FD}$	Forward current (Photodiode)	-	-	2	mA
$T_C$	Operating Case Temperature	-	-40	+85	°C
$T_{stg}$	Storage Temperature	-	-40	+85	°C

Electrical/Optical Characteristics - 1382461-1, -2

Symbol	Parameter	Test Condition	Limits			Unit	
			Min	Typ.	Max.		
Optical Spectrum	$P_o$	Optical Output Power (CW)	Reference Grade Cable $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-14 39	- 158	dB $\mu\text{W}$	
	$\lambda_c$	Central Wavelength	$T_c = 25^\circ\text{C}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	1290 1261	- 1333 1360	nm	
	$\Delta\lambda$	Spectral Width ( $-40^\circ\text{C}$ to $+85^\circ\text{C}$ )	One Sigma, RMS	-	1	2.5	nm
	$\lambda_{cT}$	Wavelength temperature coefficient		-	0.4	0.5	nm/°C
Light-Current Curve	$I_{th}$	Threshold current	$T_c = 25^\circ\text{C}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	3 1.5	6 32	10 mA mA	
	$V_F$	Forward Voltage		-	1.2	2.0	V
	$\eta$	Slope Efficiency	$T_c = 25^\circ\text{C}$	18	-	30	uW/mA
	$I_d$	Drive Current above $I_{th}$ @ $P_{oMAX}$ (CW)	$T_c = 25^\circ\text{C}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	5 4	- -	9 13	mA mA
	$P_{th}$	Coupled Power in "off" state	$I = I_{th} - 2\text{mA}$	-	-	12	$\mu\text{W}$
Modulation	$t_r, t_f$	Rise & Fall Times	20% - 80%	-	1.5	ns	
Monitor	$I_m$	Monitor Output current @ $P_{oMAX}$	$T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	0.2	-	0.45	mA
Diode		Dark current, Photodiode	$V_{RD} = 5\text{V}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-	0.01	0.1	mA
	$C_D$	Capacitance, Photodiode	$V_{RD} = 5\text{V}$ , 1MHz $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-	1.2	20	pF
	$\Delta R$	Tracking Error @ $P_{oMAX}$	$T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$			$\pm 1.5$	dB

**“NEW” Singlemode Receptacle Transmitters** (Continued)



**SC Receptacle Transmitter  
Optical Subassembly  
High Speed**

**Product Facts**

- Data rates up to 3.125 Gb/s
- 1310nm typical emission wavelength
- Low threshold, low operating current
- Singlemode fiber stub with split sleeve
- Wide temperature range operation
- High reliability, long operational life
- Telecordia GR-468 qualified

**Part Numbers**

- 1382462-1 (Case Anode)
- 1382462-2 (Common Anode)



Tyco Electronics' SC Receptacle Transmitter Optical Subassembly (OSA), with InGaAsP/InP-based Strained Multi-Quantum Well (SMQW) device, provides stable, single transverse mode oscillation with emission wavelength of 1310nm.

The OSA's are uncooled, hermetically sealed for high reliability and incorporate a photodiode for monitoring optical output.

**Absolute Maximum Ratings**

Symbol	Parameter	Conditions	Limits		Unit
			Min	Max	
$I_f$	Laser Forward Current	DC	-	150	mA
$I_r$	Laser Reverse Current	DC	-	100	uA
$V_{RL}$	Reverse Voltage (Laser diode)	DC	-	2	V
$V_{RD}$	Reverse Voltage (Photodiode)	DC	-	20	V
$I_{FD}$	Forward current (Photodiode)	-	-	2	mA
$T_C$	Operating Case Temperature	-	-40	+85	°C
$T_{std}$	Storage Temperature	-	-40	+85	°C

**Electrical/Optical Characteristics**

	Symbol	Parameter	Test Condition	Limits			Unit
				Min	Typ.	Max.	
Optical Spectrum	$P_o$	Optical Output Power (CW)	Reference Grade Cable $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-14 39	-	-8 158	dB $\mu\text{W}$
	$\lambda_c$	Central Wavelength	$T_c = 25^\circ\text{C}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	1303 1274	-	1329 1356	nm
	$\Delta\lambda$	Spectral Width ( $-40^\circ\text{C}$ to $+85^\circ\text{C}$ )	One Sigma, RMS	-	1	2.5	nm
	$\lambda_{cT}$	Wavelength temperature coefficient		-	0.4	0.5	nm/°C
Light-Current Curve	$I_{th}$	Threshold current	$T_c = 25^\circ\text{C}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	3 1.5	6	10 32	mA
	$V_F$	Forward Voltage		-	1.2	2.0	V
	$\eta$	Slope Efficiency	$T_c = 25^\circ\text{C}$	18	-	30	$\mu\text{W}/\text{mA}$
	$I_d$	Drive Current above $I_{th}$ @ $P_{oMAX}$ (CW)	$T_c = 25^\circ\text{C}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	5 4	-	9 13	mA
	$P_{th}$	Coupled Power in "off" state	$I = I_{th} - 2\text{mA}$	-	-	12	$\mu\text{W}$
Modulation	$t_r, t_f$	Rise & Fall Times	20% - 80%	-	-	1.5	ns
Monitor	$I_m$	Monitor Output current @ $P_{oMAX}$	$T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	0.1	-	0.6	mA
Diode		Dark current, Photodiode	$V_{RD} = 5\text{V}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-	0.01	0.1	mA
	$C_D$	Capacitance, Photodiode	$V_{RD} = 5\text{V}, 1\text{MHz}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-	1.2	20	pF
	$\Delta R$	Tracking Error @ $P_{oMAX}$	$T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-	-	$\pm 1.5$	dB

“NEW” Singlemode Receptacle Transmitters (Continued)



LC Receptacle Transmitter  
Optical Subassembly  
High Speed

Product Facts

- Data rates up to 3.125 Gb/s
- 1310nm typical emission wavelength
- Low threshold, low operating current
- Singlemode fiber stub with split sleeve
- Wide temperature range operation
- High reliability, long operational life
- Telecordia GR-468 qualified

Part Numbers

- 1382482-1 (Case Anode)
- 1382482-2 (Common Anode)



Tyco Electronics' SC Receptacle Transmitter Optical Subassembly (OSA), with InGaAsP/InP-based Strained Multi-Quantum Well (SMQW) device, provides stable, single transverse mode oscillation with emission wavelength of 1310nm.

The OSA's are uncooled, hermetically sealed for high reliability and incorporate a photodiode for monitoring optical output.

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Limits		Unit
			Min	Max	
$I_f$	Laser Forward Current	DC	-	150	mA
$I_r$	Laser Reverse Current	DC	-	100	uA
$V_{RL}$	Reverse Voltage (Laser diode)	DC	-	2	V
$V_{RD}$	Reverse Voltage (Photodiode)	DC	-	20	V
$I_{FD}$	Forward current (Photodiode)	-	-	2	mA
$T_C$	Operating Case Temperature	-	-40	+85	°C
$T_{std}$	Storage Temperature	-	-40	+85	°C

Electrical/Optical Characteristics

Symbol	Parameter	Test Condition	Limits			Unit	
			Min	Typ.	Max.		
Optical Spectrum	$P_o$	Optical Output Power (CW)	Reference Grade Cable $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-10 100	- 500	dB $\mu\text{W}$	
	$\lambda_c$	Central Wavelength	$T_c = 25^\circ\text{C}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	1295 1266	- 1333 1360	nm	
	$\Delta\lambda$	Spectral Width ( $-40^\circ\text{C}$ to $+85^\circ\text{C}$ )	One Sigma, RMS	-	1	2.5	nm
	$\lambda_{cT}$	Wavelength temperature coefficient		-	0.4	0.5	nm/°C
Light-Current Curve	$I_{th}$	Threshold current	$T_c = 25^\circ\text{C}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	3 1.5	6 32	10 mA	
	$V_F$	Forward Voltage		-	1.2	2.0	V
	$\eta$	Slope Efficiency	$T_c = 25^\circ\text{C}$	30	-	50	$\mu\text{W}/\text{mA}$
	$I_d$	Drive Current above $I_{th}$ @ $P_{oMAX}$ (CW)	$T_c = 25^\circ\text{C}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	10 9	- -	16 24	mA
	$P_{th}$	Coupled Power in "off" state	$I = I_{th} - 2\text{mA}$	-	-	12	$\mu\text{W}$
Modulation	$t_r, t_f$	Rise & Fall Times	20% - 80%	-	0.2	ns	
Monitor	$I_m$	Monitor Output current @ $P_{oMAX}$	$T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	0.3	0.5	0.7	mA
Diode		Dark current, Photodiode	$V_{RD} = 5\text{V}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-	0.01	0.1	mA
	$C_D$	Capacitance, Photodiode	$V_{RD} = 5\text{V}, 1\text{MHz}$ $T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-	1.2	20	pF
	$\Delta R$	Tracking Error @ $P_{oMAX}$	$T_c = -40^\circ\text{C}$ to $+85^\circ\text{C}$			$\pm 1.5$	dB

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**“NEW” Singlemode Receptacle Receivers**



**1.25 Gb/s to 2.5 Gb/s Receiver**

**Product Facts**

- Low Cost
- InGaAs/InP PIN Photodiode with transimpedance amplifier
- High sensitivity with automatic gain control
- Differential ended operation
- LC interface

**Part Numbers**

- 1382649-1 (High Reflectance)**
- 1382650-1 (Low Reflectance)**



Tyco Electronics' Receivers 1382649-1 and 1382650-1 are low cost LC connectorized metal ADM assemblies, suitable for short and intermediate reach applications. These receivers incorporate a highly reliable MOCVD InP PIN photodiode and TIA. This design operates at 3.3V

and is suitable for transceiver applications.

Normal static precautions should be taken with handling these components to prevent ESD damage or degradation.

**Absolute Maximum Ratings**

Parameter	Symbol	Specification	Units
Operating Temperature	T <sub>OP</sub>	-40 to +85	°C
Storage Temperature	T <sub>STG</sub>	-40 to +85	°C

**Electrical/Optical Characteristics**

Parameter	Symbol	Spec Min	Typical	Spec Max	Units	Conditions
Differential Gain @ -10dBm	G	5	6.7	8	mV/uW	250kHz, 25°C
Bandwidth, -40°C to +85°C	f <sub>C</sub>	1.8			GHz	
Bandwidth, +25°C	f <sub>C</sub>		2.1		GHz	
Sensitivity @ 1.25GHz -40°C to +85°C	P <sub>LOW</sub>	-19			dBm	2 <sup>23.1</sup> PBRS, BER 10 <sup>-10</sup>
Sensitivity @ 1.25GHz +25°C	P <sub>LOW</sub>		-26		dBm	2 <sup>23.1</sup> PBRS, BER 10 <sup>-10</sup>
Sensitivity @ 2.5GHz -40°C to +85°C	P <sub>LOW</sub>	-18			dBm	2 <sup>23.1</sup> PBRS, BER 10 <sup>-10</sup>
Sensitivity @ 2.5GHz +25°C	P <sub>LOW</sub>		-21		dBm	2 <sup>23.1</sup> PBRS, BER 10 <sup>-10</sup>
Max Optical Input Power	P <sub>HIGH</sub>			0	dBm	
Reflectance, 1382649-1 (HR)	R <sub>ref</sub>			-14	dB	
Reflectance, 1382650-1 (LR)	R <sub>ref</sub>			-30	dB	
Power Supply Current	I <sub>DD</sub>			50	mA	-40°C to +85°C

**“NEW” Singlemode Receptacle Receivers** (Continued)



**155 Mb/s Receiver**

**Product Facts**

- Low Cost
- InGaAs/InP PIN Photodiode with transimpedance amplifier
- High sensitivity with automatic gain control
- Differential ended operation
- SC interface

**Part Number**  
**1382594-1**



Tyco Electronics' Receiver 1382594-1 is a low cost LC connectorized metal ADM assembly, suitable for short and intermediate reach applications. This receiver incorporates a highly reliable MOCVD InP PIN photodiode

and TIA. The design operates at 3.3V and 5.0V and is suitable for transceiver applications.

Normal static precautions should be taken when handling this component to prevent ESD damage or degradation.

**Absolute Maximum Ratings**

Parameter	Symbol	Specification	Units
Operating Temperature 155 Mb/s	T <sub>OP</sub>	0 to +70	°C
Operating Temperature 622 Mb/s	T <sub>OP</sub>	-40 to +85	°C
Storage Temperature	T <sub>STG</sub>	-40 to +85	°C

**Electrical/Optical Characteristics**

Parameter	Symbol	Spec Min	Typical	Spec Max	Units	Conditions
Differential Gain @ -18dBm	G	10	12.4	15	mV/uW	250kHz, 25°C
Bandwidth, -0°C to +70°C	f <sub>C</sub>	120			MHz	
Bandwidth, +25°C	f <sub>C</sub>		525		MHz	
Sensitivity -0°C to +70°C	P <sub>LOW</sub>	-34			dBm	2 <sup>23</sup> -1 PBRS, BER 10 <sup>-10</sup>
Sensitivity +25°C	P <sub>LOW</sub>		-36		dBm	2 <sup>23</sup> -1 PBRS, BER 10 <sup>-10</sup>
Max Optical Input Power	P <sub>HIGH</sub>			-10	dBm	
Optical Impedance	Z <sub>o</sub>	36	44	57	Ω	
Reflectance	R <sub>ref</sub>			-14	dB	
Power Supply Current	I <sub>DD</sub>			50	mA	-0°C to +70°C

**Multimode InGaAs Photodetector**

**Product Facts**

- High reliability passivated planar structure
- High responsivity
- Low dark current
- Low capacitance
- Hermetically sealed TO-18 style package installed in industry standard ADMs
- -40° to +85°C operating temperature range



TO



ST Style



FC

Tyco Electronics' multimode design using InGaAs PIN photodetectors offers high responsivity for nearly all digital and analog fiber optic applications. The unique design balances high-speed performance with noise-free linear output. Spectral response has been optimized for the long wavelength region of 1150 nm to 1600 nm. Every component delivered has passed extensive high-temperature screening to ensure long-term reliability.

Compatible with industry standards, Tyco Electronics' Active Device Mount components incorporate hermetically sealed TO-18 style PIN packages which have been actively aligned for optimal performance. ST modules are suitable for both panel/bulkhead and PC board mounting. Each unit is burned-in.

Responsivity, dark current and capacitance are measured on each unit. No data is supplied with the unit. A lot code is used for traceability.

For additional information on product qualification, reference Product Specification 108-55009.

**Specifications: 25°C, -5 Volts**

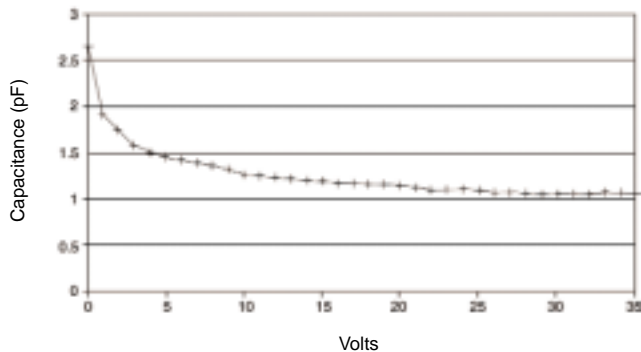
Parameter	P/N	Test Conditions	Units	Min.	Typ.	Max.
Responsivity						
50 μm	-1	LED source	A/W	.60	.71	—
62.5 μm	-1	of 10 μW	A/W	.50	.61	—
50 μm	-2	LED source	A/W	.75	.83	—
62.5 μm	-2	of 10 μW	A/W	.65	.80	—
Spectral Response	-1, 2	—	nm	1150	—	1600
Capacitance	-1, 2	f=1MHz	pF	—	1.5	1.7
Dark current	-1, 2	—	nA	—	1.5	5
Rise/fall	-1, 2	—	ns	—	—	1
Bandwidth	-1, 2	—	GHz	—	1.5	—
Reliability	-1, 2	I <sub>b</sub> >5nA	hrs	—	2.0 x 10 <sup>8</sup>	—

**Part Numbers**

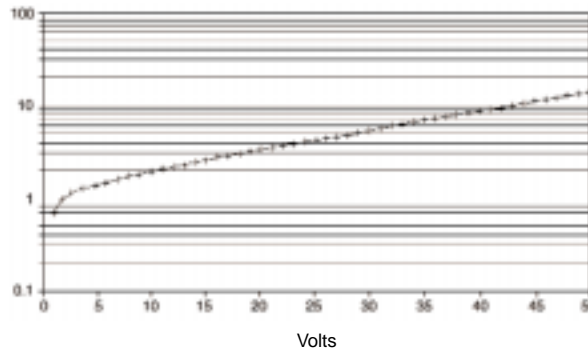
	Connector Interface		
	TO	FC	ST Style
Standard	259007-1	259015-1	259013-1
Premium	259007-2	259015-2	259013-2

**Multimode InGaAs Photodetector** (Continued)

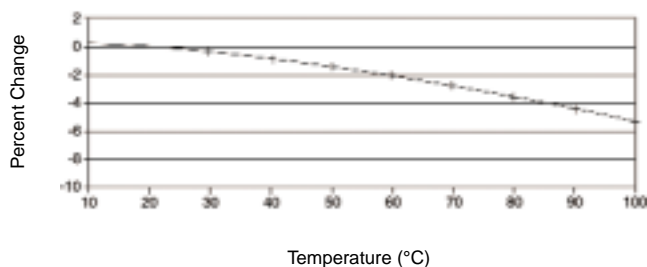
**Capacitance**



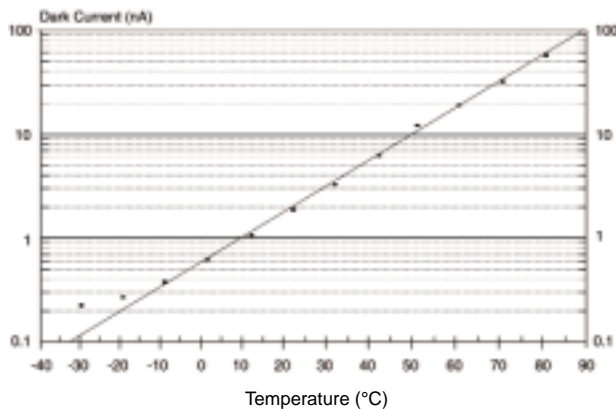
**Dark Current**



**Responsivity vs. Temperature**



**Dark Current vs. Temperature**



**Absolute Maximum Rating**

	Units	Min.	Max.
Operating temperature	°C	-40	85
Storage temperature	°C	-40	125
Reverse current	mA	—	1

**Mechanical Dimension Reference**

Figure #	1	2	3
Page No.	202	202	202

**Mechanical Dimensions**

**TO Package PIN + LED**

Part Numbers  
259006-1, -2  
259007-1, -2

Part No. Suffix	A	B
-1	.081 2.05	.026 .660
-2	.060 1.52	.020 .510

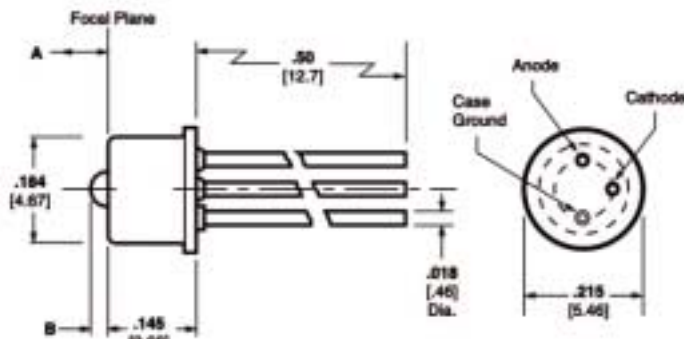


Figure 1

**ST Style Board Mount/Panel Mount PIN + LED**

Part Numbers  
259012-1, -2  
259013-1, -2

Part No. Suffix	Description
-1	Standard
-2	Premium

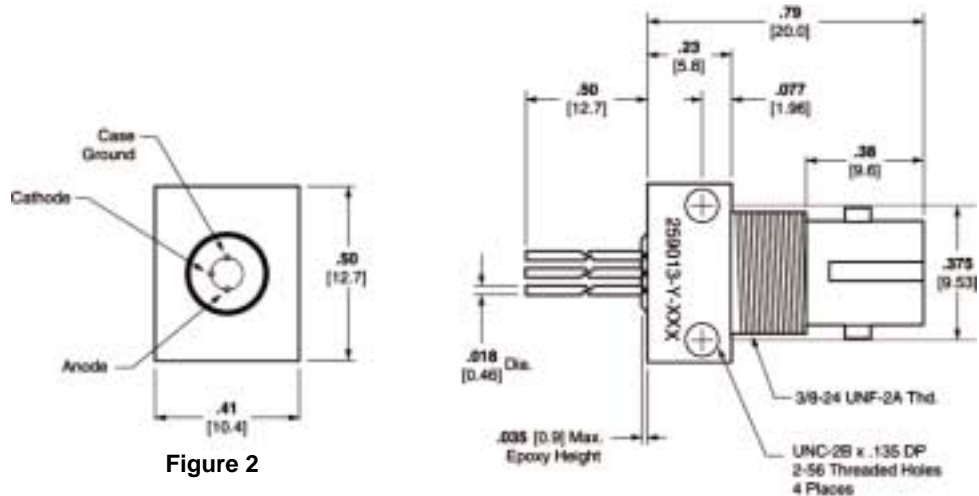


Figure 2

**FC Type Panel Mount PIN**

Part Numbers  
259015-1, -2

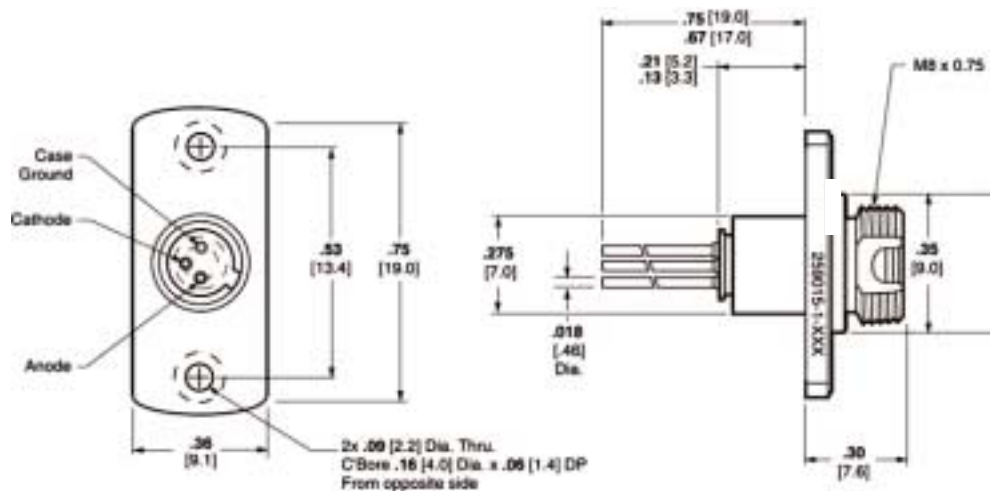


Figure 3

Dimensions on this page  
in inches over [mm]

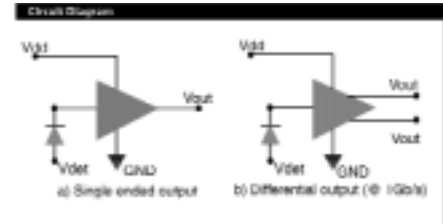
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## Fiber Optic Products Catalog

### “NEW” PINAMP Optical Receiver Modules

#### Product Facts

- 4 Mb/s, 52 Mb/s, 155 Mb/s, 622 Mb/s, and 1 Gb/s data rates
- High responsivity and low dark current InGaAs pin detector
- High sensitivity
- Wide dynamic range
- Single supply operation
- Hermetic package
- Single ended
- Differential output (1 Gb/s only)
- Satisfies Telcordia GR-468-CORE specifications



#### Absolute Maximum Ratings

	Units	Max
Detector Reverse Voltage	V	20
Detector Reverse Current	mA	10
Module Supply Voltage	V	+5.5

#### Applications

- Supervisory channel
- Long haul transmission networks
- Short haul transmission networks
- DWDM transponders
- SDH/SONET singlemode applications
- Instrumentation and testing
- Data communications
- Gigabit ethernet

#### Performance @ 25° C (+ / - 5.0 VDC)

Parameter	Unit	4 Mb/s			52 Mb/s			155 Mb/s			622 Mb/s			LPA 1000PTD 1 Gb/s		
		min	typ	max	min	typ	max	min	typ	max	min	typ	max	min	typ	max
Data Rate	mB/s	4			52			155			622			1000		
Sensitivity @ 10 <sup>-9</sup> (BER)**	dBm	-48	-50		-41	-43		-37	-39		-31	-33		-24	-27	
Overload @ -5 VDC	dBm	-4			0			0			0			0		
Transfer Gain @ 1310	V/W	40K			25K			12K			4K			4K*		
Dark Current @ -5 VDC	nA	0.5			0.5			0.5			0.5			0.5		
Responsivity @ -5 VDC @ 1310 @ 1550	A/W	0.85 0.9			0.85 0.9			0.85 0.9			0.85 0.9			0.85 0.9		
Output Impedance	Ohms	30	60		30	60		30	60		30	60		30	60	
Operating Temperature	° C	-40	85		-40	85		-40	85		-40	85		0	70	
Storage Temperature	° C	-40	85		-40	85		-40	85		-40	85		-40	85	
Supply Voltage	V	4.75 5.25			4.75 5.25			4.75 5.25			4.75 5.25			4.75 5.25		
Supply Current	mA	30			30			30			30			30		

\* Differential

\*\* Sensitivity is calculated using the noise voltage measured at 25° C at the output of a 3-pole Butterworth filter. Sensitivity is specified as the average optical power in dBm measured at 1310nm and T<sub>a</sub> = 25° C for a BER of 10<sup>-9</sup>.

#### Fiber Specifications

Fiber Type	Index Profile	N/A	Nominal Size (µm)	Cladding Tolerance	900µm Buffer Material	Fiber Yield Strength (N)	Fiber Bend Radius min. (mm)
Multimode tight buffer	Graded	0.2	50/125/245/900	125 +/-2.0µm	Hytrell	10	30

Other fiber types are available. Please contact Tyco Electronics or your Tyco Electronics representative.

#### Ordering Information

##### Base Part Numbers:

LPAD X-1436056-X LPA X-1436051-X  
 LDFC X-1436041-X LDST X-1436047-X

##### Mini-DIL PINAMPs

4 Mb/s, 52 Mb/s  
 155 Mb/s, 622 Mb/s

##### LPAD

Package Type

##### OXXX

Data Rate

##### - XX

Connector Type

##### Coaxial Pigtailed PINAMPs

4 Mb/s, 52 Mb/s, 155 Mb/s  
 622 Mb/s, 1000 Mb/s

##### LPA

Package Type

##### XXXXPT

Data Rate

##### X - XX

Pin Out Connector Type

##### Pigtail connector termination designations:

Use FC to indicate FC/PC type connector  
 Use LC to indicate LC/PC type connector  
 Use SC to indicate SC/PC type connector  
 Use ST to indicate an ST type connector

##### Receptacle PINAMPs

4 Mb/s, 52 Mb/s  
 155 Mb/s, 622 Mb/s

NOTE: No suffix digit = C Pin Out

##### LDFC

Package Type

##### OXXX

Data Rate

##### X

Pin Out

##### LDST

Package Type

##### OXXX

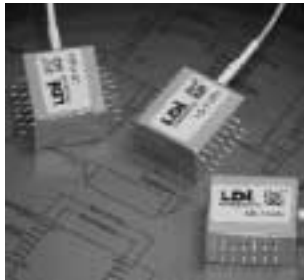
Data Rate

##### X

Pin Out

## Fiber Optic Products Catalog

### “NEW” 2.5 Gb/s PINAMP Optical Receiver



#### LPAB 2500 Series

#### Product Facts

- 2.5 Gb/s data rate, 14-pin Butterfly package
- High responsivity, low dark current InGaAs pin detector
- High sensitivity
- Wide dynamic range
- Single supply operation
- Access to detector pin
- Hermetic package
- Differential output
- Low back reflection

#### Applications

- Long haul transmission systems
- Short haul transmission systems
- Instrumentation and testing
- Digital receivers in DWDM transponders
- SDH/SONET singlemode applications

#### Absolute Maximum Ratings

Operation above absolute maximum ratings can cause damage to the device. Normal operation of the device should be per the operating conditions provided in the datasheet.

	Min	Typ	Max	Units
Negative Supply Voltage			-6	V
Optical Input Power			+8	dBm
Operating Temperature	-40		+85	°C
Storage Temperature	-40		+85	°C

#### DC Specifications

	Min	Typ	Max	Units
Negative Supply Voltage	-4.9	-5.2	-5.5	V
Supply Current		130		mA
Power Dissipation		0.7		W

**Performance Specifications** (Unless otherwise noted, the specifications are at 25° C temperature, -5.2 V supply, and 0 V detector bias.)

Parameter	Specifications			Units
	Min	Typ	Max	
Sensitivity*		-24	-22	dBm
Overload (Optical Power)		+1		dBm
Transimpedance (Differential)	5	8		KΩ
Gain Flatness		±1		dB
Bandwidth	1.5	1.7		GHz
Dynamic Range		25		dB
Optical Back Reflection			-27	dB
Dark Current			1	nA
Responsivity @ 1300nm	0.85	0.90		A/W
@ 1550nm	0.90	0.95		A/W
Output Return Loss (50Ω)		10		dB

\* Data Rate: 2.5 Gb/s; data sequence, PRBS 2<sup>23</sup>-1, BER=1E-10, DATA and  $\overline{\text{DATA}}$  are internally AC coupled to package pins.

#### Fiber Specifications

Fiber Type	Index Profile	N/A	Nominal Size (μm)	Cladding Tolerance	900μm Buffer Material
Singlemode Tight Buffer	Step	-0.13	9/125/245/900	125 +/- 1.0 μm	Hytrel

#### Ordering Information

Base Part Number:  
LPAB X-1436054-X

LPAB 2500-XX  
Pigtail connector termination designation:  
Use FC to indicate an FC type connector  
Use LC to indicate an LC type connector  
Use SC to indicate an SC type connector

Other connector options are available. Contact Tyco Electronics or your local Tyco Electronics representative to discuss your requirements.

## Fiber Optic Products Catalog

### “NEW” PINFET Optical Receiver Modules



#### Product Facts

- High sensitivity
- High overload power
- Wide dynamic range
- 850, 1310, 1550nm operation
- Hermetic package
- Custom bandwidths available

#### Applications

- Telecommunications line-terminating equipment or repeaters
- Optical sensor systems
- Optical gyroscopes
- Supervisory channel

#### Performance @ 25° C (+ / - 5.0 VDC)

		Minimum <sup>1</sup> Bandwidth (MHz)	Suggested <sup>2</sup> Data Rate (Mb/s)	Sensitivity <sup>3</sup> (dBm)		Dynamic Range (dB) typ	Transimpedance (Kohms) typ
				min	typ		
LDPF Series	LDPF 0004	4	6	-54	-56	25	1100
	LDPF 0012	12	17	-51	-53	25	740
	LDPF 0024	24	34	-48	-50	25	340
	LDPF 0032	32	45	-47	-49	25	210
	LDPF 0065	65	90	-43	-45	25	80
	LDPF 0120	120	168	-40	-42	25	40
LDPF 0250	250	350	-35	-37	25	10	
LDPW Series	LDPW 0003	3	4	-54	-56	53	1100
	LDPW 0012	12	17	-50	-52	49	350
	LDPW 0024	24	34	-48	-50	47	340
	LDPW 0036	36	52	-46	-48	45	210
	LDPW 0065	65	90	-41	-43	40	60
	LDPW 0110	110	155	-38	-40	37	30
LDSF Series	LDSF 0004	4	6	-51	-56	25	1100
	LDSF 0012	12	17	-48	-52	25	740
	LDSF 0024	24	34	-44	-50	25	340
	LDSF 0032	32	45	-43	-48	25	210
	LDSF 0065	65	90	-38	-43	25	80
	LDSF 0120	120	168	-34	-40	25	40
LDSF 0250	250	350	-29	-31	25	10	

#### Common Characteristics @ 25° C

	Units	LDPF Series			LDPW Series			LDSF Series		
		min	typ	max	min	typ	max	min	typ	max
Dark current @ -5V	nA	0.50	1		0.50	1		0.50	1	
Maximum optical input @ -5V	dBm	Sensitivity Level (dBm) +25 dB			-3	0	Sensitivity Level (dBm) +25 dB			
Sensitivity derating over operating temperature	dB	<1			<1			<1		
InGaAs detector responsivity	A/W									
1300nm		0.9			0.9			-		
1550nm		0.95			0.95			-		
Si detector responsivity	A/W									
850nm		-			-			0.50		
Maximum output signal level	V <sub>pp</sub>	2.5			0.8			2.5		
Output impedance	Ohms	10			10			10		
Load impedance	Ohms	1000			1000			1000		
Supply voltage	V	4.5	5.5		4.5	5.5		4.5	5.5	
Power supply current +5V	mA	25	35		25	35		25	35	
Power supply current -5V	mA	10	15		10	15		10	15	

#### Fiber Specifications

Fiber Type	Index Profile	N/A	Nominal Size (mm)	Cladding Tolerance	900µm Buffer Material	Fiber Yield Strength (N)	Fiber Bend Radius min. (mm)
Multimode tight buffer	Graded	0.2	50/125/245/900	125 + / - 2.0 µm	Hytrel	10	30

Other fiber types are available. Please contact Tyco Electronics or your local Tyco Electronics representative.

#### Ordering Information

##### Base Part Numbers:

LDPF X-1436044-X

LDPW X-1436045-X

LDSF X-1436046-X

##### Model Numbers

Using the performance tables below, select a series and a bandwidth within the series and use the following numbers to order:

LDPF Series High Sensitivity	LDPW Series Wide Dynamic Range	LDSF Series 850nm Operation
LDPF 0004XX	LDPW 0003XX	LDSF 0004XX
LDPF 0012XX	LDPW 0012XX	LDSF 0012XX
LDPF 0024XX	LDPW 0024XX	LDSF 0024XX
LDPF 0032XX	LDPW 0032XX	LDSF 0032XX
LDPF 0065XX	LDPW 0065XX	LDSF 0065XX
LDPF 0120XX	LDPW 0110XX	LDSF 0120XX
LDPF 0250XX		LDSF 0250XX

Note: To indicate the pigtail connector termination you require, substitute one of the following designations for "XX" in the table:

- No suffix indicates no connector
- Use FC to indicate an FC/PC type connector
- Use LC to indicate an LC/PC type connector
- Use SC to indicate an SC/PC type connector
- Use ST to indicate an ST type connector

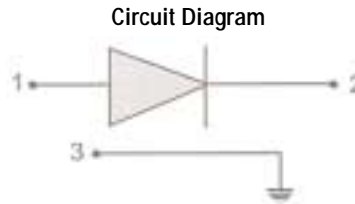
#### Absolute Maximum Ratings

	Units	LDPF Series	LDPW Series	LDSF Series
Operating temperature	°C	-40 to 70	-40 to 70	-40 to 70
Storage temperature	°C	-40 to 85	-40 to 85	-40 to 85
Positive supply voltage	V	7	7	7
Negative supply voltage	V	-7	-7	-7
Detector bias	V	-20	-20	-20
Soldering time at 260°C	secs	10	10	10

##### Notes:

1. Bandwidth is measured at the -3 dB point.
2. A given bandwidth will typically support an NRZ data rate of 1.4 times the 3 dB bandwidth.
3. Sensitivity is calculated using the noise voltage measured at 25°C at the output of a 3-pole Butterworth filter whose bandwidth equals that of the PINFET's minimum specified bandwidth. Sensitivity is specified as the average optical power in dBm measured at 1300nm and T<sub>a</sub> = 25°C for a BER of 10<sup>-9</sup>.

**“NEW” InGaAs PIN Photo Diode Modules for DWDM/EDFA Tap Monitor Applications**



**Product Facts**

- InGaAs photodiode
- Low dark current
- High responsivity
- Low PDL
- Miniature package
- Low back reflection
- Satisfies Telecordia GR-468-CORE specifications

**Applications**

- DWDM system monitor
- EDFA tap monitor
- High speed receivers
- SDH/SONET receiver

**Absolute Maximum Ratings**

		Units
Forward Voltage	0.5	V
Reverse Voltage	20	V
Forward Current	1	mA
Reverse Current	10	mA

**PIN Monitor Specifications (Performance at 25° C and -5Vr)**

Parameter	Unit	Min	Typ	Max
Detector Diameter	μm		75	
Dark Current	nA		0.08	0.5
Capacitance	pF		0.5	0.75
Responsivity	@ 1.3μm	A/W	0.8	0.85
	@ 1.55μm	A/W	0.85	0.9
Optical Back Reflection	dB	See Table Below		
PDL	dB			0.15
Input Power	dBm			3
Optical Linearity%			±3	
Bandwidth	GHz		2	
Operating Temperature	° C	-40		85
Storage Temperature	° C	-40		85
Package Type	TO-46, Pigtailed			

**Ordering Information**

Base Part Number:  
LPD X-1436059-X

**Model Number Table**

Model #*	Fiber Type	Nominal Fiber Size (μm)	Cladding Tolerance	Back Reflection Level (dBm)
LPD 3080-PM1	Corning SMF 28-CPC6	9/125/245	125 + / - 1.0μm	-40
LPD 3080-PM2	Corning 900μm TBII	9/125/245/900	125 + / - 1.0μm	-40
LPD 3080-PM3	Corning SMF 28-CPC6	9/125/245	125 + / - 1.0μm	-27
LPD 3080-PM4	Corning 900μm TBII	9/125/245/900	125 + / - 1.0μm	-27

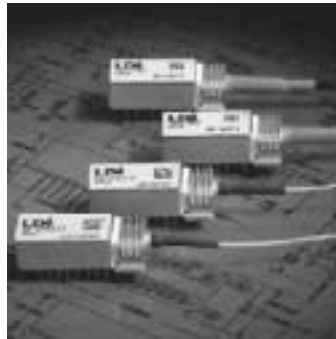
\*Adding "F" suffix to any part number specifies a board mount flange.

**Connector options available.**

**“NEW” Ruggedized Transmitter and Receiver Modules**

**Product Facts**

- Rugged MIL-qualifiable datalinks
- Data rates to 125 Mb/s
- 1.3 μm LED operation
- 16-pin package
- ECL, PECL data compatible
- FDDI, ARINC, SAFENET



**Applications**

- Commercial and military avionics systems
- Tactical military data communications
- Shipboard communications
- Other communications environments that require a ruggedized fiber optic device

These ruggedized devices are designed for use in extreme environmental conditions too demanding for a standard commercial-grade device. Extensive individual qualification has been conducted for specific programs to ensure the long-term integrity and performance of these products. A typical qualification plan is presented below:

Qualification Capabilities to MIL-STD-883 (to date)

Solderability	Method 2003
Lead integrity	Method 2004-B2
Resistance to solvents	Method 2015
Internal visual inspection	Method 2014
Wirebond strength	Method 2011-D
Die shear strength	Method 2019
Physical dimensions	Method 2016
Hermeticity, gross	Method 1014-C1
Hermeticity, fine	Method 1014-A1
Thermal shock	Method 1010-A
Steady-state life	Method 1005-B
Mechanical shock	Method 2002
Constant acceleration	Method 2001

**Ordering Information**

**Base Part Numbers:**

TS 2143      X-1436017-X  
RT 2714      X-1436015-X

**TS 2143 Transmitter Specifications and Limits**

Optical Characteristics		Min	Max
Optical output power <sup>1</sup>	dBm	-16	-
Rise/fall time	ns	-	2.5/2.5
Extinction ratio	dBm	-	10
Center wavelength	nm	120	1380
Spectral width	nm	-	180

Electrical Characteristics		Min	Max
NRZ data rate <sup>2</sup>	Mb/s	1	125
Data input voltage, low <sup>3</sup>	V	-1.81	-1.47
Data input voltage, high <sup>3</sup>	V	-1.16	-0.88
Power supply current (+5V)	mA	-	200
Operating case temperature	° C	-40	+85
Storage temperature	° C	-40	+85
Optical interface	1 meter 62.5/125/900 μm fiber pigtail		

**Notes:**

Performance is specified for a temperature range of -40° C to +85° C.

1. Average output power is based on a 50% duty cycle.
2. Consult with Tyco Electronics or your local Tyco Electronics Representative operation below 2 Mb/s.
3. Measured from V<sub>CC</sub> with a 50 ohm load to -2 volts.

**RT 2714 Receiver Specifications and Limits**

Optical Characteristics		Min	Typ	Max
Sensitivity (at 125 Mb/s) <sup>1</sup>	dBm	-34	-36	-
Overload power <sup>2</sup>	dBm	-6	-3	-
Alarm assert	dBm	-43	-	-34
Alarm deassert	dBm	-44	-	-35
Rise/fall time	ns	-	-	3.0

**Electrical Characteristics**

NRZ data rate	Mb/s	10	-	125
Data output voltage, low <sup>3</sup>	V	-1.81	-	-1.47
Data output voltage, high <sup>3</sup>	V	-1.16	-	-0.88
Power supply current (+5V)	mA	-	150	200
Operating case temperature	° C	-40	-	+85
Storage temperature	° C	-40	-	+85
Optical interface	1 meter 62.5/125/900 μm fiber pigtail			

**Notes:**

Performance is specified for a temperature range of -40° C to +85° C.

1. Minimum average optical power required to maintain a BER = 10<sup>-9</sup>. Part number RT 2714-052 will support data rates up to 52 Mb/s. Part number RT 2714-125 will support data rates up to 125 Mb/s or to \*160 Mb/s with screening.
2. Maximum average optical input to maintain a BER = 10<sup>-9</sup>.
3. Measured from V<sub>CC</sub> with a 50 ohm load to -2 volts.

\*Contact Tyco Electronics or your local Tyco Electronics Representative.

**Ordering Information**

Part Number	Description
TS 2143-016	Transmitter, 1300nm, PECL, 125 Mb/s, -16 dBm, 62-5/125/900 μm pigtail
RT 2714-052	Receiver, PECL, 52 Mb/s, 62.5/125/900 μm pigtail
RT 2714-125	Receiver, PECL, 125 Mb/s, 62.5/125/900 μm pigtail.

## Fiber Optic Products Catalog

### “NEW” Airpak Transmitter and Receiver Modules



#### Transmitter Functional Description

- Data rates up to 155 Mb/s
- Low threshold FP laser
- Wide operating temperature
- 1310nm and 1550nm options
- Automatic power control
- Transmitter disable
- Optical power monitor
- Laser bias monitor

#### Product Facts

- SONET OC1, OC3 Transmitters
- SONET OC1, OC3, OC12 receivers
- SDH STM-1 transmitters
- SDH STM-1, STM-4 receivers
- ATM/FDDI
- High-loss budget links
- Up to 622 Mb/s receivers
- Up to 155 Mb/s transmitters
- 1310nm and 1550nm
- PECL or ECL operation
- 20-Pin multi-source pinout

#### Applications

- SONET applications
- SDH applications

#### Optical Characteristics (Performance at 25 ° C)

	Units	Min	Typ	Max
Center wavelength	nm			
TL 2063		1290	-	1330
TL 2065		1520	-	1570
Average output power (over operating temperature range)	dBm			
TL 2063PT-010, TL 2065PT-010		-10	-8	-5
TL 2063PT-005, TL 2065PT-005		-5	-3	0
Spectral width (RMS)	nm	-	2.5	-
Extinction ratio	dB	10	12	-
Tx disable <sup>1</sup>	V	-3.2	-	0

#### Electrical Characteristics (Performance at 25 ° C)

	Units	Min	Typ	Max
Supply voltage ( $V_{CC} - V_{EE}$ )	V	4.75	5	5.5
Supply current	mA	-	70	130
Input data voltage <sup>1</sup>	V			
Low		-	-1.8	-
High		-	-0.8	-
Bias monitor	V	0.01	-	0.45
Back facet monitor	V	0.01	-	0.2

#### Absolute Maximum Ratings

	Units	Min	Typ	Max
Supply voltage	V	-	-	6
Storage temperature	° C	-40	-	85
Operating temperature <sup>2</sup>	° C	-40	-	85
Lead soldering temp/time	° C/sec	-	-	250/1

Notes:

1. Measured from  $V_{CC}$  with a 50-ohm load to  $V_{CC} - 0.2$  volts.
2. Temperature range for 1310nm transmitters only.

#### Ordering Information

Base Part Number:  
 TL X-1436016-X

#### Transmitter Ordering Information

Part Number	Data Rate (NRZ Mb/s)	Nominal Wavelength (nm)	Typical P <sub>AVG</sub> (dBm)	Interface Type	Operating Temperature (° C)
TL 2063PT-010FC	155	1310	-8	9/125/900 μm pigtail, FC/PC connector	-40 to +85
TL 2063PT-005FC	155	1310	-3	9/125/900 μm pigtail, FC/PC connector	-40 to +85
TL 2065PT-010FC	155	1550	-8	9/125/900 μm pigtail, FC/PC connector	-40 to +65
TL 2065PT-005FC	155	1550	-3	9/125/900 μm pigtail, FC/PC connector	-40 to +65

Note:

FC/PC connectors on the fiber pigtail are standard.  
 Other connector types are available.

## Fiber Optic Products Catalog

### “NEW” Airpak Transmitter and Receiver Modules (Continued)

#### Receiver Functional Description

- Data rates of 52, 155, and 622 Mb/s
- 1310nm and 1550nm operation
- Single 5-volt capable
- High sensitivity
- High overload power
- Wide dynamic range
- Differential data and flag outputs

#### Optical Characteristics (Performance at 25 ° C)

	Units	Min	Typ	Max
Measured average sensitivity <sup>1</sup>	dBm			
52 Mb/s		-38	-40	-
155 Mb/s		-36	-38	-
622 Mb/s		-30	-32	-
Maximum input power	dBm	-3		-
Link status threshold (Flag-logic low, decreasing light input)	dBm			
52 Mb/s		-54	-	-38
155 Mb/s		-45	-	-36
622 Mb/s		-45	-	-28
Link status threshold (Flag-logic high, increasing light input)	dBm			
52 Mb/s		-55	-	-39
155 Mb/s		-44	-	-35
622 Mb/s		-44	-	-27

#### Electrical Characteristics (Performance at 25 ° C)

	Units	Min	Typ	Max
Supply voltage (V <sub>CC</sub> )	V	4.8	5	5.3
Supply current	mA	-	100	150
Output data voltage <sup>2</sup>	V			
Low		-1.8	-1.75	-1.5
High		-1.1	-1.0	-
Output flag voltage <sup>2</sup>	V			
Low (52 Mb/s and 155 Mb/s)		-1.8	-1.75	-1.5
High (52 Mb/s and 155 Mb/s)		-1.1	-1.0	-
Low (622 Mb/s) <sup>3</sup>		-	0.2	0.5
High (622 Mb/s) <sup>3</sup>		3.0	4.0	-

#### Absolute Maximum Ratings

	Units	Min	Typ	Max
Supply voltage	V	-	-	5.5
Operating case temperature	° C	-40	-	85
Storage temperature	° C	-40	-	85
Lead soldering temp/time	° C/sec	-	-	250/10

#### Notes:

1. All values are at 1310nm, measured with an optical input using a 2<sup>23</sup>-1 pseudo random pattern with a 50% duty cycle for BER of 10<sup>-10</sup>.
2. Measured from V<sub>CC</sub> with a 50-ohm load to V<sub>CC</sub> 02 volts.
3. Measured from ground.

#### Ordering Information

Base Part Number:  
RT 2000 X-1436015-X

#### Receiver Ordering Information

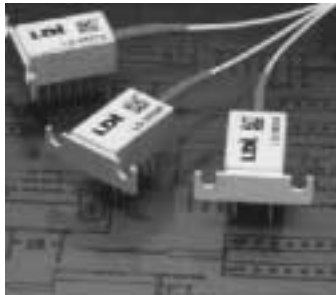
Part Number	Data Rate (NRZ Mb/s)	Typical Sensitivity (dBm)	Interface Type	Operating Temperature (° C)
RT 2000PT-052FC	52	-40	50/125/900 μm pigtail, FC/PC connector	-40 to +85
RT 2000PT-155FC	155	-38	50/125/900 μm pigtail, FC/PC connector	-40 to +85
RT 2000PT-622FC	622	-32	50/125/900 μm pigtail, FC/PC connector	-40 to +65

#### Note:

FC/PC connectors on the fiber pigtail are standard.  
Other connector types are available.

## Fiber Optic Products Catalog

### “NEW” 1310nm Laser Diode



#### Product Facts

- Power to 2 mW
- Singlemode 9/125/900 fiber
- 14-pin DIP
- Buried Hetero-Structure laser design
- High stability fiber coupling
- Hermetically sealed

#### Applications

- Telecommunications
- Test instrumentation

#### Ordering Information

Base Part Number:  
 SCW 1301      X-1436033-X

#### Specifications and Limits at 25 ° C

Spectral Characteristics		Power Options (uW)		
		500	1000	2000
Wavelength range	nm	1270-1330	1270-1330	1270-1330
Spectral width RMS (typ)	nm	1.7	1.7	1.7
Spectral width, FWHM (typ)	nm	2	2	2
Drive Characteristics				
Threshold current (typ; max)	mA	6;15	6;15	6;15
Modulation current (typ;max)	mA	10;25	10;25	10;25
Forward voltage maximum	V	2	2	2
Maximum optical rise/fall time	ns	0.5	0.5	0.5
Monitor Diode				
Photocurrent at P <sub>MAX</sub> (min;max)	uA	50;1200	50;1200	50;1200
Maximum dark current	nA	10	10	10
Maximum capacitance	pF	6	6	6
Maximum rise/fall time	ns	2	2	2
Maximum reverse voltage	V	10	10	10
Tracking error*	dB	±0.5	±0.5	±0.5
Temperature Range				
Module operating temperature	° C	-20 to +70	-20 to +70	-20 to +70
Storage temperature	° C	-40 to +85	-40 to +85	-40 to +85
Thermoelectric Cooler				
Maximum cooler capacity	° C	45	45	45
Current for maximum capacity	A	.75	.75	.75
Maximum current	A	1.2	1.2	1.2
Voltage for maximum current	V	1.2	1.2	1.2
Thermistor				
Resistance at T = 25° C	KΩ	9.8-10.2	9.8-10.2	9.8-10.2
Temperature coefficient	%/° C	-4.4	-4.4	-4.4

#### Notes:

\* Tracking error is the variation of the linear relationship between fiber-coupled power and monitor diode current over the specified operating temperature range.

#### Ordering Information

Part Number	Description
SCW 1301X-050XX	Laser, 1310nm, 50uW, 14-pin DIP, TEC, 9/125/900 μm pigtail
SCW 1301X-100XX	Laser, 1310nm, 1000 uW, 14-pin DIP, TEC, 9/125/900 μm pigtail
SCW 1301X-200XX	Laser, 1310nm, 2000 uW, 14-pin DIP, TEC< 9/125/900 μm pigtail

#### Note:

To indicate the thermistor pin assignment you require, substitute one of the following designations for the “X” in the above table:

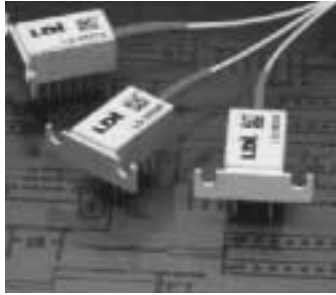
- Use F (floating thermistor) to indicate F Series pinout
- Use G (grounded thermistor) to indicate G series pinout

To indicate the pigtail connector termination you require, substitute one of the following designations for the “XX” in the above table:

- Use FC to indicate an FC/PC type connector
- Use LC to indicate an LC/PC type connector
- Use SC to indicate an SC/PC type connector
- Use ST to indicate an ST type connector
- For no connector, omit suffix

## Fiber Optic Products Catalog

### “NEW” 1550nm Laser Diode



#### Product Facts

- Power to 1 mW
- Singlemode 9/125/900 fiber
- 14-pin DIP
- MQW laser design
- High stability fiber coupling
- Hermetically sealed

#### Applications

- Telecommunications
- Test instrumentation

#### Specifications and Limits at 25 ° C

Spectral Characteristics		Power Options (uW)	
		500	1000
Wavelength range	nm	1520-1580	1520-1580
Spectral width, FWHM	nm	3	3
Drive Characteristics			
Threshold current (typ; max)	mA	20;40	20;40
Modulation current (typ;max)	mA	10;35	10;35
Forward voltage maximum	V	2	2
Maximum optical rise/fall time	ns	0.5	0.5
Monitor Diode			
Photocurrent at P <sub>MAX</sub> (min;max)	uA	50;1200	50;1200
Maximum dark current	nA	10	10
Maximum capacitance	pF	6	6
Maximum rise/fall time	ns	2.0	2.0
Maximum reverse voltage	V	10	10
Tracking error*	dB	±0.5	±0.5
Temperature Range			
Module operating temperature	° C	-20 to +70	-20 to +70
Storage temperature	° C	-40 to +85	-40 to +85
Thermoelectric Cooler			
Maximum ΔT	° C	45	45
Current for maximum capacity	A	.75	.75
Maximum current	A	1.2	1.2
Voltage for maximum current	V	1.2	1.2
Thermistor			
Resistance at T = 25° C	KΩ	9.8-10.2	9.8-10.2
Temperature coefficient	%/° C	-4.4	-4.4

#### Notes:

\* Tracking error is the variation of the linear relationship between fiber-coupled power and monitor diode current over the specified operating temperature range.

#### Ordering Information

Base Part Number:

SCW 1501 X-1436034-X

#### Ordering Information

Part Number	Description
SCW 1501X-050XX	Laser, 1550nm, 50uW, 14-pin DIP, TEC, 9/125/900 μm pigtail
SCW 1501X-100XX	Laser, 1550nm, 1000 uW, 14-pin DIP, TEC, 9/125/900 μm pigtail

#### Note:

To indicate the thermistor pin assignment you require, substitute one of the following designations for the “X” in the above table:

- Use F (floating thermistor) to indicate F Series pinout
- Use G (grounded thermistor) to indicate G series pinout

To indicate the pigtail connector termination you require, substitute one of the following designations for the “XX” in the above table:

- Use FC to indicate an FC/PC type connector
- Use LC to indicate an LC/PC type connector
- Use SC to indicate an SC/PC type connector

## Fiber Optic Products Catalog

### “NEW” 1300nm Edge-Emitting LED



#### Specifications and Limits at 25 ° C

Electro-Optical Characteristics	Unit	Min.	Typ.	Max.
Center wavelength	nm	1265	1300	1330
Spectral width	nm	-	70	-
Spectrum vs temperature coefficient	nm/° C	-	0.75	-
Spectral width vs temperature coefficient	nm/° C	-	0.3	-
Optical rise/fall time	ns	-	4.0	-
Forward current	mA	-	-	150
Output power	uW	-	-	-
Into 50-micron core, multimode fiber at 150 mA				
Option 1	-	40	-	-
Option 2	-	80	-	-
Into 9-micron core, singlemode fiber at 150 mA				
Option 1	-	4	-	-
Option 2	-	8	-	-
Average power decrease with increase in temperature*	%/° C	-	-1.5	-
Average power increase with decrease in temperature*	%/° C	-	5.0	-
<b>Absolute Maximum Ratings</b>				
Forward current	mA	-	-	200
Forward voltage	V	-	-	2.0
Soldering time at 260° C	sec	-	-	10

Note:

\* uncooled versions only

#### Product Facts

- High stability
- Fast rise time
- Singlemode and multimode pigtail
- Hermetic 14-pin DIL packages
- Thermoelectric cooler option
- Military-qualifiable package
- High reliability coupling

#### Applications

- Data and analog transmission systems

#### Packaged Diode Characteristics

	LDT 362	362NF	362E	60005	60005NF	60005E
Package style 1,2	LH	NF	LH	LD	NF	LH
Thermoelectric cooler	No	No	Yes	No	No	Yes
Pigtail	50/125	50/125	50/125	9/125	9/125	9/125
Operating temperature	-40 to +85	-40 to +85	-20 to +70	-40 to +85	-40 to +85	-20 to +70
Storage temperature	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85

Note:

Fibers have a 900 μm tight buffer jacket.  
Other fiber pigtails available upon request.

1. No flange (NF)
2. Long Horn (LH)

#### LDT362E and LDT60005E

	Typ.	Max.
<b>Thermoelectric Cooler</b>		
Cooler capacity	° C	45
Current for maximum capacity	A	.75
Maximum current	A	1.2
Voltage for maximum current	V	1.2
<b>Thermistor</b>		
Resistance at T = 25° C	KΩ	9.8-10.2
Temperature coefficient	%/° C	-4.4

#### Ordering Information

Base Part Number:  
LDT X-1436032-X

#### Order Information

Part Number	Description
LDT 362-040	LED, 1300nm, 40 uW, 14-pin DIP, flange, 50/125/900 μm pigtail
LDT 362-080	LED, 1300nm, 80 uW, 14-pin DIP, flange, 50/125/900 μm pigtail
LDT 362NF-040	LED, 1300nm, 40 uW, 14-pin DIP, no flange, 50/125/900 μm pigtail
LDT 362NF-080	LED, 1300nm, 80 uW, 14-pin DIP, no flange, 50/125/900 μm pigtail
LDT 362E-040	LED, 1300nm, 40 uW, 14-pin DIP, flange, TEC, 50/125/900 μm pigtail
LDT 362E-080	LED, 1300nm, 80 uW, 14-pin DIP, flange, TEC, 50/125/900 μm pigtail
LDT 60005-004	LED, 1300nm, 4 uW, 14-pin DIP, flange, 9/125/900 μm pigtail
LDT 60005-008	LED, 1300nm, 8 uW, 14-pin DIP, flange, 9/125/900 μm pigtail
LDT 60005NF-004	LED, 1300nm, 4 uW, 14-pin DIP, no flange, 9/125/900 μm pigtail
LDT 60005NF-008	LED, 1300nm, 8 uW, 14-pin DIP, no flange, 9/125/900 μm pigtail
LDT 60005E-004	LED, 1300nm, 4 uW, 14-pin DIP, flange, TEC, 9/125/900 μm pigtail
LDT 60005E-008	LED, 1300nm 8 uW, 14-pin DIP, flange, TEC, 9/125/900 μm pigtail

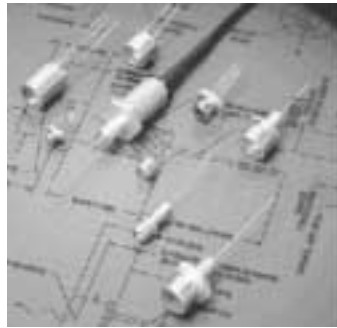
Industry standard connectors are available. Contact Tyco Electronics or your local Tyco Electronics Representative.

## Fiber Optic Products Catalog

### “NEW” High Power Pulsed Laser Diodes

#### Product Facts

- High reliability and long life
- High efficiency and low drive currents
- Stable output from -40° C to +80° C
- Single and stacked devices up to 140 Watts
- 850nm, 905nm, and 1550nm wavelengths
- Hermetic package
- Custom packaging available



Tyco Electronics' (LDI) CVD series lasers are strained layer quantum well devices fabricated by the MOCVD process. These pulsed lasers are available with up to 140W of peak power and either 850nm or 905nm. They offer a stable output power at between -40° C and +80° C.

#### Applications

- Rangefinding
- Ceilometers (Cloud Height Measurement)
- Weapons simulation
- Optical fuses
- Surveying equipment

#### CVD SERIES Characteristics at 25° C

Parameters	Symbol	Min	Typ	Max	Units
Peak Wavelength	$\lambda$				nm
CVD 60 / 160 Series		895	905	915	
CVD 90 / 190 Series		840	850	860	
Spectral Width	$\Delta\lambda$		5	12	nm
Rise Time - Lasers	$T_r$		1		ns
Pulse Width - 50% pts	$T_{pw}$		50	200	ns
Beam Spread	FWHM		10x30		degrees
Temperature Storage	$T_s$	-55		80	° C
Temperature Operating	$T_o$	-40		80	° C

#### Ordering Information

Base Part Number:  
X-1436068-X

#### CVD 905nm Series; Test Conditions: 50ns, 1Khz, 25° C

Parameters	CVD 40	CVD 60	CVD 62	CVD 65	CVD 67	CVD 68	CVD 163	CVD 165	CVD 166	CVD 167	Units
Peak Power	2.5	4	8	13	16	22	35	60	65	100	Watts
Number of Diodes	1	1	1	1	1	1	3	3	4	5	
Emitting Area <sup>1</sup>	1.6x0.8	3x.08	6x.08	10x.08	12x.08	15x.08	10x8	15x8	12x12	15x16	mils
Peak $I_f$	3	5	10	15	20	25	15	25	20	25	Amps
Duty Factor (max) <sup>2</sup>	0.1	0.1	0.1	0.1	0.1	0.1	0.08	0.04	0.04	0.04	%

Note:

1. Stack height typical
2. Heat sinking required

#### CVD 850nm Series; Test Conditions: 50ns, 1Khz, 25° C

Parameters	CVD 90	CVD 93	CVD 95	CVD 97	CVD 192	CVD 193	CVD 195	CVD 197	Units
Peak Power	5	10	15	25	25	40	60	100	Watts
Number of Diodes	1	1	1	1	3	3	3	5	
Emitting Area <sup>1</sup>	3x.08	6x.08	10x.08	15x.08	6x8	10x8	15x8	15x15	mils
Peak $I_f$	7	14	20	30	14	20	30	30	Amps
Duty Factor	0.1	0.1	0.1	0.1	0.08	0.08	0.04	0.04	%

Note:

1. Stack height typical
  2. Heat sinking required
- Fiber pigtailed versions of all lasers are available.  
Output is typically 50% of rated power.

(Contact Tyco Electronics or your local Tyco Electronics Representative.)

## Fiber Optic Products Catalog

### “NEW” High Power CW Laser Diodes

#### Product Facts

- 0.5 - 5 Watts
- High efficiency devices
- Multiple package options
- High reliability
- Long life



Tyco Electronics' (LDI) series of High Power CW products is offered with an output range from 0.5 Watt to 5.0 Watts. These devices have a standard wavelength of 808nm ±3nm with a spectral width of 2.5nm FWHM.

#### Applications

- Diode based medical systems
- Diode pumped solid state lasers
- Analytical equipment
- Illuminators
- Reprographics
- Laser initiated ordnance

#### Specification and Limits @ 25° C

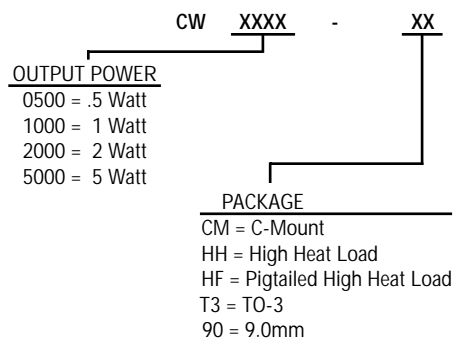
Common Characteristics	Unit	Min	Typ	Max
Peak wavelength	nm	-	808	-
Peak wavelength tolerance	nm	-	±3	-
Spectral width (50% points)	nm	-	2.5	-
Rise/fall times	ns	-	1.0	-
Far field beam divergence	deg	-	12x40	-
Efficiency at I <sub>f</sub>	%	-	40	-
Operating temperature	° C	-20	-	+30
Storage temperature	° C	-40	-	+85

#### Single Diode Lasers

Laser Characteristics	Power (watts)	Source Size (µm)	Typical I <sub>th</sub> (amps)	Max Current (amps)	Typical V <sub>f</sub> (volts)
CW 0500 Series	0.5	50	0.15	0.75	2.0
CW 1000 Series	1.0	100	0.3	1.5	2.0
CW 2000 Series	2.0	200	0.6	3.0	2.0
CW 5000 Series	5.0	460	1.3	6.5	2.0

#### Ordering Information

Base Part Number:  
CW X-1436009-X



OPTIONS

OO = None  
DO = Monitor Detector Only  
TO = TEC Only  
DT = TEC and Monitor Detector

#### Available Options

CM: OO  
90: OO, DO  
T3: OO, DO, TO, DT  
(T option up to 1W)  
HH: all options  
HF: all options

#### Laser Safety

**Personal Hazard:** Direct and prolonged exposure to a laser beam may cause eye damage. Observe precautions accompanying the product and precautions appropriate to a Class IV laser.

**Handling Precautions:** Products are subject to the risks normally associated with sensitive electronic devices including static discharge, transients, and overload.

Gallium arsenide lasers emit infrared radiation which is invisible to the human eye. When in use, safety precautions should be taken to avoid the possibility of eye damage. Wear certified eye protection.

## Fiber Optic Products Catalog

### “NEW” 1550nm Pulsed Diode Lasers

#### Product Facts

- Eye Safe
- High efficiency
- Stable output from -35° C to +65° C
- Single and stacked devices up to 40W
- Hermetic packages
- Custom packaging available

#### Applications

- Ranging
- Surveying equipment
- “Friend or Foe” identification



#### Ordering Information

Base Part Number:  
X-1436031-X

Parameters	Symbol	Min.	Typ.	Max.	Units
Peak Wavelength	$\lambda$	1535	1550	1565	nm
Spectral Width	$\Delta\lambda$		12		nm
Beam Spread	FWHM		15x50		Degrees
Operating Temperature	To	-35		+65	° C
Pulse Width	Pw			150	ns

Parameters	Symbol	LR35	LKR-2S-35	LKR-3S-35	LKR35L	Units
Peak Power (min)		10	20	30	40	Watts
Peak Forward Current	$I_f$	50	50	50	50	Amps
Threshold Current (typ)	$I_{th}$	3	3	3	3	Amps
Number of Diodes		1	2	3	4	
Emitting Area (typ)		350x2	350x110	350x220	350x330	Microns
Duty Factor*	DF	0.07	0.07	0.07	0.07	%

\*Heat sinking required.

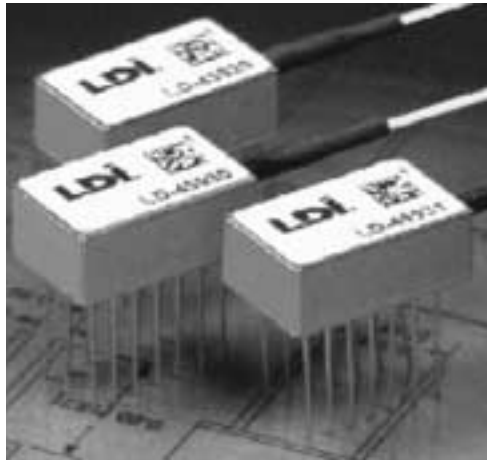
**Note:** Devices supplied case positive unless otherwise specified.

## Fiber Optic Products Catalog

### “NEW” Pulsed 850nm Instrument Laser Modules

#### Product Facts

- Optical output up to 1 Watt
- Hermetically sealed
- Low inductance
- Low power consumption
- 50 and 62.5μm fiber
- 14-PIN dual in-line package
- Connector options available



#### Ordering Information

Base Part Number:  
X-1436035-X

#### Typical Operating Conditions at 25° C

	Symbol	LP8M05-23-50	LP8M05-23-62	LP8M10-23-50	LP8M10-23-62	Units
Power (min)	Po	500	500	1000	1000	mW
Threshold Current (typ)	I <sub>th</sub>	0.8	0.75	0.8	0.75	A
Peak Forward Current (typ)*	I <sub>f</sub>	2.5	2.2	5.0	4.5	A
Peak Wavelength	λ	850±20	850±20	850±20	850±20	nm
Spectral Width (FWHM)	Δλ	10	10	10	10	nm
Pulse Width	T <sub>w</sub>	50	50	50	50	ns
Repetition Rate	PRR	10	10	10	10	KHz

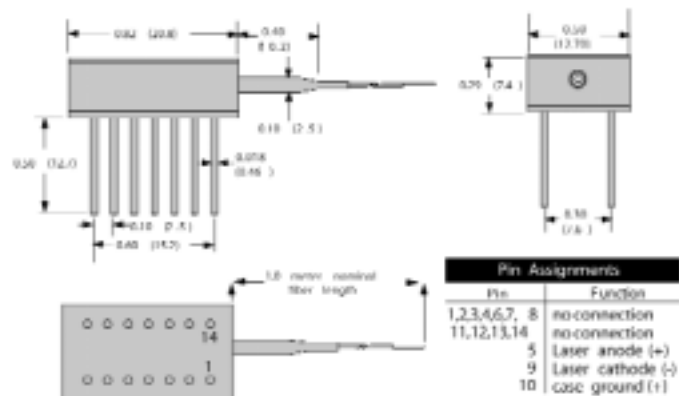
\* Lower drive current devices available on special order.  
-50 = 50μm core fiber  
-62 = 62.5μm core fiber

#### Maximum Ratings

Operation above absolute maximum ratings can cause damage to the device. Normal operation of the device should be per the operating conditions provided in the datasheet.

	Min.	Max.	Unit
Operating Temperature	-20	70	° C
Storage Temperature	-40	70	° C
Laser Forward Current		6	A
Laser Reverse Current		10	μA
Laser Reverse Voltage		0.5	V
Fiber Bend Radius		50	mm

#### Package Drawings



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**Attenuators**

**Singlemode  
Build Out Attenuators**

**Product Facts**

- A range of fixed attenuation values. Standard values of 1 through 20 and 25dB
- UPC and APC offer Excellent Return Loss
- FC, SC, ST, and D4 styles
- Attenuation is wavelength independent and polarization insensitive
- Low PDL
- Low modal noise
- Long term reliability
- Very low reflectance
- Excellent Price/Performance
- Vibration resistant
- Single and Dual Window
- Designed to comply with Telcordia GR-910

**Applications**

- Power leveling in DWDM transmission systems
- Test and Measurement
- Power attenuation at the receiver

**Available Collateral**

- Application Specification 114-13055
- Product Specification 108-2099
- Test reports qualifying product to Telcordia GR-910
- Customer Drawings

**Customizable Features**

- Attenuation tolerance
- Attenuation values in 1dB increments
- Labeling
- Kitting/Packaging
- Wavelength Dependent Loss
- Reflectance:
  - UPC to -55 dB max.
  - APC to -65 dB max.
- Pass Band



Tyco Electronics' high performance Build Out Attenuators utilize a unique all-fiber construction to absorb the optical signal.

By employing a Tyco Electronics' technology, the design minimizes

reflectance, attenuation tolerance, and PDL while maximizing reliability, environmental stability, and power handling. There are no filters, air gaps, or core mismatches.

**Specifications**

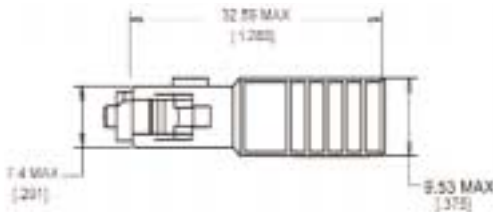
- Attenuation Values** - 1-20dB and 25 dB (Fixed)
- Reflectance** -  $\leq$  -55 and -60dB for UPC and APC polish, respectively
- Operating Temperature** - -40°C to +75°C
- Vibration Resistance** -  $<$  0.1 x attenuation

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**Attenuators** (Continued)

Singlemode  
SC Attenuators, Build Out  
Style, Fixed Value

SC/UPC



**Note:** Additional attenuation values available upon request.

Dual Window Attenuators

Operating Wavelength  
1310/1550nm ±25nm

Attenuation (dB)	Part Number
1	209943-1
2	209943-2
3	209943-3
4	209943-4
5	209943-5
6	209943-6
7	209943-7
8	209943-8
9	209943-9
10	1-209943-0
11	1-209943-1
12	1-209943-2
13	1-209943-3
14	1-209943-4
15	1-209943-5
16	1-209943-6
17	1-209943-7
18	1-209943-8
19	1-209943-9
20	2-209943-0
25	2-209943-5

**Note:** Attenuation Tolerance, Ambient  
 ≥ 5 dB: ± .10 x nominal  
 attenuation value  
 < 5 dB: ± 0.50 dB  
 Reflectance ≤ -55 dB

Bandpass Attenuators

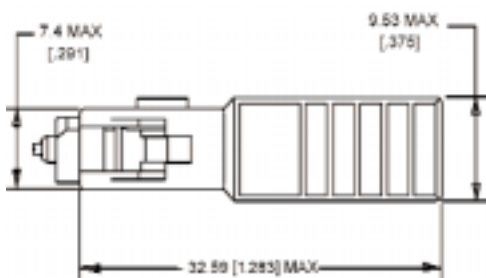
Operating Wavelength  
1260-1360 nm & 1430-1580nm

Attenuation (dB)	Part Number
1	209250-1
2	209250-2
3	209250-3
4	209250-4
5	209250-5
6	209250-6
7	209250-7
8	209250-8
9	209250-9
10	1-209250-0
11	1-209250-1
12	1-209250-2
13	1-209250-3
14	1-209250-4
15	1-209250-5
16	1-209250-6
17	1-209250-7
18	1-209250-8
19	1-209250-9
20	2-209250-0
25	2-209250-5

**Note:** Attenuation Tolerance, Ambient  
 ≥ 5 dB: ± .15 x nominal  
 attenuation value  
 < 5 dB: ± 0.75 dB  
 Reflectance ≤ -55 dB

Singlemode  
SC Attenuators, Build Out  
Style Fixed Value

SC/APC 8°



**Note:** Additional attenuation values available upon request.

\* 9° APC Available (417496-X)

Dual Window Attenuators

Operating Wavelength  
1310/1550nm ±25nm

Attenuation (dB)	Part Number
1	209597-1
2	209597-2
3	209597-3
4	209597-4
5	209597-5
6	209597-6
7	209597-7
8	209597-8
9	209597-9
10	1-209597-0
11	1-209597-1
12	1-209597-2
13	1-209597-3
14	1-209597-4
15	1-209597-5
16	1-209597-6
17	1-209597-7
18	1-209597-8
19	1-209597-9
20	2-209597-0
25	2-209597-5

**Note:** Attenuation Tolerance, Ambient  
 ≥ 5 dB: ± .10 x nominal  
 attenuation value  
 < 5 dB: ± 0.50 dB  
 Reflectance ≤ -60 dB

Bandpass Attenuators

Operating Wavelength  
1260-1360nm & 1430-1580nm

Attenuation (dB)	Part Number
1	417021-1
2	417021-2
3	417021-3
4	417021-4
5	417021-5
6	417021-6
7	417021-7
8	417021-8
9	417021-9
10	1-417021-0
11	1-417021-1
12	1-417021-2
13	1-417021-3
14	1-417021-4
15	1-417021-5
16	1-417021-6
17	1-417021-7
18	1-417021-8
19	1-417021-9
20	2-417021-0
25	2-417021-5

**Note:** Attenuation Tolerance, Ambient  
 ≥ 5 dB: ± .15 x nominal  
 attenuation value  
 < 5 dB: ± 0.75 dB  
 Reflectance ≤ -60 dB

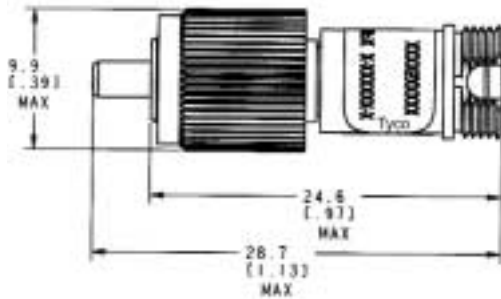


Fiber Optic Products Catalog

**Attenuators** (Continued)

Singlemode  
FC Attenuators, Build Out  
Style, Fixed Value

FC/UPC



**Note:** Additional attenuation values available upon request.

Dual Window Attenuators  
Operating Wavelength  
1310/1550nm ±25nm

Attenuation (dB)	Part Number
1	209948-1
2	209948-2
3	209948-3
4	209948-4
5	209948-5
6	209948-6
7	209948-7
8	209948-8
9	209948-9
10	1-209948-0
11	1-209948-1
12	1-209948-2
13	1-209948-3
14	1-209948-4
15	1-209948-5
16	1-209948-6
17	1-209948-7
18	1-209948-8
19	1-209948-9
20	2-209948-0
25	2-209948-5

**Note:** Attenuation Tolerance, Ambient  
 ≥ 5 dB: ± .10 x nominal  
 attenuation value  
 < 5 dB: ± 0.50 dB  
 Reflectance ≤ -55 dB

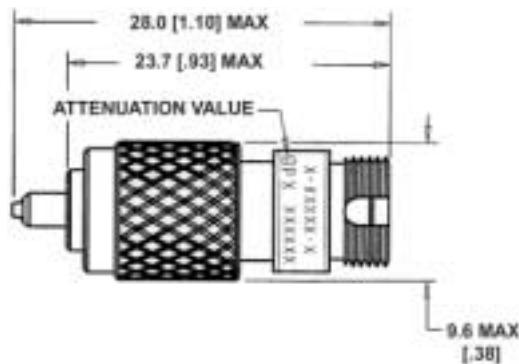
Bandpass Attenuators  
Operating Wavelength  
1260-1360nm & 1430-1580nm

Attenuation (dB)	Part Number
1	209285-1
2	209285-2
3	209285-3
4	209285-4
5	209285-5
6	209285-6
7	209285-7
8	209285-8
9	209285-9
10	1-209285-0
11	1-209285-1
12	1-209285-2
13	1-209285-3
14	1-209285-4
15	1-209285-5
16	1-209285-6
17	1-209285-7
18	1-209285-8
19	1-209285-9
20	2-209285-0
25	2-209285-5

**Note:** Attenuation Tolerance, Ambient  
 ≥ 5 dB: ± .15 x nominal  
 attenuation value  
 < 5 dB: ± 0.75 dB  
 Reflectance ≤ -55 dB

Singlemode  
FC Attenuators, Build Out  
Style, Fixed Value

FC/APC (8°)



**Note:** Additional attenuation values available upon request.

Dual Window Attenuators  
Operating Wavelength  
1310/1550nm ±25nm

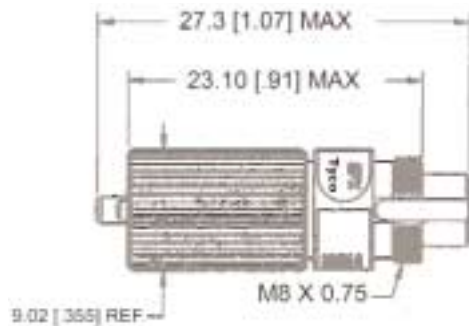
Attenuation (dB)	Part Number
1	209845-1
2	209845-2
3	209845-3
4	209845-4
5	209845-5
6	209845-6
7	209845-7
8	209845-8
9	209845-9
10	1-209845-0
11	1-209845-1
12	1-209845-2
13	1-209845-3
14	1-209845-4
15	1-209845-5
16	1-209845-6
17	1-209845-7
18	1-209845-8
19	1-209845-9
20	2-209845-0
25	2-209845-5

**Note:** Attenuation Tolerance, Ambient  
 ≥ 5 dB: ± .10 x nominal  
 attenuation value  
 < 5 dB: ± 0.50 dB

**Attenuators** (Continued)

Singlemode  
D4 Attenuators, Build Out  
Style, Fixed Value

D4/PC



**Note:** Additional attenuation values available upon request.

Dual Window Attenuators

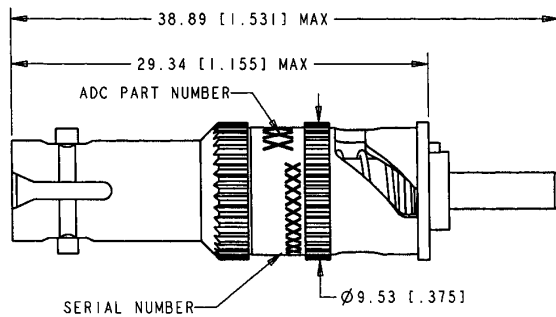
Operating Wavelength  
1310/1550nm ±25nm

Attenuation (dB)	Part Number
5	209570-5
10	1-209570-0
15	1-209570-5
20	2-209570-0

**Note:** Attenuation Tolerance, Ambient  
≥ 5 dB: ± .15 x nominal  
attenuation value  
< 5 dB: ± 0.75 dB  
Reflectance ≤ -45 dB

Singlemode  
ST Attenuators, Build Out  
Style, Fixed Value

ST/UPC



Dual Window Attenuators

Operating Wavelength  
1310/1550nm ±25nm

Attenuation (dB)	Part Number
1	417549-1
2	417549-2
3	417549-3
4	417549-4
5	417549-5
6	417549-6
7	417549-7
8	417549-8
9	417549-9
10	1-417549-0
11	1-417549-1
12	1-417549-2
13	1-417549-3
14	1-417549-4
15	1-417549-5
16	1-417549-6
17	1-417549-7
18	1-417549-8
19	1-417549-9
20	2-417549-0
25	2-417549-5

**Note:** Attenuation Tolerance, Ambient  
≥ 5 dB: ± .15 x nominal  
attenuation value  
< 5 dB: ± 0.75 dB

Bandpass Attenuators

Operating Wavelength  
1260-1360nm & 1430-1580nm

Attenuation (dB)	Part Number
1	417399-1
2	417399-2
3	417399-3
4	417399-4
5	417399-5
6	417399-6
7	417399-7
8	417399-8
9	417399-9
10	1-417399-0
11	1-417399-1
12	1-417399-2
13	1-417399-3
14	1-417399-4
15	1-417399-5
16	1-417399-6
17	1-417399-7
18	1-417399-8
19	1-417399-9
20	2-417399-0
25	2-417399-5

**Note:** Attenuation Tolerance, Ambient  
≥ 5 dB: ± .15 x nominal  
attenuation value  
< 5 dB: ± 0.75 dB

**Attenuators** (Continued)

**In Line Attenuators**

**Product Facts**

- A range of fixed attenuation values. Standard values of 1 through 20, and 25 dB
- UPC and APC offer Excellent Return Loss
- Attenuation is wavelength independent and polarization insensitive
- Low PDL
- Low modal noise
- Long term reliability
- $\leq -60\text{dB}$  Reflectance (unconnectorized)
- Low cost
- Vibration resistant
- Single and Dual Window
- Designed to comply with Telcordia GR-910

**Applications**

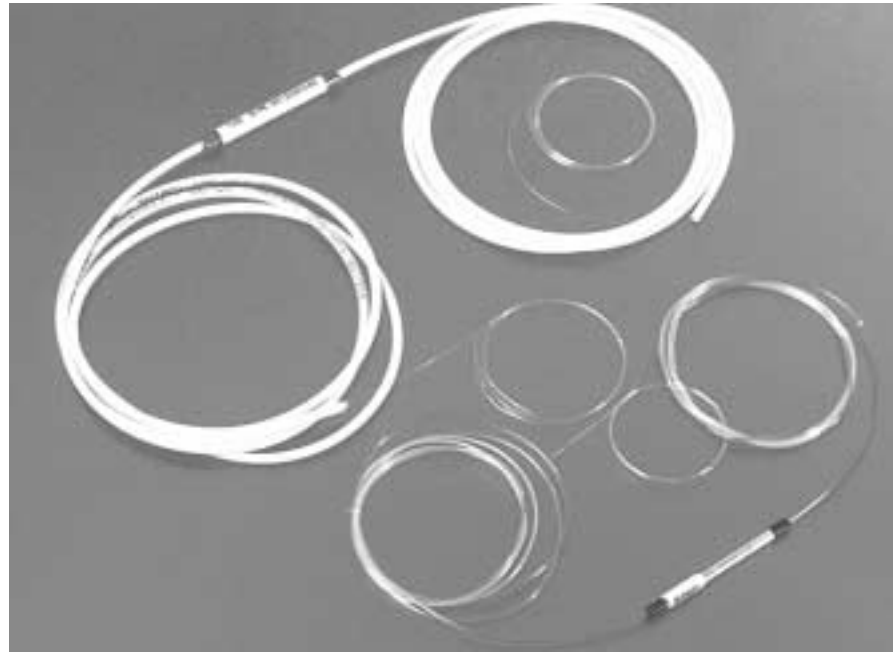
- Power leveling in DWDM transmission systems
- Test and Measurement
- Power attenuation at the receiver

**Available Collateral**

- Product Specification
  - 108-2103 Heavy Duty 3mm cable
  - 108-2130 Medium Duty 900 $\mu\text{m}$  cable
- Product designed to meet Telcordia GR-910
- Customer Drawings

**Customizable Features**

- Lead lengths
- Connectorized types, including SC, FC, ST, LC, and MU
- LC and MU available in Medium Duty (900  $\mu\text{m}$  cable) only
- Available in Heavy Duty (3mm cable) and Medium Duty (900  $\mu\text{m}$  cable)



Tyco Electronics' High Performance In Line Attenuators utilize a unique all fiber construction to absorb the optical signal.

By employing a Tyco Electronics' technology,

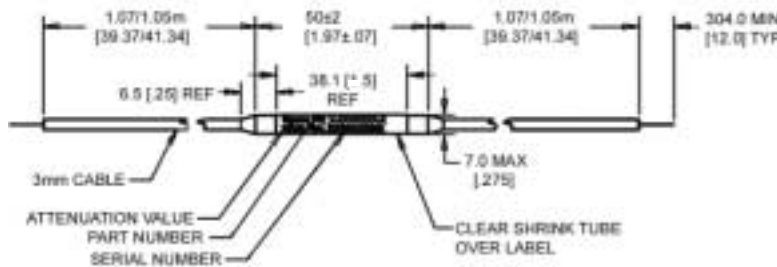
the design minimizes reflectance, attenuation tolerance, and PDL while maximizing reliability, environmental stability, and power handling. There are no filters, air gaps, or core mismatches.

**Specifications**

- Attenuation Values** - 1-20dB and 25 dB (Fixed)
- Reflectance** -  $\leq -55$  and  $-60\text{dB}$  for UPC and APC polish, respectively
- Operating Temperature** -  $-40^{\circ}\text{C}$  to  $+75^{\circ}\text{C}$
- Vibration Resistance** -  $< 0.1 \times$  attenuation

**Attenuators** (Continued)

Singlemode  
In Line Attenuators,  
Heavy Duty (3mm cable),  
Fixed Value



Connector Type	Base Number	Reflectance
SC - SC	1588517	≤ -55 dB
FC - FC	1431254	≤ -55 dB
None	417277	≤ -60 dB

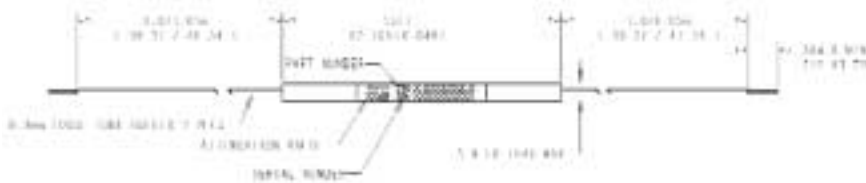
Dual Window In Line Attenuators  
Operating Wavelength  
1310/1550nm ±25nm

Attenuation (dB)	Part Number
1	Base Number -1
2	Base Number -2
3	Base Number -3
4	Base Number -4
5	Base Number -5
6	Base Number -6
7	Base Number -7
8	Base Number -8
9	Base Number -9
10	1- Base Number -0
11	1- Base Number -1
12	1- Base Number -2
13	1- Base Number -3
14	1- Base Number -4
15	1- Base Number -5
16	1- Base Number -6
17	1- Base Number -7
18	1- Base Number -8
19	1- Base Number -9
20	2- Base Number -0
25	2- Base Number -5

**Note:** Attenuation Tolerance, Ambient  
≥ 5 dB: ± .10 x nominal  
attenuation value  
< 5 dB: ± 0.50 dB

Attenuators, WDMs, and Switches

Singlemode  
In Line Attenuators,  
Medium Duty (900 μm  
cable), Fixed Value



Connector Type	Base Number	Reflectance
SC - SC	1588566	≤ -55 dB
FC - FC	1588565	≤ -55 dB
LC - LC	1588564	≤ -50 dB
MU - MU	1588451	≤ -50 dB
None	1321273	≤ -60 dB

Dual Window In Line Attenuators  
Operating Wavelength  
1310/1550nm ±25nm

Attenuation (dB)	Part Number
1	Base Number -1
2	Base Number -2
3	Base Number -3
4	Base Number -4
5	Base Number -5
6	Base Number -6
7	Base Number -7
8	Base Number -8
9	Base Number -9
10	1- Base Number -0
11	1- Base Number -1
12	1- Base Number -2
13	1- Base Number -3
14	1- Base Number -4
15	1- Base Number -5
16	1- Base Number -6
17	1- Base Number -7
18	1- Base Number -8
19	1- Base Number -9
20	2- Base Number -0
25	2- Base Number -5

**Note:** Attenuation Tolerance, Ambient  
≥ 5 dB: ± .10 x nominal  
attenuation value  
< 5 dB: ± 0.50 dB

**Wavelength Division Multiplexer and Demultiplexer Products**

**Singlemode and Multimode Lensed WDM's**

**Features**

- High isolation
- Wide bandpass
- Excellent reflectance
- Small footprint

**Applications**

- Two-way, single-fiber video links
- Instrumentation

**Available Collateral**

- Application Note 114-13057
- Customer Drawings

**Customizable Features**

- Lead Lengths
- Connector Type
- Labels
- Optical Specifications



Tyco Electronics' Multiplexers allow use of a single fiber for simultaneous transmission of two signals of different wavelengths.

Tyco Electronics' Demultiplexers separate the combined wavelengths from the single fiber into individual fibers. The universal MUX/DEMUX's are available for multimode as well as singlemode applications.

Through the use of high-quality dichroic coatings, which act as bandpass filters, numerous wavelength combinations from 400-1600 nm can be accommodated.

Unlike the narrow bandpass of fused multiplexers, the minimum bandpass of these devices around the central wavelength is  $\pm 50$  nm. This feature makes these multiplexers ideal for use in broadband communications applications.

These devices are unique in that their optical performance is independent of polarization effects of the light source.

The 7/16 inch [11.9 mm] thick encapsulated devices with monolithic lens structures tolerate vibration and shock; their low profile permits easy printed circuit board mounting.

**Specifications –Multimode**

**Insertion Loss (per FOTP-34, Method A2) -**

Typical	Maximum
0.9 dB	1.3 dB

**Directivity (50/125, 62.5/125 only) -**

Typical: >55 dB
Minimum: >45 dB

**Wavelength Bandpass (nm) -**

Typical: 120 nm
Minimum: 100 nm

**Return Loss (Reflectance) -**

Port 1	$\leq -13$ dB
Port 2	$\leq -15$ dB
Port 3	$\leq -35$ dB

Without connectors

**Isolation -**

35 dB Minimum (Typical 42 dB)

**Fiber Types** -50/125 and 62.5/125

**Specifications –Singlemode**

**Insertion Loss (per FOTP-180) -**

Typical	Maximum
0.9 dB	1.3 dB

**Directivity -**

Typical: >65 dB
Minimum: >55 dB

**Wavelength Bandpass (nm) -**

Typical: 120 nm
Minimum: 100 nm

**Return Loss (Reflectance) -**

Port 1	$\leq -40$ dB
Port 2	$\leq -55$ dB
Port 3	$\leq -55$ dB

Without connectors

**Isolation -**

35 dB Minimum (Typical 42 dB)

**Polarization Sensitivity** -<0.1 dB

**Fiber Types** - (Corning SMF-28)

**Temperature**

**Multimode -**

-40°C to +65°C (Operating)
-40°C to +75°C (Storage)

**Singlemode -**

-20°C to +60°C (Operating)
-20°C to +60°C (Storage)

**Weight** -1.5 oz. [42 grams]

**Pigtail** -0.5 meter, [3mm] OD cable, 900  $\mu$ m OD cable.

Terminations and connectors available on request.

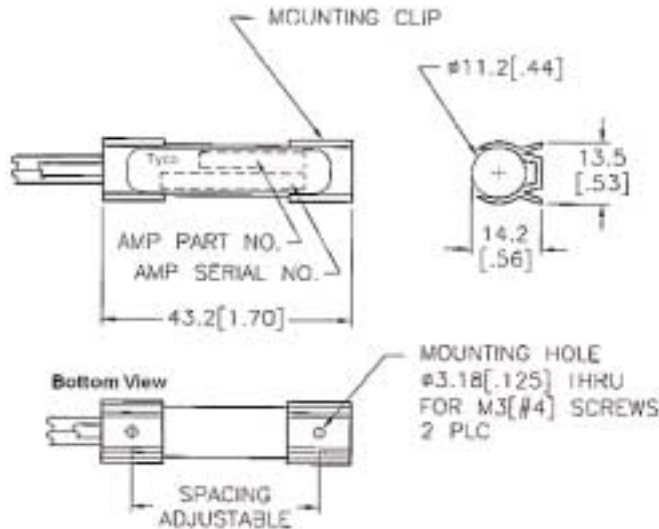
**Wavelength Division Multiplexer and Demultiplexer Products** (Continued)

**Singlemode and Multimode Lensed WDM's** (Continued)

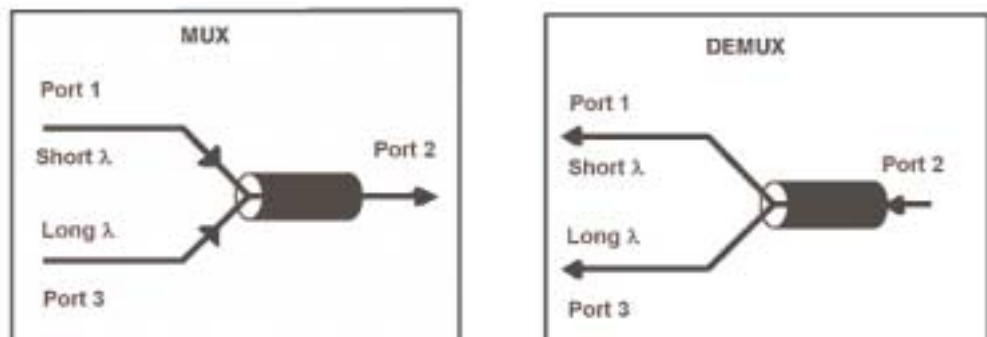
**Part Numbers**

Fiber	.5m Cable Length	Connector	850/1310 nm	1310/1550 nm
			DEMUX Optimized	Useable as MUX Also
50/125 Multimode	3mm	ST	99102-2	99105-2
	3mm	None	99108-1	—
	900 μm	ST	9-99102-2	—
	900 μm	None	9-99108-1	9-99111-1
62.5/125 Multimode	3mm	ST	99102-3	99105-3
	3mm	None	99108-2	—
	900 μm	ST	9-99102-3	9-99105-3
	900 μm	None	9-99108-2	9-99111-2
Singlemode	3mm	FC/APC	—	99717-4
	3mm	None	—	99717-5
	3mm	FC/UPC	—	99717-6
	3mm	ST/UPC	—	99717-7
	3mm	SC/UPC	—	99717-8
	900 μm	FC/APC	—	9-99717-4
	900 μm	None	—	9-99717-5
	900 μm	FC/UPC	—	9-99717-6
	900 μm	ST/UPC	—	9-99717-7
	900 μm	SC/UPC	—	9-99717-8

**Note:** Mux specific versions available when higher return loss required. Contact your local Tyco Electronics Sales Office.



**Application**



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For drawings, technical data or samples, contact your Tyco Electronics sales engineer, call 1-800-522-6752, or visit our Website at: <http://www.amp.com/fiberoptics>. Specifications subject to change. Consult Tyco Electronics for latest specifications.

**Wavelength Division Multiplexer and Demultiplexer Products** (Continued)

**"Blue-Red" Band Pass Filters**

**Product Facts**

- Thin film filter technology
- Passes "blue" band (1529-1542nm) and reflects "red" band (1547-1560nm) (or vice versa)
- Custom channel bands available as well
- Low insertion loss
- Low PDL
- Good pass channel isolation
- Thermally stable package
- No epoxy in the optical path
- Tested to Bellcore 1209

**Applications**

- Optical Add-Drop Multiplexing
- Dual Band Fiber Amplifier
- System monitoring
- DWDM dual band channel upgrade

**Available Collateral**

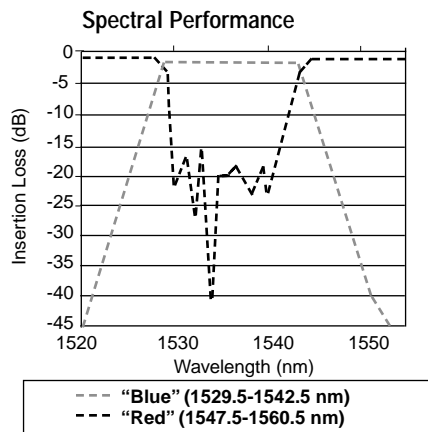
- Qualification Test Reports
- Customer Drawings

**Customizable Features**

- Optical Specifications
- Connector Termination
- Labels
- Custom Packaging (rack mount, card mount or stand alone)



Sample Light duty and heavy duty package.



**Specifications**

Operating Wavelength (nm)		1529.5-1542.5 & 1547.5-1560.5
Insertion Loss (dB)	Pass Channel	≤ 1.0
	Reflect Channel	≤ 1.0
Isolation (dB)	Pass Channel	>20
	Reflect Channel	>10
Ripple (dB)		≤ 0.35
PDL (dB)		≤ 0.1
Return Loss (dB)		≥ 55
Directivity (dB)		≥ 55
Thermal Stability (dB/ °C)		≤ 0.005
Maximum Operating Power (mW)		250
Tensile Load (N)		5
Operating Temperature ( °C)		-5 to 65
Storage Temperature ( °C)		-40 to 85

**Ordering Information**

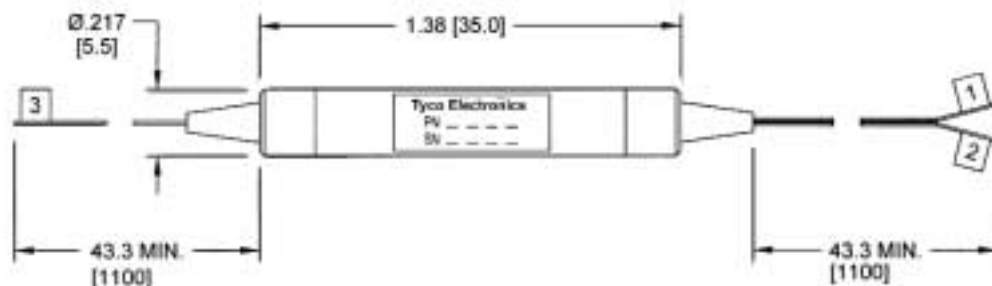
Part Number	Description	Fiber Jacket	Package Style	Connector Type
6-1321248-1	Blue Pass	250 mm pigtail	Light duty	FC UPC
6-1321248-9	Blue Pass	250 mm pigtail	Light duty	None
7-1321248-1	Red Pass	250 mm pigtail	Light duty	FC UPC
7-1321248-9	Red Pass	250 mm pigtail	Light duty	None

**Note:** Products are also available connectorized, to meet your specific needs. Please contact your local Tyco Electronics Sales Office for assistance.

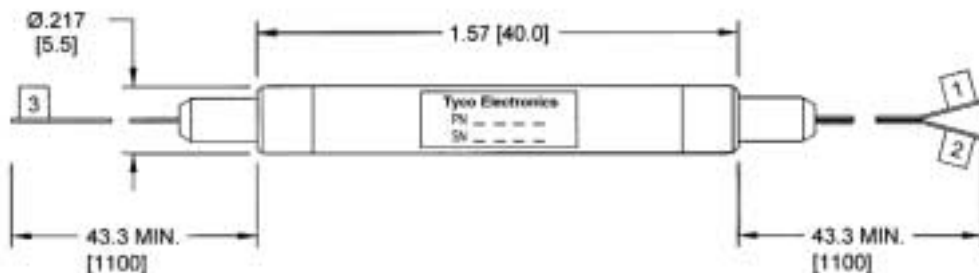
**Wavelength Division Multiplexer and Demultiplexer Products** (Continued)

Band Pass Filter Available  
Package Options

Port	1	Common
Port	2	Reflect
Port	3	Pass

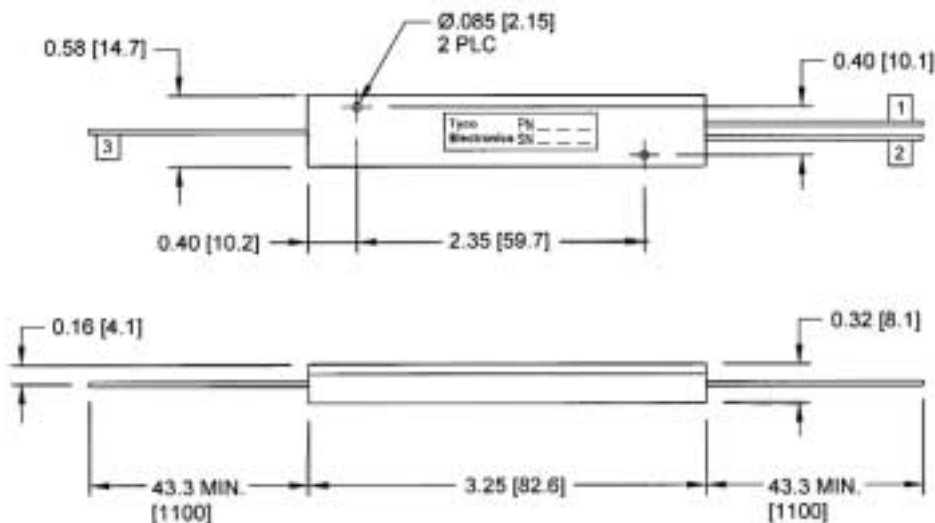


**FIG.1 - LIGHT DUTY PACKAGE, 250µm BUFFER PIGTAIL**



**FIG.2 - MEDIUM DUTY PACKAGE, 900µm LOOSE TUBE**

Please contact Your Local Tyco Electronics Sales Office.



**FIG.3 - HEAVY DUTY PACKAGE, 3.0mm JACKET**

Please contact Your Local Tyco Electronics Sales Office.

Dimensions on this page  
in inches over [mm]

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For drawings, technical data or samples, contact your Tyco Electronics sales engineer, call 1-800-522-6752, or visit our Website at: <http://www.amp.com/fiberoptics>. Specifications subject to change. Consult Tyco Electronics for latest specifications.

**Wavelength Division Multiplexer and Demultiplexer Module Products**

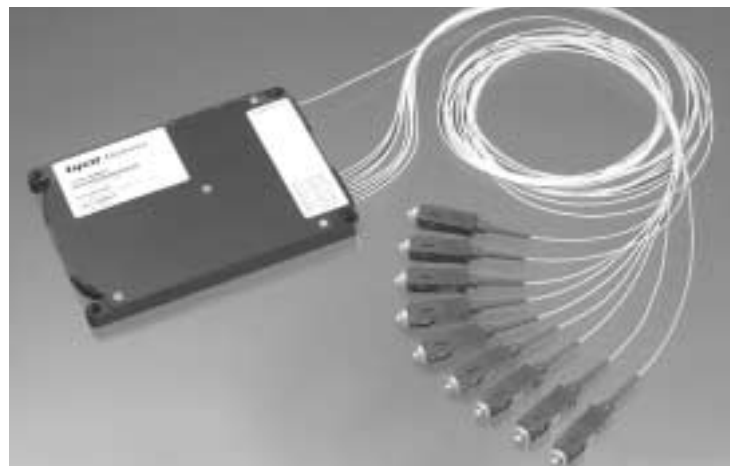
**WDM Products**

**Product Facts**

- Excellent optical performance by employing Thin Film Filter (TFF) Technology applied to 100, 200 GHz channel spacings and CWDM
- ITU channel grid –full range C-L Band: (100 GHz ITU wavelength 1529.55 to 1612.65 or C60 to L59)
- Available in 4 and 8 channel Mux or Demux (with or without upgrade ports) – in cassette, snap-in module (LGX style) and custom packaging
- Mux and Demux can be paired for optimum optical performance
- Low insertion loss
- Low PDL
- High channel isolation
- Thermally stable package
- No epoxy in the optical path
- Designed to meet to Bellcore 1209
- Customized wavelength channel spacings available
- Low loss upgrade versions employing band separators available

**Applications**

- Point to point systems – Long Haul Telco Transmission
- Terrestrial Systems
- DWDM Systems
- Broadband Networks
- Telecommunication (Local Exchange Carrier Networks)
- Multi-channel Add Dropping in Protection Ring
- Metro Networks
- Optical Cross Connect



**Customizable Features**

- Optical Specifications
- Connector Termination
- Labels
- Custom packaging (rack mount, card mount or stand alone)
- Configuration options for up to 64 channel systems available

**Datasheet Contents**

- 100 GHz DWDM Modules
- 200 GHz DWDM Modules
- CWDM Modules
- Definitions for DWDM Modules

**Packaging Options**

- Standard ITU Grid
- 64 Channel 200 GHz DWDM System Design Guide

**Available Collateral**

- Product Specifications: 108-2076 (Modules) 108-2075 (Add/Drops)
- Application Specification 114-13061 (Parameter Definitions)
- Customer Drawings
- See URL below



**Wavelength Division Multiplexer and Demultiplexer Module Products** (Continued)

4-Channel CWDM Specifications

Parameter	Mux	Demux
Channel Number	4	
Channel Wavelength	1510nm - 1570nm 1511nm - 1571nm	
Minimum Passband	CWL +/- 6.0 nm	
Typ. Insertion Loss (Without Connector)	2.0 dB	
Maximum Insertion Loss (Without Connector)	2.3 dB	
Maximum Passband Flatness	0.4 dB	
Maximum Channel Uniformity (@ Central Wavelength)	1.5 dB	
Minimum adjacent channels Isolation	N/A	25 dB
Minimum non-adjacent channels Isolation	N/A	40 dB
Minimum Directivity	60 dB	
Minimum Optical Return Loss	45 dB	
Maximum Polarization Dependent Loss	0.1 dB	
Maximum Polarization Mode Dispersion	0.1 ps	
Maximum Thermal Stability	0.005 dB/°C	
Maximum Optical Power	300 mW	
Maximum Tensile Load	5N	
Operating Temperature	0°C to + 65°C	
Storage Temperature	-40°C to 85°C	
Package Dimension	S: 120mm (L) X 80mm (W) X 8mm (H)	



## Fiber Optic Products Catalog

## Wavelength Division Multiplexer and Demultiplexer Module Products (Continued)

 100 GHz DWDM Module Specifications  
 (Performance value stated unconnectorized)

		4 Channel			8 Channel		
		Standard	Low Upgrade Loss	Low UG + SUP	Standard	Low Upgrade Loss	Low UG + SUP
Channel Spacing	[GHz]	100					
Passband	[nm] min	0.2					
Insertion Loss	[dB] max Mux or Demux	2.8	4	4	4.8	4.5	4.5
	Upgrade (UG)	2.8	1	1.5	4.8	1.5	2
	Supervisory (SUP)	N/A	N/A	2.5	N/A	N/A	2.8
Adjacent Channel Crosstalk	[dB]-min Mux	10					
	Demux	25					
Passband Ripple	[dB] max	0.5					
Return Loss	[dB] min	40					
Directivity	[dB] min	50					
PDL	[dB] max	0.2	0.3		0.2	0.3	
Wavelength Temperature Sensitivity	[nm/deg C] max	0.001					
Max Optical Power	[mW]	250					
Storage Temp	[deg C]	-40 to +85° C					
Operating Temp	[deg C]	-10 to +65° C					

\* Please contact your local Tyco Electronics Sales Office for additional information.

 200 GHz DWDM Module Specifications  
 (Performance value stated unconnectorized)

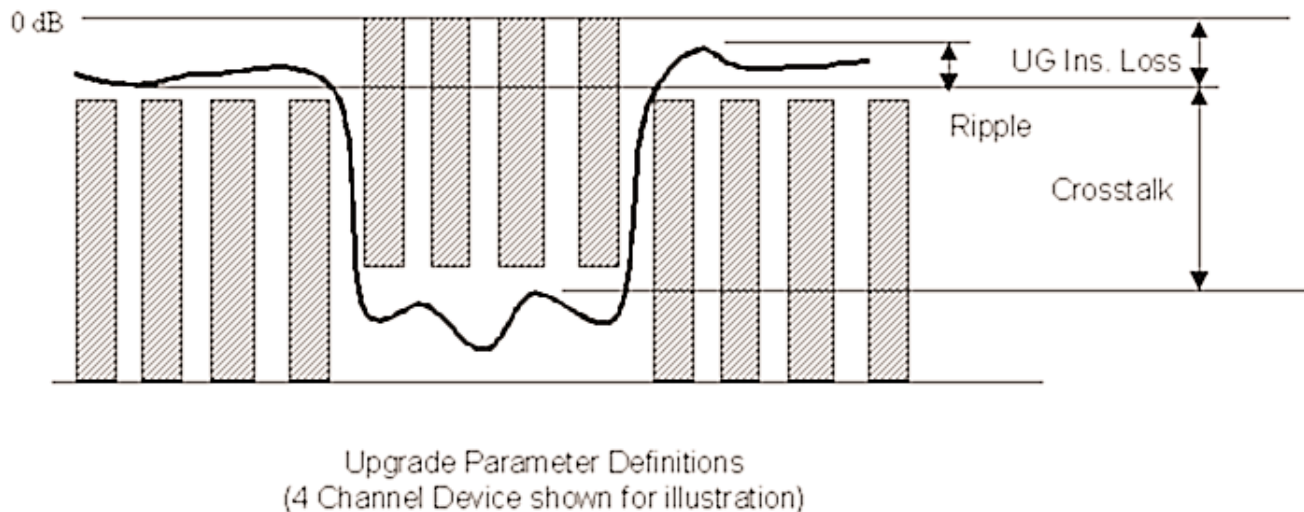
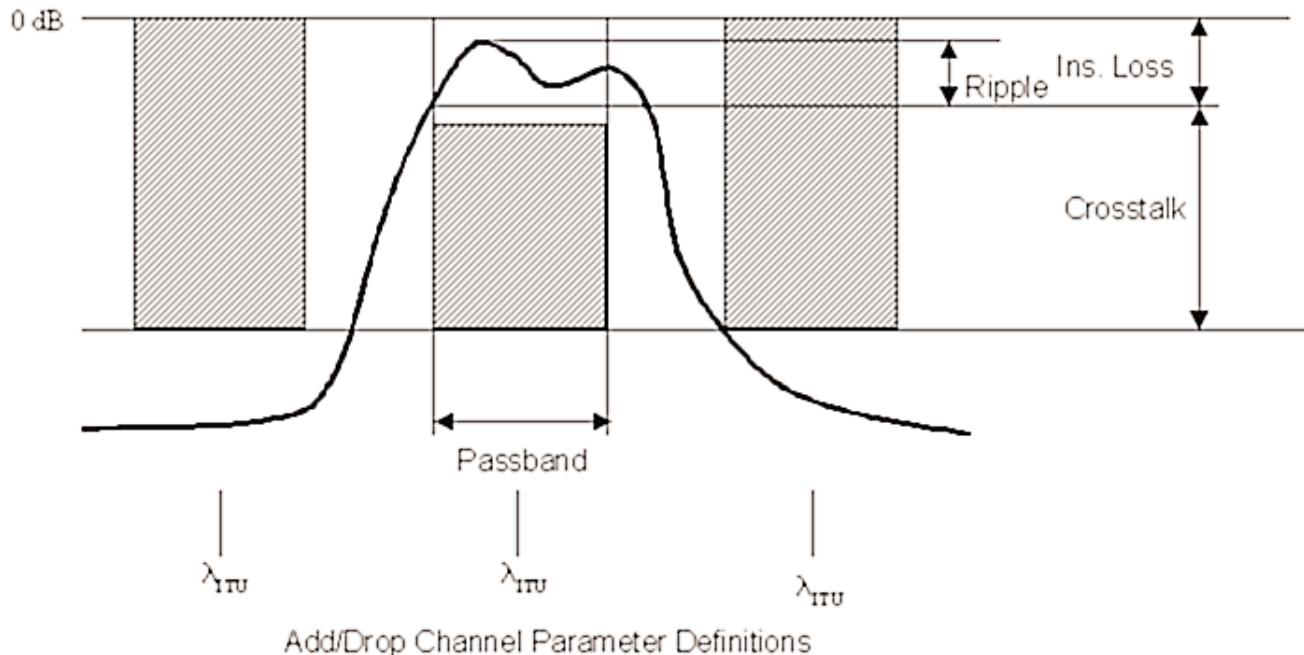
		4 Channel				8 Channel			
		Standard	Premium	Low Upgrade Loss	Low UG + SUP	Standard	Premium	Low Upgrade Loss	Low UG + SUP
Channel Spacing	[GHz]	200							
Passband	[nm] min	0.5							
Insertion Loss	[dB] max Mux or Demux	2.7	2.5	3.5	3.5	4.7	4.5	4	4
	Upgrade	2.5	2.2	1	1.5	4.7	4.5	1.5	2
	Supervisory	N/A	N/A	N/A	2	N/A	N/A	N/A	2.5
Adjacent Channel Isolation	[dB]-min Mux	12	15	12		12	15	12	
	Demux	25	28	28	28	25	28	28	28
Passband Ripple	[dB] max	0.5							
Return Loss	[dB] min	45							
Directivity	[dB] min	55							
PDL	[dB] max	0.1	0.2			0.2			
Wavelength Temperature Sensitivity	[nm/deg C] max	0.0025							
Max Optical Power	[mW]	250							
Storage Temperature	[deg C]	-40 to +80° C							
Operating Temperature	[deg C]	0 to +65° C							

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**Wavelength Division Multiplexer and Demultiplexer Module Products** (Continued)

Specification Parameters  
for DWDM Modules



**Note:** See Application Specification 114-13061 for detailed parameter definition For both individual Add/Drops and DWDM Modules.



**Wavelength Division Multiplexer and Demultiplexer Module Products** (Continued)

Standard ITU Grid

This table defines the channel number in terms of both frequency and wavelength currently available from Tyco Electronics.

Ch	THz	nm	Ch	THz	nm	Ch	THz	nm
C60	196	1529.55	C25	192.5	1557.36	L90	189	1586.20
C59	195.9	1530.33	C24	192.4	1558.17	L89	188.9	1587.04
C58	195.8	1531.12	C23	192.3	1558.98	L88	188.8	1587.88
C57	195.7	1531.90	C22	192.2	1559.79	L87	188.7	1588.73
C56	195.6	1532.68	C21	192.1	1560.61	L86	188.6	1589.57
C55	195.5	1533.47	C20	192	1561.42	L85	188.5	1590.41
C54	195.4	1534.25	C19	191.9	1562.23	L84	188.4	1591.26
C53	195.3	1535.04	C18	191.8	1563.05	L83	188.3	1592.10
C52	195.2	1535.82	C17	191.7	1563.86	L82	188.2	1592.95
C51	195.1	1536.61	C16	191.6	1564.68	L81	188.1	1593.79
C50	195	1537.40	C15	191.5	1565.50	L80	188	1594.64
C49	194.9	1538.19	C14	191.4	1566.31	L79	187.9	1595.49
C48	194.8	1538.98	C13	191.3	1567.13	L78	187.8	1596.34
C47	194.7	1539.77	C12	191.2	1567.95	L77	187.7	1597.19
C46	194.6	1540.56	C11	191.1	1568.77	L76	187.6	1598.04
C45	194.5	1541.35	C10	191	1569.59	L75	187.5	1598.89
C44	194.4	1542.14	C09	190.9	1570.42	L74	187.4	1599.75
C43	194.3	1542.94	C08	190.8	1571.24	L73	187.3	1600.60
C42	194.2	1543.73	C07	190.7	1572.06	L72	187.2	1601.46
C41	194.1	1544.53	C06	190.6	1572.89	L71	187.1	1602.31
C40	194	1545.32	C05	190.5	1573.71	L70	187	1603.17
C39	193.9	1546.12	C04	190.4	1574.54	L69	186.9	1604.03
C38	193.8	1546.92	C03	190.3	1575.37	L68	186.8	1604.88
C37	193.7	1547.72	C02	190.2	1576.20	L67	186.7	1605.74
C36	193.6	1548.51	C01	190.1	1577.03	L66	186.6	1606.60
C35	193.5	1549.32	C00	190	1577.86	L65	186.5	1607.47
C34	193.4	1550.12	L99	189.9	1578.69	L64	186.4	1608.33
C33	193.3	1550.92	L98	189.8	1579.52	L63	186.3	1609.19
C32	193.2	1551.72	L97	189.7	1580.35	L62	186.2	1610.06
C31	193.1	1552.52	L96	189.6	1581.18	L61	186.1	1610.92
C30	193	1553.33	L95	189.5	1582.02	L60	186	1611.79
C29	192.9	1554.13	L94	189.4	1582.85	L59	185.9	1612.65
C28	192.8	1554.94	L93	189.3	1583.69			
C27	192.7	1555.75	L92	189.2	1584.53			
C26	192.6	1556.55	L91	189.1	1585.36			

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**Switches**

Multimode  
1 x 2 SPDT Switch  
Dual 1 x 2 DPDT Switch  
2 x 2 Bypass Switch

**Product Facts**

- Low profile
- Utilizes pivoting mirror
- Wide wavelength range
- Low insertion loss
- Excellent repeatability
- Environmentally stable
- Shock and vibration resistant
- Board or chassis mounting
- Optical & electrical leads exit from one end for easy cable routing



Tyco Electronics' Low Profile Fiber Optic Switches are miniature, board mountable devices that permit the switching of an optical signal from one fiber to another. Switching is accomplished by a slight pivoting motion of a spherical mirror which reflects the optical signal to the appropriate fiber. This patented imaging technology provides very low optical loss.

Tyco Electronics' Fiber Optic Switches can be terminated with any Tyco fiber optic connector, and they are

available in the following configurations, in standard and ruggedized versions:

- **1 x 2, AMP SPDT Switch**
- **Dual 1 x 2, AMP DPDT Switch**

Tyco Electronics' SPDT and DPDT Switches permit the transfer of optic signals from an input fiber to either of two output fibers. Switches are applied to the positive terminal. The switch reverts to its original state when power is removed.

- **2 x 2 AMP Bypass Switch (FDDI)**

Tyco Electronics' Bypass Switches provide bypass protection for fiber optic ring networks. They also provide bypass protection for fiber optic ring networks per IEEE 802.5 and ANSI FDDI standards.

A self-test path permits testing the node's transmitter against its receiver when the switch is in the bypass mode. This transmitter - receiver path is attenuated to prevent saturation of the receiver, while maintaining minimal light loss in the bypass path.

"NEW" Ruggedized Multimode Switches



**"NEW" Tyco Electronics Ruggedized multimode switches have a greater than 150G's resistance to shock!**



NEW "Ruggedized" switch solutions for harsh environments and latching options are available. Please consult your local Tyco Electronics Sales Office.

**Switches** (Continued)

Multimode  
 1 x 2 SPDT Switch  
 Dual 1 x 2 DPDT Switch  
 2 x 2 Bypass Switch (Continued)

<b>Specifications</b>		
	<b>1 x 2 and Dual 1 x 2</b>	<b>2 x 2 Fully Reversing Bypass</b>
Configuration		
Switching speed	5 milliseconds typical, 10 milliseconds maximum	5 milliseconds typical, 10 milliseconds maximum
Operating wavelength	750–1450 nanometers	750–1550 nanometers
Insertion loss at 1310nm	0.5 dB typical, 0.8 dB max. per FOTP-34 Method B (long launch)*	0.5 dB typical, 0.8 dB max. per FOTP-34 Method B (long launch)*
	0.8 dB typical, 1.1 dB max. per FOTP-34 Method A (short launch)*	0.8 dB typical, 1.1 dB max. per FOTP-34 Method A (short launch)*
		1-5 dB on loopback path
Crosstalk	–45 dB typical per FOTP-42	–45 dB typical per FOTP-42
Switch driver	5 V at 80mA max., 12 V option available	5 V at 80mA max., 12 V option available
Drop In/Drop Out	Drop In: 4.0 V minimum	Drop In: 4.0 V minimum
Voltage	Drop Out: 0.5 V minimum	Drop Out: 0.5 V minimum
Fiber types	Graded index 50/125, 62.5/125, 100/140 (others available upon request)	Graded index 50/125, 62.5/125, 100/140 (others available upon request)
Lead length	1 meter	1 meter
Temperature range	Operating –10°C to +65°C per FOTP-3, C2	Operating –10°C to +65°C per FOTP-3, C2
	Storage –30°C to +70°C per FOTP-3, C2	Storage –30°C to +70°C per FOTP-3, C2
Vibration tolerance	15 Gs on 3 axes per FOTP-11	15 Gs on 3 axes per FOTP-11
Physical shock	30 Gs on 3 axes per FOTP-14	30 Gs on 3 axes per FOTP-14
Connector styles	ST Style	ST Style
	(others available upon request)	(others available upon request)
Electrical interface	Bent pins for PCB soldering,	Bent pins for PCB soldering,
	straight pins for soldering,	or straight pins for soldering, or
	AMP modular connector	AMP modular connector
Durability	>1 million cycles	>1 million cycles
Weight (unconnectorized)	<1 oz.	<1 oz.

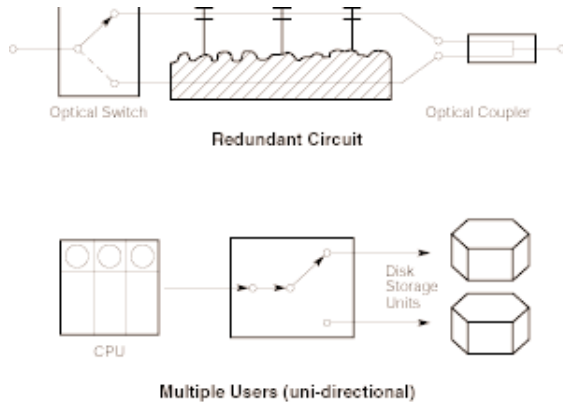
\*Note: FOTU-171 Method A1 for connectorized versions.

**Switches** (Continued)

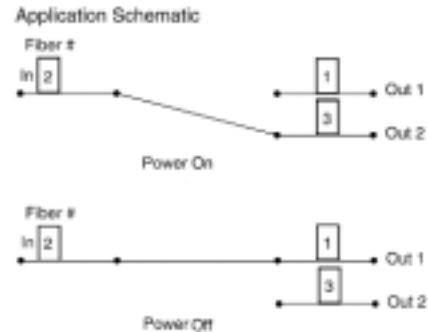
Multimode  
1 x 2 SPDT Switch  
Dual 1 x 2 DPDT Switch  
2 x 2 Bypass Switch (Continued)  
1 x 2 SPDT

**Application Information**

**Possible Application**

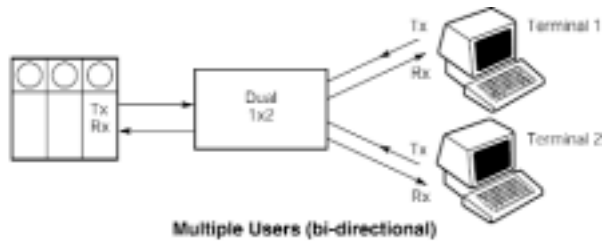


**Schematic**



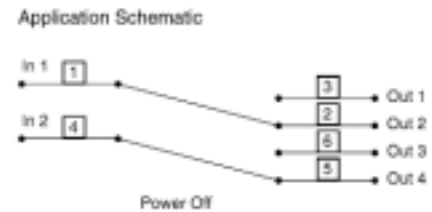
**Dual 1 x 2 DPDT**

**Possible Application**

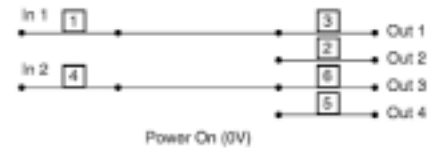


**Schematic**

**Position 1**

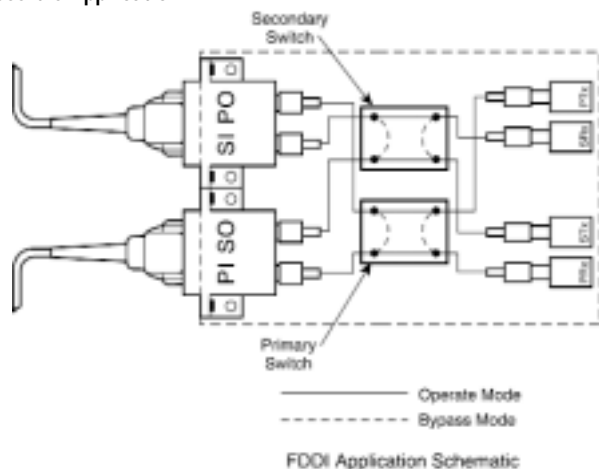


**Position 2**

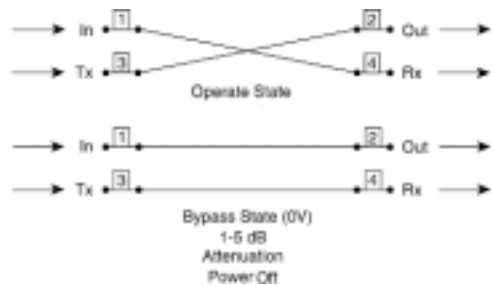


**2 X 2 Bypass Fully Reversing**

**Possible Application**



**Schematic**



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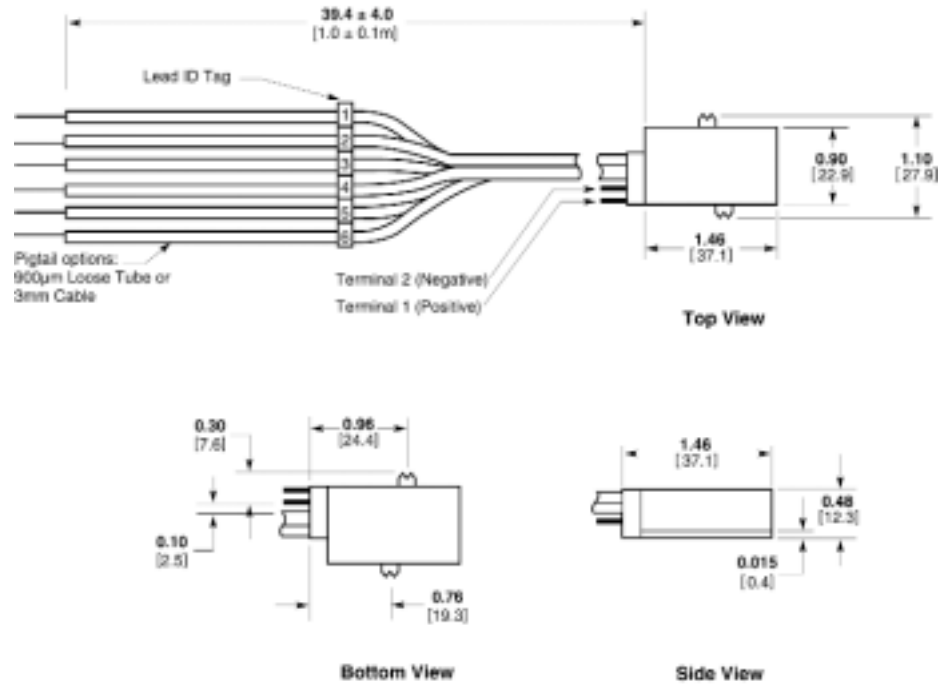
# Fiber Optic Products Catalog

## Switches (Continued)

Multimode  
1 x 2 SPDT Switch  
Dual 1 x 2 DPDT Switch  
2 x 2 Bypass Switch (Continued)

### Dimensions

Switch	Fiber Leads Used
1 x 2 SPDT	1,2,3
Dual 1 x 2 DPDT	1,2,3,4,5,6
2 x 2 Bypass	1,2,3,4



### Part Number Information

Switch Type:	Electrical Interface	Base Part Numbers		
		Fiber Connector	900 µm Loose Tube	3 mm Cable Jacket
1 x 2	Bent Pin	None	—	99403
		ST Style	99414	99415
		SC Style	—	8-99403
	Straight Pin	None	99420	99421
		ST Style	—	99427
		SC Style	8-99420	8-99421
Dual 1 x 2	Bent Pin	None	99973	99974
		ST Style	—	—
		SC Style	8-99973	8-99974
	Straight Pin	None	99979	—
		ST Style	99981	99982
		SC Style	8-99979	—
2 x 2 Bypass	Bent Pin	None	—	99415
		ST Style	99416	99417
		SC Style	—	8-99415
	Straight Pin	None	—	99423
		ST Style	—	99429
		SC Style	—	8-99423

Add the appropriate "dash numbers" below to the base part number above:

Fiber Type:	50/125	62.5/125	100/140
	-1	-2	-3

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in inches over [mm]

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**Switches** (Continued)

**Multimode  
FDDI Bypass Switches**

**Product Facts**

- Increases reliability of mission-critical network applications
- Meets or exceeds all ANSI standards
- Low insertion loss – 1.1 dB typical, including connectors
- Meets ANSI FDDI power output specification of -20 dBm
- Choice of 62.5/125  $\mu$ m, 50/125  $\mu$ m
- Choice of FSD MIC, ST-style, or duplex SC connectors and ports
- Rack or panel-mount versions
- Compact size with all front-mounted connections to conserve space
- High-speed optical switching
- Simple to install



Tyco Electronics' FDDI Bypass Switch is a second-generation device that allows a dual-attach station to be bypassed without loss of ring integrity. The switch module contains two fully reversing optical bypass switches that direct the optical signals to the appropriate fiber according to signals on the device's electrical interface.

A spherical mirror, which is pivoted at high speeds between two stable positions, reflects light into specific fibers in either the operate or bypass state.

Signal attenuation is very low on the network path. In the bypass state, the path from transmitter to receiver is attenuated to prevent receiver saturation. Holding the switches in the operating (non-bypass) state requires a 5-Vdc, 160-mA power. Both switches return to the bypass state if the power is removed. Switching occurs in less than 10 ms.

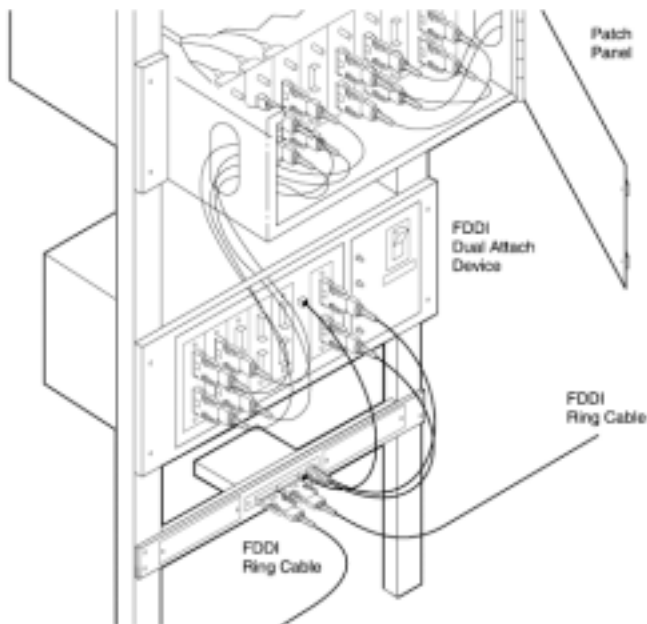
The modules are easy to install between a dual-attached station and the ring. Pigtailed optical-fiber cables connect the switch module to the node, while

the primary and secondary ring cables connect to the switch's A and B ports. The electrical connection is supplied by one of seven standard electrical interfaces. A status LED lights when the switch is in the operate state. The FDDI bypass switch can be either booth panel or rack mounted.

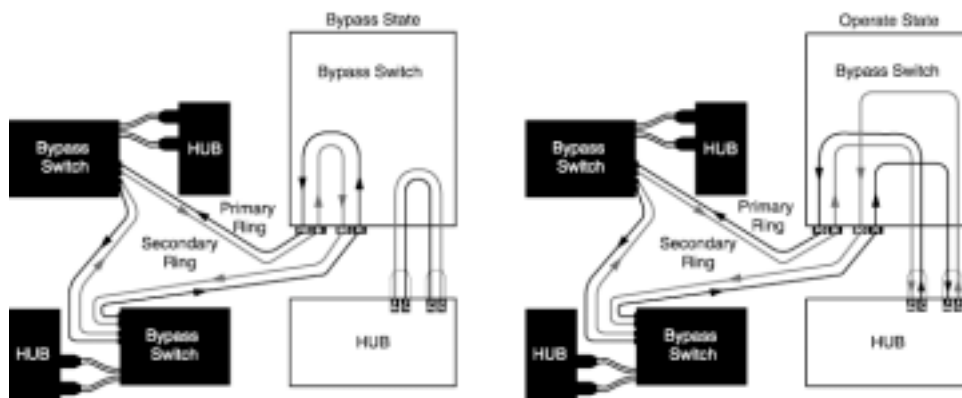
"Ruggedized" switch solutions are available for harsh environments. Please consult your local Tyco Electronics Sales Office.

**Switches** (Continued)

**Multimode  
FDDI Bypass Switches**  
(Continued)



**Switch Operation: Bypass and Operate States**



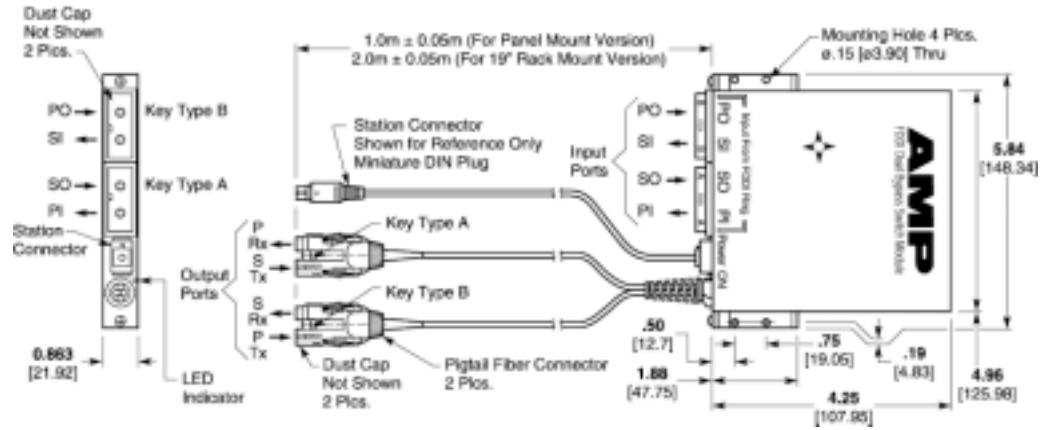
**Specifications**

Item	Value
Switching Speed	10 ms max.
Operating Wavelength	750 - 1550 nm
Insertion Loss	1.1 dB typ., 1.8 dB max. (FOTP -34, Method B – Long Launch)* 1.4 dB typ., 2.1 dB max. (FOTP-34, Method A – Short Launch)* <5 dB on loopback path (Other ranges available on request) (Insertion loss includes one connector pair)
Crosstalk	-45 dB typ. (FOTP-42)
Switch Driver	5 V at 160 mA
Fiber Type	62.5/125- $\mu$ m or 50/125- $\mu$ m graded index
Operating Temperature	-10°C to +65°C (FOTP-3, Condition C2)
Storage Temperature	-30°C to +70°C (FOTP-3, Condition C2)
Vibration Tolerance	15 G's on 3 axes (FOTP-11)
Physical Shock	30 G's on 3 axes (FOTP-14)
Durability	>1 million cycles
Weight	12 oz [340 g]

\* Note: FOTP-171 Method A1 for connectorized versions.

**Multimode  
FDDI Bypass Switches**  
(Continued)

**Switches** (Continued)



**Switch Module Base Part Numbers**

Input Port Interface	Mounting	Part Numbers				
		Optical Fiber Pigtails				
		62.5/125- $\mu$ m Fiber		50/125- $\mu$ m Fiber		
		FSD MIC	ST-style	SC	FSD MIC	SC
FSD MIC	Panel	209161	209162	209163	209167	—
	Rack	209164	209165	209166	209170	—
ST	Panel	—	209174	209175	—	—
	Rack	—	209177	—	—	—
Duplex SC	Panel	—	—	209187	—	209193
	Rack	209188	—	209190	—	209196

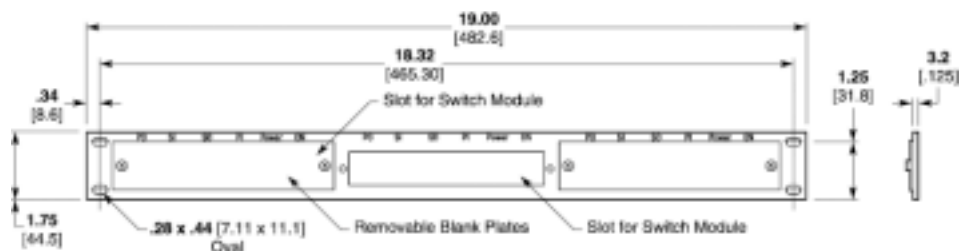
**Switch Module Dash Numbers: Electrical Interface**

Dash Number	Station Connector
-1	6-pos. AMPMODU* MTE Receptacle
-2	6-pos. Shielded Circular DIN Plug
-3	6-pos. Shielded Modular Plug
-4	6-pos. Shielded Miniature Circular DIN Plug
-5	9-pos. Subminiature-D Plug
-6	4-pos. Modular Plug
-7	25-pos. Shielded Subminiature-D Plug

**Note:** The electrical cable consists of an 8-position modular plug at one end for connecting to the switch and one of the connectors listed at the other end.

**Ordering Information**

Select the required switch module. To the base part number for the module, add the dash number for the electrical interface you require for the station connector. Example: 209163-3 is a switch with FSD MIC receptacles on ring ports, duplex SC connectors on the fiber pigtails, and a 6-position modular plug on the electrical cable.



Dimensions on this page  
in inches over [mm]

**Rack-Mount Panel**

Part Number: 209197-1 Mounts in a 19-inch rack and accepts up to three switch modules.

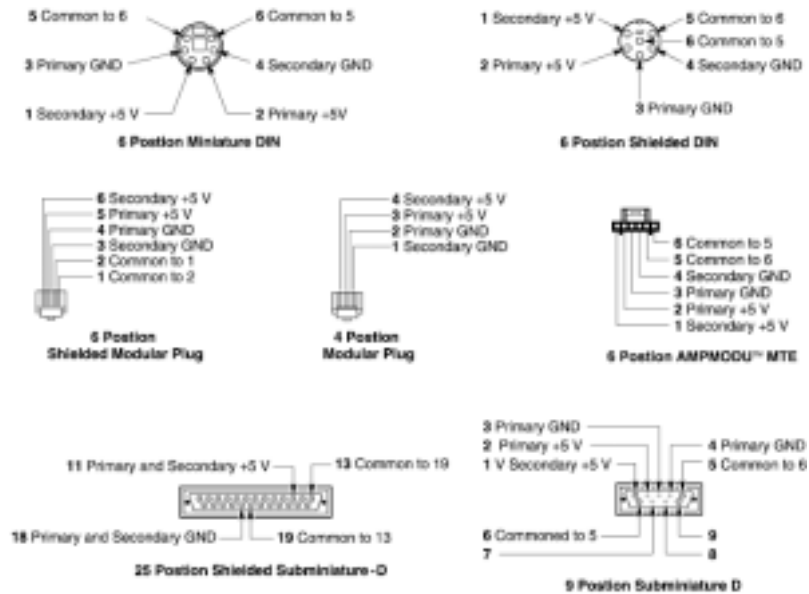
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**Switches** (Continued)

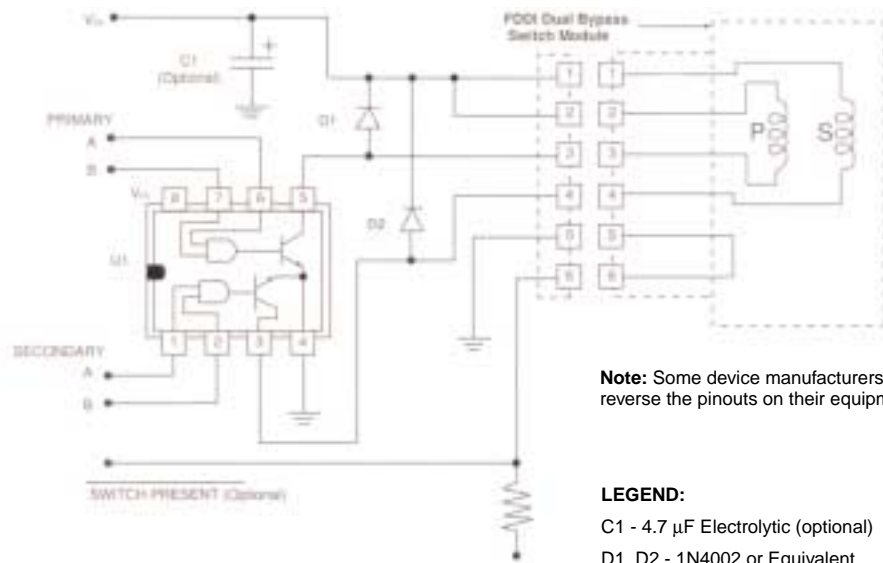
**Multimode  
FDDI Bypass Switches**  
(Continued)

**Station Connector  
and Pinouts**

**Contact ID Shown from Mating End of Station Connector**



**Typical Bypass Switch Driver Circuit**



**Note:** Some device manufacturers reverse the pinouts on their equipment.

**LEGEND:**

- C1 - 4.7 μF Electrolytic (optional)
- D1, D2 - 1N4002 or Equivalent
- U1 - 75452 or 75462 TTL NAND Driver

**Function Table (each driver)**

A	B	V	Switch State
L	L	H (off state)	Bypass (off)
L	H	H (off state)	Bypass (off)
H	L	H (off state)	Bypass (off)
H	H	L (off state)	Insert (on)



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