Phoenix Digital now provides Fault Tolerant, Redundant, Self-Healing, Fiber Optic Modules for Allen-Bradley ControlNet, Ethernet (ALL Protocols), Data Highway Plus, Remote I/O, DH-485, DF1, Modbus, and RS-232/RS-485 Communications. Optical Communication Modules are available for 1771, 1746, and 1756 Chassis Installation (direct plug-in), or in modular Standalone, Industrial Enclosures for Panelmount or DIN-Rail Installation... with integral 120/220 VAC, 24 VDC, and 125 VDC single or dual power supply options.

FEATURES

- Fiber Optic Communications. . . Noise Immunity, Intrinsically Safe.
- Plugs Directly into A-B System Chassis. . . 1771, 1746, 1756 Plug-In Modules.
- User Program Accessible Diagnostics.
- Enhanced, PC Resident Diagnostics.
- Selectable Wavelengths. . . 850, 1300, 1550 nm.
- Fault Tolerant, Redundant Fiber Media.

- UL Class I, Division 2 Rating on all 1756 Plug-In and DIN-Rail, Standalone Modules.
- Extended Capacity, ControlNet and Ethernet. . . Multidrop 99+ ControlNet or Ethernet Fiber Modules on a Bus, Ring, or Star Network.
- Supports Simultaneous Ethernet and Modbus Communication on the same Fiber Network.
- Supports Extended DH+ and RIO Data Rates. . . 57.6K, 115.2K, and 230.4K.
- On-the-Fly Modbus Multi-Master Multiplexing.
DESCRIPTION

Phoenix Digital’s family of Optical Communication Modules (OCMs), Optical Link Couplers (OLCs), and Optical ControlLogix Modules (OCXs) for Allen-Bradley ControlNet, Ethernet (ALL Protocols), Data Highway Plus, Remote I/O, DH-485, DF1, Modbus, and RS-232/RS-485 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, carrier symmetry, and optical signal strength. All of this, together with comprehensive network-wide diagnostics (user program accessible), optimizes the overall integrity of Allen-Bradley communication networks at-large, providing Dependable Data Communications. Optical communication network options include features not found in even the most expensive network installations:

- On-line Diagnostic Monitoring.
- Self-Healing Communication Recovery.
- Synchronous Fault Tracking for Multipoint Fault Management.
- In-Line Signal Monitoring.
- Locates Fault and Impeding Fault Conditions.
- Annunciation of Low Optical Power.
- User Program Access to Network-Wide Interactive Diagnostics.
- Multidrop 99+ ControlNet or Ethernet Fiber Modules on a Single Bus, Ring, or Star Network.
- UL Class I, Division 2 Rating on all 1756 Plug-In and DIN-Rail, Standalone Modules.

- Faster Ethernet Communication Designed Specifically for Control Applications, only from Phoenix Digital:
  - Overcome PLC Scan Time Limitations with Ultra-High Speed, Self-Healing Switch-Over in Ring Configurations.
  - Fastest Self-Healing Communication Recovery available on the market today.
  - Manage Overall Communication Bandwidth and Network Latency with Phoenix Digital’s proprietary Priority Queuing System (PQS), to Insure Priority Access and Even Faster Thruput for Critical Control Nodes on the Network.
  - Auto-Negotiation and Auto-Crossover on all Ethernet Modules.

- Modbus & Ethernet Fiber Modules (OLC/OCX-EMOD) Simultaneously Support one Modbus Port (RS-232 or RS-485) and Six RJ-45, 10/100 Base-T Transparently Switched Ethernet Ports on each module, compatible with ALL ETHERNET PROTOCOLS.

- On-the-Fly, Modbus Multi-Master Multiplexing Allows an Unlimited Number of Modbus Master devices anywhere on the network, Transparent to Network Operation.

- PC Resident Diagnostics for Ethernet networks provide detailed Interactive Diagnostic information for network troubleshooting, monitor Network Performance, and verify Link Status for ALL connections on the network (Fiber and Copper).

Phoenix Digital’s fiber optic modules may be used to interconnect Allen-Bradley Controllers, I/O Racks, Flex I/O, Operator Interface Terminals, Computers, etc. Phoenix Digital makes all of this possible, in the price range of a conventional communication module, through application of its patented self-healing communication switch and advanced optical technologies.
OPERATION

FAULT PREDICTIVE... Phoenix Digital’s fiber optic modules provide fault prediction thru diagnostic monitoring and detection of impending communication failures resulting from gradual degradation of the communication link itself. The fiber optic modules monitor for impending fault conditions by continuously measuring the actual in-line signal strength (optical power) of the data communications at the receive data inputs on the module. The fiber modules continuously compare these actual in-line measurements to preset optical power reference thresholds. If the actual in-line data communication signal strength degrades below these power thresholds the fiber modules will detect and annunciate the impending failure condition via indicators on the front of the module. Phoenix Digital’s fiber optic modules also provide user program accessible interactive diagnostics (1771 Plug-In OCM, 1746 Plug-In OLC, 1756 Plug-In OCX) and diagnostic outputs (Panelmount and DIN-Rail OCM/OLC/OCX) for detecting and locating impending fault conditions, and analog outputs for on-line optical power measurement. Thus, communication network status is continuously monitored, and impending failure conditions are located and annunciated before the communication failure actually occurs. These fiber optic network diagnostics insure on-line network integrity, and enable maintenance personnel to perform Predictive Maintenance on fiber optic ControlNet, Ethernet, Data Highway Plus, Remote I/O, DH-485, DF1, Modbus, and RS-232/RS-485 communication networks at-large!

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 optic 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, enabling maintenance personnel to splice/terminate/replace fiber media, add/delete nodes, etc. on-line, without disrupting network communications! In addition, Phoenix Digital’s fiber optic modules provide user program accessible diagnostics (1771 Plug-In OCM, 1746 Plug-In OLC, 1756 Plug-In OCX) and diagnostic outputs (Panelmount and DIN-Rail OCM/OLC/OCX) to locate network fault conditions, providing on-line diagnostic monitoring of the communication network at-large. All of this is transparent to the operation of ControlNet, Ethernet (ALL Protocols), Data Highway Plus, Remote I/O, DH-485, DF1, Modbus, and RS-232/RS-485 networks.

ON-LINE, REAL TIME, USER PROGRAM ACCESSIBLE DIAGNOSTICS... Phoenix Digital’s fiber optic modules provide system-level interactive diagnostics. These diagnostics may be accessed via the PLC User Program to assist in troubleshooting network problems:

— Detect and Locate Fault Conditions Throughout the Network.
— Detect and Locate Impending Fault Conditions Throughout the Network.
— Simulate Network Fault Conditions.
— Verify Fault Management and Overall Network Integrity.

These advanced interactive diagnostics provide the user with a powerful set of tools, greatly simplifying network start-up and on-line maintenance of ControlNet, Ethernet (ALL Protocols), Data Highway Plus, Remote I/O, DH-485, DF1, Modbus, and RS-232/RS-485 communication networks.
Phoenix Digital’s fiber optic modules provide optional wavelength selection for extended distance applications. The economical 850 nanometer wavelength may be selected for data communication networks with less than 12,000 feet (3,650 meters) between nodes. The higher performance 1300 and 1550 nanometer multimode wavelengths may be selected for longer distance applications, extending communication distances between nodes to over 6 miles (10 kilometers). The 1300 and 1550 nanometer single mode wavelengths may be selected for extended distance applications, extending communication distances between ControlNet, Data Highway Plus, Remote I/O, DH-485, DF1, and RS-232/RS-485 nodes to over 16 miles (25 kilometers), and between Ethernet and Modbus nodes to over 60 miles (96 kilometers).

**INSTALLATION**

Phoenix Digital’s fiber optic modules may be interconnected on the fiber optic network in an active bus, fault tolerant ring, or any other standard fieldbus cable 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. (Connection details are given in the product users manuals.) This configuration may be made fault tolerant by cross-connecting the fiber optic modules on either end of the active bus. (See Figures on pages 8 thru 12.) This automatically transforms the network into a fault tolerant, redundant, self-healing, counter-rotating ring configuration for ControlNet, Ethernet (ALL Protocols), Data Highway Plus, Remote I/O, DH-485, DF1, Modbus, or RS-232/RS-485 networks, without requiring any further action by the user.
INDUSTRIAL FIBER OPTIC CABLE and ACCESSORIES

Phoenix Digital provides fiber optic cable specifically designed for rugged industrial applications.

- **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

Consult the Factory or Visit our Website at “www.phoenixdigitalcorp.com” for more detailed specifications and model numbers on all Phoenix Digital Fiber Cable Products and Services.
# ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL NUMBER(1)</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCX-CTN</td>
<td>1756 Plug-In OCX for ControlNet Networks</td>
</tr>
<tr>
<td>OCX-ETF</td>
<td>1756 Plug-In OCX for 10/100 Mbps Ethernet Networks (ALL Protocols)</td>
</tr>
<tr>
<td>OCX-ETH</td>
<td>1756 Plug-In OCX for 10 Mbps Ethernet Networks</td>
</tr>
<tr>
<td>OCX-DPR</td>
<td>1756 Plug-In OCX for Data Highway Plus and Remote I/O Networks</td>
</tr>
<tr>
<td>OCX-MOD</td>
<td>1756 Plug-In OCX for Modbus Networks</td>
</tr>
<tr>
<td>OCX-EMOD</td>
<td>1756 Plug-In OCX for 10/100 Mbps Ethernet &amp; Modbus Networks</td>
</tr>
<tr>
<td>OCM-CTN</td>
<td>1771 Plug-In OCM for ControlNet Networks</td>
</tr>
<tr>
<td>OCM-ETH</td>
<td>1771 Plug-In OCM for 10 Mbps Ethernet Networks</td>
</tr>
<tr>
<td>OCM-DPR</td>
<td>1771 Plug-In OCM for Data Highway Plus and Remote I/O Networks</td>
</tr>
<tr>
<td>OCM-DPR1</td>
<td>1771 Plug-In OCM for DH-485 Networks</td>
</tr>
<tr>
<td>OCM-DF1</td>
<td>1771 Plug-In OCM for DF1 Networks</td>
</tr>
<tr>
<td>OCM-MOD</td>
<td>1771 Plug-In OCM for Modbus Networks</td>
</tr>
<tr>
<td>OCM-232</td>
<td>1771 Plug-In OCM for RS-232 Networks</td>
</tr>
<tr>
<td>OCM-485</td>
<td>1771 Plug-In OCM for RS-485 Network</td>
</tr>
<tr>
<td>OLC-CTN</td>
<td>1746 Plug-In OLC for ControlNet Networks</td>
</tr>
<tr>
<td>OLC-ETF</td>
<td>1746 Plug-In OLC for 10/100 Mbps Ethernet Networks (ALL Protocols)</td>
</tr>
<tr>
<td>OLC-ETH</td>
<td>1746 Plug-In OLC for 10 Mbps Ethernet Networks</td>
</tr>
<tr>
<td>OLC-DPR</td>
<td>1746 Plug-In OLC for Data Highway Plus and Remote I/O Networks</td>
</tr>
<tr>
<td>OLC-DPL</td>
<td>1746 Plug-In OLC for DH-485 Networks</td>
</tr>
<tr>
<td>OLC-DPL</td>
<td>1746 Plug-In OLC for DF1 Networks</td>
</tr>
<tr>
<td>OLC-MOD</td>
<td>1746 Plug-In OLC for Modbus Networks</td>
</tr>
<tr>
<td>OLC-EMOD</td>
<td>1746 Plug-In OLC for 10/100 Mbps Ethernet &amp; Modbus Networks</td>
</tr>
<tr>
<td>OLC-232</td>
<td>1746 Plug-In OLC for RS-232 Networks</td>
</tr>
<tr>
<td>OLC-485</td>
<td>1746 Plug-In OLC for RS-485 Networks</td>
</tr>
<tr>
<td>OCM-CBL-TF</td>
<td>OCM/OLC/OCX ControlNet Fault Tracking Interconnect Cable (3 ft./.9 meter length).</td>
</tr>
<tr>
<td>OLC-CBL-SC</td>
<td>SLC 500 to OLC Interconnect Cable for DH-485 (1 ft./.3 meter length).</td>
</tr>
<tr>
<td>OCM-CBL-DF</td>
<td>PLC-5 to OCM Interconnect Cable for DF1 (1 ft./.3 meter length).</td>
</tr>
<tr>
<td>OLC-CBL-DF</td>
<td>SLC 500 to OLC Interconnect Cable for DF1 (1 ft./.3 meter length).</td>
</tr>
<tr>
<td>OCM-CBL-A1</td>
<td>10 Base-T or 10/100 Base-T OCM/OLC/OCX Interconnect Cable for Ethernet (1 ft./.3 meter length).</td>
</tr>
<tr>
<td>OCX-CBL-A1</td>
<td>10 Base-T OLC/OCX-ETH (Port 2) Interconnect Cable for Ethernet (1 ft./.3 meter length).</td>
</tr>
<tr>
<td>OCM-AUI-A1</td>
<td>10 Base-T Ethernet Transceiver.</td>
</tr>
<tr>
<td>OCX-CBL-MOD</td>
<td>Modbus OLC/OCX-MOD and OLC/OCX-EMOD Interconnect Cable Adapter. (One end 9 pin Micro D Subminiature connector (female pins), one end 9 pin Standard D Subminiature connector (female pins); 18 inches/.5 meter length)</td>
</tr>
<tr>
<td>OCX-DIAG-ETF</td>
<td>On-Line, Real Time Ethernet Diagnostic Software Package (PC Resident).</td>
</tr>
</tbody>
</table>
Add the Following Options to the Product Model Numbers given on page 6:

(1) Add suffix “-85” for 12,000 feet/3,650 meters between nodes (850 nm Multimode Wavelength).
Add suffix “-13” for 32,000 feet/10 kilometers between nodes (1300 nm Multimode Wavelength).
Add suffix “-15” for 43,000 feet/13 kilometers between nodes (1550 nm Multimode Wavelength).
(The 1550 nm Multimode wavelength is not available on OLC/OCX-ETF, MOD, and EMOD modules.)

Add suffix “-P” for Panelmount, Standalone Module Enclosure.
Add suffix “-R” for DIN-Rail, Standalone Module Enclosure. (Available with OCX modules only.)

Add suffix “-D” for Real Time Diagnostic Option. (Required on OCX Modules for UL and UL/C Class I, Division 2 Rating.)

Add suffix “-ST” for ST Fiber Optic Connector Style. (Available on all fiber module types, for all optical wavelengths.)
Add suffix “-SC” for SC Fiber Optic Connector Style. (Available on OLC/OCX-ETF, MOD, and EMOD modules only, for all optical wavelengths.)
Add suffix “-LC” for LC Fiber Optic Connector Style. (Available on OLC/OCX-ETF, MOD, and EMOD modules only, for the 1300 nm and 1550 nm optical wavelengths.)
Add suffix “-MT” for MTRJ Fiber Optic Connector Style. (Available on OLC/OCX-ETF, MOD, and EMOD modules only, for the 1300 nm wavelength.)
Add suffix “-SMA” for SMA Fiber Optic Connector Style. (Available on all fiber module types except OLC/OCX-ETF, MOD, and EMOD modules, for the 850 nm wavelength.)

Add suffix “-24V” for 24 VDC Operation, or “R24V” for Redundant, 24 VDC Operation.
Add suffix “-125V” for 125 VDC Operation, or “R125V” for Redundant, 125 VDC Operation.
Add suffix “-ACV” for 120/220 VAC Operation, or “RACV” for Redundant, 120/220 VAC Operation.

Add suffix “-xA1” to OCM/OLC/OCX-ETH Modules for 10 Base-T Operation and to OLC/OCX-ETF and OLC/OCX-EMOD Modules for 10/100 Base-T Operation, where “x” specifies the number of 10 Base-T or 10/100 Base-T ports available on the module. (1 or 2 for OCM/OLC/OCX-ETH modules; 1, 2, or 4 for OLC/OCX-ETF and EMOD 1746/1756 Plug-In Modules, and 1, 2, 3, 4, 5, or 6 for OCX-ETF-R and OCX-EMOD-R DIN-Rail, Standalone Modules.)
Add suffix “-A2” to OCM/OLC/OCX-ETH Modules for 10 Base-2 Operation.

Add suffix “-EXT” for Networks with 28 or More OCM/OLC/OCX-CTN Modules; 10 or More OCM/OLC/OCX-ETH, OLC/OCX-ETF, or OLC/OCX-EMOD modules; and 13 or more OCM/OLC/OCX-DPR Modules.

Add suffix “-485” to OLC/OCX-MOD, EMOD, and OCM-MOD Modules for RS-485 Modbus Communication.
Add suffix “-FD” to OLC/OCX-MOD, EMOD, and OCM-MOD Modules for Full Duplex, Point-to-Point Communication.
Add suffix “-MAS” to OLC/OCX-MOD and EMOD Modules for On-the-Fly, Modbus Multi-Master Multiplexing.
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.)

Add suffix “-10F” to all OCM/OLC/OCX-CBL Cable Model Numbers for 10 ft./3 m. length.
Add suffix “-HUB” to OCM/OCX-CBL-A1 Cable Model Numbers for Direct Connection to HUBs.
Add suffix “-09P”, “-15P”, “-25P” to OCM-CBL-DF1 and OLC-CBL-DF1 Cable Model Numbers for 9, 15, 25 pin A-B connectors, respectively.
UL CLASS I, DIVISION 2 (HAZARDOUS LOCATIONS)
10/100 Mbps ETHERNET DUAL MEDIA RING CONFIGURATION
(FAULT TOLERANT)

TYPICAL ETHERNET OCX-ETF INSTALLATION CONFIGURATION

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

(2) OPTICAL ControlLogix MODULE
MODEL # OCX-ETF-13-D-ST-4A1
(UL CLASS I, DIV. 2)
UL CLASS I, DIVISION 2 (HAZARDOUS LOCATIONS)
MODBUS (RS-232/485) & ETHERNET (10/100 Mbps) DUAL MEDIA RING CONFIGURATION
(FAULT TOLERANT)

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

(2) OPTICAL ControlLogix MODULE
MODEL # OCX-EMOD-13-D-ST-4A1-485-MAS
(UL CLASS I, DIV. 2)

TYPICAL MODBUS & ETHERNET OCX-EMOD INSTALLATION CONFIGURATION
UL CLASS I, DIVISION 2 (HAZARDOUS LOCATIONS)
DATA HIGHWAY PLUS DUAL MEDIA RING CONFIGURATION
(FAULT TOLERANT)

(1) OPTICAL COMMUNICATION MODULE
MODEL # OCX-DPR-85-R-D-ST-ACV
(UL CLASS I, DIV. 2)

(2) OPTICAL ControlLogix MODULE
MODEL # OCX-DPR-85-D-ST
(UL CLASS I, DIV. 2)

ETHERNET DUAL MEDIA RING CONFIGURATION (FAULT TOLERANT)

(1) OPTICAL COMMUNICATION MODULE
MODEL # OCX-ETH-85-R-D-ST-ACV-2A1
(UL CLASS I, DIV. 2)

(2) OPTICAL Communication MODULE
MODEL # OCM-ETH-85-D-ST-2A1
(UL CLASS I, DIV. 2)

TYPICAL OCM/OLC/OCX INSTALLATION CONFIGURATIONS
TYPICAL OCM/OLC/OCX INSTALLATION CONFIGURATIONS

11/07 OCM
TYPICAL ControlNet OCM/OLC/OCX-CTN INSTALLATION CONFIGURATION

(1) OPTICAL COMMUNICATION MODULE (UL CLASS I, DIV. 2)
   MODEL # OCM-CTN-85-R-D-ST-ACV
(2) OPTICAL COMMUNICATION MODULE
   MODEL # OCM-CTN-85-D-ST
(3) OPTICAL LINK COUPLER
   MODEL # OLC-CTN-85-D-ST
(4) OPTICAL ControlLogix MODULE (UL CLASS I, DIV. 2)
   MODEL # OCX-CTN-85-D-ST
(5) OPTICAL COMMUNICATION MODULE
   MODEL # OCM-CTN-85-P-D-ST-ACV

Consult factory for additional information on fiber optic modules
for other Allen-Bradley networks; multiplexers and network servers for MODBUS;
Industrial Fiber Optic Cable (indoor, outdoor, aerial, burial, etc.); Wavelength Division
Multiplexers and Optical Couplers; and Optical Slip Rings.