



Phoenix
Digital

OPTICAL COMMUNICATION

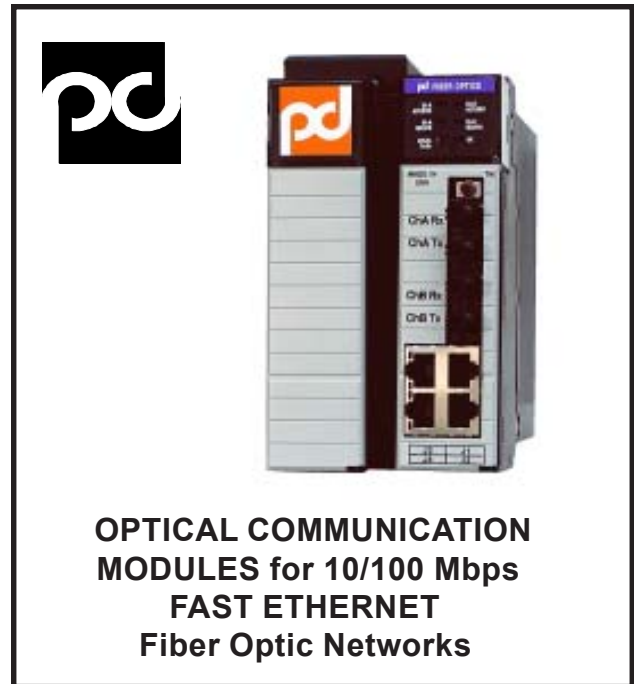
For 10/100 Mbps

FAST ETHERNET Networks

Phoenix Digital now provides Fault Tolerant, Redundant, Self-Healing, Fiber Optic Modules for 10/100 Mbps FAST Ethernet (ALL Protocols... TCP/IP, IP, CP, etc). Optical Communication Modules are available in modular Standalone, Industrial Enclosures for DIN-Rail or Panelmount Installation... with Integral 120/220 VAC, 24 VDC, and 125 VDC power supply options.

FEATURES

- Fiber Optic Communications. . .
 - Noise Immunity.
 - Intrinsically Safe.
- Dependable Data Communications. . .
 - Fault Tolerant, Redundant Fiber Media.
 - Fault Location.
 - On-Line Error Checking.
- Fastest Self-Healing Ethernet Communication Recovery available on the market today.
- Overcomes PLC Scan Time Limitations with Ultra-High Speed, Self-Healing Switch-Over in Ring Configurations.
- Network-Wide Interactive Diagnostics. . .
 - Locates Fault Conditions.
- **UL Class I, Division 2 Rating.**
- Extended Capacity, Ethernet. . .
 - Multidrop 100+ Fast Ethernet Fiber Modules on a Bus, Ring, or Star Network.
- Supports Six 10/100 Base-T Ports.
- Transparent Management and Switched Operation for **ALL ETHERNET PROTOCOLS.**
- Supports Auto-Negotiation and Auto-MDI/MDIX Crossover.
- Phoenix Digital Proprietary Priority Queuing System (PQS). . .
 - Real Time Management of Overall Communication Bandwidth and Network Latency to Insure Priority Access and Ultra-High Thruput for Critical Control Nodes on the Network.
- Short or Long Distance. . .
 - 6 Feet (2 Meters) to 4+ Miles (6.4 Kilometers) Apart - Multimode Operation. (Longer Distances possible with Phoenix Digital High Bandwidth Multimode fiber optic cable.)
 - Over 60 Miles (96 Kilometers) Apart - Single Mode Operation.
- Selectable Wavelengths. . .850, 1300, 1550 nm.
- Selectable Fiber Optic Connector Styles. . . ST, SC, LC, or MTRJ.
- Compatible with Both Single Mode and Multimode Fiber, and with Industrial Fiber.



DESCRIPTION

Phoenix Digital's family of Optical Communication Modules for 10/100 Mbps Fast Ethernet networks provide the most advanced, comprehensive, fiber optic communication capabilities on the market today. Phoenix Digital's fiber optic modules provide optical communication media, transparent to the communication protocol and configurable for distribution by the user in ring, bus, star, tree, or point-to-point network installations. Fiber optic cable is now the media of preference for harsh industrial network environments due to the inherent benefits of high reliability, electrical noise immunity, and intrinsic safety. Phoenix Digital's fiber optic modules provide **continuous on-line error checking for jitter, pulsewidth distortion, and carrier symmetry**. All of this, together with comprehensive network-wide diagnostics, optimizes the overall integrity of Fast Ethernet communication networks at-large, providing Dependable Data Communications.

Optical communication network options include features not found in even the most expensive communication network installations:

- On-line Diagnostic Monitoring.
- Self-Healing Communication Recovery.
- Locates Fault Conditions.
- User Access to Network-Wide Diagnostics.
- Multidrop 100+ Fast Ethernet Fiber Modules on a Single Bus, Ring, or Star Network.
- Overcomes PLC Scan Time Limitations with High Speed, Self-Healing Switch-Over in Ring Configurations.
- High Speed, Self-Healing Switch-Over provides Ultra-Fast Recovery of Ethernet Control Networks.
- Supports Six 10/100 Base-T Transparently Managed and Switched Ports, compatible with ALL ETHERNET PROTOCOLS.

- Phoenix Digital Proprietary Priority Queuing System (PQS) Manages Overall Communication Bandwidth and Network Latency to Insure Priority Access and Even Faster Thruput for Critical Control Nodes on the Network.
- Supports Auto-Negotiation and Auto-MDI/MDIX Crossover, for Plug-and-Play Connectivity.
- UL Class I, Division 2 Rating on all Phoenix Digital Fast Ethernet Fiber Optic Modules.
 - Wavelength Selection
 - Extended Communication Distances

Phoenix Digital's Fast Ethernet fiber optic modules may be used together in the same physical network to connect Programmable Logic Controllers (PLCs), Distributed Control Systems (DCS), Host Computers, Workstations, Operator Interface Panels, etc. Phoenix Digital makes all of this possible, in the price range of a conventional communication modem, through application of its patented self-healing communication switch and advanced optical technologies.

OPERATION

FAULT MANAGEMENT... Phoenix Digital's fiber optic modules provide fault tolerant, redundant, self-healing communications through diagnostic monitoring of the communication signal waveforms at each node on the network, and ultra-high speed detection and isolation of points of communication failure anywhere on the network. The fiber modules self-heal around communication failures in ring, bus, star, tree, or point-to-point network configurations. They automatically redirect network traffic around points of failure until the failure conditions are corrected, and then automatically restore the communication network to its original traffic patterns. Thus, communication continuity is unconditionally maintained by the fiber modules in the event of either node or media failure!

In addition, Phoenix Digital's fiber optic modules provide diagnostic outputs to locate network fault conditions, enabling maintenance personnel to splice/terminate/replace fiber media, add/delete nodes, etc. on-line, without disrupting network communications! All of this is transparent to the operation of 10/100 Mbps Fast Ethernet communication networks.

INTERACTIVE DIAGNOSTICS... Phoenix Digital's fiber optic modules provide advanced, system-level interactive diagnostics. These diagnostics may be used to assist in troubleshooting a wide variety of different types of network problems:

- Detect and Locate Fault Conditions Throughout the Network
- Trap-and-Hold, and Locate Intermittent Communication Failures
- Verify Fault Management and Overall Network Integrity

These advanced diagnostics provide the user with a powerful set of tools, greatly simplifying network start-up and on-line maintenance of Fast Ethernet communication networks.

FIBER MEDIA COMPATIBILITY... Phoenix Digital's fiber optic modules provide optional wavelength selection for extended distance applications, and for universal compatibility with all types of fiber optic cable. The economical 850 nanometer wavelength may be selected for data communication networks with less than 6,600 feet (2.0 kilometers) between nodes. The higher performance 1300 nanometer multimode wavelength may be selected for longer distance applications, extending communication distances between nodes to over 4+ miles (6.4 kilometers). (Consult the factory for longer distance multimode fiber optic networks, using Phoenix Digital's High Bandwidth fiber optic cable.) The 1300 nanometer single mode wavelength may be selected for extended distance applications, extending communication distances between nodes to over 32 miles (51 kilometers). The

1550 nanometer single mode wavelength may be selected for extremely long distance applications, extending communication distances between Fast Ethernet nodes to over 60 miles (96 kilometers)!

INSTALLATION

Phoenix Digital's Fast Ethernet Optical Communication Modules are available in rugged, modular, industrial enclosures, for DIN-Rail or Panelmount installation, with integral 120/220 VAC, 24 VDC, and 125 VDC power supply options. Ethernet devices may be cabled directly to Fast Ethernet fiber optic modules using twisted pair wire cable with standard RJ-45 connectors (10/100 Base-T).

Phoenix Digital's fiber optic modules may be interconnected on the fiber optic network in an active bus or fault tolerant ring configuration, using either multimode or single mode fiber optic cable. Fiber optic Channel A and B inputs and outputs may be interconnected sequentially from fiber module to fiber module to create a bi-directional, active bus. (See Figure on page 7. Connection details are given in the product users manual.) This configuration may be made fault tolerant by cross-connecting the fiber optic modules on either end of the active bus. (See Figure on page 8.) This effectively transforms it into a fault tolerant, redundant, self-healing, counter-rotating ring configuration for Fast Ethernet networks, without requiring any further action by the user.

Phoenix Digital's Fast Ethernet fiber optic modules can also be connected transparently to Ethernet Hubs, Switches, Routers, etc., to provide **Total Enterprise Connectivity...** Integrating Multidrop Bus, Ring, Star, and Tree Network Topologies.

SPECIFICATIONS

Fiber Optic Cable Type	: Multimode or Single Mode
Mating Connector	: ST, SC, MTRJ, LC
Transmit Launch Power	: -15 dBm (Typical, Multimode); -18 dBm (Single Mode)
Receive Sensitivity	: -32 dBm
Power Supply	: 120/220 VAC, 24 VDC, or 125 VDC.... 8 to 10 Watts
Environmental	
Operating Temperature	: 0° to 60° C (32° to 140° F)
Storage Temperature	: -40° to 85° C (-40° to 185° F)
Relative Humidity	: 0 to 95% RH, noncondensing
Dimensions (DIN-Rail, Panelmount)	: 6.10" H x 3.10" W x 5.50" D (15.49cm H x 7.87cm W x 13.97cm D)
Hazardous Location Approval	: UL and UL/C Class I, Div. 2 Groups A, B, C, D (US and Canadian UL Mark for use in Class I, Div. 2 Groups A, B, C, and D Hazardous Locations.)
European Union Directives	: CE

ORDERING INFORMATION

Model Number ⁽¹⁾	Description
OCX-ETF	Fiber Optic Module for 10/100 Mbps Fast Ethernet Networks (ALL Protocols)
OCM-CBL-A1-10	10/100 Base-T OCX Interconnect Cable (10 ft./3 meter length)

- (1) Add suffix "-85" for the 850 nm Multimode Wavelength.
 Add suffix "-13" for the 1300 nm Multimode or Single Mode Wavelength.
 Add suffix "-15" for the 1550 nm Single Mode Wavelength.
 Add suffix "-R" for DIN-Rail, Panelmount Module Enclosure.
 Add suffix "-D" for Real Time Diagnostic Option. (Required for UL and UL/C Class I, Division 2 Rating.)
 Add suffix "-ST" for ST Fiber Optic Connector Style.
 Add suffix "-SC" for SC Fiber Optic Connector Style.
 Add suffix "-LC" for LC Fiber Optic Connector Style. (Available for the 1300 nm and 1550 nm optical wavelengths only.)
 Add suffix "-MT" for MTRJ Fiber Optic Connector Style. (Available for all optical wavelengths except the 1550 nm single mode wavelength.)
 Add suffix "-24V" for 24 VDC Operation.
 Add suffix "-125V" for 125 VDC Operation.
 Add suffix "-ACV" for 120/220 VAC Operation.
 Add suffix "-xA1" for 10/100 Base-T Operation, where "x" specifies the number of 10/100 Base-T ports available on the module. (x = 1, 2, 3, 4, 5, or 6)
 Add suffix "-EXT" for Networks with 10 or more fiber optic modules.
 Add suffix "-FD" for Full Duplex, Point-to-Point Communication.
 Add suffix "-SM" for Single Mode Operation. (Available with the 1300 Nanometer Wavelength and ST, SC, LC, or MTRJ Fiber Optic Connectors; or with the 1550 Nanometer Wavelength and ST, SC, or LC Fiber Optic Connectors.)

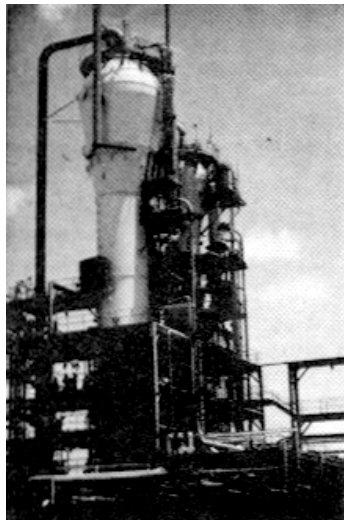
INDUSTRIAL FIBER OPTIC CABLE

Phoenix Digital provides fiber optic cable specifically designed for rugged industrial applications. Phoenix Digital's Industrial Fiber Optic Cable provides a full range of superior optical performance, rugged packaging and protection, and the physical integrity the industrial user wants and needs for ease of installation and handling.



FEATURES

- **INDUSTRIAL PACKAGING OPTIONS. . .**
 - Rugged Industrial Construction - Life Expectancy Exceeds 20 Years
 - Double Jacketing, High Tensile Strength
 - Extended Temperature and Humidity Range
 - Oil, Chemical, Moisture, Abrasion, and UV Sunlight Resistant
 - Riser Rated (OFNR) and CSA FT-4, Passes Stringent UL 1666 Flame Test
 - Plenum Rated (OFNP) and CSA FT-6, Passes Stringent UL 910 Flame Test
- **WIDE VARIETY OF INSTALLATION OPTIONS. . .**
 - Gel Filled Loose Tube Construction for both Indoor and Outdoor Installation
 - Self-Supporting, All Dielectric Cable for Aerial Installation
 - Direct Burial, Armored Cable for Underground Installation
 - Low Smoke, Zero Halogen Cable for Premise Installation
 - Ultra Strong, Non-Armored Cable for Deep Mine Applications



- **SUPERIOR OPTICAL PERFORMANCE. . .**
 - Multiple Fibers per Cable (2 to 36 Fibers)
 - 9/125, 50/125, 62.5/125, and 200/230 Micron Sizes
 - Multiple Wavelengths - Multimode and Single Mode Capability
- **FULLY COMPATIBLE WITH PHOENIX DIGITAL'S COMPLETE LINE OF INDUSTRIAL OPTICAL COMMUNICATION MODULES.**
- **WHEN PHOENIX DIGITAL PROVIDES BOTH THE FIBER OPTIC MODULES AND THE FIBER OPTIC CABLE IT WARRANTS NETWORK PHYSICAL LAYER COMPATIBILITY!**



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 Scottsdale, AZ 85260
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OPTICAL PERFORMANCE

FIBER OPTIC CABLE MODEL # FOC-EXP, FOC-SSA, FOC-DBA, FOC-LSZHB, AND FOC-USNA

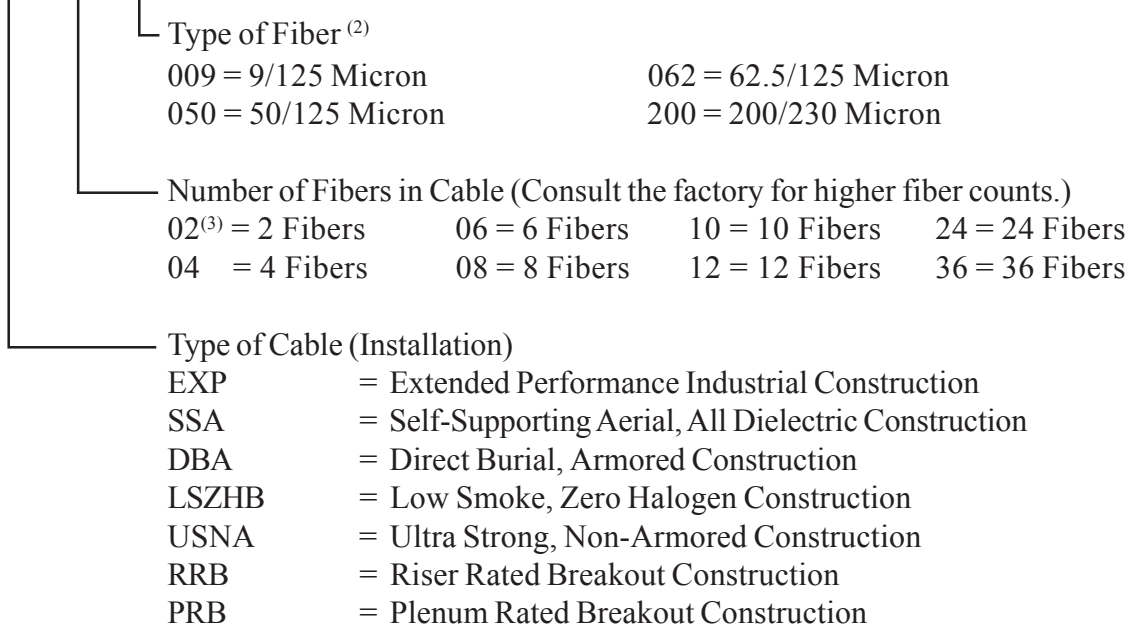
Fiber Type (Core/Cladding size...microns)	Mode Type	Max. Attenuation (dB/km)		Min. Bandwidth (MHz.km)		Numerical Aperture
		850 nm	1300 nm	850 nm	1300 nm	
9/125	Single Mode	N/A	.4	N/A	N/A	N/A
50/125	Multimode	3.00	1.00	800	800	0.200
62.5/125	Multimode	3.75	1.50	160	500	0.275
200/230	Multimode	7.0	N/A	15	N/A	0.370

FIBER OPTIC CABLE MODEL # FOC-RRB AND FOC-PRB

Fiber Type (Core/Cladding size...microns)	Mode Type	Max Attenuation (dB/km)		Min Bandwidth (MHz.km)		Numerical Aperture
		850 nm	1300 nm	850 nm	1300 nm	
9/125	Single Mode	N/A	.7	N/A	N/A	N/A
50/125	Multimode	3.50	1.50	800	800	0.200
62.5/125	Multimode	3.75	1.50	160	500	0.275
200/230	Multimode	12.0	N/A	15	N/A	0.370

FIBER OPTIC CABLE ORDERING INFORMATION⁽¹⁾

Model # FOC-XXX-YY-ZZZ



(1) Consult the factory for High Bandwidth Multimode Glass Fiber, for Extended Distance applications.

(2) Consult the factory for other types of cable constructions, types of optical fibers, quantities of bundled fibers, and custom cables.

(3) Specify "02F" for Flat Zipcord Breakout Construction.

7560 East Evans Rd., Bldg A

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(480) 483-7393 Phone

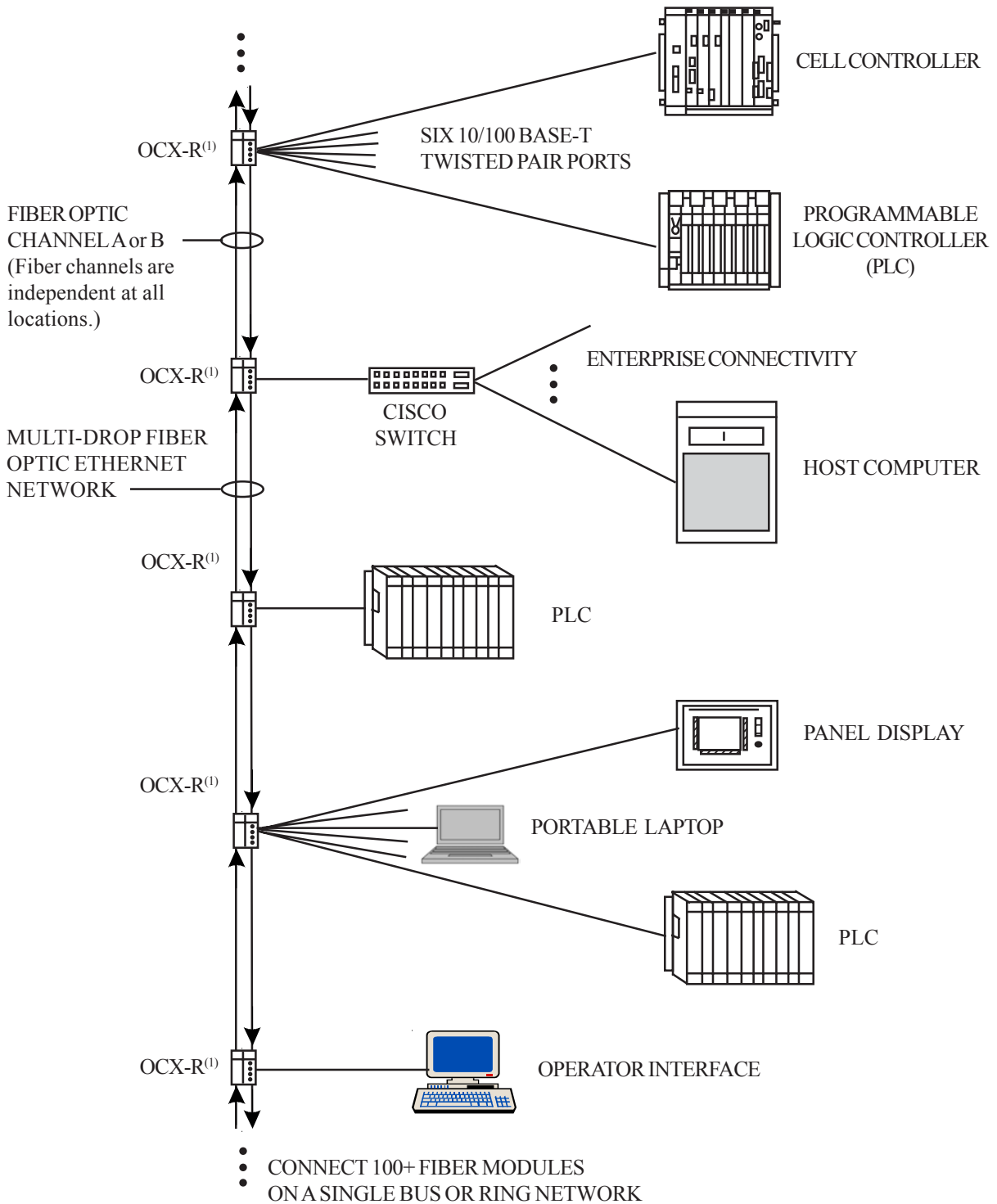
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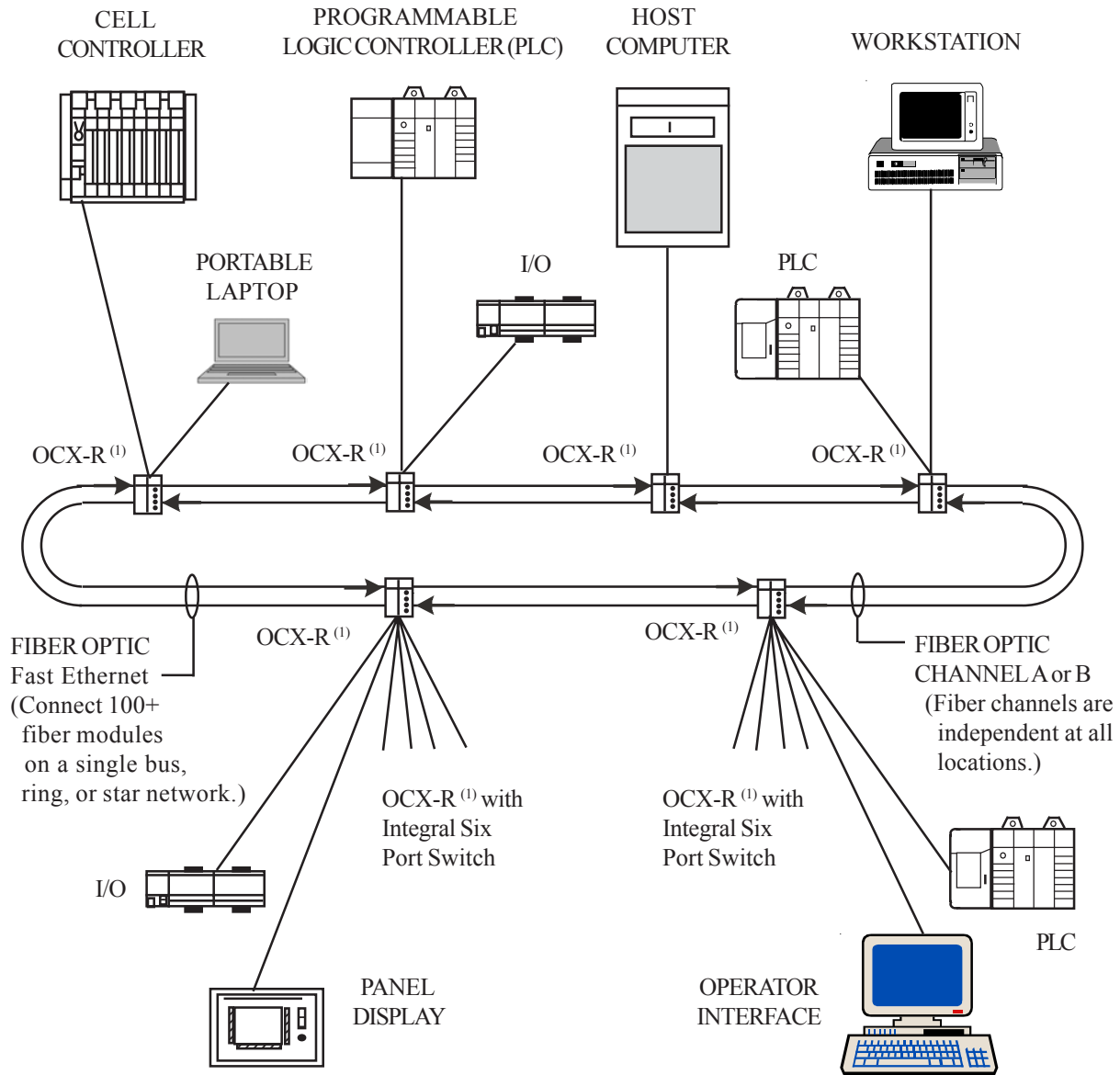
10/100 Mbps FAST ETHERNET ACTIVE BUS CONFIGURATION



(1) OPTICAL COMMUNICATION MODULE MODEL# OCX-ETF-13-R-D-ST-ACV-6A1

TYPICAL 10/100 Mbps FAST ETHERNET FIBER OPTIC INSTALLATION CONFIGURATION

UL CLASS I, DIVISION 2 (HAZARDOUS LOCATIONS) 10/100 Mbps FAST ETHERNET DUAL MEDIA RING CONFIGURATION (FAULT TOLERANT)



(1) OPTICAL COMMUNICATION MODULE MODEL # OCX-ETF-13-R-D-ST-ACV-6A1 (UL CLASS I, DIV. 2)



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INDUSTRIAL FIBER OPTIC CABLE

Phoenix Digital provides fiber optic cable specifically designed for rugged industrial applications. Phoenix Digital's Industrial Fiber Optic Cable provides a full range of superior optical performance, rugged packaging and protection, and the physical integrity the industrial user wants and needs for ease of installation and handling.



FEATURES

- **INDUSTRIAL PACKAGING OPTIONS...**

- Rugged Industrial Construction - Life Expectancy Exceeds 20 Years
- Double Jacketing, High Tensile Strength
- Extended Temperature and Humidity Range
- Oil, Chemical, Moisture, Abrasion, and UV Sunlight Resistant
- Low Smoke, Zero Halogen
- Riser Rated (OFNR) and CSA FT-4, Passes Stringent UL 1666 Flame Test
- Plenum Rated (OFNP) and CSA FT-6, Passes Stringent UL 910 Flame Test

- **WIDE VARIETY OF INSTALLATION OPTIONS...**

- Dry Block With Gel Filled, Loose Tube Construction for both Indoor and Outdoor Installation
- Self Supporting, All Dielectric Cable for Aerial Installation
- Direct Burial, Armored Cable for Underground Installation
- Riser and Plenum Rated Cable for Riser, Premise, and Cable Tray Installation



- **SUPERIOR OPTICAL PERFORMANCE...**

- Multiple Fibers per Cable (2 to 36 Fibers)
- 9/125, 50/125, 62.5/125, and 200/230 Micron sizes
- Multiple Wavelengths
- Multimode and Singlemode Capability

- **FULLY COMPATIBLE WITH PHOENIX DIGITAL'S COMPLETE LINE OF INDUSTRIAL OPTICAL COMMUNICATION MODEMS FOR...**

Rockwell/A-B	Modicon
Siemens/TI	Foxboro
GE Fanuc	Rosemount
Square D	Honeywell
ABB Process Automation	Omron
Kent-Taylor	Plus Many Others

EXTENDED PERFORMANCE FIBER OPTIC CABLE FOR INDUSTRIAL APPLICATIONS

FEATURES... BENEFITS:

- Extended Performance...
Suitable for Harsh Industrial Environments
- Proprietary, Polyolefin-Based Jacketing Material (No Plasticizers)...
Corrosion, Moisture, Oil, Flame, Gas, Chemical and UV Resistant
Meets the Requirements of IEEE-383 Flame Test UL 1581
- Rugged, Industrial Construction...
Life Expectancy Exceeds 20 Years
- Superior Abrasion and Flexibility to Standard PVC and Polyethylene...
Ease of Installation and Handling in Both High and Low Temperature Environments
- Gel Filled, Loose Tube Construction...
Wide Storage and Operating Temperature Range
- Dry Block Technology...
Simplifies Installation and Reduces Termination Time

INSTALLATION:

Both Indoor and Outdoor Application
Cable Tray... Crush Resistant, Low Friction Jacketing Material
Aerial... With Messenger
Burial... In Conduit

SPECIFICATIONS FOR MODEL # FOC-EXP FIBER OPTIC CABLE:

Mechanical Properties...

Fiber Quantity	Outer Diameter inches (mm)	Cable Weight lbs./1,000 ft. (kg/km)	Maximum Tension lbs. (N)		Minimum Bend Radius inches (cm)		Maximum Vertical Rise ft. (M)
			Install.	Operating	Install.	Operating	
2	0.425 (10.8)	65 (97)	600 (2670)	200 (890)	8.5 (21.6)	4.3 (10.8)	2462 (750)
4	0.425 (10.8)	65 (97)	600 (2670)	200 (890)	8.5 (21.6)	4.3 (10.8)	2462 (750)
6	0.425 (10.8)	65 (97)	600 (2670)	200 (890)	8.5 (21.6)	4.3 (10.8)	2462 (750)
8	0.425 (10.8)	65 (97)	600 (2670)	200 (890)	8.5 (21.6)	4.3 (10.8)	2462 (750)
10	0.425 (10.8)	65 (97)	600 (2670)	200 (890)	8.5 (21.6)	4.3 (10.8)	2462 (750)
12	0.425 (10.8)	65 (97)	600 (2670)	200 (890)	8.5 (21.6)	4.3 (10.8)	2462 (750)
24	0.425 (10.8)	65 (97)	600 (2670)	200 (890)	8.5 (21.6)	4.3 (10.8)	2462 (750)
36	0.454 (11.5)	77 (115)	600 (2670)	200 (890)	9.1 (23.1)	4.5 (11.5)	2078 (633)

Environmental Properties...

Storage Temperature = -40° C to +80° C
Operating Temperature = -40° C to +80° C
Relative Humidity = 0 to 100%

SELF SUPPORTING, ALL DIELECTRIC FIBER OPTIC CABLE FOR AERIAL INSTALLATION

FEATURES... BENEFITS:

- Self Supporting Installation...
Additional Strength Members Eliminate Need to Install or Lash to Messenger Cable Between Poles
- High Density Double Polyethylene Jacket...
Corrosion, Moisture, Oil, Chemical, and UV Resistant
- All Dielectric Construction...
Superior Performance When Exposed to Lightning, Electric Fields from Adjacent Power Lines, etc.
- Track Resistant...
Suitable for Installation in High Voltage Applications up to 25kv/m
- Abrasion Resistant...
Reduces Ice Build-up in Aerial Installations and Allows Longer Pulls in Wire Duct
- Gel Filled, Loose Tube Construction...
Wide Installation and Operating Temperature Range

INSTALLATION:

Outdoor Application

Aerial... No Messenger Required

Wire Duct... High Tensile Strength and Low Abrasion for Longer Pulls

SPECIFICATIONS FOR MODEL # FOC-SSA FIBER OPTIC CABLE:

Mechanical Properties...

Fiber Quantity	Outer Diameter inches (mm)	Cable Weight lbs./1,000 ft. (kg/km)	Maximum Tension lbs. (N)		Breaking Strength lbs. (N)	Minimum Bend Radius inches (cm)	
			Install.	Operating		Install.	Operating
2	0.525 (13.34)	100 (150)	1000 (4450)	2000 (8900)	7500 (33,375)	10.6 (26.6)	5.3 (13.3)
4	0.525 (13.34)	100 (150)	1000 (4450)	2000 (8900)	7500 (33,375)	10.6 (26.6)	5.3 (13.3)
6	0.525 (13.34)	100 (150)	1000 (4450)	2000 (8900)	7500 (33,375)	10.6 (26.6)	5.3 (13.3)
8	0.525 (13.34)	100 (150)	1000 (4450)	2000 (8900)	7500 (33,375)	10.6 (26.6)	5.3 (13.3)
10	0.525 (13.34)	100 (150)	1000 (4450)	2000 (8900)	7500 (33,375)	10.6 (26.6)	5.3 (13.3)
12	0.525 (13.34)	100 (150)	1000 (4450)	2000 (8900)	7500 (33,375)	10.6 (26.6)	5.3 (13.3)
24	0.525 (13.34)	100 (150)	1000 (4450)	2000 (8900)	7500 (33,375)	10.6 (26.6)	5.3 (13.3)
36	0.525 (13.34)	100 (150)	1000 (4450)	2000 (8900)	7500 (33,375)	10.6 (26.6)	5.3 (13.3)

Environmental Properties...

Storage Temperature = -40° C to +70° C

Operating Temperature = -40° C to +70° C

Relative Humidity = 0 to 100%

CRUSH RESISTANT, ARMORED FIBER OPTIC CABLE FOR DIRECT BURIAL INSTALLATION

FEATURES... BENEFITS:

- Direct Burial Installation
- Corrugated Steel Armor Bonded to Outer Jacket...
 Provides Additional Crush Strength and Rodent Protection
- MDPE Double Polyethylene Jacket...
 Corrosion, Moisture, Oil, Chemical, and UV Resistant
- Abrasion Resistant...
 Ease of Installation and Handling
- Dry Block With Gel Filled, Loose Tube Construction...
 Wide Installation and Operating Temperature Range

INSTALLATION:

Underground... Direct Burial, Conduit
Conduit, Wire Duct, and Aerial Lashing

SPECIFICATIONS FOR MODEL # FOC-DBA FIBER OPTIC CABLE:

Mechanical Properties...

Fiber Quantity	Outer Diameter inches (mm)	Cable Weight lbs./1,000 ft. (kg/km)	Maximum Tension lbs. (N)		Minimum Bend Radius inches (cm)		Maximum Vertical Rise ft. (M)
			Install.	Operating	Install.	Operating	
2	0.650 (16.5)	148 (220)	600 (2670)	200 (890)	13.0 (33.0)	9.8 (24.8)	1080 (330)
4	0.650 (16.5)	148 (220)	600 (2670)	200 (890)	13.0 (33.0)	9.8 (24.8)	1080 (330)
6	0.650 (16.5)	148 (220)	600 (2670)	200 (890)	13.0 (33.0)	9.8 (24.8)	1080 (330)
8	0.650 (16.5)	148 (220)	600 (2670)	200 (890)	13.0 (33.0)	9.8 (24.8)	1080 (330)
10	0.650 (16.5)	148 (220)	600 (2670)	200 (890)	13.0 (33.0)	9.8 (24.8)	1080 (330)
12	0.650 (16.5)	148 (220)	600 (2670)	200 (890)	13.0 (33.0)	9.8 (24.8)	1080 (330)
24	0.650 (16.5)	148 (220)	600 (2670)	200 (890)	13.0 (33.0)	9.8 (24.8)	1080 (330)
36	0.690 (17.5)	160 (238)	600 (2670)	200 (890)	13.8 (35.1)	10.4 (26.3)	1000 (305)

Environmental Properties...

Storage Temperature = -40° C to +70° C
 Operating Temperature = -40° C to +70° C
 Relative Humidity = 0 to 100%

LOW SMOKE, ZERO HALOGEN FIBER OPTIC CABLE FOR PREMISE AND RAPID TRANSIT INSTALLATIONS

FEATURES... BENEFITS:

- Halex Jacketing (OFN, UL1581)...
Zero Halogen Content, Low Toxicity, Low Smoke, and Flame Retardent
- Meets Fire Safety Tests IEEE-383, NRS 713, NES 711, ASTM E-622,
AETA D-2671-74, and IEC 754-1

INSTALLATION:

Both Indoor and Outdoor Application
Premise and Rapid Transit Installation

SPECIFICATIONS FOR MODEL # FOC-LSZHB FIBER OPTIC CABLE:

Mechanical Properties...

Fiber Quantity	Outer Diameter inches (mm)	Cable Weight lbs./1,000 ft. (kg/km)	Maximum Tension lbs. (N)		Minimum Bend Radius inches (cm)		Maximum Vertical Rise ft. (M)
			Install.	Operating	Install.	Operating	
2	0.425 (10.8)	70 (104)	600 (2670)	200 (890)	21.6 (8.5)	10.8 (4.3)	2286 (697)
4	0.425 (10.8)	70 (104)	600 (2670)	200 (890)	21.6 (8.5)	10.8 (4.3)	2286 (697)
6	0.425 (10.8)	70 (104)	600 (2670)	200 (890)	21.6 (8.5)	10.8 (4.3)	2286 (697)
8	0.425 (10.8)	70 (104)	600 (2670)	200 (890)	21.6 (8.5)	10.8 (4.3)	2286 (697)
10	0.425 (10.8)	70 (104)	600 (2670)	200 (890)	21.6 (8.5)	10.8 (4.3)	2286 (697)
12	0.425 (10.8)	70 (104)	600 (2670)	200 (890)	21.6 (8.5)	10.8 (4.3)	2286 (697)
24	0.425 (10.8)	70 (104)	600 (2670)	200 (890)	21.6 (8.5)	10.8 (4.3)	2286 (697)
36	0.454 (11.5)	76 (113)	600 (2670)	200 (890)	23.1 (9.1)	11.5 (4.5)	1975 (602)

Environmental Properties...

Storage Temperature = -40°C to +80°C
Operating Temperature = -40°C to +80°C
Relative Humidity = 0 to 100%

QUALITY CONTROL:

- Post Construction Fiber Testing For Attenuation and Bandwidth
- Optional Sweep Bandwidth Testing
- Quality Assurance Program meets requirements of IOCFR50, Appendix B

ULTRA-STRONG, NON-ARMORED FIBER OPTIC CABLE FOR HIGH CRUSH STRENGTH AND LONG VERTICAL RISE INSTALLATIONS

FEATURES... BENEFITS:

- Stronger than Standard Armored Cables...
Crush Strength = 1,500 lbs/inch (2,684 N/cm)
- Longer Vertical Rise...
Ideal for Deep Mine Applications
- Non-Armored Construction...
Smaller and Lighter than Standard Armored Cables
- Meets Stringent Standards...
NEC Type OFNR UL1666 Riser Rated and CSA FT-4 and FT-5
Mine Safety and Health Administration Approved MSHA-SC-P-7K-263066
Pennsylvania Bureau of Deep Mine Safety Approved ("P" Number)
- Gel Filled, Loose Tube Construction...
Wide Installation and Operating Temperature Range

INSTALLATION:

Both Indoor and Outdoor Application
Conduit, Wire Duct, and Aerial Lashing

SPECIFICATIONS FOR MODEL # FOC-USNA FIBER OPTIC CABLE:

Mechanical Properties...

Fiber Quantity	Outer Diameter inches (mm)	Cable Weight lbs./1,000 ft. (kg/km)	Maximum Tension lbs. (N)		Minimum Bend Radius inches (cm)		Maximum Vertical Rise ft. (M)
			Install.	Operating	Install.	Operating	
2	0.415 (10.50)	59 (81)	1000 (4450)	333 (1482)	8.3 (21.0)	4.1 (10.5)	3281 (1000)
4	0.415 (10.50)	59 (81)	1000 (4450)	333 (1482)	8.3 (21.0)	4.1 (10.5)	3281 (1000)
6	0.415 (10.50)	59 (81)	1000 (4450)	333 (1482)	8.3 (21.0)	4.1 (10.5)	3281 (1000)
8	0.415 (10.50)	59 (81)	1000 (4450)	333 (1482)	8.3 (21.0)	4.1 (10.5)	3281 (1000)
10	0.415 (10.50)	59 (81)	1000 (4450)	333 (1482)	8.3 (21.0)	4.1 (10.5)	3281 (1000)
12	0.415 (10.50)	59 (81)	1000 (4450)	333 (1482)	8.3 (21.0)	4.1 (10.5)	3281 (1000)
24	0.415 (10.50)	59 (81)	1000 (4450)	333 (1482)	8.3 (21.0)	4.1 (10.5)	3281 (1000)
36	0.415 (10.50)	59 (81)	1000 (4450)	333 (1482)	8.3 (21.0)	4.1 (10.5)	3281 (1000)

Environmental Properties...

Storage Temperature = -40° C to +80° C
Operating Temperature = -40° C to +80° C
Relative Humidity = 0 to 100%

RISER AND PLENUM RATED FIBER OPTIC CABLE

FEATURES... BENEFITS:

- Halex Jacketing (OFNR)...
Low Smoke, Zero Halogen, Fire Safe
- Optical Fiber Non-Conductive Riser-Rated (OFNR and CSA FT-4)...
Passes Stringent UL 1666 Flame Test
- Optical Fiber Non-Conductive Plenum-Rated (OFNP and CSA FT-6)...
Passes Stringent UL 910 Flame Test

INSTALLATION:

OFNR Fiber Optic Cable for Riser and Premise Installation

OFNP Fiber Optic Cable for Plenum, Riser, and Premise Installation

Breakout Installation for Cabling from Wire Closets, Equipment Racks, etc.

SPECS FOR MODEL # FOC-RRB & FOC-PRB FIBER OPTIC CABLE:

OFNR Fiber Optic Cable Mechanical Properties...

Fiber Quantity	Outer Diameter inches (mm)	Cable Weight lbs./1,000 ft. (kg/km)	Maximum Tension lbs. (N)		Minimum Bend Radius inches (cm)		Maximum Vertical Rise ft. (M)
			Install.	Operating	Install.	Operating	
2F ⁽¹⁾	0.12 x 0.24 (3.0 x 6.0)	8 (12)	224 (997)	112 (498)	2.0 (5.0)	1.0 (2.5)	N/A
2	0.286 (7.26)	33 (48)	270 (1201)	112 (498)	5.8 (14.6)	2.9 (7.3)	2715 (830)
4	0.325 (8.25)	40 (60)	400 (1780)	215 (957)	6.6 (16.6)	3.3 (8.3)	4300 (1310)
6	0.380 (9.65)	57 (84)	600 (2670)	250 (1112)	7.6 (19.4)	3.8 (9.7)	3510 (980)
8	0.445 (11.30)	78 (115)	600 (2670)	250 (1112)	9.0 (22.9)	4.5 (11.3)	2565 (780)
10	0.510 (12.95)	105 (157)	600 (2670)	250 (1112)	10.2 (26.0)	5.1 (13.0)	1900 (580)
12	0.565 (14.40)	129 (192)	600 (2670)	250 (1112)	11.4 (28.8)	5.7 (14.4)	1550 (475)
24	0.680 (17.30)	194 (288)	600 (2670)	250 (1112)	13.6 (34.6)	6.8 (17.3)	1030 (315)
36	0.780 (19.80)	212 (315)	600 (2670)	250 (1112)	15.6 (39.6)	7.8 (19.8)	945 (290)

OFNP Fiber Optic Cable Mechanical Properties...

Fiber Quantity	Outer Diameter inches (mm)	Cable Weight lbs./1,000 ft. (kg/km)	Maximum Tension lbs. (N)		Minimum Bend Radius inches (cm)		Maximum Vertical Rise ft. (M)
			Install.	Operating	Install.	Operating	
2F ⁽¹⁾	0.12 x 0.24 (3.0 x 6.0)	8 (12)	224 (997)	112 (498)	2.0 (5.0)	1.0 (2.5)	N/A
2	0.231 (5.86)	24 (35)	270 (1201)	112 (498)	4.6 (11.7)	2.3 (5.9)	3730 (1135)
4	0.272 (5.90)	30 (43)	600 (2670)	250 (1112)	5.4 (13.8)	2.7 (6.9)	2985 (910)
6	0.323 (8.20)	44 (65)	600 (2670)	250 (1112)	6.4 (16.4)	3.2 (8.2)	4545 (1385)
8	0.401 (10.19)	70 (103)	600 (2670)	250 (1112)	8.0 (20.3)	4.0 (10.2)	2855 (870)
10	0.462 (11.73)	93 (138)	600 (2670)	250 (1112)	9.2 (23.4)	4.6 (12.7)	2150 (655)
12	0.523 (13.3)	125 (186)	600 (2670)	250 (1112)	10.5 (26.6)	5.2 (13.3)	2740 (835)
24	0.620 (15.73)	150 (220)	600 (2670)	250 (1112)	12.4 (31.6)	6.2 (15.8)	1350 (410)
36	0.715 (18.15)	185 (280)	600 (2670)	250 (1112)	14.4 (36.4)	7.2 (18.2)	1085 (330)

(1) Flat Zipcord Breakout Construction

Environmental Properties...

Storage Temperature = -40° C to +80° C

Operating Temperature = -20° C to +80° C

Relative Humidity = 5 to 95%

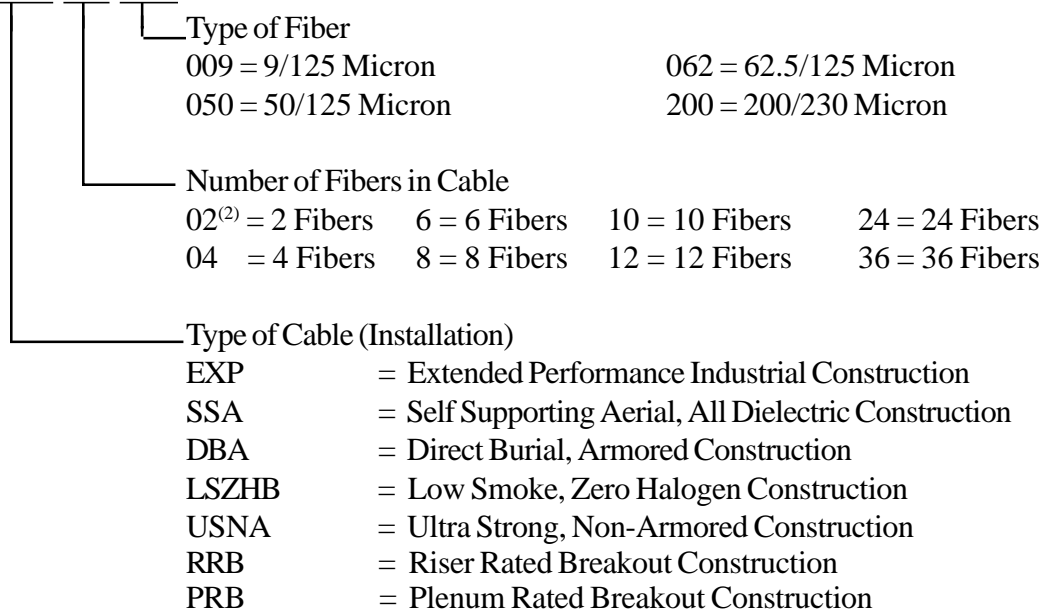
OPTICAL PERFORMANCE:

FIBER OPTIC CABLE MODEL # FOC-EXP, FOC-SSA, FOC-DBA, FOC-LSZHB, AND FOC-USNA

Fiber Type (Core/Cladding size...microns)	Mode Type	Max. Attenuation (db/km)		Min. Bandwidth (MHz-km)		Numerical Aperture
		850 nm	1300 nm	850 nm	1300 nm	
9/125	Singlemode	N/A	.4	N/A	N/A	N/A
50/125	Multimode	3.00	1.00	800	800	0.200
62.5/125	Multimode	3.75	1.50	160	500	0.275
200/230	Multimode	7.0	N/A	15	N/A	0.370

FIBER OPTIC CABLE MODEL # FOC-RRB AND FOC-PRB

Fiber Type (Core/Cladding size...microns)	Mode Type	Max Attenuation (db/km)		Min Bandwidth (MHz-km)		Numerical Aperture
		850 nm	1300 nm	850 nm	1300 nm	
9/125	Singlemode	N/A	.7	N/A	N/A	N/A
50/125	Multimode	3.50	1.50	800	800	0.200
62.5/125	Multimode	3.75	1.50	160	500	0.275
200/230	Multimode	12.0	N/A	15	N/A	0.370

FIBER OPTIC CABLE ORDERING INFORMATION⁽¹⁾ :Model # FOC-XXX-YY-ZZZ

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