
# ROCKWELL ALLEN-BRADLEY DATA HIGHWAY PLUS and REMOTE I/O COMMUNICATION MODULES

# INSTALLATION and USERS MANUAL

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# PHOENIX DIGITAL CORPORATION

## ROCKWELL ALLEN-BRADLEY
## DATA HIGHWAY PLUS and REMOTE I/O
## OPTICAL COMMUNICATION MODULES

Users Manual

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# CHAPTER 1

# DESCRIPTION AND SPECIFICATION

## 1.1 INTRODUCTION

Phoenix Digital's family of Rockwell Allen-Bradley Data Highway Plus and Remote I/O (DH+/RIO) fiber optic modules provide the most advanced, comprehensive, state-of-the-art fiber optic communication capabilities on the market today. Phoenix Digital's DH+/RIO fiber optic modules are available as standalone, panelmount modules with integral 120/220 VAC, 24 VDC, or 125 VDC power supplies (Optical Communication Modules... OCMs), 1771 plug-in modules (Optical Communication Modules... OCMs), 1746 plug-in modules (Optical Link Couplers... OLCs), and 1756 plug-in modules (Optical ControlLogix Modules... OCXs). 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), in-line signal strength monitoring with annunciation of impending communication failures (Fault Predictive), interactive diagnostics to locate fault and impending fault conditions (accessible by the user program), and wavelength selection for matching fiber media characteristics. Phoenix Digital makes all of this possible through application of its patented self healing communication switch and advanced optical measurement technologies.

The following table provides correspondence between Phoenix Digital fiber optic module Model Numbers and Rockwell Allen-Bradley 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.

| OCM MODEL # | NETWORK COMPATIBILITY |
|---|---|
| OCM-DPR-(1)-(2)-(3)-(4)-(5)-(6)-(7) | DH+/RIO Communications (1771 Plug-In and Standalone, Panelmount modules) |
| OLC-DPR-(1)-(3)-(4)-(6)-(7) | DH+/RIO Communications (1746 Plug-In modules) |
| OCX-DPR-(1)-(3)-(4)-(6)-(7) | DH+/RIO Communications (1756 Plug-In modules) |

| | | | |
|---|---|---|---|
| (1) | “85” | = | 850 nanometer wavelength selection |
| | “13” | = | 1300 nanometer wavelength selection |
| | “15” | = | 1550 nanometer wavelength selection |
| (2) | “P” | = | Standalone, Panelmount Enclosure |
| | blank | = | 1771, 1746, or 1756 Plug-In Module |
| (3) | “D” | = | Interactive Diagnostics |
| | blank | = | No Diagnostics |
| (4) | “ST” | = | ST Fiber Optic Connector Style |
| | “SMA” | = | SMA Fiber Optic Connector Style (Available with 850nm Wavelength only.) |
| (5) | “24V” | = | 24 VDC Operation |
| | “ACV” | = | 120/220 VAC, 50/60 Hz Operation |
| | “125V” | = | 125 VDC Operation |
| (6) | “SM” | = | Singlemode Fiber Compatibility (Available with 1300nm or 1550 nm Wavelengths, and ST connector options only.) |
| | blank | = | Multimode Fiber Compatibility |
| (7) | “EXT” | = | Extended Capacity Feature (24+ fiber optic modules on a single bus or ring network configuration.) |
| | blank | = | No Extended Capacity Feature (Maximum of 12 fiber optic modules on a single bus or ring network configuration.) |

**PRODUCT MODEL NUMBER DEFINITION**

**TABLE 1**

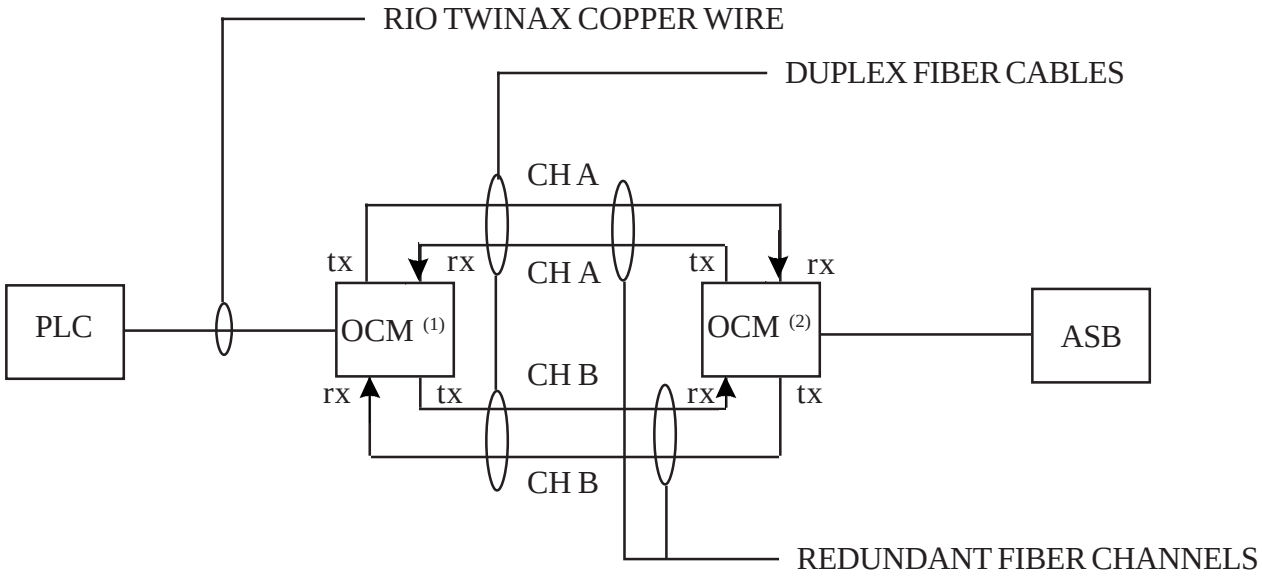
A summary of selected fiber optic features is given below:

- Supports a Wide Range of Communication Distances: Beyond 6 miles/10 kilometers between nodes using Multimode fiber, and beyond 16 miles/25 kilometers using Singlemode fiber.
- Fault Tolerant Communication: Provides On-line Diagnostic Monitoring and High Speed, Self Healing Communication Recovery.
- Fault Predictive Communication: Provides In-line Optical Signal Strength Monitoring and Annunciation of Impending Communication Failures.
- Interactive Diagnostics (User Program Accessible): Locates Fault and Impending Fault Conditions Throughout the Network.
- Selectable Wavelengths: 850 nanometer, 1300 nanometer (multimode and singlemode), and 1550 nanometer (multimode and singlemode).
- Extended capacity option: Supports over 24 fiber optic modules on a Single Multidrop bus or ring network
- Easy to see, visual indication of Communication Diagnostic Status.

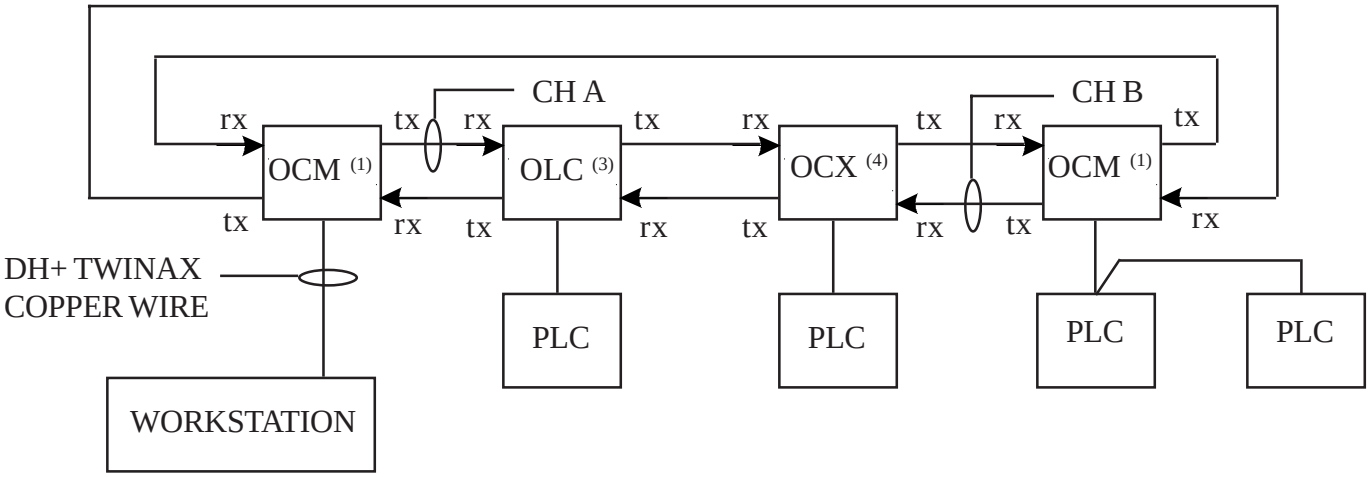
## 1.2 PRODUCT DESCRIPTION

### 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. Figure 1 illustrates Examples of Typical Fiber Optic Module Network Configurations.




FAULT TOLERANT, REMOTE I/O POINT-TO-POINT NETWORK CONFIGURATION




FAULT TOLERANT DATA HIGHWAY PLUS RING NETWORK CONFIGURATION

(1) OPTICAL COMMUNICATION MODULE
MODEL # OCM-DPR-85-P-D-ST-ACV

(2) OPTICAL COMMUNICATION MODULE
MODEL # OCM-DPR-85-D-ST

(3) OPTICAL LINK COUPLER
MODEL # OLC-DPR-85-D-ST

(4) OPTICAL ControlLogix MODULE
MODEL # OCX-DPR-85-D-ST

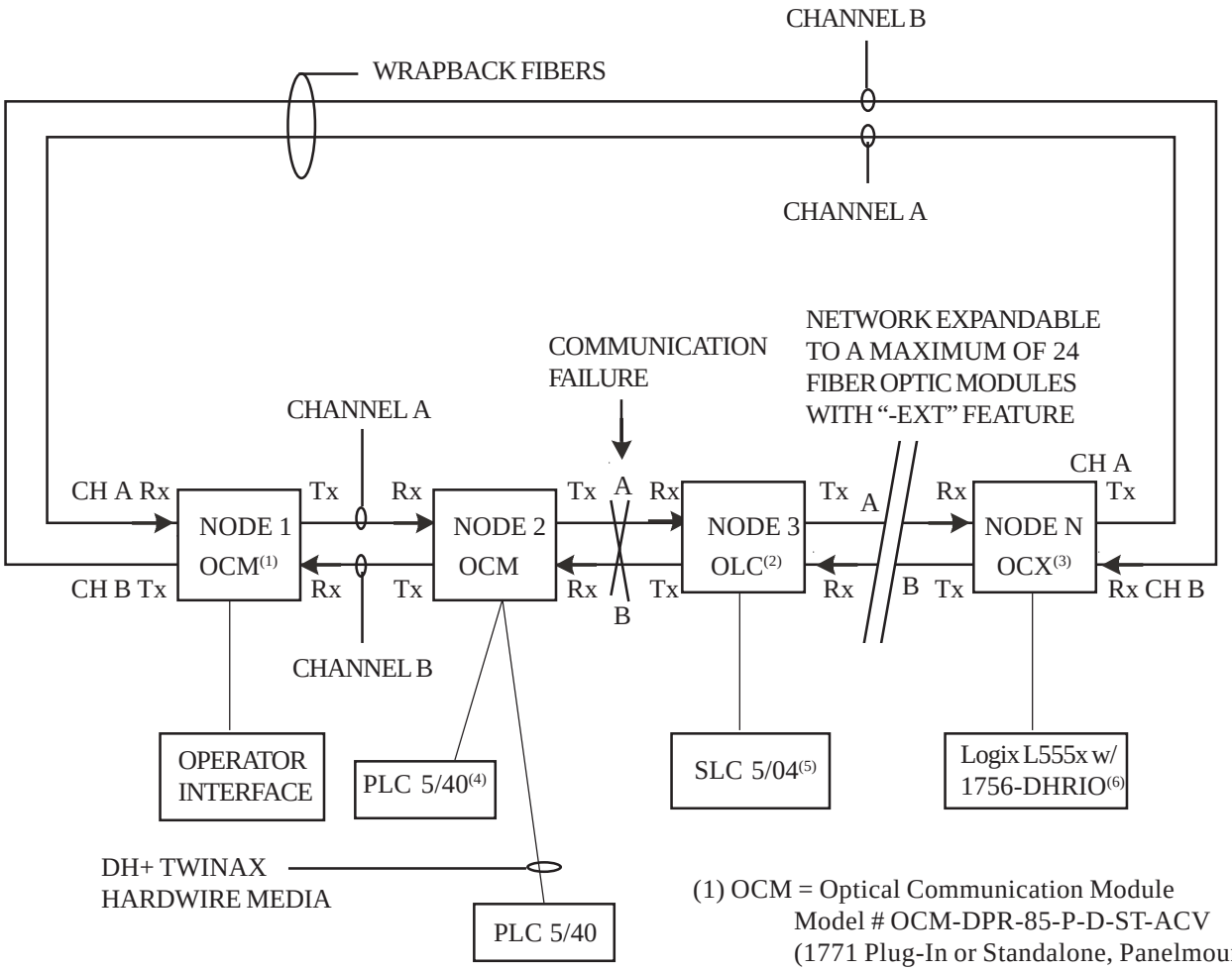
**EXAMPLES OF TYPICAL FIBER OPTIC DH+ and RIO NETWORK CONFIGURATIONS**

**FIGURE 1**

The ultra-high speed, self healing communication technology on each 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 redirecting data communications around the point of failure. This is accomplished by wrapping back network communications at the communication nodes on either side of the point of failure, through the use of a high-speed, combinational wrapback communication switch (hardware pass-thru, non-software interactive) built into the front-end optical interface of each Phoenix Digital fiber optic module.

Figure 2 illustrates a typical fiber optic DH+ fault tolerant ring network configuration. In this configuration, the fiber optic modules must be connected Ch A Transmit to Ch A Receive, Ch A Transmit to Ch A Receive, etc., around the ring (counter-clockwise in Figure 2); and Ch B Transmit to Ch B Receive, Ch B Transmit to Ch B Receive, etc., around the ring (clockwise in Figure 2). Diagnostic monitoring circuitry at each module will continuously monitor the integrity of the communication carriers present at the receive data inputs of each communication channel. 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: Node 2/Channel B receiver and Node 3/Channel A receiver) the fiber modules detecting the failure (Nodes 2 and 3) will immediately redirect communication around the point of failure, the opposite way around the ring. 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 network), thus insuring communication network continuity and fault isolaton. In addition to providing network fault tolerance, Phoenix Digital's fiber optic modules enable maintenance personnel to locate fault conditions (remote status monitoring), add/delete nodes, and splice/terminate/replace media online, without disrupting network communications.

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 optic modules will automatically restore the communication network to its original traffic patterns.




(1) OCM = Optical Communication Module
Model # OCM-DPR-85-P-D-ST-ACV
(1771 Plug-In or Standalone, Panelmount)
(2) OLC = Optical Link Coupler
Model # OLC-DPR-85-D-ST (1746 Plug-In)
(3) OCX = Optical ControlLogix Module
Model # OCX-DPR-85-D-ST (1756 Plug-In)
(4) PLC 5/40 = PLC 5/40 with DH+ Interface
(5) SLC 5/04 = SLC Processor with DH+ Interface
(6) Logix L555x w/ 1756-DHRIO = ControlLogix
Processor with DH+ Comm Module

**OCM DATA HIGHWAY PLUS NETWORK ILLUSTRATING SELF HEALING COMMUNICATION WRAPBACK**

**FIGURE 2**

### 1.2.2 FAULT PREDICTIVE COMMUNICATION (850 nm and 1300 nm MULTIMODE ONLY)

Phoenix Digital's Fault Predictive Communication Technology provides diagnostic monitoring and detection of impending communication failures resulting from gradual degradation of the communication link itself. Phoenix Digital's fiber optic modules monitor impending fault conditions by continuously measuring the actual in-line signal strength (optical power) of the data comunications at each receive input on the module. The fiber modules continuously compare these actual in-line measurements to preset optical power reference thresholds, which are normalized to power levels where valid network communications will still be assured, but impending communication failures can be accurately predicted. If the actual in-line data communication signal strength degrades below these power thresholds (resulting from one or more sources of link degradation) the fiber modules will automatically detect and annunciate the impending failure conditions via visual indicators on the front of the module. Phoenix Digital's fiber optic modules also provide User Program Accessible, Interactive Diagnostics (1771, 1746, and 1756 Plug-In Fiber Modules) and Hardwired Diagnostic Ouputs (Standalone, Panelmount Fiber Modules) for remote monitoring, detecting, and locating of impending fault conditions (remote status monitoring). In addition, the fiber optic modules provide a linear DC voltage representation (analog) of the actual in-line signal strength (normalized for a 0 to +3.5 VDC range) for more precise monitoring of communication link status (on-line optical power metering). Thus, communication link status is continuously monitored and impending failure conditions are annunciated by the fiber modules before the communication failure actually occurs, enabling maintenance personnel to perform Predictive Maintenance on the fiber optic communication network at-large. (The Impending Fault Monitoring feature is available only on 850 nm or 1300 nm multimode fiber optic modules with the "-D" Diagnostic Option.)

### 1.2.3 WAVELENGTH SELECTION

Phoenix Digital's fiber optic modules provide five options for wavelength selection. The economical 850 nanometer multimode wavelength may be selected for data communication networks with less than 12,000 feet (3,650 meters) between communication 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). For maximum distance, the ultra-high performance 1300 and 1550 nanometer singlemode wavelengths may be selected, extending communication distances to over 16 miles (25 kilometers) between communication nodes!

## 1.3 PRODUCT SPECIFICATIONS

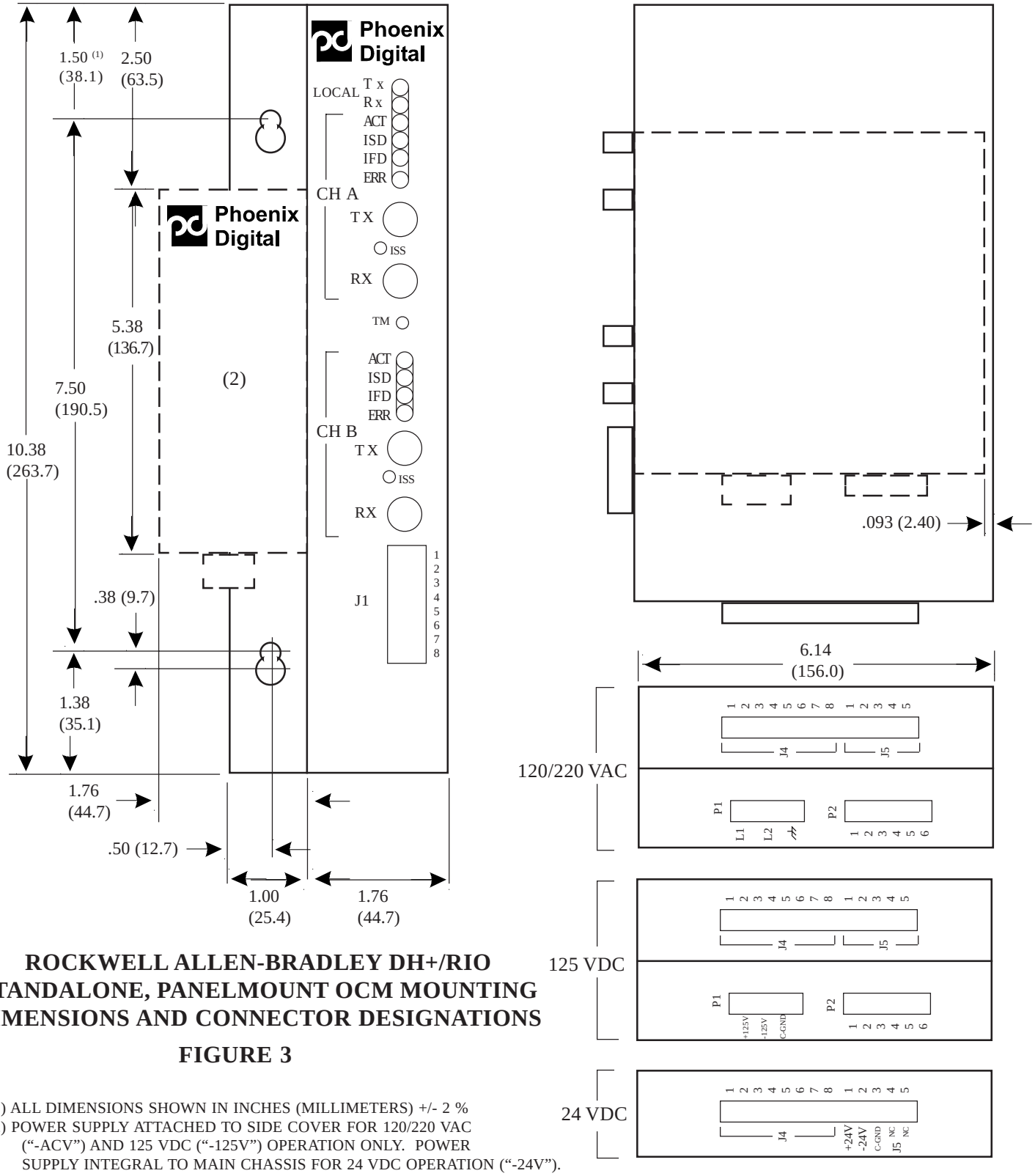
Fiber Optic Module Mounting Dimensions and Connector Designations are provided in Figures 3 thru 6.

### 1.3.1 DEVICE INTERFACE SPECIFICATIONS

The standalone, panelmount OCM and 1771 plug-in OCM Device Interface Port Connections are provided on the front of the OCM module (designated as J1 - see Figures 3 and 4).

The 1746 plug-in OLC and 1756 plug-in OCX Device Interface Port Connections are provided on the bottom of the fiber modules (designated as J2 - see Figures 5 and 6).

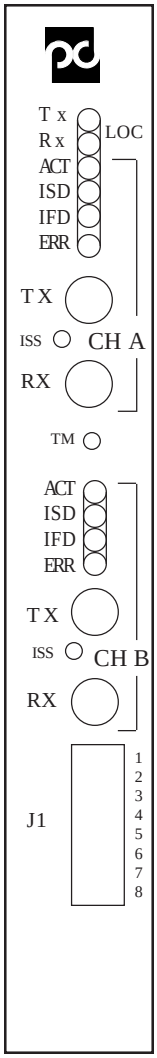
The user must follow all Rockwell Allen-Bradley Installation, Wiring Guidelines, and Termination Procedures for interconnect wiring of DH+ and RIO devices and Phoenix Digital fiber optic modules.




**ROCKWELL ALLEN-BRADLEY DH+/RIO STANDALONE, PANELMOUNT OCM MOUNTING DIMENSIONS AND CONNECTOR DESIGNATIONS**

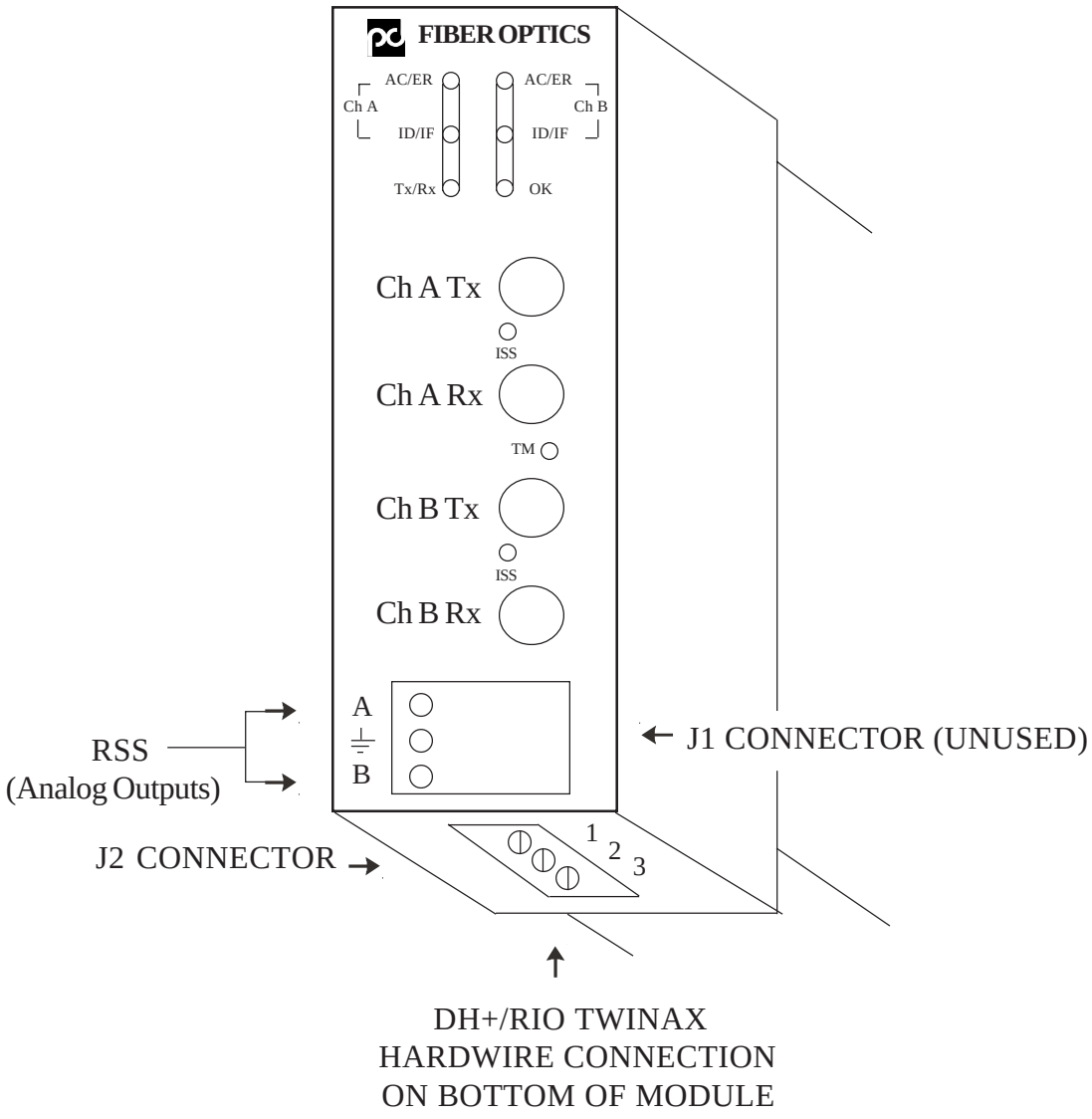
**FIGURE 3**

(1) ALL DIMENSIONS SHOWN IN INCHES (MILLIMETERS) +/- 2 %
(2) POWER SUPPLY ATTACHED TO SIDE COVER FOR 120/220 VAC ("-ACV") AND 125 VDC ("-125V") OPERATION ONLY. POWER SUPPLY INTEGRAL TO MAIN CHASSIS FOR 24 VDC OPERATION ("-24V").



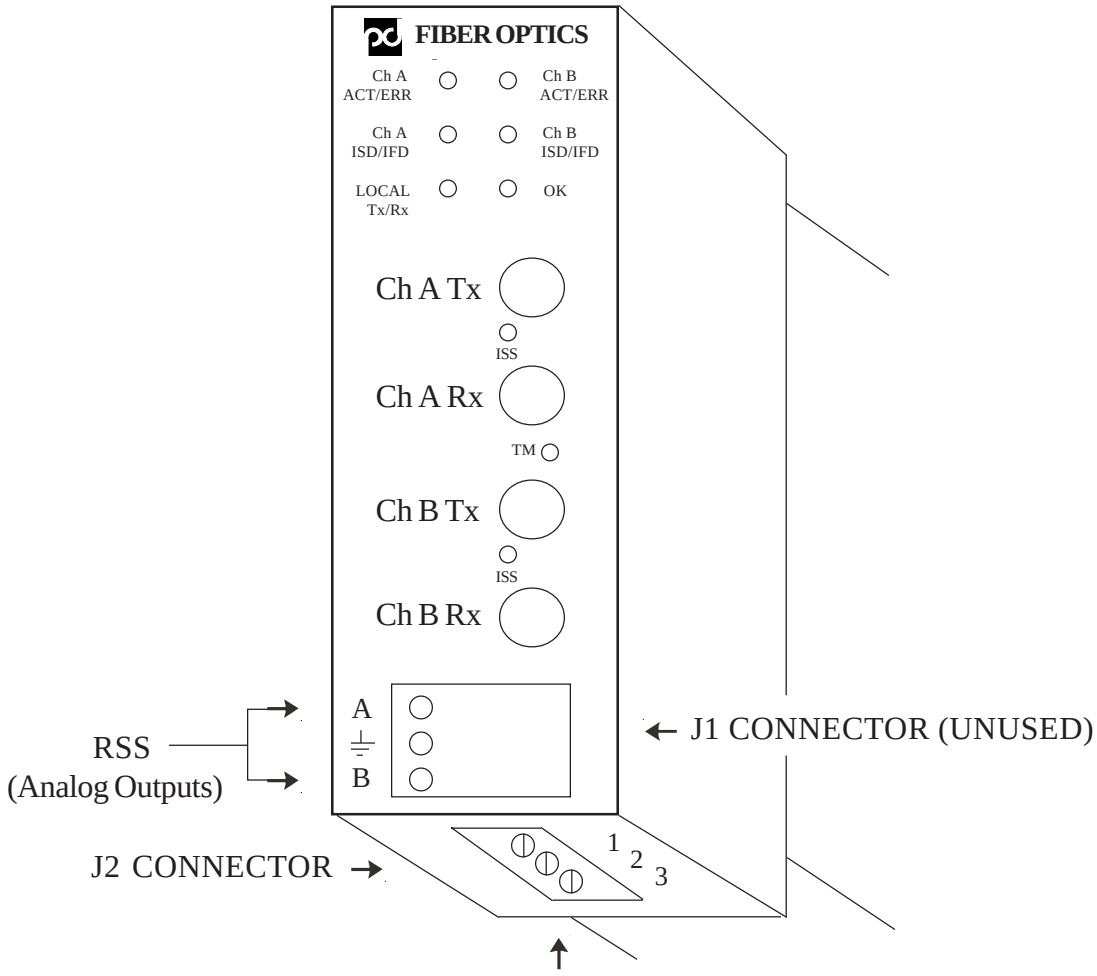

**ROCKWELL ALLEN-BRADLEY DH+/RIO**
**1771 PLUG-IN OCM CONNECTOR DESIGNATIONS**

**FIGURE 4**




**ROCKWLL ALLEN-BRADLEY DH+/RIO**
**1746 PLUG-IN OLC CONNECTOR DESIGNATIONS**

**FIGURE 5**




**ROCKWELL ALLEN-BRADLEY DH+/RIO**
**1756 PLUG-IN OCX CONNECTOR DESIGNATIONS**

**FIGURE 6**

### 1.3.1.1 STANDALONE, PANELMOUNT OCM AND 1771 PLUG-IN OCM J1 CONNECTOR PIN DESIGNATIONS

| OCM J1 Connector Pin Numbers (1) | DH+/RIO Signal Name |
|---|---|
| 1(2) | Ch A Receive Signal Strength (RSS) |
| 2 | RSS Signal Ground |
| 3(2) | Ch B Receive Signal Strength |
| 4 | Shield In |
| 5 | Shield Out |
| 6(3, 4) | Serial 2/Blue(DH+), Serial 1/Blue (RIO) |
| 7(3, 4) | Serial 1/Clear (DH+), Serial 2/Clear (RIO) |
| 8(3) | Termination |

(1) J1 Connector Orientation on the front of the OCM module is top to bottom, Pin #s 1 thru 8 respectively. (All unused J1 connector screw terminals should be fully seated.) See Figures 3 and 4 for J1 Connector Designations.

(2) Channel A and Channel B RSS provide DC voltage outputs proportional to the optical receive signal strength of fiber optic channels A and B respectively. (Available only on fiber optic modules operating on the 850nm or 1300 nm multimode wavelengths. See Interactive Diagnostics in Section 1.3.3 for detailed information.)

(3) Each end of each hardwired DH+ or RIO network stub (wire connection made to the OCM J1 connector) must be terminated with either an 82 ohm, 5%, 1/4 watt resistor (230 K baud and Remote I/O "Extended Node" networks), or a 150 ohm, 5%, 1/4 watt resistor (57.6 K baud and 115.2 K baud networks, excluding "Extended Node" RIO networks).

A 150 ohm, 5%, 1/4 watt termination resistor is internally provided in every OCM module. This resistor is connected across Serial 1 and Serial 2 by jumpering together pin #s 7 and 8 on the OCM J1 connector (Factory Default). If the OCM is located on either end of the hardwired network stub (connected to the OCM J1 connector), and a 150 ohm termination resistor is required, then a termination jumper must be provided on the OCM J1 connector between pin #s 7 and 8. If a 150 ohm termination resistor is not required at the OCM location then the jumper should not be installed. If an 82 ohm resistor is required at the OCM location then this resistor must be installed externally, on the OCM J1 connector, across J1 connector pin #s 6 and 7. In this case, J1 connector pin #s 7 and 8 should NOT be jumpered together. (An external 82 ohm resistor is provided with every OCM-DPR.)

If the OCM is used as a fiber optic repeater and is not connected to any Rockwell devices, then it should have the J1 Connector Local Interface disabled. See Interactive Diagnostics in Section 1.3.3 for more information.

(4) All of the DH+ and RIO devices on each hardwired nework stub must be interconnected Serial 1 to Serial 1 and Serial 2 to Serial 2. Cross-connecting Serial 1 to Serial 2 will cause communication failures. Consult Rockwell DH+ and RIO Network Installation Guidelines for more information on correct network installation and wiring procedures.

**OCM DH+/RIO DEVICE INTERFACE CONNECTOR PIN DEFINITIONS**

**TABLE 2**

### 1.3.1.2 1746 PLUG-IN OLC AND 1756 PLUG-IN OCX J2 CONNECTOR PIN DESIGNATIONS (CONNECTOR ON BOTTOM OF MODULE)

| OLC/OCX J2 Connector Pin Numbers (1) | DH+/RIO Signal Name |
|---|---|
| 1 (2, 3) | Serial 1/Clear (DH+), Serial 2/Clear (RIO) |
| 2 | Shield |
| 3 (2, 3) | Serial 2/Blue (DH+), Serial 1/Blue (RIO) |

(1) J2 Connector Orientation on the bottom of OLC and OCX modules is front to back, Pin #s 1 thru 3 respectively. See Figures 5 and 6 for J2 Connector Designations.

(2) Each end of each hardwired DH+ or RIO network stub (wire connection made to the OLC/OCX J2 connector) must be terminated with either an 82 ohm, 5%, 1/4 watt resistor (230 K baud and Remote I/O "Extended Node" networks), or a 150 ohm, 5%, 1/4 watt resistor (57.6 K baud and 115.2 K baud networks, excluding "Extended Node" RIO networks). (External 82 ohm and 150 ohm termination resistors are provided with every OLC and OCX module.)

If the OLC or OCX is used as a fiber optic repeater and is not connected to any Rockwell devices, then it should have the J2 Connector Local Interface disabled. See Interactive Diagnostics in Section 1.3.3 for more information.

(4) All of the DH+ and RIO devices on each hardwired nework stub must be interconnected Serial 1 to Serial 1 and Serial 2 to Serial 2. Cross-connecting Serial 1 to Serial 2 will cause communication failures. Consult Rockwell DH+ and RIO Network Installation Guidelines for more information on correct network installation and wiring procedures.

## OLC and OCX DH+/RIO DEVICE INTERFACE CONNECTOR PIN DEFINITIONS

## TABLE 3

### 1.3.2 OPTICAL NETWORK INTERFACE SPECIFICATIONS

The Optical Network Interface is designated as ChA Tx, Ch A Rx, Ch B Tx, and ChB Rx on the fiber optic module faceplate (see Figures 3, 4, 5, and 6). Phoenix Digital fiber optic modules are compatible with either ST or SMA 905/906 style fiber optic connectors... as an ordering option (mating connector which is terminated to the fiber media). (Alignment sleeves should be provided on all SMA Style 906 connectors for optical alignment.) Detailed specifications describing optical network transmit and receive capabilities at the 850nm multimode, 1300nm multimode, 1550 nm multimode, 1300nm singlemode, and 1550 nm singlemode wavelengths are provided below:

**OPTICAL TRANSMITTER (850nm MULTIMODE)**

Electro-Optical Characteristics

| Parameter | Test Condition | SYM. | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Fiber Coupled Power | 50/125 micron, Graded, 0.20NA | Poc | 10/-20.0 | 20/-17.0 | | microwatts/dBm |
| | 62.5/125 micron, Graded, 0.28NA | | 21.9/-16.6 | 45/-13.5 | | microwatts/dBm |
| | 100/140 micron, Graded, 0.29NA | | 58.0/-12.4 | 115/-9.4 | | microwatts/dBm |
| | 200/230 micron, Graded, 0.37NA | | 320/-4.9 | | | microwatts/dBm |
| Peak Wavelength | | $\lambda_P$ | | 850 | | nm |
| Spectral Width | | $\lambda_W$ | | 50 | | nm |

**TABLE 4**

**OPTICAL TRANSMITTER (1300nm MULTIMODE)**

Electro-Optical Characteristics

| Parameter | Test Condition | SYM. | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Fiber Coupled Power | 50/125 micron Graded, 0.20NA | Poc | 25/-16.0 | | | microwatts/dBm |
| | 62.5/125 micron Graded, 0.28NA | | 50/-13.0 | | | microwatts/dBm |
| Wavelength | | $\lambda_P$ | 1290 | | 1350 | nm |
| Spectral Width | | $\lambda_W$ | | | 160 | nm |

**TABLE 5**

**OPTICAL TRANSMITTER (1550nm MULTIMODE)**

Electro-Optical Characteristics

| Parameter | Test Condition | SYM. | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Fiber Coupled Power | 50/125 micron Graded, 0.20NA | Poc | 50/-13.0 | | | microwatts/dBm |
| Wavelength | | $\lambda_P$ | 1510 | | 1580 | nm |
| Spectral Width | | $\lambda_W$ | 45 | | 100 | nm |

**TABLE 6**

**OPTICAL TRANSMITTER (1300nm SINGLEMODE)**

Electro-Optical Characteristics

| Parameter | Test Condition | SYM. | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Fiber Coupled Power | 9/125 micron | Poc | 16/-18.0 | | | microwatts/dBm |
| Wavelength | | $\lambda_P$ | 1270 | | 1340 | nm |
| FWHM | | $\lambda_W$ | 70 | | 90 | nm |

**TABLE 7**

**OPTICAL TRANSMITTER (1550nm SINGLEMODE)**

Electro-Optical Characteristics

| Parameter | Test Condition | SYM. | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Fiber Coupled Power | 9/125 micron | Poc | 30/-15.0 | | | microwatts/dBm |
| Wavelength | | $\lambda_P$ | 1510 | | 1580 | nm |
| FWHM | | $\lambda_W$ | 45 | | 100 | nm |

**TABLE 8**

**OPTICAL RECEIVER (850nm MULTIMODE, 1300/1550nm MULTIMODE, and 1300/1550nm SINGLEMODE)**

Receiver Sensitivity: -32dbm

Phoenix Digital's fiber optic modules may be interconnected on the fiber optic network in an active bus configuration. Network Channel A Receive Data inputs and Transmit Data outputs should be interconnected sequentially from fiber module to fiber module in one direction, and Channel B Receive and Transmit Data inputs and outputs interconnected sequentially in the opposite direction. This configuration may be made fault tolerant by cross-connecting Channel A (Ch A Transmit to Ch A Receive) and Channel B (Ch B Transmit to Ch B Receive) on the fiber modules on either end of the active bus (See Figure 7). This effectively transforms the network into a DH+ or RIO counter-rotating ring network configuration.

### 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 (1771, 1746, and 1756 Plug-In Modules) or via Discrete Contact Outputs (Standalone, Panelmount Fiber Module) to validate network integrity and assist in troubleshooting network problems...

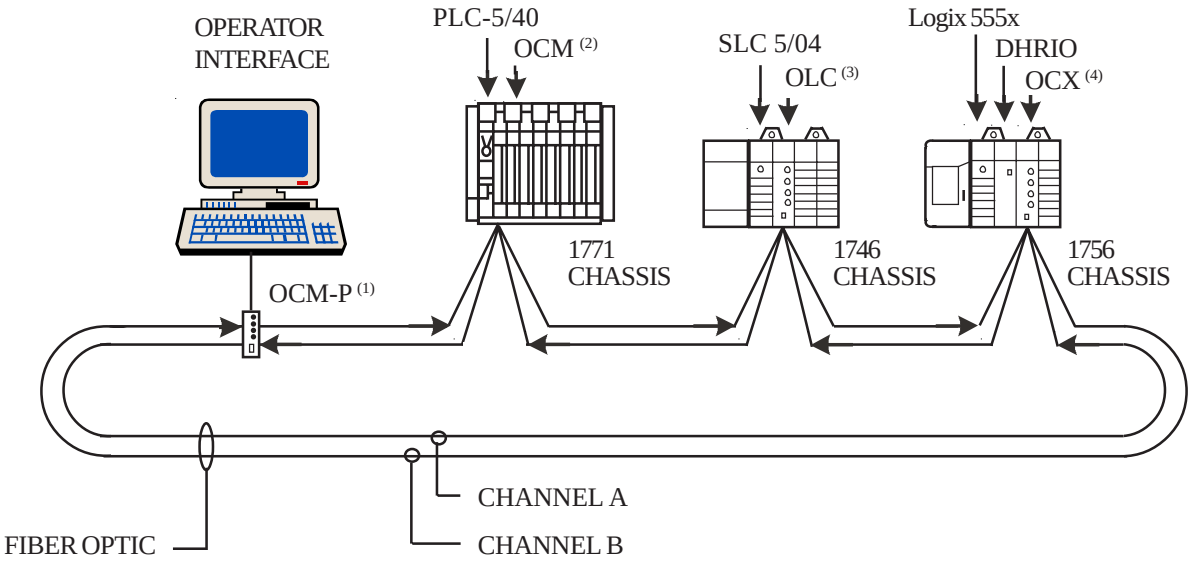
-Detect and Locate Fault Conditions Throughout the Network
-Trap-and-Hold, and Locate Intermittent Fault Conditions Throughout the Network
-Detect and Locate Impending Fault Conditions Throughout the Network
-Verify Fault Managment and Overall Network Integrity
-Optical Power Metering

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

#### 1.3.3.1 STANDALONE, PANELMOUNT OCMS

Activation and control of Standalone OCM Diagnostics is provided through Diagnostic Select Switch Settings. Diagnostic Select Switch Settings are provided in Table 9. Monitoring of Standalone, Panelmount OCM diagnostics is provided using reed relay contact outputs. These outputs are provided on Standalone OCMs (with the "-D" Option) and are accessible on the J4 connector.

**DH+ DUAL MEDIA RING CONFIGURATION (FAULT TOLERANT)**




(1) OPTICAL COMMUNICATION MODULE
MODEL # OCM-DPR-85-P-D-ST-ACV

(2) OPTICAL COMMUNICATION MODULE
MODEL # OCM-DPR-85-D-ST

(3) OPTICAL LINK COUPLER
MODEL # OLC-DPR-85-D-ST

(4) OPTICAL ControlLogix MODULE
MODEL # OCX-DPR-85-D-ST

**TYPICAL DH+ FIBER OPTIC MODULE**
**INSTALLATION CONFIGURATION**

**FIGURE 7**

| SWITCH [1] | POSITION [1] | FUNCTION [2] | FACTORY CONFIGURATION (DEFAULT) |
|---|---|---|---|
| Switch 4 | 1 | Enable Diagnostic Relay Outputs [3] | OFF |
| (SW 4) | 2 | Unused [4] | OFF |
| | 3 | Enable Impending Fault Detection | OFF |
| | 4 | Disable Local Interface (J1 Connector) | OFF |
| | 5 | Force Channel A Error | OFF |
| | 6 | Force Channel B Error | OFF |
| | 7 | Trap Mode Select | OFF |
| | 8 | Unused [4] | OFF |
| | 9 | Enable Processor Write [5] | OFF |
| | 10 | Unused [4] | OFF |

(1) See Figure 8 for designated switch locations

(2) ON = Enable (Active, Switch Closed)
OFF = Disable (Switch Open)

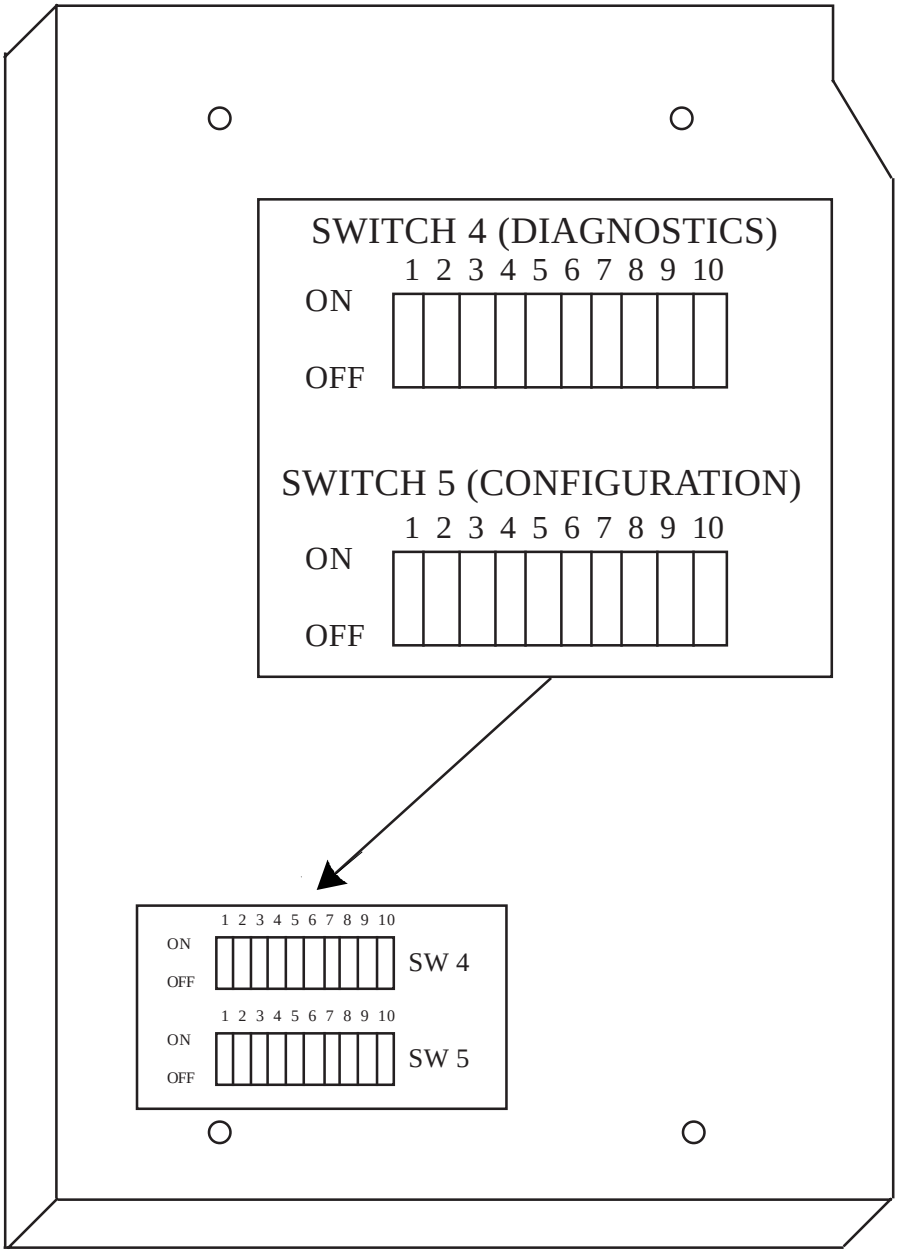
(3) Used on standalone, panelmount OCM modules with the "-D" diagnostic option only. Unused on standalone, panelmount OCM modules without the diagnostic option, and on 1771 plug-in OCM modules.

(4) All unused switch positions must remain set in the Factory Default Configuration.

(5) Used on 1771 plug-in OCM modules with the "-D" diagnostic option only. Unused 1771 plug-in OCM modules without the diagnostic option, and on standalone, panelmount OCM modules.

**STANDALONE, PANELMOUNT OCM and 1771 PLUG-IN OCM MODULE DIAGNOSTIC SELECT SWITCH DESIGNATIONS**

**TABLE 9**




**STANDALONE, PANELMOUNT OCM AND 1771 PLUG-IN OCM DIAGNOSTIC AND CONFIGURATION SWITCH DESIGNATIONS**

**FIGURE 8**

Specifications detailing J4 connector pin-out are provided in Table 10. Further explanation of OCM diagnostic functions is provided in Sections 1.3.3.5-1.3.3.10. Electrical specifications for diagnostic relay outputs are given below:

Diagnostic Relay Contacts

| | | |
|---|---|---|
| Arrangement | : | 1a |
| Initial contact resistance, max. | : | 30 Meg Ohm |
| Rating (resistive) | | |
| Max. switching voltage | : | 380 VAC, 125 VDC |
| Max. switching current | : | .5A |
| Initial breakdown voltage | | |
| Between open contacts | : | 1,000 Vrms |
| Between contact sets | : | 2,000 Vrms |
| Between contacts and coil | : | 3,000 Vrms |
| Initial insulation resistance | : | 1,000m ohm at 500 VDC |
| FCC surge voltage between open contacts | : | 1,500V |

(Note: Standalone, Panelmount OCMs are shipped from the factory with Diagnostic Relays disabled. To enable Diagnostic Relay Outputs, Diagnostic Select Switch SW4-1 must be set ON by the user.)

### 1.3.3.2 1771 PLUG-IN OCMs (Modules with "-D" Diagnostic Option Only)

Activation, control, and monitoring of 1771 Plug-In OCM 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 Select Switch Settings. The 1771 Plug-In OCM (with "-D" Option) occupies a single I/O module slot, and simulates either an 8 bit bi-directional I/O module (when OCM Processor Write is Enabled) or an 8 bit input module (when OCM Processor Write is Disabled). The OCM is addressable to the 1771 I/O module slot it occupies. The 1771 I/O module slot addressing density (2-slot, 1-slot, 1/2-slot I/O Group) is switch selectable on the backplane of the 1771 chassis. (OCM modules without the "-D" diagnostic option do not have a 1771 bus interface and appear as empty slots to the processor.)

| J4 CONNECTOR PIN # | STANDALONE, PANELMOUNT OCM DIAGNOSTIC OUTPUT (1) |
|---|---|
| 1, 2 | Channel A Error (ERR) |
| 3, 4 | Channel A Impending Fault Detect (IFD) |
| 5, 6 | Channel B ERR |
| 7, 8 | Channel B IFD |

(1) Each diagnostic output is provided as a normally open FORM A contact on the designated pair of J4 pin numbers. When a diagnostic function is asserted (i.e. error or impending fault) the corresponding contact will close.

Diagnostic Select Switch SW4-1 must be set ON (active) to enable diagnostic relay outputs.

**STANDALONE, PANELMOUNT OCM J4 CONNECTOR DIAGNOSTIC OUTPUT PIN DEFINITIONS**

**TABLE 10**

RSLogix 5 OCM I/O module configuration is similar to other types of 1771 I/O modules. The first step is to select “I/O Configuration” for the 1771 Chassis. Next select the chassis and I/O slot where the OCM is located, and open the “Edit Module - Module Type” configuration table. From this table select either “1771-SIM - 8pt Discete I/O Simulator” if OCM Processor Write is Enabled (SW 4 Position 9 ON), or “1771-IG - 5v DC TTL 8pt Input” if OCM Processor Write is Disabled (SW 4 Position 9 OFF). (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 for the 1771 Plug-In OCM Module are given in the Diagnostic I/O Bit Map illustrated in Figure 9. Definitions of Diagnostic Select Switch Settings are provided in Table 9. Specifications and further explanation of OCM diagnostic functions are provided in Sections 1.3.3.5-1.3.3.10.

#### 1.3.3.3 1746 PLUG-IN OLCs (Modules with “-D” Diagnostic Option Only)

Activation, control, and monitoring of 1746 Plug-In OLC 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 Select Switch Settings given in Table11. The 1746 Plug-In OLC (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) or an 8 bit input module (when OLC Processor Write is Disabled). 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 module is configured to simulate an 8 bit bi-directional I/O module (ie. SW 2 VALUE 3 is selected), then the module designation is “OTHER”, I/O Mix Code = “19”, and 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 module is configured as an 8 bit input module (ie. SW 2 VALUE 7 is selected) then the module designation is “OTHER”, I/O Mix Code = “19”, and the I/O Type Code = “00”.

RSLogix 500 OLC 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 Processor Write is Enabled (see Diagnostic Switch Designations in Table 11) enter “1935”. If OLC Processor Write is Disabled 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 9. Definitions of Diagnostic/Configuration Select Switch Settings are provided in Table 11. Specifications and further explanation of OLC diagnostic functions are provided in Sections 1.3.3.5-1.3.3.10.

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

Monitoring of 1756 Plug-In OCX 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. Diagnostic function control is provided via Diagnostic Select Switch Settings. (OCX modules without the "-D" diagnostic option do not have a 1756 bus interface and appear as empty slots to the processor.)

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_DPR_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 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_DPR_" 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-DPR module present in the I/O configuration will have a unique name.

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

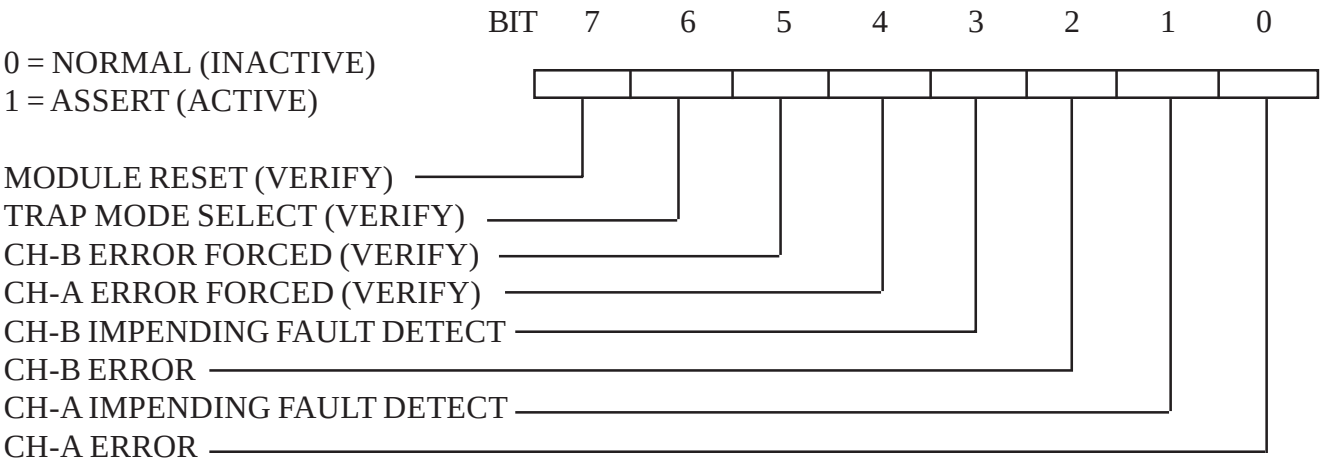
Identification

| | |
|---|---|
| Vendor: | (420) Unknown |
| Product Type: | (128) Unknown |
| Product Code: | (549) Unknown |
| Revision: | x.x |
| Serial Number: | 000xxxxx |
| Product Name: | OCX_DPR_x |
| | Phoenix_Digital_Rx.x |

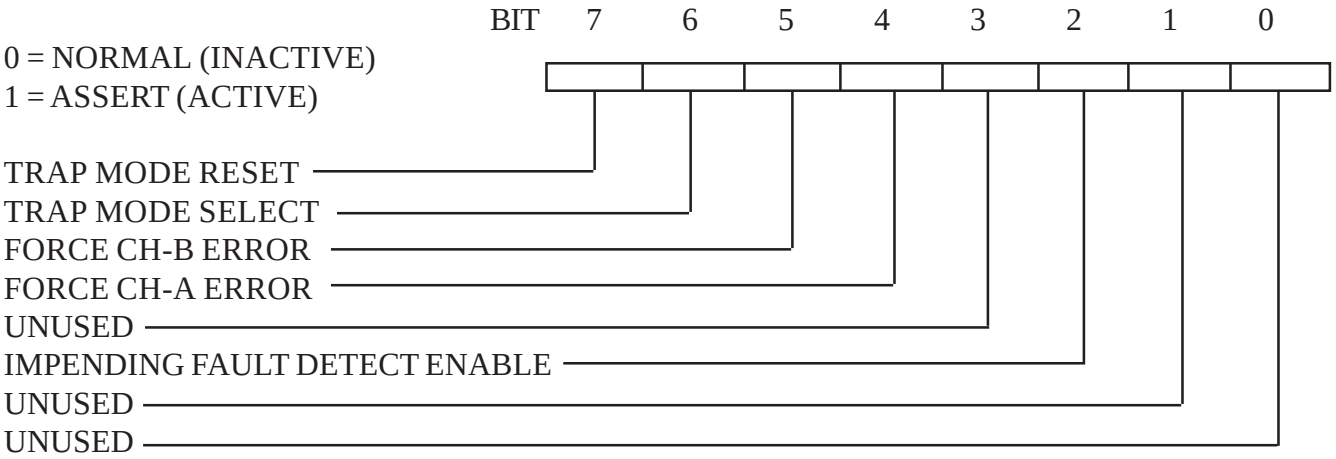
The OCX-DPR module revision level will be 1.2 or above. Module serial numbers will range between 00000000 and 00099999. The numeric information given above for Vendor, Product Type, and Product Code have been assigned to the OCX-DPR module. Rockwell anticipates that RSLogix software will eventually be 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 10. Definitions of Diagnostic Select Switch Settings are provided in Table 11. Specifications and further explanation of OCX diagnostic functions are provided in Sections 1.3.3.5-1.3.3.10.

READ STATUS BYTE



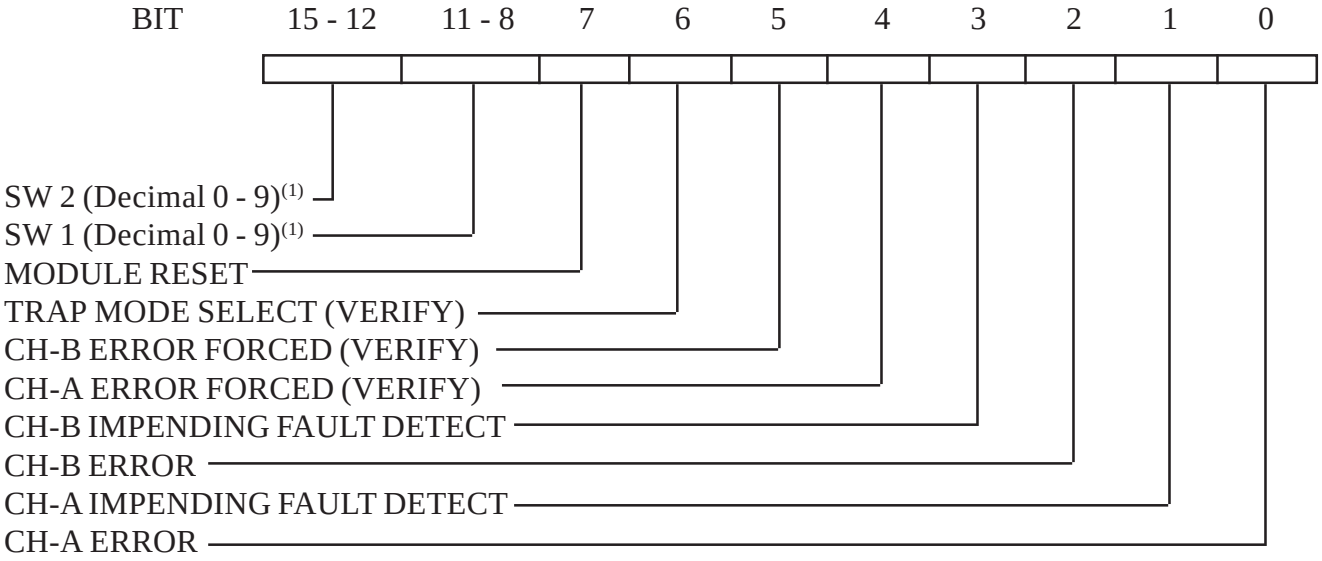

WRITE CONTROL BYTE




**1771 PLUG-IN OCM AND 1746 PLUG-IN OLC**
**DIAGNOSTIC STATUS AND CONTROL FUNCTIONS**

**FIGURE 9**

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




(1) Rotary Switch Definition

| SW 2 | BIT # 15 | 14 | 13 | 12 |
|---|---|---|---|---|
| 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 |

| 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**
**DIAGNOSTIC STATUS AND CONTROL FUNCTIONS**

**FIGURE 10**

| SWITCH (1) | VALUE SELECTED ON DIAL | FUNCTION (2) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Local Interface (J1 Conn) | Impending Fault Detection | Force Ch A Error | Force Ch B Error | Trap Mode Select | Processor Write |
| SW 2 | 0 (3) | Enable | Enable | Disable | Disable | Disable | Disable |
| | 1 | Enable | Enable | Disable | Disable | Disable | Enable |
| | 2 | Enable | Enable | Disable | Disable | Disable | Enable |
| | 3 (4) | Enable | Enable | Disable | Disable | Disable | Enable |
| | 4 | Disable | Enable | Disable | Disable | Disable | Enable |
| | 5 | Enable | Enable | Enable | Disable | Disable | Enable |
| | 6 | Enable | Enable | Disable | Enable | Disable | Enable |
| | 7 (3) | Enable | Disable | Disable | Disable | Disable | Disable |
| | 8 | Enable | Disable | Disable | Disable | Disable | Enable |
| | 9 | Enable | Enable | Disable | Disable | Enable | Enable |

(1) See Figure 11 for designated switch locations. (Note that VALUES for both SW 2 and SW 1 are echoed in bits 15-12 and 11-8, respectively, in the upper byte of the 16 bit Read Status register for the 1756 OCX module.)

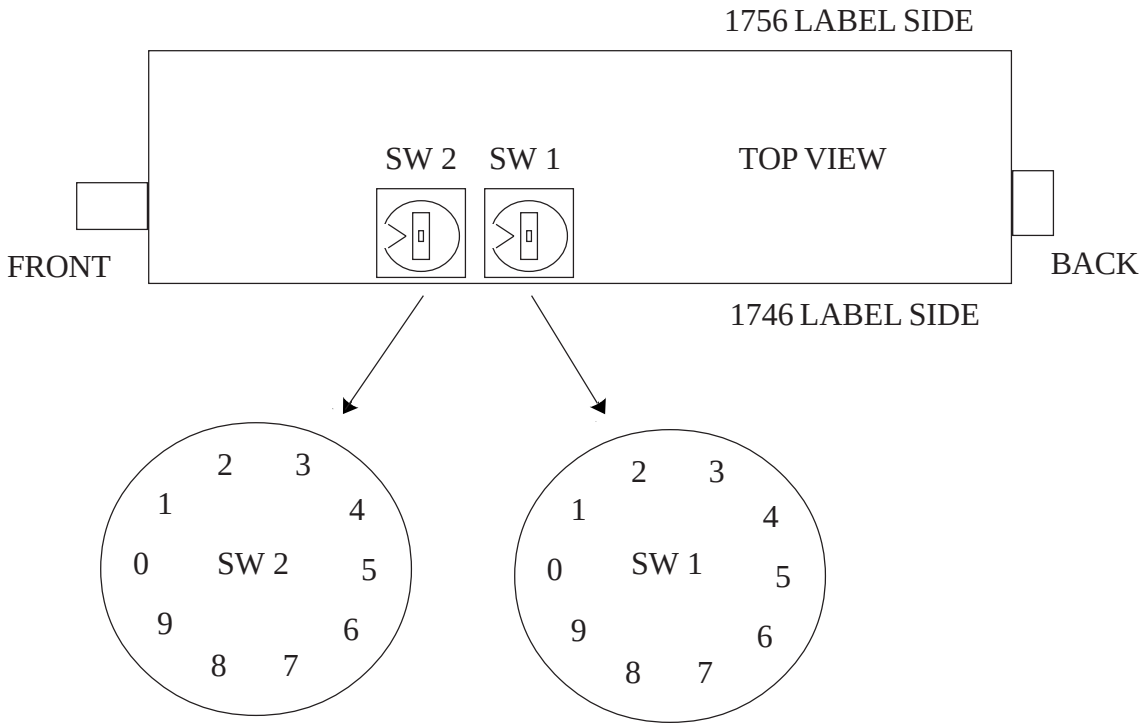
(2) Switch Function overrides corresponding (complementary) bits of Write Control Byte for 1746 Plug-In OLC modules.

(3) SW 2, VALUES 0 and 7 will disable Processor Write communication for 1746 OLC modules with the "-D" Diagnostic Option only.

(4) Factory Default Value selected on the dial.

**1746 OLC AND 1756 OCX DIAGNOSTIC SELECT SWITCH DESIGNATIONS**

**TABLE 11**




**1746 OLC AND 1756 OCX**
**DIAGNOSTIC AND CONFIGURATION**
**SWITCH DESIGNATIONS**

**FIGURE 11**

### 1.3.3.5 DETECT AND LOCATE NETWORK FAILURES

Fiber optic network fault conditions are reported by 1771, 1746, and 1756 Plug-In fiber optic modules on diagnostic status bits 0 and 2... for fiber optic receive Channels A and B respectively (see Figures 9 and 10). Fault conditions are reported by standalone, panelmount fiber optic modules on reed relay contact outputs on J4 connector pin #s 1,2 and 5,6... for fiber optic Channels A and B respectively. (Diagnostic Select Switch SW4-1 must be set ON (active) to enable diagnostic relay outputs.) 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. These bits and contact outputs may be used to locate the precise fiber 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). Contact Outputs on standalone, panelmount fiber optic modules, and Diagnostic Status Bits on 1771, 1746, and 1756 plug-in fiber optic modules 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 communication modules provide automatic recovery from communication failures. In the Auto-Recovery Mode of operation fiber optic modules automatically detect, isolate, and correct communication failures by switching network data around points of failure, and then automatically restore the network to its original configuration when the sources of the failures are corrected. However, as an alternative to Auto-Recovery Mode, Phoenix Digital's fiber optic modules can also be configured for Trap Mode Operation. This configuration may be selected on Standalone, Panelmount OCM Modules through Diagnostic Select Switch 4 (see Table 9); on 1771 Plug-In OCM Modules through Diagnostic Select Switch 4 (see Table 9) and/or the Diagnostic Control Byte (see Figure 9); on 1746 Plug-In OLC Modules through the Diagnostic Select Switch 2 (see Table 11) and/or the Diagnostic Control Byte (see Figure 9); and on 1756 Plug-In OCX Modules through Diagnostic Select Switch 2 (see Table 11).

In Trap Mode, Phoenix Digital's fiber optic modules will continue to detect, isolate, and correct communication failures, just as in Auto-Recovery Mode. But when the source of the failure is corrected or randomly disappears (as commonly occurs with intermittent failures), 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 failure is corrected, and the fiber modules that trapped the failure are reset. Thus, intermittent failures will be continuously trapped by the fiber optic modules, providing maintenamce personnel with the opportunity to locate and correct the source of the network failure.

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

1. Install and interconnect all fiber optic 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, the Trap Mode fiber modules may assume that the 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 modules configured for Trap Mode operation may indicate a failed condition on both channels... Ch A ERR, Ch B ERR.)

3. Reset each Trap Mode fiber optic module on the network by either toggling the appropriate bit in the Write Control Byte ON (Enable) and then OFF (Disable) (1771 OCM and 1746 OLC plug-in fiber optic modules only), or by depressing the TM (Trap Mode) pushbutton on the front of each Trap Mode fiber optic module (all modules). This will switch the fiber optic module into an active, online, error free mode of operation, until such time as an intermittent failure occurs and the fiber module traps the failure. (See Figures 3, 4, 5 and 6 for fiber optic module TM Pushbutton designations.)

4. Trap Mode fiber optic modules may be subsequently reset (after trapping an intermittent failure) by either toggling the Trap Mode Reset bit (1771 OCM and 1746 OLC plug-in fiber optic modules only), or by depressing the TM Pushbutton (all modules).

### 1.3.3.7 DETECT AND LOCATE IMPENDING NETWORK FAILURES (850nm AND 1300 nm MULTIMODE MODULES ONLY)

Phoenix Digital's fiber optic modules provide the unique capability to detect impending optical communication faults on the fiber optic network before they actually occur. Impending Fault Monitoring may be Enabled on Standalone, Panelmount OCM Modules through Diagnostic Select Switch 4 (see Table 9); on 1771 Plug-In OCM Modules through Diagnostic Select Switch 4 (see Table 9) and/or the Diagnostic Control Byte (see Figure 9); on 1746 Plug-In OLC Modules through the Diagnostic Select Switch 2 (see Table 11) and/or the Diagnostic Control Byte (see Figure 9); and on 1756 Plug-In OCX Modules through Diagnostic Select Switch 2 (see Table 11).

The fiber optic module Impending Fault Initialization procedure is accomplished by first connecting the module optical receive inputs to the optical transmit outputs of adjacent fiber module(s) (adjacent on the fiber optic network), with the actual fiber optic cable to be used in the final installation. (It is recommended that this initialization be accomplished post-installation in order to match the fiber module impending fault monitoring circuitry to the final communication link characteristics.) The adjacent fiber modules (adjacent on the fiber optic network) must be powered during the initialization process to provide a receive signal reference (communication data carrier) to the fiber optic module undergoing initialization. The fiber modules must be powered for at least 15 minutes prior to initialization in order to stabilize all internal references. (The initialization procedure may also be performed on-line with actual network data transmissions, and will be totally transparent to network operation.) While visually observing the ISD/ID indicators on the front of the fiber optic module the ISS (Initial Signal Set) potentiometers should be turned clockwise if the corresponding ISD/ID indicators are off (or red), or counterclockwise if they are on green, until the ISD/ID indicators switch state (either turning green to off or off to green). Then, as the final step, the Initial Signal Set potentiometers should be turned 1/4 turn clockwise, at which point the corresponding ISD/ID indicators should be maintained continuously on (green). (Note: If the Receive Optical Signal Strength is too high, the optical input may have to be attenuated before proceeding with the Impending Fault Initialization Procedure. If the Receive Signal Strength is greater than -20dbm, the input signal should be artificially attenuated to reduce the signal strength below this threshold, before attempting Impending Fault Detect Initialization. As an alternative, the user may wish to leave the Impending Fault Detect threshold at the factory default setting of -28dbm.)

The fiber module initialization procedure normalizes the impending fault monitoring detection thresholds to the attenuation characteristics of the final network installation. (It should be noted that the ISD/ID indicators may occasionally flash green or off, or turn off entirely over time. This is a normal operating condition and should be ignored post installation.) After initialization any optical network impending fault condition which causes the optical network receive power level to drop by more than 3.0 decibel-milliwatts (optical power) relative to the initialization power level will cause the corresponding Impending Fault Detect (IFD/IF) indicator to illuminate red, and will be reported on the

corresponding Diagnostic Status Bit(s) or Relay Output(s). (Note that both ID and IF are provided on the same indicator for 1746 OLC and 1756 OCX plug-in modules. For ID the indicator changes between green and off, and for IF the indicator changes between red and off.)

No additional calibration adjustments will be required for the lifetime of the network installation, unless the network characteristics are changed. Changes affecting either the optical characteristics of the network media (media replacement, splice, new terminations, etc.), or replacement of one or more fiber optic modules, will require that the initialization procedure be repeated for each fiber module which has one or more of its' optical network receive inputs affected by the change. (The initialization procedure may be done on-line, post installation, and will not affect real time network data transmissions.)

Impending Fault conditions are reported by standalone, panelmount OCMs through reed relay contact outputs on J4 connector pin #s 3,4 and 7,8... for fiber optic channel A and B respectively (see Table 10). Impending fiber optic network fault conditions are reported by 1771 Plug-In OCMs, 1746 Plug-In OLCs, and 1756 Plug-In OCXs in the Diagnostic Status Byte (see Figures 9 and 10). If a fiber module detects an impending communication failure on the fiber optic receive data inputs on Channel A and/or B (due to either media failure or failure of an adjacent fiber module) it will assert the corresponding diagnostic status bit or relay output. These bits and relay outputs may be used to locate the precise fiber where the failure is occurring. (Note: Impending Fault Monitoring is only available on 850 nm and 1300 nm multimode fiber optic modules.)

#### 1.3.3.8 SIMULATE NETWORK FAULT CONDITIONS

After a fault tolerant fiber optic communication network becomes operational it is very important to verify the network is correctly configured for fault management. 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 Phoenix Digital fiber optic modules by forcing errors on the fiber optic Channel A and B transmit outputs. This may be accomplished on 1771 OCM and 1746 OLC plug-in fiber optic modules through the Diagnostic Control Byte (see Figure 9), and on all fiber optic modules through the Diagnostic Select Switches (see Tables 10 and 11).

#### 1.3.3.9 LOCAL INTERFACE DISABLED

On certain occasions in it may be necessary to segment or partition the communication network in order to isolate one or more problems on the network grid. These problems may include improper

termination and/or cross-wiring on individual hardwired network stubs (network segments leading to the electrical connection on each fiber optic module), duplicate node address settings, incompatible baud rate settings, etc., on one or more devices on the network. In order to find these types of problems it is often necessary to start-up the overall network one part at a time... after the fiber optic network grid is installed and operational.

Phoenix Digital's fiber optic modules allow the user to disable the Local Interface on the J1 or J2 connectors, at one or more locations on the network grid, through Diagnostic Select Switches (see Tables 9 and 11). When the Local Interface is Disabled the fiber optic modules will still function as active repeaters on the fiber optic network, but will disable all communications (read/write) on the Local Interface J1 or J2 connector. Thus, if an unknown problem exists somewhere on the network, individual hardwired network stubs leading from each fiber optic module may be taken off-line until the source of the failure is isolated and the problem itself is identified and corrected.

The Local Interface should always be disabled when a fiber optic module is used as an active repeater (i.e. no connection to the Local Interface on the J1 or J2 connectors).

#### 1.3.3.10 OPTICAL POWER METERING ("-D" OPTION... 850 nm and 1300 nm MULTIMODE ONLY)

Phoenix Digital fiber optic modules provide two analog outputs (one per optical network receive input), proportional to the receive optical signal strength at the module, for optical power measurement. These two analog outputs provide an absolute +DC voltage representation of the optical power level or Receive Signal Strength (RSS) for each network receive input. The RSS outputs are buffered for increased drive current capability. RSS output specifications are the following:

Linear Outputs (Ch A RSS, Ch B RSS)

Voltage Range ($V_{out}$) = 0 to +3.5 VDC
Drive Current ($I_{out}$) = 20 ma (max)

RSS analog outputs are provided on the J1 Connector Pin #s 1, 2, and 3, on the front of Standalone, Panelmount OCMs and 1771 Plug-In OCMs. (See Figures 3 and 4, and Table 1 for OCM Device Interface J1 Connector Pin Definitions.)

RSS analog outputs are provided on RSS Test Jacks on the front of 1746 Plug-In OLC and 1756 Plug-In OCX modules. (See Figures 5 and 6 for OLC and OCX RSS Test Jack Designations.)

See Table 12 for corresponding values of RSS Voltage Out vs Receive Optical Power-In at both the 850nm and 1300 nm wavelengths (multimode only).

| RSS V (OUT) (1) | OPTICAL POWER IN (dbm @ 850nm, MULTIMODE) | OPTICAL POWER IN (dbm @ 1300nm, MULTIMODE) |
|---|---|---|
| 3.5 | -18.0 | -20.0 |
| 3.0 | -18.6 | -21.0 |
| 2.5 | -19.4 | -21.9 |
| 2.0 | -20.4 | -23.3 |
| 1.5 | -22.0 | -24.5 |
| 1.0 | -24.0 | -27.0 |
| 0.5 | -28.0 | -33.0 |
| 0.3 | -33.2 | |

(1) Proportional Accuracy: +/- .3 volt

**NETWORK OPTICAL POWER-IN VERSUS RSS VOLTAGE-OUT (ANALOG)**

**TABLE 12**

RSS Return connection is provided on the Standalone, Panelmount OCM J1 connector (Pin #2... RSS Signal Ground), and on the 1746 Plug-In OLC and 1756 Plug-In OCX Test Jacks directly adjacent to the Signal Ground symbol on the lower front of the module. It is recommended that RSS Return/Signal Ground be used as the common mode reference for RSS analysis. (It can also be used as the negative signal reference for differential analysis of RSS.)

Since the RSS diagnostic outputs are active outputs the user must insure electrical compatibility before connection to any external device. (Note: Optical Power Metering is only available on 850 nm and 1300 nm multimode fiber optic modules with the “-D” diagnostic option.)

### 1.3.4 POWER SUPPLY AND GROUNDING SPECIFICATIONS

#### 1.3.4.1 STANDALONE, PANELMOUNT OCM POWER SUPPLY AND GROUNDING SPECIFICATIONS

Standalone OCMs may be operated from a 24 VDC, 120/220 VAC, or 125 VDC input power source (subject to Power Option specified at time of ordering... see Ordering Information).

The Auxiliary 120/220 VAC or 125 VDC power supply is attached to the side of the Standalone OCM enclosure. The Auxiliary Power Supply P2 Connector is hardwired at the factory to the Standalone OCM Base Enclosure J5 connector. This cable brings the necessary regulated power supply voltages from the Auxiliary Power Supply into the base OCM electronics. This cable should never be removed or modified in any way. Also, no other connection should be made to either the OCM P2 or J5 connectors.

The Auxiliary 24 VDC power supply is mounted inside the main enclosure.

##### 1.3.4.1.1 AUXILIARY POWER SUPPLY SPECIFICATIONS

The Auxiliary Power Supply must be ordered as an option to the Standalone, Panelmount OCM module.

Table 13 provides input power pin definitions for the J5 connector for the 24 VDC power supply option (See Figure 3).

| J5 CONNECTOR PIN NUMBER | J5 CONNECTOR PIN DESIGNATION | SIGNAL NAME (PIN DEFINITION) |
|---|---|---|
| 1 | +24V | +24 VDC |
| 2 | -24V | +24 VDC Return |
| 3 | C-GND | Chassis Ground |
| 4 | NC | No Connection |
| 5 | NC | No Connection |

**24V DC INPUT CONNECTOR PIN DEFINITIONS**

**TABLE 13**

24 VDC Power Supply Requirements (Specified at the +24 VDC, +24 VDC Return Input Power Connections on the Standalone, Panelmount OCM connector):

| | | |
|---|---|---|
| Input Voltage Range | : | +18 VDC to +30 VDC |
| OCM Input Current | : | .60 Amps |
| Regulation (Load and Line) | : | .6% (min) |
| Fuse [1] | : | 2 AMP, 250 VAC SLO BLO (.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 cover from the left side of the Standalone, Panelmount OCM enclosure.

Table 14 provides input power pin definitions for the Auxiliary Power Supply Pl barrier strip for the 120/220 VAC power supply option (See Figure 3).

| 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 14**

120/220 VAC Power Supply Requirements (Specified at the L1 , L2 Input Power Connections on the Standalone, Panelmount OCM 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 (.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 enclosure from the side of the Standalone, Panelmount OCM enclosure.

Table 15 provides input power pin definitions for the Auxiliary Power Supply Pl Barrier Strip for the 125 VDC Power Supply Option (See Figure 3):

| 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 15**

125 VDC Power Supply Requirements (Specified at the +125V, +125V Return Input Power Connections on the Standalone, Panelmount OCM Connector):

| | | |
|---|---|---|
| Input Voltage Range | : | 120 VDC to 370 VDC |
| Power Consumption<br>UL, CSA, VDE Approved | : | 15 watts per OCM (approximate) |
| Fuse (1) | : | 2 AMP, 250 VAC, SLO BLO<br>(.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 enclosure from the side of the Standalone, Panelmount OCM enclosure.

### 1.3.4.2 1771 PLUG-IN OCM POWER SUPPLY SPECIFICATIONS

Backplane (system chassis) power supply requirements for 1771 Plug-In OCMs are the following:

| | | |
|---|---|---|
| Input Voltage (1) | : | +5 VDC |
| Input Current (1) | : | 1.9 Amps |

(1) Supplied by 1771 Chassis Power Supply

### 1.3.4.3 1746 PLUG-IN OLC AND 1756 PLUG-IN OCX POWER SUPPLY SPECIFICATIONS

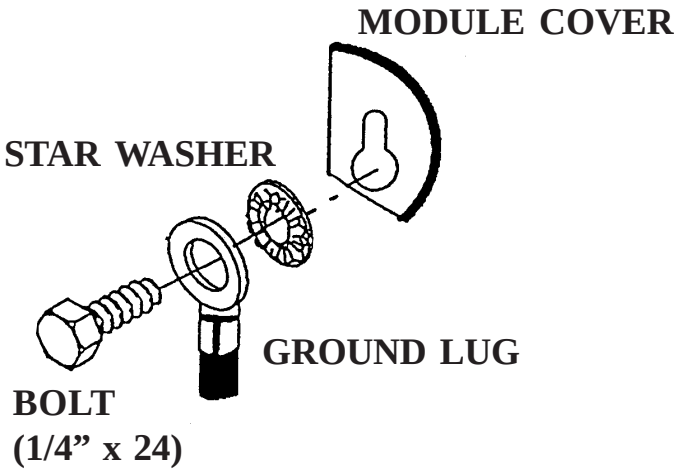
Backplane (system chassis) power supply requirements for 1746 Plug-In OLCs and 1756 OCXs are the following:

| | | |
|---|---|---|
| Input Voltage (1) | : | +5 VDC |
| Input Current (1) | : | 1.5 Amps |

(1) Supplied by 1746/1756 Chassis Power Supply

### 1.3.4.4 ELECTRICAL GROUNDING

The Standalone, Panelmount OCM enclosure must be electrically connected to earth ground. This may be accomplished by connecting the Chassis Ground on the Auxiliary Power Supply Pl connector to earth ground, or by attaching a ground electrode directly to the chassis or module cover. Figure 12 illustrates how to attach a ground lug to the module cover by using one of the module mounting bolts. To ensure a good electrical connection between the ground lug and the module, remove paint from the cover where the lug makes contact. Connect the ground lug to earth ground with an adequate grounding electrode.




**STANDALONE, PANELMOUNT OCM**
**ENCLOSURE ELECTRICAL GROUNDING PROCEDURE**

**FIGURE 12**

### 1.3.5 MECHANICAL AND ENVIRONMENTAL SPECIFICATIONS

FIBER OPTIC MODULE DIMENSIONS :

| | | |
|---|---|---|
| Standalone, Panelmount OCM Module | : | 10.38” H x 3.50” W x 6.14” D*<br>(26.37 cm H x 8.89cm W x 15.60 cm D*)<br><br>* Assumes Auxiliary Power Supply is attached to side of module. |
| 1771 Plug-In OCM Module | : | Single slot, 1771 Chassis Installation. |
| 1746 Plug-In OLC Module | : | Single slot, 1746 Chassis Installation. |
| 1756 Plug-In OCX Module | : | Single slot, 1756 Chassis Installation. |

FIBER OPTIC MODULE ENVIRONMENTAL SPECIFICATIONS :

| | | |
|---|---|---|
| Temperature | : | Operating 0° to 60°C<br>Storage -40°C to +85°C |
| Relative Humidity | : | 0 to 90% (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, Panelmount OCMs should be panelmounted per the mounting specifications provided in Figure 3. 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 Rockwell Allen-Bradley Installation and Mounting Procedures for 1771, 1746, and 1756 Chassis Installation... for 1771 Plug-In OCM, 1746 Plug-In OLC, and 1756 Plug-In OCX modules.

## 2.4 DIAGNOSTIC STATUS INDICATOR DEFINITION

### 2.4.1 STANDALONE, PANELMOUNT OCMs AND 1771 PLUG-IN OCMs (REFERENCE FIGURES 3 AND 4 FOR FIBER OPTIC MODULE NOMENCLATURE AND DESIGNATIONS).

(i) Tx (Local) - Illuminates when the tramsmit data output is active (transmit data from the OCM Device Interface to the local device).

(ii) Rx (Local) - Illuminates when the receive data input is active (transmit data from the local device to the OCM Device Interface).

(iii) ACT (Ch A, B Active) - Illuminates green when the corresponding optical network receive input is receiving a valid data carrier.

(iv) ISD (ChA, B Initial Signal Detect) - Illuminates green when the corresponding optical network receive input is initialized for Impending Fault Detection (see Section 1.3.3.7 for Initialization Procedure).

(v) IFD (ChA, B Impending Fault Detect) - Illuminates red when the corresponding optical network receive input power level drops 3.0 decibel-milliwatts (optical) below the Initial Signal Strength (see Section 1.3.3.7 for Initialization Procedure).

(vi) ERR (ChA, B Communication Error) - Illuminates red when the corresponding optical network receive input fails to detect valid data communications.

### 2.4.2 1746 OLCs AND 1756 OCXs (REFERENCE FIGURES 5 AND 6 FOR FIBER OPTIC MODULE NOMENCLATURE AND DESIGNATIONS).

(i) Local Tx, Rx
- Illuminates flashing green when the tramsmit data output is active (transmit data from the OLC/OCX Device Interface to the local device).
- Illuminates flashing yellow when the receive data input is active (transmit data from the local device to the OLC/OCX Device Interface).
- Illuminates solid green when both the receive and transmit data inputs are active (simultaneous transmit and receive data between the local device and the OLC/OCX Device Interface).

(ii) OK... Module Without Diagnostic Option -
Illuminates continuous green when the OLC/OCX module is powered.
OK... 1746 OLC Module With Diagnostic Option -
Illuminates continuous green when the OLC module is powered.
OK... 1756 OCX Module With Diagnostic Option -
Illuminates flashing red when previously established communication with the OCX I/O module slot has timed out.
Illuminates continuous red during reset condition.
Illuminates flashing green when the OCX I/O module slot is not correctly configured, or is not actively controlled by a system processor.
Illuminates continuous green during normal operation.

(iii) Ch A, B AC/ER for OLC; Ch A, B ACT/ERR for OCX (Ch A, B Active/Error) - Illuminates green when the corresponding optical network receive input is receiving valid communications. Illuminates red when the corresponding optical network receive input fails to detect valid communications.

(iv) Ch A, B ID/IF for OLC; Ch A, B ISD/IFD for OCX (ChA, B Initial Signal Detect/Impending Failure Detect) - Illuminates green when the corresponding optical network receive input is initialized for Impending Fault Detection. Illuminates red when the corresponding optical network receive input power level drops 3.0 decibel-milliwatts (optical) below the Initial Signal Strength (see Section 1.3.3.7 for Initialization Procedure).

## 2.5 INITIAL SIGNAL SET POTENTIOMETERS

(i) ISS (Initial Signal Set Potentiometers) - Initializes Impending Fault Detection thresholds for the corresponding optical network receive inputs (see Section 1.3.3.7 for Initialization Procedure)

## 2.6 DIAGNOSTIC STATUS OUTPUT CONNECTIONS

(i) IFD (ChA, B Impending Fault Detect... Standalone, Panelmount OCMs only) - Switches ON (closed contact) when the corresponding optical network receive input power level drops 3.0 decibel-milliwatts (optical) below the initial signal strength (see Section 1.3.3.7 for Initialization Procedure). (Diagnostic Select Switches SW4-1 and SW4-3 must be set ON (active) to enable diagnostic relay outputs.)

(ii) ERR (ChA, B Communication Error...Standalone, Panelmount OCMs only) - Switches ON (closed contact) when the corresponding optical network receive input fails to detect valid data communications. (Diagnostic Select Switch SW4-1 must be set ON (active) to enable diagnostic relay outputs.)

(iii) RSS (ChA, B Receive Signal Strength) - Provides a linear voltage representation (analog - scaled from 0 to +3.5 VDC) for the corresponding optical network receive input.

## 2.7 CONFIGURATION INSTRUCTIONS

### 2.7.1 FIBER OPTIC MODULE CONFIGURATION INSTRUCTIONS

Each fiber optic module must be configured (switch selectable) prior to installation. Configuration options include network baud rate selection (57.6 Kbaud, 115.2 Kbaud, and 230.4 Kbaud), and network key-up selection.

Configuration Switch and Jumper locations are identified on the overview of the fiber optic modules depicted in Figures 8, 11, and 13. Specifications detailing fiber optic module Network Configuration Switch and Jumper designations for standalone, panelmount OCM and 1771 plug-in OCM fiber optic modules are provided in Tables 16, 17, 18, and 19, and for 1746 plug-in OLC and 1756 plug-in OCX fiber optic modules are provided in Tables 20 and 21.

#### 2.7.1.1 FIBER OPTIC MODULE BAUD RATE SELECTION

Phoenix Digital's fiber optic modules will operate at all Rockwell DH+ and RIO network baud rates... including 57.6 Kbaud, 115.2 Kbaud, and 230.4 Kbaud. The Rockwell equipment must first be configured for the desired baud rate. Then the Phoenix Digital fiber optic modules can be switch selected to be compatible with the desired baud rate. (The Factory Default Baud Rate for all Phoenix Digital fiber optic modules is 57.6 Kbaud.)

See Figure 8 and Tables 16 and 17 for Network Baud Rate switch definitions for standalone, panelmount OCM and 1771 plug-in OCM fiber optic modules. See Figure 11 and Table 20 for Network Baud Rate switch definitions for 1746 plug-in OLC and 1756 plug-in OCX fiber optic modules.

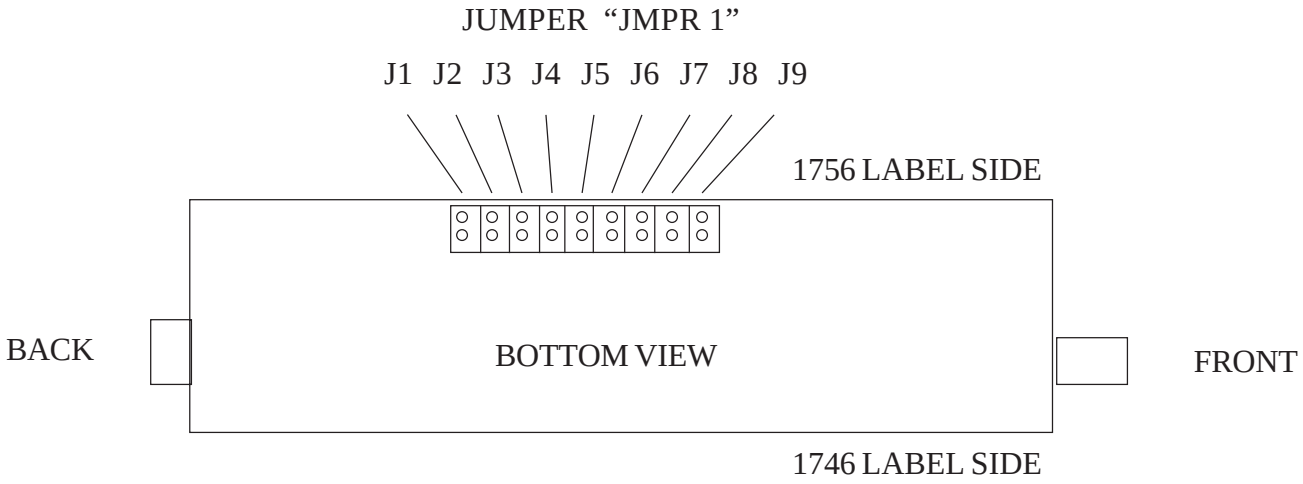
#### 2.7.1.2 FIBER OPTIC MODULE NETWORK KEY-UP SELECTION

Phoenix Digital's fiber optic modules insure the highest level of data integrity possible for all DH+ and RIO data transmissions on the fiber optic network. No leading or trailing data bits are ever lost (or chopped) using Phoenix Digital's fiber optic modules, and data that is repeated from module to module on the fiber optic network is always precisely synchronized to the exact timing of the network protocol. All of this is accomplished through the use of very accurate, high speed modulation techniques, continuously applied to every data transmission on the network.

In order to insure that all DH+ and RIO network data transmissions are precisely regenerated and synchronized on the fiber optic network, as described above, the fiber network must be keyed-up in advance of each data transmission. During this very brief key-up time Phoenix Digital's fiber optic modules insure that no data is lost, and that this time is fully absorbed in the natural message gaps of the DH+ and RIO data transmissions. Therefore, no additional time delay is experienced by the network at-large. The total amount of network key-up time required in advance of each data transmission is determined by the total number of fiber optic modules connected in a continuous bus or ring network configuration.

Network key-up time must be switch or jumper selected on each Phoenix Digital fiber optic module. See Figure 8 and Tables 16, 18, and 19 for Network Key-Up switch definitions for standalone, panelmount OCM and 1771 plug-in OCM fiber optic modules. See Figure 13 and Table 21 for Network Key-Up jumper definitions for 1746 plug-in OLC and 1756 plug-in OCX fiber optic modules.

(Tables 18, 19, and 21 provide a variety of network key-up settings, as a function or the maximum number of fiber optic modules on the bus or ring network. Each column heading in these tables has two sets of numbers. The first is the number of fiber optic modules on the network, and the second is the maximum distance a DH+ or RIO network may travel at this setting, in both miles and kilometers. These distance limitations assume worst case network set-up times required only for older revision Rockwell/Allen-Bradley products (PLC-2, PLC-3, etc.). For Rockwell DH+ or RIO networks using newer revision products such as PLC 5 and/or SLC processors, this maximum distance may exceed 10 miles (16 kilometers). Consult the factory for more information on how to go greater distances, if required.)




**1746 OLC AND 1756 OCX**
**CONFIGURATION JUMPER DESIGNATIONS**

**FIGURE 13**

| SWITCH [1] | POSITION [1] | FUNCTION [2] | FACTORY CONFIGURATION (DEFAULT) |
|---|---|---|---|
| Switch 5 | 1 | Network Key-Up Select [3] | ON |
| (SW 5) | 2 | Network Key-Up Select [3] | OFF |
| | 3 | Unused [4] | OFF |
| | 4 | Unused | OFF |
| | 5 | Baud Rate Select [5] | OFF |
| | 6 | Baud Rate Select [5] | ON |
| | 7 | Network Key-Up Select [3] | ON |
| | 8 | Network Key-Up Select [3] | OFF |
| | 9 | Network Key-Up Select [3] | OFF |
| | 10 | Unused | OFF |

(1) See Figure 8 for designated switch locations

(2) ON = Enable (Active, Switch Closed)
OFF = Disable (Switch Open)

(3) See Tables 18 and 19 for details on Network Key-Up Selection

(4) All unused switch positions must remain set in the Factory Default Configuration.

(5) See Table 17 for details on Network Baud Rate Selection.

**STANDALONE, PANELMOUNT AND 1771 PLUG-IN OCM MODULE CONFIGURATION SWITCH DEFINITIONS**

**TABLE 16**

| SWITCH [1] | POSITION | DH+/RIO BAUD RATE [2] | | |
|---|---|---|---|---|
| | | 57.6 Kbaud [3] | 115.2 Kbaud | 230.4 Kbaud |
| Switch 5 | 5 | OFF | ON | ON |
| (SW 5) | 6 | ON | OFF | ON |

(1) See Figure 8 for designated switch locations

(2) ON = Enable (Active, Switch Closed)
OFF = Disable (Switch Open)

(3) Factory Default Setting

**STANDALONE, PANELMOUNT AND 1771 PLUG-IN OCM MODULE BAUD RATE SWITCH DEFINITIONS**

**TABLE 17**

| SWITCH [1] | POSITION [2] | NETWORK KEY-UP FOR OCM MODULES WITHOUT "-EXT" FEATURE (Maximum Number of Fiber Optic Modules per bus or ring network/ Maximum overall network distance (miles (km))[3] | | |
|---|---|---|---|---|
| | | **4**/6.0(9.6) | **8**/5.0(8.0)[4] | **12**/4.5(7.2) |
| Switch 5 | 1 | ON | ON | ON |
| (SW 5) | 2 | OFF | OFF | OFF |
| | 7 | ON | ON | OFF |
| | 8 | OFF | OFF | ON |
| | 9 | ON | OFF | ON |

(1) See Figure 8 for designated switch locations

(2) ON = Enable (Active, Switch Closed)
OFF = Disable (Switch Open)

(3) Network Key-Up is determined by the total number of fiber optic modules connected in a continuous bus or ring network configuration, and is given above as the first number at the top of each column. The second pair of numbers at the top of each column gives the maximum distance a DH+ or RIO network may travel, in both miles and kilometers, assuming older revision Rockwell/Allen-Bradley products (PLC-2, PLC-3, etc.). For Rockwell DH+ or RIO networks using newer revision products such as PLC 5 or SLC processors, this maximum distance may exceed 10 miles (16 kilometers). Consult the factory for more information.

(4) Factory Default Setting

**STANDALONE, PANELMOUNT AND 1771 PLUG-IN OCM MODULE NETWORK KEY-UP SWITCH DEFINITIONS (OCMs WITHOUT "-EXT" FEATURE)**

**TABLE 18**

| SWITCH [1] | POSITION [2] | NETWORK KEY-UP FOR OCM MODULES WITH "-EXT" FEATURE (Maximum Number of Fiber Optic Modules per bus or ring network/ Maximum overall network distance (miles (km))[3] | | | | |
|---|---|---|---|---|---|---|
| | | **4**/6.0(9.6) | **8**/5.0(8.0) [4] | **12**/4.5(7.2) | **20**/4.0(6.4) | **24**/2.0(3.2) |
| Switch 5 | 1 | ON | ON | ON | OFF | OFF |
| (SW 5) | 2 | OFF | OFF | OFF | ON | ON |
| | 7 | ON | ON | OFF | OFF | ON |
| | 8 | OFF | OFF | ON | ON | ON |
| | 9 | ON | OFF | ON | OFF | OFF |

(1) See Figure 8 for designated switch locations

(2) ON = Enable (Active, Switch Closed)
OFF = Disable (Switch Open)

(3) Network Key-Up is determined by the total number of fiber optic modules connected in a continuous bus or ring network configuration, and is given above as the first number at the top of each column. The second pair of numbers at the top of each column gives the maximum distance a DH+ or RIO network may travel, in both miles and kilometers, assuming older revision Rockwell/Allen-Bradley products (PLC-2, PLC-3, etc.). For Rockwell DH+ or RIO networks using newer revision products such as PLC 5 or SLC processors, this maximum distance may exceed 10 miles (16 kilometers). Consult the factory for more information.

(4) Factory Default Setting

**STANDALONE, PANELMOUNT AND 1771 PLUG-IN OCM MODULE NETWORK KEY-UP SWITCH DEFINITIONS (OCMs WITH"-EXT" FEATURE)**

**TABLE 19**

| SWITCH [1] | VALUE SELECTED ON DIAL | DH+/RIO BAUD RATE [2] | | |
|---|---|---|---|---|
| | | 57.6 K Baud Rate [3] | 115.2 K Baud Rate | 230.4 K Baud Rate |
| Switch 1 | 0 [3] | Enable | Disable | Disable |
| (SW 1) | 1 | Disable | Enable | Disable |
| | 2 | Disable | Disable | Enable |
| | 3 - 9 [4] | ---------- Unused ---------- | | |

(1) See Figure 11 for designated switch locations. (Note that VALUES for both SW 2 and SW 1 are echoed in bits 15-12 and 11-8, respectively, in the upper byte of the 16 bit Read Status register for the 1756 OCX module.)

(2) Baud Rate Selection

(3) Factory Default Value selected on the dial.

(4) Unused Switch Positions 3 - 9 may cause interemittent communication failures, and should not be selected.

**1746 OLC AND 1756 OCX**
**BAUD RATE SWITCH DEFINITIONS**

**TABLE 20**

| JUMPER [1] | POSITION [2] | NETWORK KEY-UP (Maximum Number of Fiber Optic Modules per bus or ring network/ Maximum overall network distance (miles (km))[3] | | | | |
|---|---|---|---|---|---|---|
| | | **4**/6.0(9.6) | **8**/5.0(8.0)[4] | **12**/4.5(7.2) | **20**/4.0(6.4)[5] | **24**/2.0(3.2)[5] |
| Jumper 1 | 1 | IN | IN | IN | OUT | OUT |
| (JMPR 1) | 2 | IN | IN | OUT | OUT | OUT |
| | 3 | OUT | IN | IN | IN | OUT |
| | 4 | IN | IN | IN | OUT | IN |
| | 5 - 9[6] | ---------- Unused ---------- | | | | |

(1) See Figure 13 for designated jumper locations.

(2) IN = Jumper Installed
OUT = Jumper NOT Installed

(3) Network Key-Up is determined by the total number of fiber optic modules connected in a continuous bus or ring network configuration, and is given above as the first number at the top of each column. The second pair of numbers at the top of each column gives the maximum distance a DH+ or RIO network may travel, in both miles and kilometers, assuming older revision Rockwell/Allen-Bradley products (PLC-2, PLC-3, etc.). For Rockwell DH+ or RIO networks using newer revision products such as PLC 5 processors, SLC 5/04 processors, or 1756-DHRIO modules, this maximum distance may exceed 10 miles (16 kilometers). Consult the factory for more information.

(4) Factory Default Setting

(5) These Network Key-Up settings are only availble with the Extended Key-Up Option ("-EXT" Option). If this feature is not included on the product, these switch settings may not be selected. Selection of these settings without the "-EXT" Option may result in intermittent network failures.

(6) Unused Jumper Positions 5 - 9 may cause intermittent communication failures, and should not be selected.

**1746 OLC AND 1756 OCX**
**NETWORK KEY-UP JUMPER DEFINITIONS**

**TABLE 21**

# APPENDIX A

## LIST OF FIGURES IN MANUAL

# APPENDIX B

## LIST OF TABLES IN MANUAL