Phoenix Digital

ROCKWELL ALLEN-BRADLEY FAST ETHERNET OPTICAL COMMUNICATION MODULES

INSTALLATION and USERS MANUAL

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Users Manual

Notes: 1. This manual provides user information describing the operation and functionality of the following Ethernet fiber optic modules:

OLC-ETF-xx (1746 Plug-In);
OCX-ETF-xx (1756 Plug-In);
OCX-ETF-xx-R (Standalone, DIN-Rail or Panelmount).

2. All OCX modules (with the "-D" diagnostic option) are rated for use in Class I, Division 2 Groups A, B, C, and D hazardous locaitons. The following information is provided for hazardous location approval for OCX module applications:

"WARNING - Explosion Hazard - Do not disconnect while circuit is live unless area is known to be non-hazardous."

"WARNING - Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2."

"This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only."

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CHAPTER 1

DESCRIPTION AND SPECIFICATION

1.1 INTRODUCTION

Phoenix Digital's family of Rockwell Allen-Bradley 10/100 Mbps FAST Ethernet fiber optic modules provide the most advanced, comprehensive, state-of-the-art fiber optic communication capabilities on the market today. Phoenix Digital's FAST Ethernet fiber optic modules are available as Standalone, DIN-Rail or Panelmount modules with integral 120/220 VAC, 24 VDC, or 125 VDC power supplies (Optical Communication Modules... OCX-ETF-R), 1746 Plug-In modules (Optical Link Couplers... OLC-ETF), and 1756 Plug-In modules (Optical ControlLogix Modules... OCX-ETF). These fiber optic modules translate hardwire networks into an optical network medium, 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 network options include features not found in even the most expensive communication network installations; on-line diagnostic monitoring with high speed self-healing communication recovery around points of failure (Fault Tolerant), interactive diagnostics to locate and trap fault conditions (accessible by the user program), and wavelength selection for matching fiber media characteristics to enable communication over extended distances. Phoenix Digital makes all of this possible through application of its patented self-healing communication switch and advanced optical technologies.

The following table provides correspondence between Phoenix Digital fiber optic module Model Numbers and Allen-Bradley FAST Ethernet network compatibility. The user should check the Model Number label located on the side of the fiber optic module cover to verify network interface compatibility.

FIBER OPTIC MODULE MODEL #	NETWORK COMPATIBILITY
OCX-ETF-(1)-(2)-(3)-(4)-(5)-(6)-(7)-(8)	FAST Ethernet Communications (Standalone, DIN-Rail or Panelmount modules)
OLC-ETF-(1)-(3)-(4)-(6)-(7)-(8)	FAST Ethernet Communications (1746 Plug-In modules)
OCX-ETF-(1)-(3)-(4)-(6)-(7)-(8)	FAST Ethernet Communications (1756 Plug-In modules)
OCM-CBL-A1-(9)	10/100 Base-T Intereconnect Cable (RJ45 to RJ45)

(1)	"85"	=	850 nanometer wavelength selection (Multimode only)
	"13"	=	1300 nanometer wavelength selection (Multimode or Single Mode)
	"15"	=	1550 nanometer wavelength selection (Single mode only)
(2)	"R"	=	Standalone DIN-Rail or Panelmount Enclosure
	blank	=	1746 or 1756 Plug-In Module
(3)	"D"	=	Interactive Diagnostics
	blank	=	No Diagnostics
(4)	"ST"	=	ST Fiber Optic Connector Style
	"SC"	=	SC Fiber Optic Connector Style
	"LC"	=	LC Fiber Optic Connector Style (Not available for the 850 nm wavelength.)
	"MT"	=	MTRJ Fiber Optic Connector Style (Not available for the 1550 nm wavelength.)
(5)	"24V"	=	24 VDC Operation
	"ACV"	=	120/220 VAC, 50/60 Hz Operation
	"125V"	=	125 VDC Operation
(6)	"SM"	=	Single Mode Fiber Compatibility (Available with the 1300 nm or 1550 nm wavelengths only.)
	blank	=	Multimode Fiber Compatibility
(7)	"xA1"	=	Integral 10/100 Base-T Transceiver, where "x" specifies the number of 10/100 Base-T ports (1, 2, or 4 for OLC/OCX-ETF 1746/1756 Plug-In modules, or 1, 2, 3, 4, 5, or 6 for OCX-ETF-R Standalone, DIN-Rail or Panelmount modules)
(8)	"EXT"	=	Extended Capacity option, required for networks with 10 or more OLC/OCX-ETF modules connected together in a ring or bus network configuration.
(9)	"10"	=	10 foot/3 meter length
	blank	=	1 foot/.3 meter length

PRODUCT MODEL NUMBER DEFINITION

TABLE 1

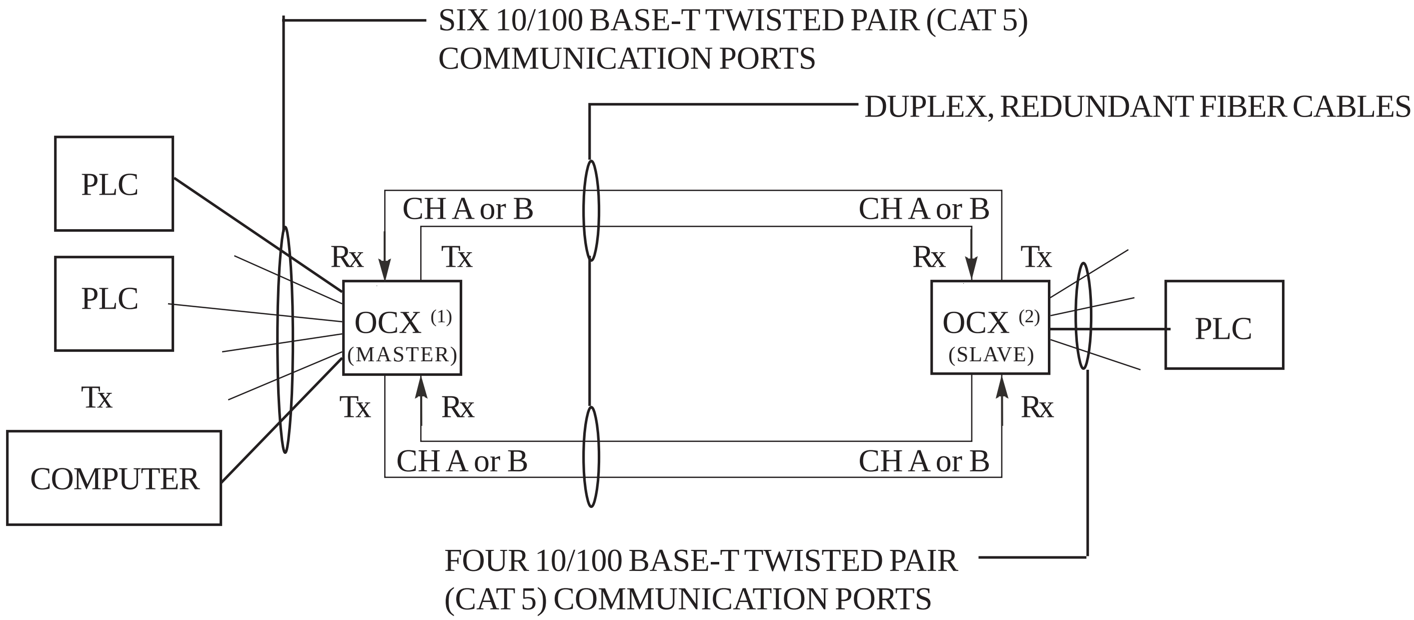
A summary of selected fiber optic module features is given below:

- o Provides Transparent Network Management and Switched Operation for up to 6 independent, 10/100 Base-T communication ports on each module.
- o Fault Tolerant Communication: Provides On-line, Interactive Diagnostic Monitoring and Ultra-Fast, High Speed, Self-Healing Communication Recovery for FAST Ethernet Control Networks.
- o 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.
- o Interactive Diagnostics (User Program Accessible): Locates Fault Conditions Throughout the Network.
- o Selectable Wavelengths: 850 nanometer (multimode), 1300 nanometer (multimode and single mode), and 1550 nanometer (single mode).
- o Extended Capacity Option: Supports an Unlimited Number of Fiber Optic Modules on a Single Multidrop Bus or Ring Network Configuration.
- o Easy to see, visual indication of Communication Diagnostic Status.

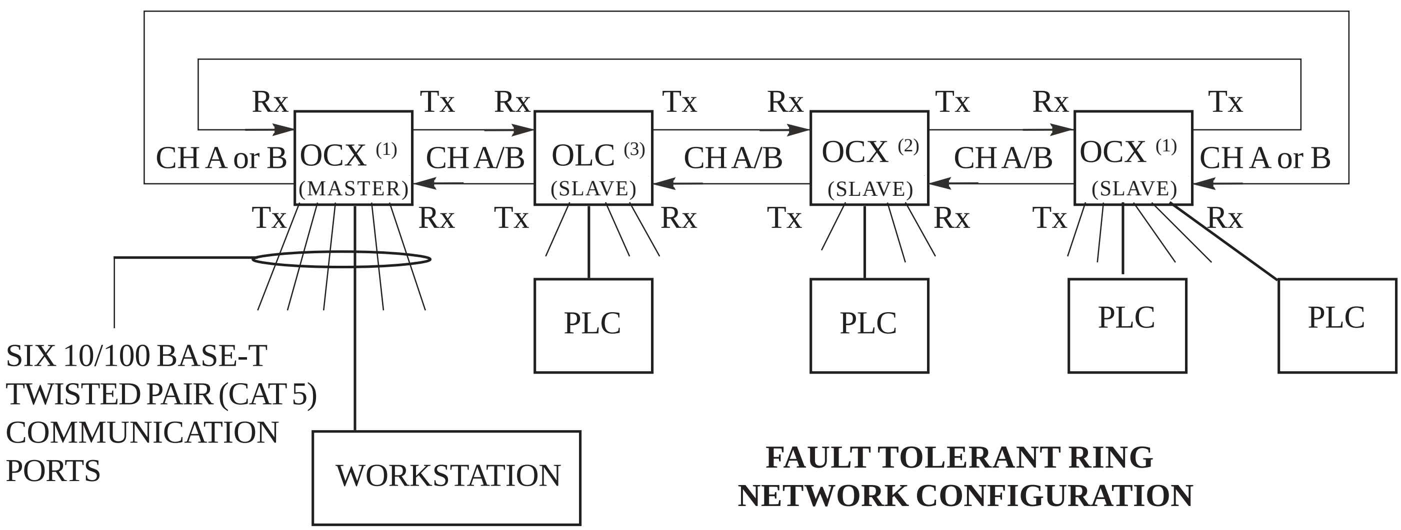
1.2 PRODUCT DESCRIPTION

1.2.1 FAULT TOLERANT, SELF-HEALING COMMUNICATION

Phoenix Digital's Fault Tolerant, Self-Healing Communication technology provides diagnostic monitoring of the communication signal waveforms at each node on the network, and ultra-high speed detection, isolation, and correction of points of communication failure anywhere on the network grid. Phoenix Digital's fiber optic modules will self-heal around communication failures in ring, bus, star, tree, or point-to-point network configurations, and automatically reconfigure the overall fiber optic communication network to maintain communication continuity throughout the network. In the event of a network failure in a fault tolerant network configuration, Phoenix Digital's FAST Ethernet Fiber Optic communication modules will insure fiber optic Network Reconfiguration in less than 2.0 millisecond. Figure 1 illustrates Examples of Typical Fault Tolerant, Fiber Optic Module Network Configurations using Phoenix Digital's FAST Ethernet fiber optic communication modules.



FAULT TOLERANT, POINT-TO-POINT NETWORK CONFIGURATION



FAULT TOLERANT RING NETWORK CONFIGURATION

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

(2) OPTICAL ControlLogix MODULE
MODEL # OCX-ETF-13-D-ST-4A1

(3) OPTICAL LINK COUPLER
MODEL # OLC-ETF-13-D-ST-4A1

EXAMPLES OF TYPICAL FAULT TOLERANT, FIBER OPTIC FAST ETHERNET NETWORK CONFIGURATIONS

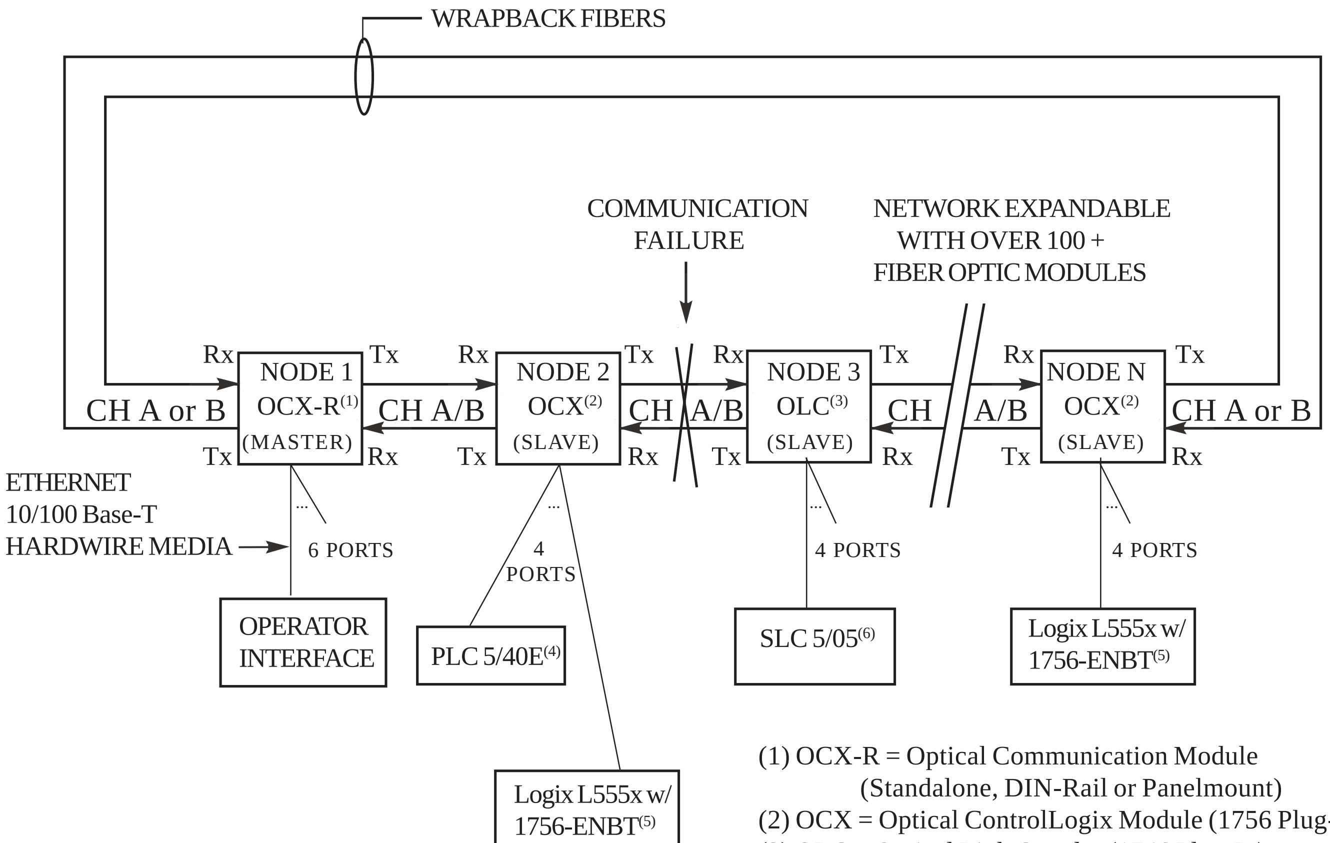
FIGURE 1

The ultra-high speed, self-healing communication technology on each Phonix Digital fiber optic module will automatically redirect network traffic around points of failure (wrapback communication). In a failed condition, the fiber optic communication network will self-heal around a fault by reconfiguring the network, and redirecting data communications around the point of failure to find the shortest path from the source location to the intended destination.

In fault tolerant ring network configurations, one fiber module on the fiber optic FAST Ethernet ring must be switch configured to be a Network Master module, and all other modules must be switch configured to be Slave modules. The fiber optic Network Master module may be located anywhere on the fiber optic network. In the event of a failure of any Slave module, or failure of the Network Master module itself, the remaining fiber optic modules will self-heal around the module faillure, maintaining network communication by redirecting data communications around the point of failure. (Configuring more than one fiber optic Master module on a ring network will result in network failures. See Table 8 for fiber optic module Master/Slave Switch Designations. See Configuration Instructions in Chapter 2, Section 2.6 for more detailed information.)

Figure 2 illustrates a typical redundant, fault tolerant, fiber optic ring, FAST Ethernet network configuration. In this example one fiber optic module is configured to be the Network Master module, and the other fiber optic modules are configured as Slaves. The fiber optic modules may either be interconnected Channel A Tx/Rx to Channel A Rx/Tx, then Ch B Tx/Rx to Ch B Rx/Tx, etc., around the ring; or Ch A Tx/Rx to Ch B Rx/Tx, then Ch A Tx/Rx to Ch B Rx/Tx, etc., around the ring. There is no special restriction limiting how the fiber channels must be connected together, as long as the transmit/receive connections from one channel are connected to a complementary set of connections on another channel. Diagnostic monitoring circuitry at each module (master and slave) will continuously monitor the integrity of the communication carriers present at the receive data inputs of each communication module. This high speed combinational diagnostic monitoring circuitry will monitor and detect communication failures in carrier symmetry, jitter, amplitude, and babble. In the event a fault condition is diagnosed on the network (Figure 2: Between Nodes 2 and 3) the fiber modules detecting the failure (Nodes 2 and 3) will immediately redirect communication around the point of failure. Essentially, the network dynamically reconfigures to form a new communication path from node 2 to node 3, away from the point of failure (the long way around the ring network), thus insuring communication network continuity and fault isolaton. In additon to providing network fault tolerance, Phoenix Digital's fiber optic modules enable maintenance personnel to locate fault conditons (remote status monitoring), add/delete nodes, and splice/terminate/replace media on-line, without disrupting network communications.

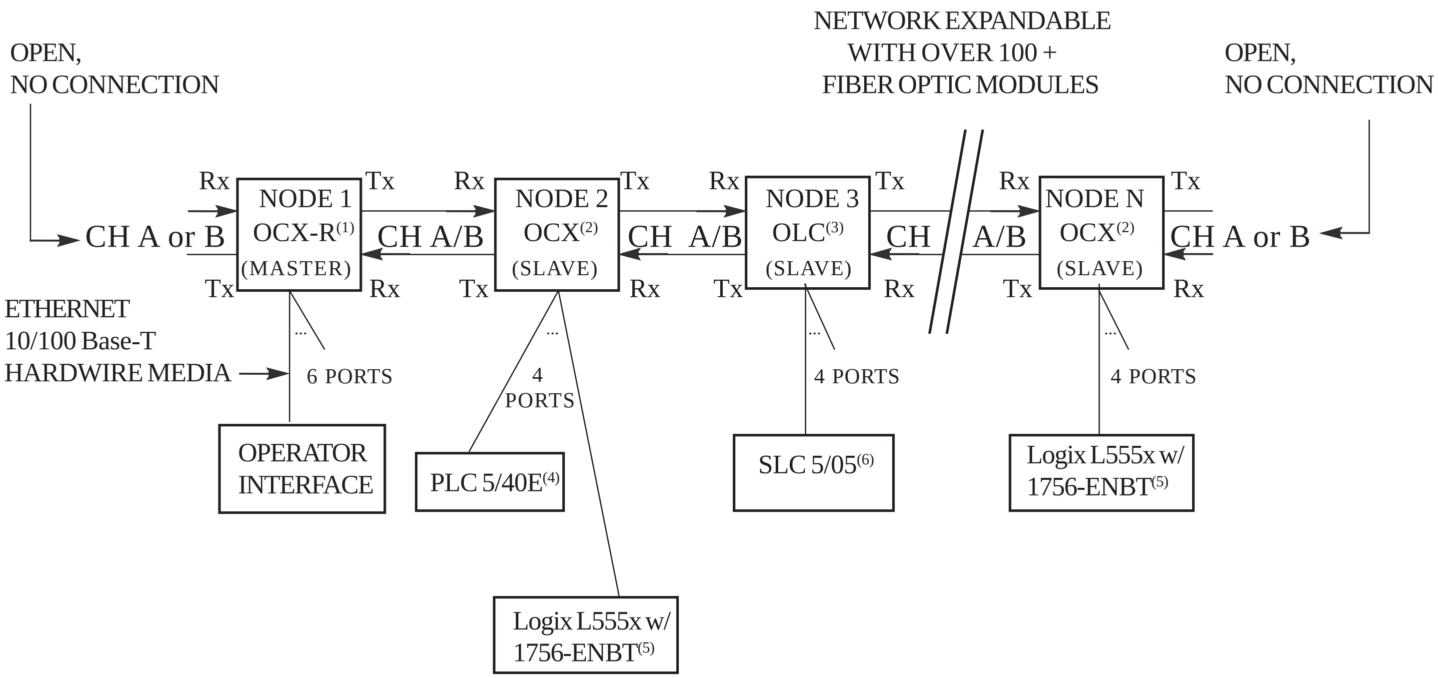
Figure 3 illustrates a typical, non-redundant, fiber optic bus Ethernet network configuration. In this example, all of the fiber optic modules should be configured as Slaves. The fiber optic modules may be interconnected Channel A Tx/Rx to Channel A Rx/Tx, then Ch B Tx/Rx to Ch B Rx/Tx, etc., throughout the bus; or Ch A Tx/Rx to Ch B Rx/Tx, then Ch A Tx/Rx to Ch B Rx/Tx, etc., throughout the bus. The outside ports on the two end fiber modules should remain unconnected to any other



(1) OCX-R = Optical Communication Module
(Standalone, DIN-Rail or Panelmount)
(2) OCX = Optical ControlLogix Module (1756 Plug-In)
(3) OLC = Optical Link Coupler (1746 Plug-In)
(4) PLC 5/40E = PLC 5/40 with Ethernet
Processor Interface
(5) Logix L555x w/ 1756-ENBT = ControlLogix
Processor with ENBT Ethernet Comm Module
(6) SLC 5/05 = SLC Processor

10/100 Mbps ETHERNET RING NETWORK CONFIGURATION
ILLUSTRATING SELF-HEALING COMMUNICATION WRAPBACK

FIGURE 2



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(6) SLC 5/05 = SLC Processor

NON-REDUNDANT, 10/100 Mbps ETHERNET BUS NETWORK CONFIGURATION

FIGURE 3

devices. Since the red ERR or ER error indicator on the front of the fiber optic module will remain on whenever there is no connection and/or valid carrier signal at the corresponding fiber optic receive input, the error indicators corresponding to the receive data inputs on the outside ports of the two end fiber modules on the bus will remain continuously on. However, this is not an indication of a network error, because in this configuration these network inputs will remain open and unconnected.

In redundant, point-to-point fiber optic network configurations, in which two fiber optic modules are interconnected with fiber cables on two, redundant channels (see top of Figure 1), one of the fiber modules must be configured as a Network Master. For non-redundant, point-to-point fiber optic network configuration, in which only one channel is used to connect from one module to the other, both modules may be configured as Slaves.

In all redundant fiber optic network configurations, communication continuity will be unconditionally maintained by the fiber optic modules in the event of either node or media failure. When the source of the network failure is corrected, the fiber modules will automatically restore the communication network to its' original traffic patterns. See Figure 4 for a typical FAST Ethernet network installation in a redundant, fiber optic ring configuration.

1.2.2 WAVELENGTH SELECTION

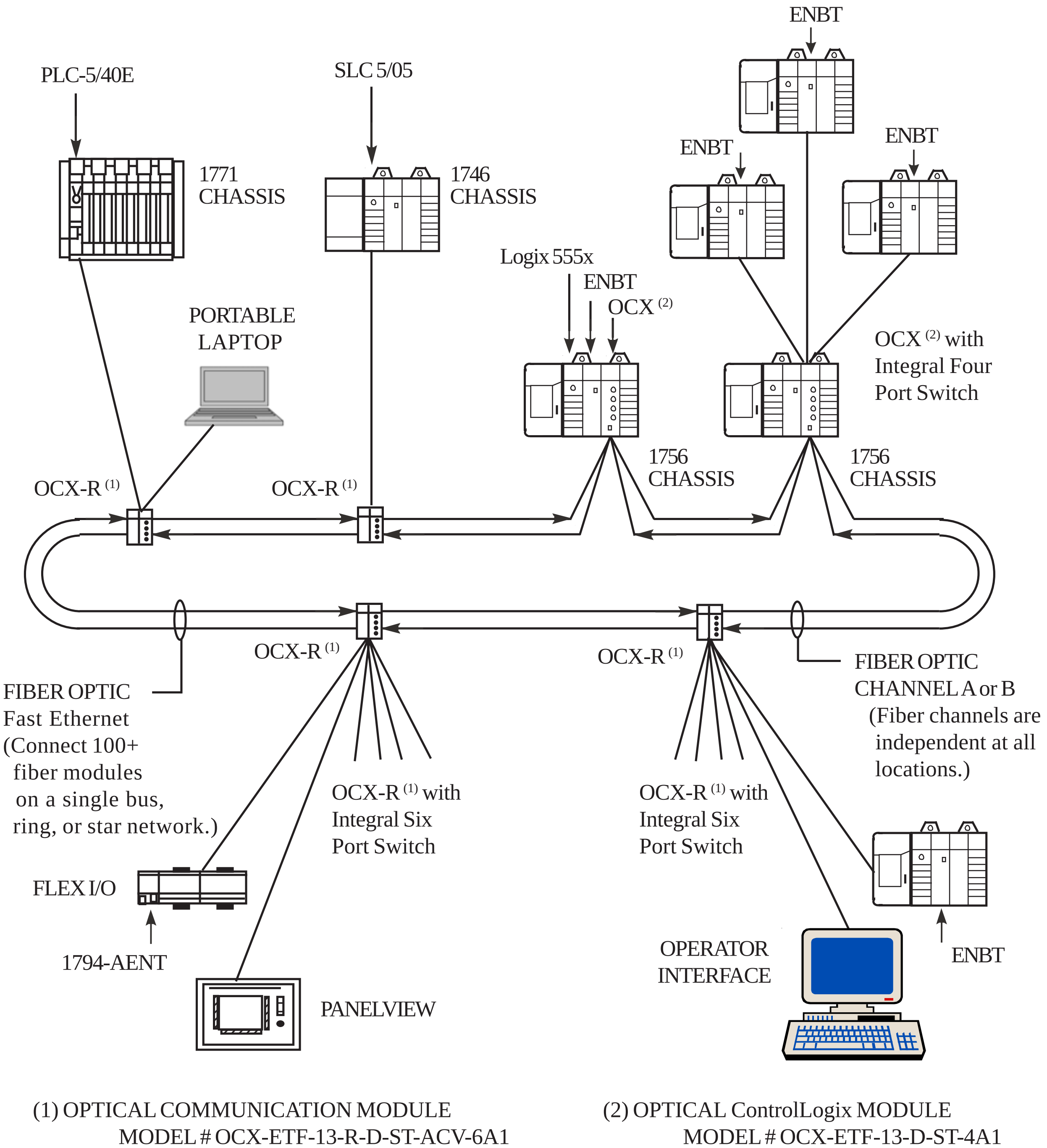
Phoenix Digital's fiber optic modules provide four options for wavelength selection. The economical 850 nanometer multimode wavelength may be selected for data communication networks with less than 8,000 feet (2,500 meters) between communication nodes. The higher performance 1300 nanometer multimode wavelengths may be selected for longer distance applications, extending communication distances between nodes to over 4 miles (6.4 kilometers). For maximum distance, the ultra-high performance 1300 and 1550 nanometer singlemode wavelengths may be selected, extending communication distances to over 60 miles (96 kilometers) between communication nodes!

1.3 PRODUCT SPECIFICATIONS

Fiber Optic Module Mounting Dimensions and Connector Designations are provided in Figures 5 thru 8.

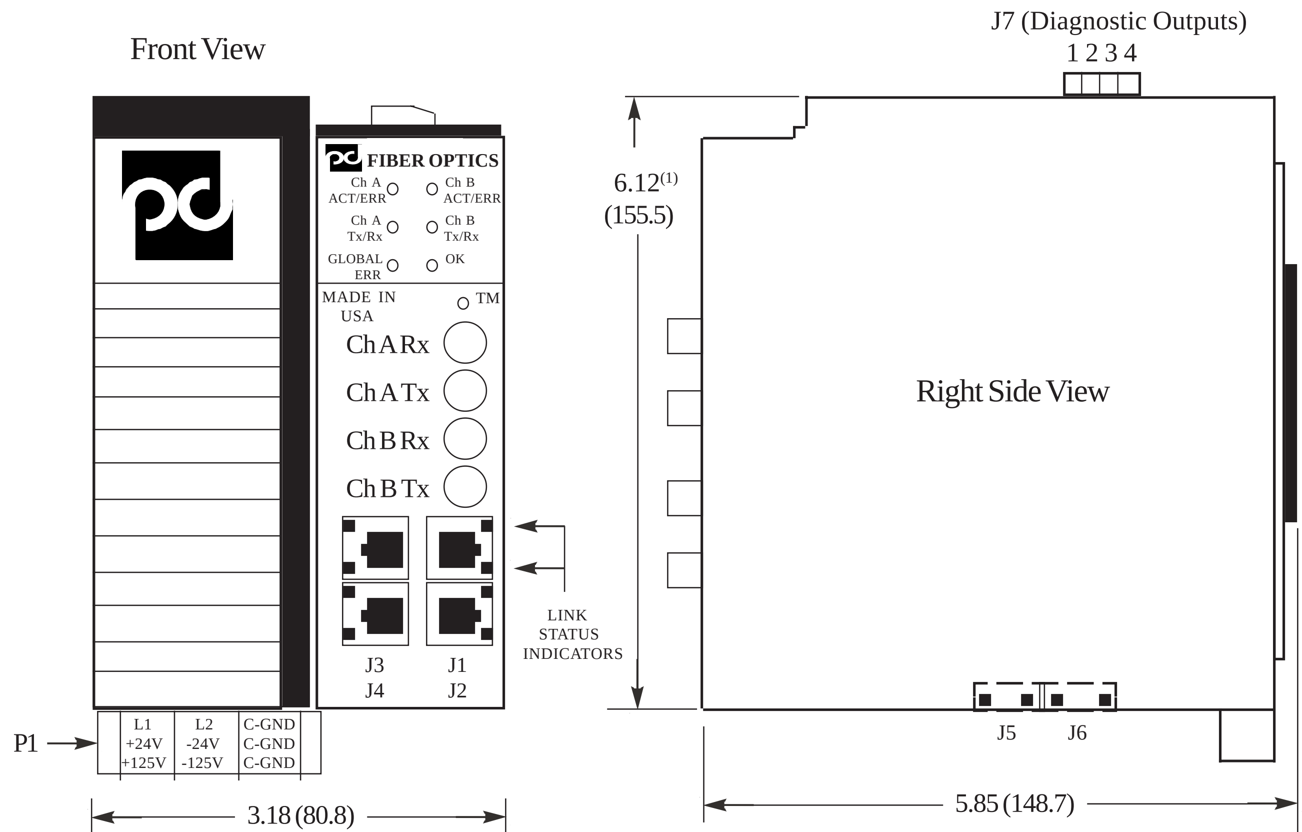
1.3.1 DEVICE INTERFACE SPECIFICATIONS

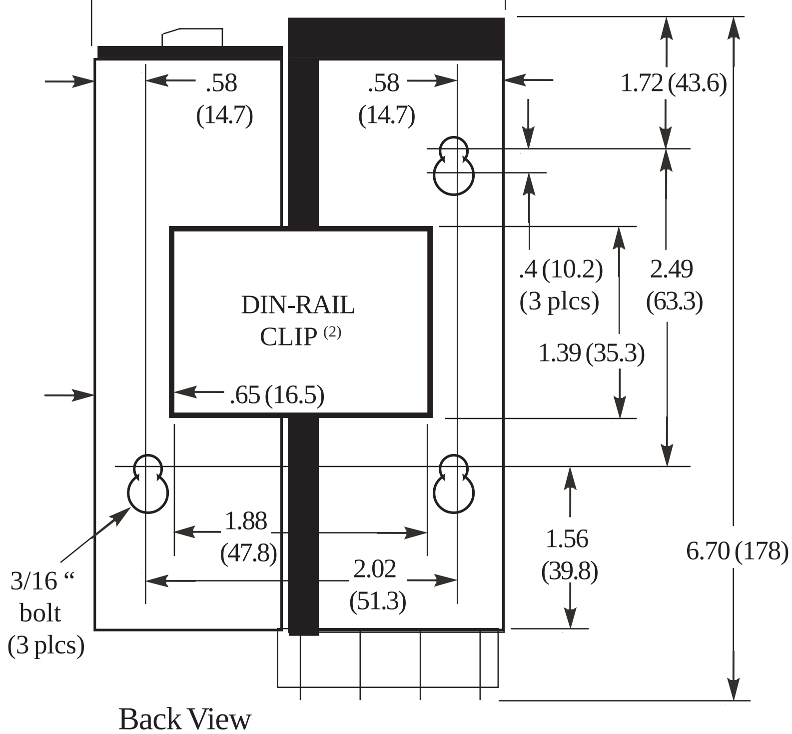
The Standalone, DIN-Rail/Panelmount OCX-ETF-R 10/100 Base-T device interface port connections are provided on the front and bottom of the OCX-ETF-R module (RJ45 connectors designated as J1, J2, J3, J4, J5, and J6 - see Figures 5 and 8). The 1746 Plug-In OLC-ETF and



TYPICAL FAST ETHERNET OCX-ETF INSTALLATION IN A REDUNDANT, FIBER OPTIC RING CONFIGURATION

FIGURE 4



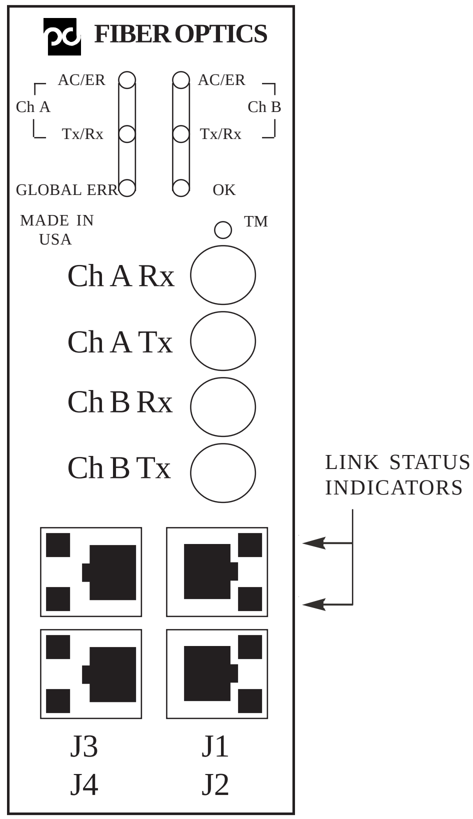


ALLEN-BRADLEY FAST ETHERNET STANDALONE, DIN-RAIL/PANELMOUNT OCX-ETF-R MOUNTING DIMENSIONS AND CONNECTOR DESIGNATIONS

FIGURE 5

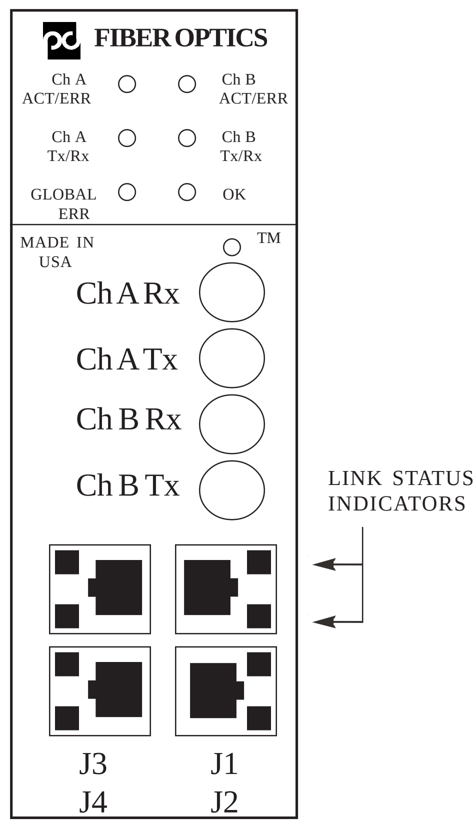
(1) ALL DIMENSIONS SHOWN IN INCHES (MILLIMETERS) +/- 2 %

(2) DIN-RAIL CLIP MAY BE REMOVED FROM BACK OF OCX-ETF-R FOR OPTIONAL PANELMOUNTING.



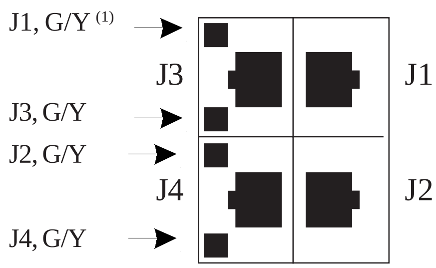
ALLEN-BRADLEY FAST ETHERNET
1746 PLUG-IN OLC-ETF
CONNECTOR DESIGNATIONS

FIGURE 6

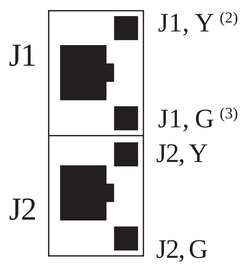


ALLEN-BRADLEY FAST ETHERNET
1756 PLUG-IN OCX-ETF
CONNECTOR DESIGNATIONS

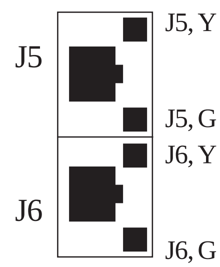
FIGURE 7



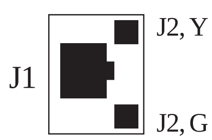
Quad Connector used on 1746 OLC-ETF and 1756 OCX-ETF when module is ordered with four ports, and on Standalone, DIN-Rail/Panelmount OCX-ETF-R when the module is ordered with four, five, or six ports.



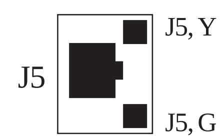
Dual Connector used on 1746 OLC-ETF, 1756 OCX-ETF and Standalone, DIN-Rail/Panelmount OCX-ETF-R when the module is ordered with two or three ports.



Dual Connector used on Standalone, DIN-Rail/Panelmount OCX-ETF-R when the module is ordered with six ports.



Single Connector used on 1746 OLC-ETF, 1756 OCX-ETF and Standalone, DIN-Rail/Panelmount OCX-ETF-R when the module is ordered with one port.



Single Connector used on Standalone, DIN-Rail/Panelmount OCX-ETF-R when the module is ordered with three or five ports.

(1) Dual Color Link Status Indicator (Quad Connector Only):
Solid Green (Link Established), Flashes Green (Transmit Data), Flashes Yellow (Receive Data), OFF (No Link).

(2) Single Color Link Status Indicator (Single and Dual Connectors Only):
Solid Yellow (Receive Data), OFF (All other states and conditions).

(3) Single Color Link Status Indicator (Single and Dual Connectors Only):
Solid Green (Link Established), Flashes Green (Transmit or Receive Data), OFF (No Link).

OLC-ETF, OCX-ETF, AND OCX-ETF-R 10/100 BASE-T CONNECTOR DESIGNATIONS AND LINK STATUS INDICATORS

FIGURE 8

1756 Plug-In OCX-ETF 10/100 Base-T device interface port connections are provided on the front of the OLC and OCX modules (RJ45 connectors designated as J1, J2, J3, and J4 - see Figures 6, 7 and 8). The number of these ports populated on the OCX-ETF-R, OLC-ETF, or OCX-ETF varies as a function of the number specified in the ordering information and model number ("xA1"). These port connetions are provided in sequential order beginning with J1, except in the case of an OCX-ETF-R with three 10/100 Base-T ports. In this case, these ports will be provided as J1, J2, and J5.

The RJ45 connectors on the front and/or bottom of the OLC-ETF, OCX-ETF, and OCX-ETF-R modules provide independent, switched 10/100 Base-T FAST Ethernet ports. Each of these ports also provides Auto-Negotiation, to automatically determine and conform to the speed and duplex mode of whatever device it is connected to. The ports will independently Auto-Negotiate these operating parameters each time a new device is connected, and on initial power-up.

Each RJ45 connector port also provides Auto MDI/MDIX Crossover. This feature allows each individual port to determine whether or not it needs to interchange cable sense between complementary pairs of signals in the cable, so that an external crossover cable will not be required if the signals in the cable are not compatible with the connector. If a port on the fiber optic module is connected to a device that cannot automatically correct for crossover, the fiber module will make the necessary adjustment prior to Auto-Negotiation. The following table provides pin mapping for the MDI/MDIX pin functions:

Physical Pin	MDIX		MDI	
	100BASE-TX	10BASE-T	100BASE-TX	10BASE-T
TXP/TXN	Transmit	Receive	Receive	Transmit
RXP/RXN	Receive	Transmit	Transmit	Receive

MDI/MDIX PIN FUNCTIONS

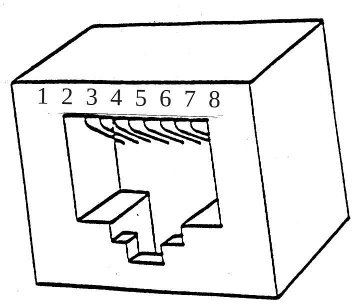
TABLE 2

In addition to all of the above, the OLC-ETF, OCX-ETF, and OCX-ETF-R fiber optic modules provide a CAT-5 Cable Tester, built into the RJ45 connector of each 10/100 Base-T communication port (included with the "-D" diagnostic option only). This feature utilizes Time Domain Reflectometry (TDR) to determine the quality of cables, connectors, and terminators. Some of the possible problems that can be diagnosed by the fiber optic module include opens, shorts, cable impedance mismatches, bad connectors, termination mismatches, and bad magnetics. The cable tester feature is enabled whenever the fiber module is not in Trap Mode, and the TM (Test Mode/Trap Mode) pushbutton on the front of the module is depressed. When this button is depressed the Ethernet devices which are connected to the fiber module RJ45 ports will lose their respective links, and the fiber optic module will sequentially perform TDR testing on all device interface ports, one at a time. (The TDR test will last two to four seconds on each port.) If no problems are detected on the connected ports, the port indicators on the corresponding RJ45 connectors will flash green with a one second frequency (approximate). If one or more of the above problems are detected on one or more of the connected ports, the corresponding port indicator(s) will flash yellow with a one second frequency. (Port indicators for off-line ports, not connected to any devices, will also flash yellow.) When the TDR test is complete, the OCX-ETF will automatically re-enable link communications. (Note that while the Network Master module is performing the TDR cable test, network fault management will be disabled, until the Master module cable test is complete.)

1.3.1.1 10/100 BASE-T CONNECTORS (J1, J2, J3, J4, J5, J6)

10/100 Base-T Pin Number (1)	Ethernet Connector Signal Name (10/100 Base-T RJ45 Interface... Orientation)
1	RD+ (Output)
2	RD- (Output)
3	TD+ (Input)
4	NC (2)
5	NC (2)
6	TD- (Input)
7	NC (2)
8	NC (2)

(1) The 10/100 Base-T connectors are 8 pin RJ45 Receptacles. RJ45 Receptacle pin orientation (front view) is given in the figure below...



(2) "NC" = No Connection. All undersignated pin numbers should remain unconnected to any electrical signals.

10/100 BASE-T CONNECTORS (J1, J2, J3, J4, J5, J6)

TABLE 3

1.3.2 OPTICAL NETWORK INTERFACE SPECIFICATIONS

The Optical Network Interface is designated as ChA Rx, Ch A Tx, Ch B Rx, and Ch B Tx on the fiber optic module faceplate (see Figures 5, 6, and 7). Phoenix Digital fiber optic modules are compatible with ST, SC, LC, or MTRJ fiber optic connectors... as an ordering option (mating connector which is terminated to the fiber media). Detailed specifications describing optical network transmit and receive capabilities at the 850 nm multimode, 1300 nm multimode, 1300 nm single mode, and 1550 nm single mode wavelengths are provided below:

1.3.2.1 OPTICAL TRANSMITTER BANDWIDTH (ALL WAVELENGTHS)

Maximum Optical Bandwidth = 62.5 MHz

1.3.2.2 OPTICAL TRANSMITTER (850 nm MULTIMODE) :

Electro-Optical Characteristics

Parameter	Test Condition	SYM.	MIN.	TYP.	MAX.	UNITS
Fiber Coupled Power	50/125 micron, Graded, 0.20NA	Poc	65/-12.0			microwatts/dBm
	62.5/125 micron, Graded, 0.28NA		160/-9.0			microwatts/dBm
Peak Wavelength	λ_P		830	850	870	nm
Spectral Width	λ_W			1.0	4.0	nm

850 nm MULTIMODE FIBER OPTIC TRANSMITTER SPECIFICATIONS

TABLE 4

OPTICAL TRANSMITTER (1300 nm MULTIMODE)

Electro-Optical Characteristics

Parameter	Test Condition	SYM	MIN.	TYP.	MAX.	UNITS
Fiber Coupled Power	50/125 micron Graded, 0.20NA	Poc	5.75 /-22.5	9/-20.3	40/-14.0	microwatts/dBm
	62.5/125 micron Graded, 0.28NA		13/-19.0	28/-15.7	40/-14.0	microwatts/dBm
Wavelength		λ_P	1270	1308	1380	nm
Spectral Width		λ_W		147		nm

1300 nm MULTIMODE FIBER OPTIC TRANSMITTER SPECIFICATIONS

TABLE 5

OPTICAL TRANSMITTER (1300 nm SINGLE MODE)

Electro-Optical Characteristics

Parameter	Test Condition	SYM.	MIN.	TYP.	MAX.	UNITS
Fiber Coupled Power	9/125 micron	Poc	320/-5.0			microwatts/dBm
Wavelength		λ_P	1261	1310	1360	nm
Spectral Width		λ_W		7.7		nm

1300 nm SINGLE MODE FIBER OPTIC TRANSMITTER SPECIFICATIONS

TABLE 6

OPTICAL TRANSMITTER (1550 nm SINGLE MODE)

Electro-Optical Characteristics

Parameter	Test Condition	SYM.	MIN.	TYP.	MAX.	UNITS
Fiber Coupled Power	9/125 micron	Poc	250/-6.0			microwatts/dBm
Wavelength		λ_P	1500	1550	1600	nm
Spectral Width		λ_W		3.0		nm

1550 nm SINGLE MODE FIBER OPTIC TRANSMITTER SPECIFICATIONS

TABLE 7

1.3.2.3 OPTICAL RECEIVER (850 nm MULTIMODE, 1300 nm MULTIMODE, and 1300/1550 nm SINGLE MODE)

Receiver Sensitivity: .65 microwatts/-32dbm

1.3.3 INTERACTIVE DIAGNOSTICS

Phoenix Digital's fiber optic modules provide advanced, interactive, system-level diagnostics. (Fiber modules must be ordered with the "-D" Option for Interactive Diagnostics.) These diagnostics may be accessed thru the PLC User Program (1746 and 1756 Plug-In Modules) or via Discrete Contact Outputs (Standalone, DIN-Rail/Panelmount Fiber Module) to validate network integrity and assist in troubleshooting network problems...

- Detect and Locate Fault Conditions Throughout the Network
- Verify Fault Managment and Overall Network Integrity
- Simulate Network Fault Conditions
- Trap-and-Hold Intermittent Failure Conditions

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

1.3.3.1 STANDALONE, DIN-RAIL/PANELMOUNT OCX-ETF-R MODULES

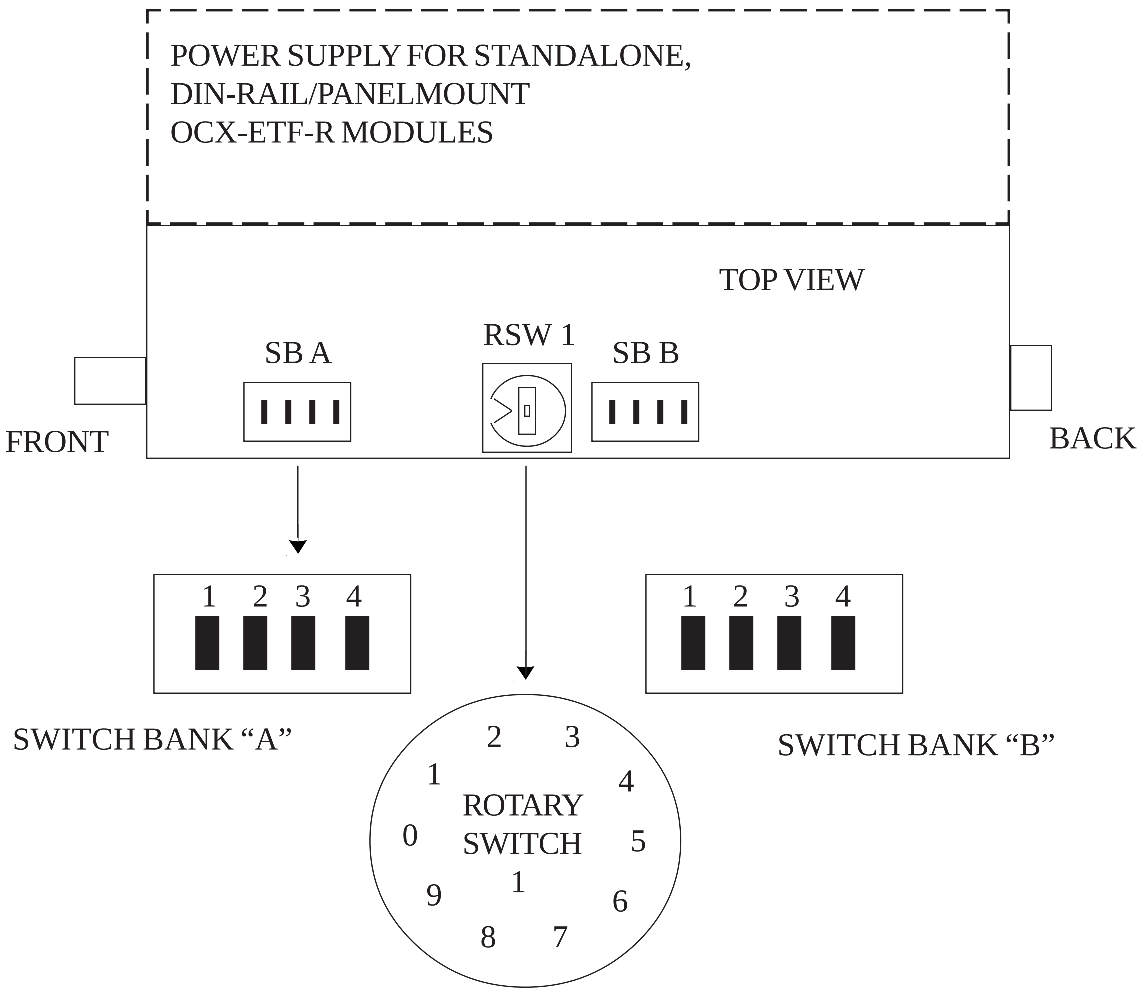
Activation and control of Standalone OCX-ETF-R Diagnostics is provided through Diagnostic/Configuration Select Switch Settings. Diagnostic/Configuration Select Switch Settings are provided in Table 8. Monitoring of Standalone, DIN-Rail/Panelmount OCX-ETF-R diagnostics is provided using reed relay contact outputs. These outputs are accessible on the J7 connector. Specifications and detailed pin-out for the J7 connector pin-out are provided in Table 9. Further explanation of fiber optic module diagnostic functions is provided in Sections 1.3.3.5-1.3.3.7.

SWITCH [1]	POSITION [1]	FUNCTION [2]	FACTORY CONFIGURATION (DEFAULT)
Switch Bank "A"	1	Unused [3]	OFF
	2	Processor Backplane Communications Enable [4] (1746 Plug-In Modules Only)	**ON**
	3	Unused [3]	OFF
	4	Unused [3]	OFF
Switch Bank "B"	1	Network Master Fiber Module	OFF
	2	Trap Mode Select	OFF
	3	Force Optical Channel A Error	OFF
	4	Force Optical Channel B Error	OFF
Rotary Switch 1	0	Level 1, Standard Priority, All Ports	**ON**
	1	Level 2, Elevated Priority, All Ports	OFF
	2	Level 3, High Priority, All Ports	OFF
	3	Ports J1, J3, J5 Level 2 Priority Ports J2, J4, J6 Level 1 Priority	OFF
	4	Ports J1, J3, J5 Level 3 Priority Ports J2, J4, J6 Level 1 Priority	OFF
	5	Ports J1, J3, J5 Level 3 Priority Ports J2, J4, J6 Level 2 Priority	OFF
	6	Ports J1, J3, J5 Level 4, Management Priority Ports J2, J4, J6 Level 1 Priority	OFF
	7	Ports J1, J3, J5 Level 4, Management Priority Ports J2, J4, J6 Level 3 Priority	OFF
	8	Local Interface Disable	OFF
	9	Unused [3]	OFF

(1) See Figure 9 for designated switch locations
(2) ON = Assert (Active, Switch Closed); OFF = Inactive (Switch Open),
See Chapter 2, Section 2.7 for Configuration Instructions.
(3) All unused switch positions must remain set in the Factory Default Configuration.
(4) Disable Processor Write ONLY for the OLC-ETF Plug-In Module.

OLC-ETF, OCX-ETF, AND OCX-ETF-R DIAGNOSTIC/CONFIGURATION SELECT SWITCH DESIGNATIONS

TABLE 8



OLC-ETF, OCX-ETF, AND OCX-ETF-R DIAGNOSTIC AND CONFIGURATION SWITCH DESIGNATIONS

FIGURE 9

J7 CONNECTOR PIN # (1)	STANDALONE, DIN-RAIL/PANELMOUNT OCX-ETF-R DIAGNOSTIC OUTPUTS (2)
1, 2	Channel A Error (ERR)
3, 4	Channel B ERR

(1) Each diagnostic output is provided as a normally open 1 FORM A contact on the designated pair of J7 pin numbers. When a diagnostic function is asserted (i.e. error) the corresponding contact will close.

(2) Diagnostic Relay Contact Electrical Specifications:

Arrangement	:	1 FORM A
Initial isolation resistance, max.	:	1,000 Meg Ohm
Rating (resistive)		
Max. switching voltage	:	350 VAC, 350 VDC
Max. continuous load current	:	.1 A
Max power dissipation	:	800 mW
Max. On resistance	:	35 ohms
Max. Off state leakage	:	1 microamp
Isolation voltage	:	1,500 VAC

STANDALONE, DIN-RAIL/PANELMOUNT OCX-ETF-R
J7 CONNECTOR DIAGNOSTIC OUTPUT
ELECTRICAL SPECIFICATIONS AND PIN DEFINITIONS

TABLE 9

1.3.3.3 1746 PLUG-IN OLCs (Modules with "-D" Diagnostic Option Only)

Activation, control, and monitoring of 1746 Plug-In OLC-ETF diagnostics is provided under program control thru read/write status and control bytes in the PLC I/O Image Table, and is also provided under manual control via Diagnostic/Configuration Select Switch Settings. The 1746 Plug-In OLC-ETF (with "-D" Option) occupies a single I/O module slot, and simulates either an 8 bit bi-directional I/O module (when OLC Processor Write is enabled... Switch Bank A, Switch 2 ON) or an 8 bit input module (when OLC Processor Write is disabled... Switch Bank A, Switch 2 OFF). The 1746 I/O module designation, density, and type are program configurable, and must be configured to match the I/O modules in the system... prior to programming. If the 1746 Plug-In OLC-ETF module is configured to simulate an 8 bit bi-directional I/O module, then the module designation is "OTHER", I/O Mix Code = 19, and the I/O Type Code = "35". (Example: If the 1746 Plug-In OLC Module is in I/O slot 1 then the correct configuration for this slot would be "Slot 1 = OTHER 1935".) If the 1746 Plug-In OLC-ETF module is configured as an 8 bit input module then the module designation is "OTHER", I/O Mix Code = 19, and the I/O Type Code = "00".

RSLogix 500 OLC-ETF I/O module configuration is similar to other types of 1746 I/O modules. The first step is to select "I/O Configuration" for 1746 Chassis. Next select the chassis and I/O slot where the OLC is located. This will also open an "I/O Configuration" table which will show "Current Cards Available". From this table select "Other - Requires I/O Card Type ID", which will prompt you to "Enter the I/O Card's ID (decimal);". If OLC-ETF Processor Write is Enabled (Switch Bank A, Switch 2 ON) enter "1935". If OLC-ETF Processor Write is Disabled (Switch Bank A, Switch 2 OFF) enter "1900". (Note: User should consult Rockwell Allen-Bradley Hardware Installation Manual for more information on addressing modes and program configuration for I/O Groups, Chassis, and Racks.)

Read/Write Diagnostic Status and Control functions are given in the Diagnostic I/O Bit Map illustrated in Figure 10. Definitions of Diagnostic/Configuration Select Switch Settings are provided in Table 8. Specifications and further explanation of OLC diagnostic functions are provided in Sections 1.3.3.5-1.3.3.7.

1.3.3.4 1756 PLUG-IN OCXs (Modules with "-D" Diagnostic Option Only)

Monitoring of 1756 Plug-In OCX-ETF module diagnostics is provided thru a read status register in the PLC Processor I/O memory. The 1756 Plug-In OCX module (with "-D" Option) occupies a single I/O module slot, and simulates a 16 bit input module, addressable to the 1756 I/O module slot it occupies. The 1756 Plug-In OCX module simulates an EMPTY SLOT if it does not include the "-D" diagnostic option. Diagnostic function control is provided via Diagnostic/Configuration Select Switch Settings.

RSLogix 5000 OCX I/O module configuration is similar to other types of 1756 I/O modules. The first step is to confirm the OCX module is "Offline". Next open the "Select Module Type" configuration screen, and select from the list given on the screen the I/O Module Type/Description... "1756-Module Generic 1756 Module". This will create a new module "Module Properties" configuration screen. In the "Module Properties" configuration screen, the user must select the "General" tab and enter and/or select the following I/O module configuration information:

Name:	OCX_ETF_x *
Description:	Optical Comm Module
Comm Format:	Data - DINT
Slot:	The I/O slot # where the OCX is located.

Connection Parameters

	Assembly Instance:	Size:
Input:	130	2
Output:	197	1
Configuration:	1	8

* Each OCX-ETF module must have a unique Name, so that each I/O module in the I/O configuration can be individually identified and located by RSLogix I/O configuration software. Therefore, in the example given above, the Name field "OCX_ETF_" is followed by a variable field "x", and this field should be designated by the user as a number (ie. 1, 2, 3, 4, 5, etc.) or letter (ie. a, b, c, d, e, etc.) so that each OCX-ETF module present in the I/O configuration will have a unique name.

After putting the 1756 Plug-In OCX-ETF module “Online”, the user may confirm OCX-ETF identification information in the “Module Properties” screen by selecting the “Module Info” tab. The following informtion should be provided:

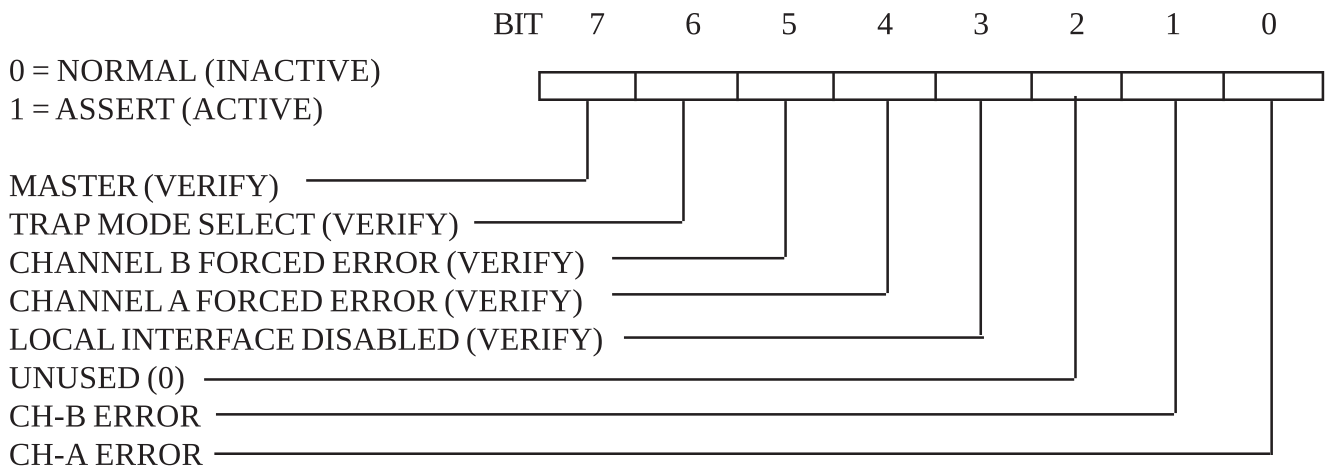
Identification

Vendor:	(420) Unknown
Product Type:	(128) Unknown
Product Code:	(552) Unknown
Revision:	x.x
Serial Number:	000xxxxx
Product Name:	OCX_ETF_x
	Phoenix_Digital_Rx.x

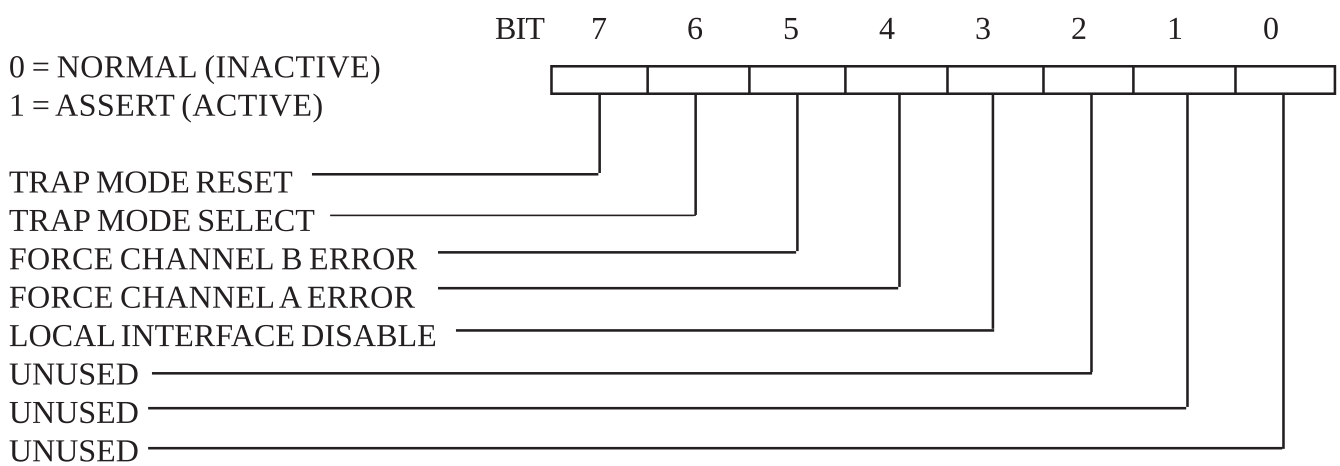
The OCX-ETF module revision level will be 1.2 or above. Module serial numbers will range between 00000000 and 00099999. The numeric information given above for Vendor, Product Type, and Product Code have been assigned to the OCX-ETF module. Rockwell anticipates that RSLogix software will eventually be able to provide this identification information in a descriptive text format, but as of the date of publication of this manual this capability is not available in RSLogix software.

Read Diagnostic Status functions are given in the Diagnostic Input Bit Map illustrated in Figure 11. Definitions of Diagnostic/Configuration Select Switch Settings are provided in Table 8. Specifications and further explanation of OCX-ETF diagnostic functions are provided in Sections 1.3.3.5-1.3.3.7.

READ STATUS BYTE



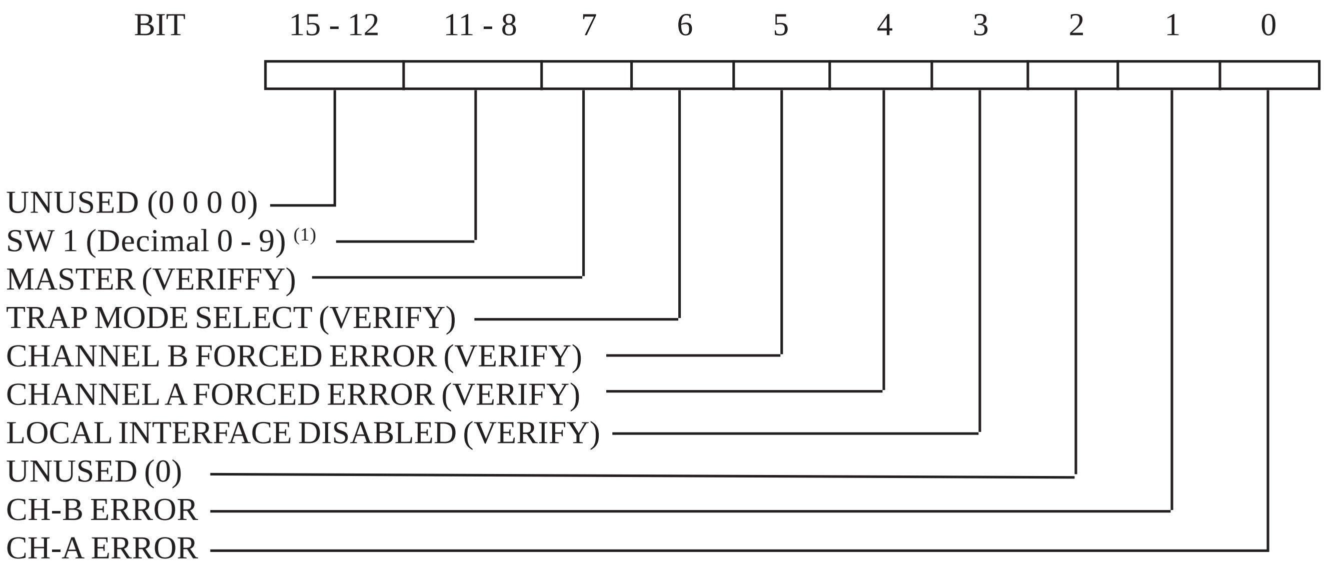
WRITE CONTROL BYTE



1746 PLUG-IN OLC-ETF
DIAGNOSTIC STATUS AND CONTROL FUNCTIONS

FIGURE 10

READ STATUS BYTE : 0 = NORMAL (INACTIVE); 1 = ASSERT (ACTIVE)



(1) Rotary Switch Definition

SW 1	BIT # 11	10	9	8
0	1	1	1	1
1	1	1	1	0
2	1	1	0	1
3	1	1	0	0
4	1	0	1	1
5	1	0	1	0
6	1	0	0	1
7	1	0	0	0
8	0	1	1	1
9	0	1	1	0

1756 PLUG-IN OCX-ETF
DIAGNOSTIC STATUS AND CONTROL FUNCTIONS

FIGURE 11

1.3.3.5 DETECT AND LOCATE NETWORK FAILURES

Fiber optic network fault conditions are reported by 1746 Plug-In OLC-ETF and 1756 Plug-In OCX-ETF fiber optic modules on diagnostic status bits 0 and 1... for fiber optic receive Channels A and B respectively (see Figures 10 and 11). Fault conditions are reported by Standalone, DIN Rail/Panelmount fiber optic modules on relay contact outputs on J7 connector pin #s 1, 2 and 3, 4... for fiber optic Channels A and B respectively. If a fiber optic module detects a communication failure on the fiber optic receive data inputs on either Channel A or B (due to either a media failure or failure of an adjacent fiber module) it will assert the corresonding diagnostic status bit or contact output, and disable the corresponding fiber optic channel transmit data output (resulting in an identical failure on the complementary receive data input of the fiber optic module, adjacent on the network). These bits and contact outputs may be used to locate the precise location where the failure is occurring.

1.3.3.6 TRAP-AND-HOLD, AND LOCATE INTERMITTENT NETWORK FAILURES

When a fiber optic communication failure occurs it normally causes the network to remain in a failed condition until the source of the failure is identified and corrected (solid failure). Diagnostic status bits on all OLC/OCX-ETF plug-in fiber modules (bits 0 and 1), and contact outputs on Standalone, DIN-Rail/Panelmount OCX-ETF-R fiber modules (J7 Pin #s 1, 2 and 3, 4) enable network maintenance personnel to quickly locate this type of failure. However, occasionally an intermittent communication failure may occur, causing the network to briefly fail and then automatically recover. This type of failure can be very difficult to locate because it does not remain in the failed condition long enough for maintenance personnel to locate the source of the problem.

In the factory default configuration, all Phoenix Digital fiber optic modules provide automatic recovery from communication failures. In Auto-Recovery Mode, Phoenix Digitals' fiber modules automatically detect, isolate, and correct communication failures by switching the network around points of failure, and then automatically restore the network to its original configuration when the source of the failure(s) is corrected. However, as an alternative to Auto-Recovery Mode, Phoenix Digitals' fiber optic modules may also be configured to Trap-and-Hold the location of the failure, by configuring the fiber optic modules to operate in Trap Mode. Trap Mode Operation may be switch selected on networks with 1746 Plug-In OLC-ETF, 1756 Plug-In OCX-ETF, and/or Standalone, DIN-Rail/Panelmount OCX-ETF-R modules by setting the Network Master Module Switch Bank "B", Switch 2 ON. It may also be software selected on 1746 Plug-In OLC-ETF modules (if the OLC-ETF is the Network Master module) by setting OLC-ETF Bit # 6 ON. Selecting Trap Mode on the Network Master module will automatically put the entire network into Trap Mode, and no other fiber module switch or software configuration is required.

In non-redundant fiber optic networks configured for Auto-Recovery, such as open bus or single channel point-to-point network configurations, selection of a fiber optic Network Master module is optional, and not required for network operation. However, in the case of Trap Mode operation, a single fiber optic module must always be configured as a Network Master module, and this module must also have the Trap Module switch selected. Please also note that when a Network Master module is selected in non-redundant, open bus or single channel point-to-point network configurations, the Global Error indicator will indicate an Error condition on all modules on the network. This indicator should be ignored for purposes of Trap Mode testing. See Figures 9, 10, and 11, and Table 8 for more information.

In Trap Mode, Phoenix Digital's fiber optic modules will continue to automatically detect, isolate, and correct communication failures, just as in Auto-Recovery mode. But when the source of the failures is corrected the Trap Mode fiber modules will NOT automatically restore the network to its original configuration. Instead, the network will remain trapped in the failed condition until the source of the failures is corrected AND the fiber optic modules are reset. Thus, intermittent failures will be continuously trapped by the fiber modules (latched), providing maintenance personnel with the necessary time to locate and correct the source of the network failures.

When Trap Mode is selected the fiber optic modules must be initialized for network communications in the following manner:

1. Install and interconnect all fiber modules on the network with fiber optic cable, in the appropriate network configuration. (Note that if the fiber modules on the network are not properly interconnected with fiber optic cable, they will assume that any improper connection is an intermittent failure and trap the failure accordingly.)

2. Apply power to all of the fiber optic modules on the network. (At this point fiber optic modules configured for Trap Mode operation may indicate a failed condition on both channels... Ch A ERR or ER, Ch B ERR or ER).

3. Reset the Trap Mode fiber optic modules by either depressing the TM (Test Mode/ Trap Mode) Pushbutton on the front of any fiber optic module on the network, or by toggling the Trap Mode Reset bit in the Write Control Byte of any 1746 Plug-In OLC-ETF module on the network. This will switch the fiber modules into an active, on-line, error free mode of operation, until such time as an intermittent communication failure occurs and the fiber modules trap the failure. (See Figures 5, 6, and 7 for the fiber module TM Pushbutton front panel designations.)

4. Trap Mode fiber optic modules may be subsequently reset (after trapping an intermittent failure) by either depressing the TM Pushbutton on any fiber optic module on the network, or by toggling the Trap Mode Reset bit on any 1746 Plug-In OLC-ETF module on the network.

1.3.3.7 SIMULATE NETWORK FAULT CONDITIONS

After a fault tolerant fiber optic communication network becomes operational it is important to verify the network is correctly configured for fault managment. This may be done by deliberately introducing single points of failure throughout the network, and verifying communication continuity after each failure.

Fiber optic network faults may be simulated by forcing errors on the Channel A or B transmit outputs. Simulation of fiber optic channel errors may be accomplished on 1746 Plug-In OLC-ETF, 1756 Plug-In OCX-ETF, and on Standalone, DIN-Rail/Panelmount OCX-ETF-R modules by setting Switch Bank “B”, Switches 3 and/or 4 ON, for fiber optic channels A and B respectively. It may also be accomplished with 1746 Plug-In OLC-ETF modules by setting bits 0 and/or 1 ON, for channels A and B respectively. See Figures 9, 10, and 11, and Table 8. (Corresponding Diagnostic/Configuration Select Switches must be set to enable Processor Write Communication on all 1746 Plug-In OLC-ETF modules.)

1.3.4 POWER SUPPLY AND GROUNDING SPECIFICATIONS

1.3.4.1 STANDALONE, DIN-RAIL/PANELMOUNT OCX-R POWER SUPPLY AND GROUNDING SPECIFICATIONS

Standalone, DIN-Rail/Panelmount OCX-ETF-R modules may be operated from a 24 VDC, 120/220 VAC, or 125 VDC input power source, subject to the Power Supply Option specified in the product model number (see Ordering Information). The Auxiliary 24 VDC, 120/220 VAC, or 125 VDC power supply is attached to the side of the OCX-ETF-R enclosure.

1.3.4.1.1 AUXILIARY POWER SUPPLY SPECIFICATIONS

The Auxiliary Power Supply must be ordered as an option to the Standalone, DIN-Rail/ Panelmount OCX-ETF-R module (as shown in Figure 5).

Table 10 provides input power pin definitions for the Auxiliary Power Supply Pl barrier strip for the 24 VDC Power Supply Option (see Figure 5).

P1 BARRIER STRIP PIN DESIGNATION	SIGNAL NAME (PIN DEFINITION)
+24V	+24 VDC
-24V	+24 VDC Return
C-GND	Chassis Ground

24V DC INPUT BARRIER STRIP PIN DEFINITIONS

TABLE 10

24 VDC Power Supply Requirements (Specified at the +24 VDC, +24 VDC Return Input Power Connections on the Standalone, DIN-Rail/Panelmount OCX-ETF-R connector):

Input Voltage Range	:	+18 VDC to +30 VDC
OCM Input Current	:	0.60 Amps
Regulation (Load and Line)	:	0.6% (min)
Fuse [1]	:	2 AMP, 250 VAC SLO BLO (0.8 inch/20 millimeter)

(1) The fuse is mounted on the internal printed circuit board of the Auxiliary Power Supply. For fuse access the user must remove the Auxiliary Power Supply from the side of the Standalone, DIN-Rail/Panelmount OCX-ETF-R enclosure.

Table 11 provides input power pin definitions for the Auxiliary Power Supply Pl barrier strip for the 120/220 VAC power supply option (See Figure 5).

P1 BARRIER STRIP PIN DESIGNATION	SIGNAL NAME (PIN DEFINITION)
L1	AC Power In (High Line)
L2	AC Power In (Neutral)
⏚	Chassis Ground

120/220 VAC INPUT BARRIER STRIP PIN DEFINITIONS

TABLE 11

120/220 VAC Power Supply Requirements (Specified at the L1 , L2 Input Power Connections on the Standalone, DIN-Rail/Panelmount OCX-ETF-R Connector):

Input Voltage Range	:	85 VAC to 264 VAC
Input Frequency Range	:	47 Hz to 440 Hz
Conducted RFI (Input Line Filter)	:	FCC limit B and VDE limt A
Hold-Up Time	:	12 milliseconds
Power Consumption UL, CSA, VDE Approved	:	15 watts per OCM (approximate)
Fuse [1]	:	2 AMP, 250 VAC, SLO BLO (0.8 inch/20 Millimeter)

(1) The fuse is mounted on the internal printed circuit board of the Auxiliary Power Supply. For fuse access the user must remove the Auxiliary Power Supply from the side of the Standalone, DIN-Rail/Panelmount OCX-ETF-R enclosure.

Table 12 provides input power pin definitions for the Auxiliary Power Supply Pl Barrier Strip for the 125 VDC Power Supply Option (See Figure 5):

P1 BARRIER STRIP PIN DEFINITIONS	**SIGNAL NAME (PIN DEFINITION)**
+125V	+125 VDC In
-125V	+125 VDC Return
C-GND	Chassis Ground

125 VDC INPUT BARRIER STRIP PIN DEFINITIONS

TABLE 12

125 VDC Power Supply Requirements (Specified at the +125V, +125V Return Input Power Connections on the Standalone, DIN-Rail/Panelmount OCX-ETF-R Connector):

Input Voltage Range	:	120 VDC to 370 VDC
Power Consumption UL, CSA, VDE Approved	:	15 watts per OCM (approximate)
Fuse [1]	:	2 AMP, 250 VAC, SLO BLO (0.8 inch/20 millimeter)

(1) The fuse is mounted on the internal printed circuit board of the Auxiliary Power Supply. For fuse access the user must remove the Auxiliary Power Supply from the side of the Standalone, DIN-Rail/Panelmount OCX-ETF-R enclosure.

1.3.4.2 1746 PLUG-IN OLC-ETF AND 1756 PLUG-IN OCX-ETF POWER SUPPLY SPECIFICATIONS

Backplane (system chassis) power supply requirements for 1746 Plug-In OLC-ETF and 1756 Plug-In OCX-ETF are the following:

Input Voltage [1]	:	+5 VDC
Input Current [1]	:	1.5 Amps

(1) Supplied by 1746/1756 Chassis Power Supply

1.3.4.2 ELECTRICAL GROUNDING

The Standalone DIN-Rail OCX-ETF-R enclosure must be electrically connected to earth ground. This may be accomplished by connecting the Chassis Ground on the Auxiliary Power Supply connector to earth ground, or by attaching a ground electrode directly to the chassis. To ensure a good electrical connection between the ground lug and the module, remove paint from the chassis where the lug makes contact. Connect the ground lug to earth ground with an adequate grounding electrode.

1.3.5 MECHANICAL AND ENVIRONMENTAL SPECIFICATIONS

FIBER OPTIC MODULE DIMENSIONS :

Standalone, DIN-Rail/Panelmount OCX-ETF-R Module	:	6.70” H x 3.18” W x 5.85” D (17.8 cm H x 8.1 cm W x 14.9 cm D)
1746 Plug-In OLC-ETF Module	:	Single slot, 1746 Chassis Installation.
1756 Plug-In OCX-ETF Module	:	Single slot, 1756 Chassis Installation.

FIBER OPTIC MODULE ENVIRONMENTAL SPECIFICATIONS :

Temperature	:	Operating 0° to 60°C Storage -40°C to 85°C
Relative Humidity	:	0 to 95% (non-condensing)

CHAPTER 2

CONFIGURATION AND INSTALLATION INSTRUCTIONS

This chapter provides preparation for use and installation instructions (including unpacking and inspection instructions), and a functional description of indicators, diagnostics and configuration instructions.

2.1 UNPACKING INSTRUCTIONS

All Phoenix Digital fiber optic modules are shipped from the factory in shock absorbing materials. Remove the fiber modules from the packing material and refer to the packing list to verify that all items are present. Save the packing materials for future storage or reshipment.

NOTE: If the shipping carton is damaged upon receipt, request that the carrier's agent be present while the unit is being unpacked and inspected.

2.2 INSPECTION PROCEDURE

Fiber optic modules should be inspected visually for damage upon removal from the shipping container.

2.3 INSTALLATION MOUNTING PROCEDURE

Standalone, DIN-Rail/Panelmount OCX-ETF-R modules should be DIN-Rail mounted or panelmounted per the mounting specifications provided in Figure 5. All Phoenix Digital fiber optic modules are convection cooled, requiring no fan or forced air cooling. An unobstructed air space must be maintained above and below the fiber modules (6 inches minimum) to insure adequate convection airflow. The air at the bottom of the fiber optic module may not exceed 60 degrees celsius (140 degrees F).

The user should follow Allen-Bradley Installation and Mounting Procedures for 1746 and 1756 Chassis Installation... for 1746 Plug-In OLC-ETF and 1756 Plug-In OCX-ETF modules.

2.4 DIAGNOSTIC STATUS INDICATOR DEFINITION (REFERENCE FIGURES 5, 6, 7, and 8 FOR INDICATOR DESIGNATIONS)

(i) Ch A, B AC/ER for OLC-ETF (Ch A, B Active/Error);
Ch A, B ACT/ERR for OCX-ETF and OCX-ETF-R (Ch A, B Active/Error)
- Illuminates solid green when the corresponding optical network receive input is receiving valid communications.
- Illuminates solid red when the corresponding optical network receive input fails to detect valid communications.
- Illuminates flashing green/red when the network is in Trap Mode, the module at this location had previously trapped a failure, the cause of the failure has been repaired, and the network has not yet been reset from the trapped condition.

(ii) Ch A, B Tx/Rx
- Illuminates solid green when the corresponding optical network channel is active, and no data is passing through the channel in either direction.
- Illuminates flashing green when the module is transmitting data on the corresponding fiber optic network transmit data output.
- Illuminates flashing yellow when the module is receiving data on the corresponding fiber optic network receive data input.
- Indicator is OFF when the corresponding optical network channel is inactive.

(iii) Global ERR
- Illuminates solid green when all network fiber connections are good. (Requires a redundant network configuration with a Network Master module.)
- Illuminates flashing green when there is a break somewhere in the network and the modules are not in Trap Mode. (Requires a redundant network configuration with a Network Master module.)
- Illuminates flashing red when the network is in Trap Mode and there is a failure condition trapped somewhere on the network.
- Illuminates flashing green/red when the network is in Trap Mode, a failure had been previously trapped somewhere on the network, the cause of the failure has been repaired, and the network has not yet been reset from the trapped condition.
- Indicator is OFF when no Master Module is detected on the network.

(iv) OK... Standalone, DIN-Rail/Panelmount OCX-ETF-R Module, or 1746/1756 Plug-In OLC/OCX-ETF Module Without Diagnostic Option -
Illuminates solid green when the OLC/OCX module is powered.

OK... 1746 Plug-In OLC-ETF Module With Diagnostic Option -
Illuminates solid green when the OLC module is powered.

OK... 1756 Plug-In OCX-ETF Module With Diagnostic Option -
Illuminates flashing red when previously established communication with the OCX-ETF I/O module slot has timed out.
Illuminates solid red during reset condition.
Illuminates flashing green when the OCX-ETF I/O module slot is not correctly configured, or is not actively controlled by a system processor.
Illuminates solid green during normal operation.

(v) Link Status Indicators (See Figure 8 for Link Status Indicator Designations)

Dual Color: Green/Yellow (Provided only on Quad Connectors for the J1, J2, J3, and J4 ports, on OLC/OCX-ETF Plug-In Modules and OCX-ETF-R Standalone, DIN-Rail/Panelmount Modules with four or more ports.)...
Solid Green = Link Established
Flashing Green = Transmit Data
Flashing Yellow = Receive Data
OFF = No Link Detected

Single Color: Green (Provided only on Single and Dual Connectors for the J1, J2, J5, and J6 ports, on OLC/OCX-ETF Plug-In Modules and OCX-ETF-R Standalone, DIN-Rail/Panelmount Modules with one, two, three, five, or six ports.)...
Solid Green = Link Established
Flashing Green = Transmit or Receive Data
OFF = No Link Detected

Single Color: Yellow (Provided only on Single and Dual Connectors for the J1, J2, J5, and J6 ports, on OLC/OCX-ETF Plug-In Modules and OCX-ETF-R Standalone, DIN-Rail/Panelmount Modules with one, two, three, five, or six ports.)...
Solid Yellow = Receive Data
OFF = No Receive Data

2.5 DIAGNOSTIC STATUS OUTPUT CONNECTIONS

ERR (Ch A, B Communication Error...Standalone, DIN-Rail/Panelmount OCX-ETF-R Modules only) -

Switches ON (closed contact) when the corresponding optical network receive input fails to detect valid data or data carrier. (Since the module detecting the receive data input failure will also disable the corresponding transmit data output, this will have the affect of creating an identical error on the complementary network channel of the fiber optic module, adjacent on the network. The corresponding channel ERR contact will also Switch ON for the adjacent fiber optic module.)

2.6 CONFIGURATION INSTRUCTIONS

Each fiber optic module must be configured (switch selectable) prior to installation.

Configuration Switch locations are identified on the overview of the fiber optic modules depicted in Figure 9. Specifications detailing fiber optic module Network Configuration Switch designations are provided in Table 8.

2.6.1 FIBER OPTIC MODULE REPEATER OPERATION

Phoenix Digital's FAST Ethernet fiber optic modules function as active fiber optic repeaters on the FAST Ethernet optical network. Each fiber module serves to both restore and resynchronize the FAST Ethernet data at each location on the network. Therefore, Phoenix Digital's FAST Ethernet fiber optic modules may be daisychained and/or cascaded together in any quantity and over virtually any distance... subject only to the fiber optic module transmit power, and the optical attenuation (loss) of the optical communication paths.

Optical attenuation may be caused by a number of different elements, including optical connectors, series optical couplers, splices and/or the fiber optic cable itself. If the actual distance between adjacent fiber optic modules on the network is greater than the maximum distance allowed due to optical attenuation, the user should consider upgrading to a more powerful version of the FAST Ethernet fiber optic module (1300 nm Multimode or 1300/1550 nm Single Mode). However, as an alternative to upgrading the fiber module optical interface, additional fiber optic modules may be inserted into the network as needed, and used as standalone fiber optic repeaters, without making any type of connection to the fiber module's FAST Ethernet interface. In these cases, the fiber modules will serve as fiber network repeaters only, extending the maximum allowable distance between adjacent locations on the network.

2.6.2 FIBER OPTIC MODULE MASTER/SLAVE CONFIGURATION

One fiber optic module must be switch configured as a Network Master module on all redundant ring and redundant point-to-point network configurations. The fiber optic Network Master module may be located anywhere on the fiber optic network. This Network Master module provides data management and control throughout the fiber optic network. (In tree [combinaton ring, bus/star] network topologies each redundant fiber network segment [segment in a ring or redundant point-to-point configuration] must have one fiber module configured as a Network Master module.) All other fiber optic modules on the network must be configured as Slaves.

In the event of a failure of any Slave module, or failure of the Network Master module itself, the remaining fiber optic modules will self-heal around the module faillure, maintaining network communication by redirecting data communications around the point of failure.

An example of a fiber optic module Master/Slave configuration in a ring topology network is illustrated in Figure 2. Fiber optic module Master/Slave Selection switch configuration instructions are provided in Table 8. (Note that in the event of failure of the Network Master fiber optic module in a fault tolerant, ring topology network configuration, the remaining fiber optic modules will assume network management, and communication continuity will be maintained throughout the network.)

2.6.3 FIBER OPTIC NETWORK PRIORITY QUEUING SYSTEM (PQS)

Phoenix Digital's FAST Ethernet fiber optic communication modules enable the user to adjust overall fiber optic network bandwidth, and tune the performance of the fiber network to insure that higher priority and more frequent communication access is given to the most important devices, in the most critical locations on the network, during time periods when the network is heavily loaded with data. Network bandwidth tuning is accomplished by setting Rotary Switch 1 (described in Table 8) to one of eight Priority Settings, 0 through 7.

Rotary Switch 1, Priority Setting 0 is the factory default setting. At this setting the fiber optic module will operate at the Level 1, Standard Priority. All devices connected to this module will have equal priority and equal access to the network. If all fiber optic modules on the network are at the Level 1 Priority setting, all devices on the network will have equal priority and equal access, regardless of network loading.

Rotary Switch 1, Priority Setting 1 will set the fiber optic module to operate at the Level 2, Elevated Priority. At this setting all of the devices connected to this module will have equal priority and equal access to the fiber optic network. On networks where this is the only one Level 2, Elevated Priority fiber optic module, and all of the other fiber optic modules are at the Level 1, Standard Priority, devices connected to the Level 2 module will have the highest priority on the network. During times of heavy network traffic, devices connected to the Level 2 fiber optic module will be given twice as much network access as devices connected to Level 1 fiber modules.

Rotary Switch 1, Priority Setting 2 will set the fiber optic module to operate at the Level 3, High Priority. At this setting all of the devices connected to this module will have equal priority and equal access to the fiber optic network. On networks where this is the only Level 3, High Priority fiber optic module, and all of the other fiber optic modules are either at Level 1, Standard Priority or Level 2 Elevated priority, devices connected to the Level 3 module will have the highest priority on the network. During times of heavy network traffic, devices connected to the Level 3 fiber optic module will be given twice as much network access as devices connected to Level 2 fiber modules, and four times as much network access as devices connected to Level 1 fiber optic modules.

Rotary Switch 1, Priority Settings 3, 4, and 5 enable the user to mix network priorities among devices connected to the same fiber optic module. Rotary Switch Priority Setting 3 will assign network Priority Level 2 to devices connected to the odd numbered ports (J1, J3, J5), and Priority Level 1 to devices on the even numbered ports (J2, J4, J6). Similarly, Rotary Switch Priority Setting 4 will assign network Priority Level 3 to devices connected to the odd numbered ports, and Priority Level 1 to devices on the even numbered ports. Rotary Switch Priority Setting 5 will assign network Priority Level 3 to devices connected to the odd numbered ports, and Priority Level 2 to devices on the even numbered ports. These mixed settings are recommended for applications in which the user wants to reserve the highest priority for only the most critical devices connected to the fiber optic module.

Rotary Switch, Priority Settings 6 and 7 provide the Management Priority Level, which is the very highest priority level that can be assigned to any device on the network. These settings enable the user to mix the Management Priority level with lower priority devices, connected to the same fiber optic module. During times of heavy network traffic, devices connected to fiber optic module ports assigned to the Management Priority will be given twice as much network access as devices connected to Level 3 fiber modules and/or ports, four times as much network access as devices connected to Level 2 fiber modules and/or ports, and eight times as much network access a devices connected to Level 1 fiber optic modules and/or ports. Rotary Switch Priority Setting 6 will assign the Management Priority to devices connected to the odd numbered ports on the module, and Priority Level 1 to devices on the even numbered ports. Similarly, Rotary Switch Priority Setting 7 will assign the Managment Priority to devices connected to the odd numbered ports, and Priority Level 3 to devices on the even numbered ports.

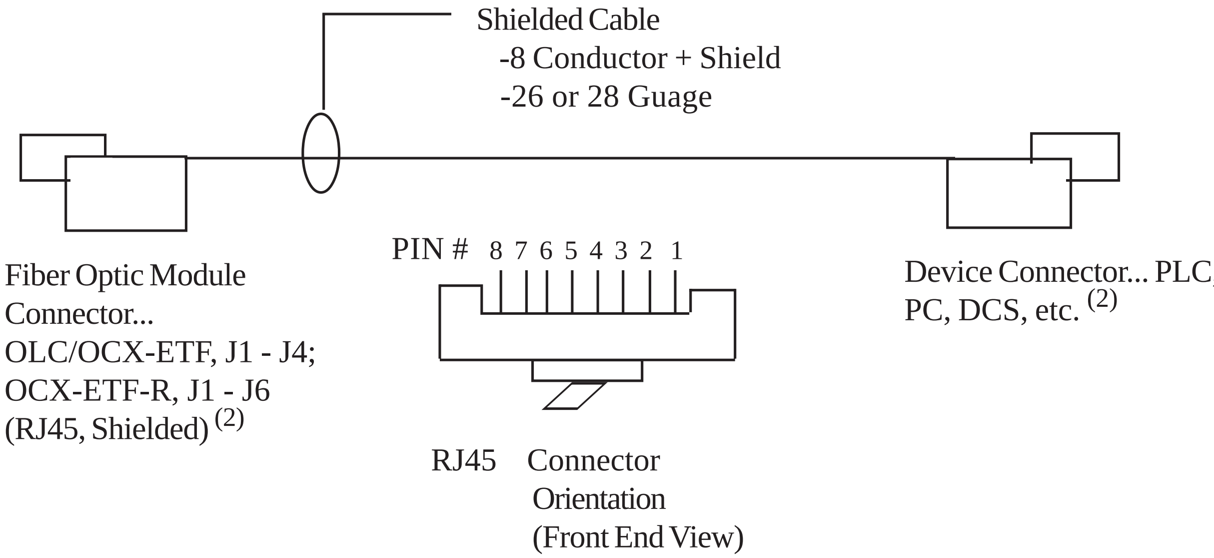
It is recommended for optimum performance, the user assign no more than one fiber optic module on the network to the Management Priority Level. This fiber module should be connected to the most time-critical devices on the network, transmitting short to medium length messages. Assignment of Management Priority to more than one fiber optic module may result in slightly longer reconfiguration times in fault tolerant network configurations.

It is important to recognize that Phoenix Digital's Priority Queuing System (PQS) prioritizes fiber optic network access between the fiber optic modules themselves, and among their respective communication ports. As such, the user should reserve higher priority communication levels for only the select few devices which would benefit from more frequent network access, and allow all other devices to communicate at lower priority levels. The more fiber optic communication modules and/or ports that are assigned to higher priorities, the less noticeable the improvement of communication thruput will be for higher priority devices. For instance, if all of the fiber optic communication modules and/or ports are set to the Level 3, High Priority, the relative communication thruput for all devices would be exactly the same as if all of the fiber optic modules were set to the Level 1, Standard Priority. Therefore, assignment of higher priorities to fiber optic modules and/or ports should only be made when and where needed, and should be judiciously applied.

It is also important for the user to recognize that Phoenix Digital's Priority Queuing System will not improve and/or enhance the performance of the individual communication devices beyond their own unique capabilities. The PQS will only have a relative affect on the preformance of devices connected to higher priority fiber optic modules and/or module ports during periods of heavy network loading. During these times, devices connected to higher priority fiber optic modules and/or ports will experience a significant improvement in network access and thruput. However, during times of moderate network loading, the relative communication thruput improvement of devices connected to higher priority fiber modules and/or ports may be less noticeable. Similarly, during periods of light network loading, the relative communication thruput improvement of devices connected to higher priority fiber modules may not be noticeable at all. During these periods of light network loading, all network devices, regardless of the priority of their fiber optic modules and/or ports, should have the same opportunity to gain access to the fiber optic network, whenever requested. Therefore, there may be little or no noticeable relative performance improvement of those devices which are connected to higher priority fiber optic modules and/or module ports. Essentially, in a lightly loaded networking environment, network performance may be optimum for all devices at all locations, and thus relative performance improvements are not necessary.

APPENDIX A

FIBER OPTIC MODULE 10/100 BASE-T CABLE DRAWING (OCM-CBL-A1-(10) (1))



Fiber Module Connector Pin Number	Device Connector Pin Number	Signal Name
1	1	RD +
2	2	RD -
3	3	TD +
4	4	No Connection
5	5	No Connection
6	6	TD -
7	7	No Connection
8	8	No Connection

(1) 1 Foot/.3 Meter Length = No Suffix; 10 Foot/3 Meter Length = “-10” Suffix

(2) Cable shield foil or braid should be placed under RJ45 shield housing in order to make good electrical contact.

APPENDIX B

LIST OF FIGURES IN MANUAL

APPENDIX C

LIST OF TABLES IN MANUAL