Phoenix Digital

MODICON REMOTE I/O
OPTICAL
COMMUNICATION MODEM

INSTALLATION
and
USERS MANUAL

PHOENIX DIGITAL CORPORATION

MODICON REMOTE I/O OPTICAL COMMUNICATION MODEMS

User's Manual

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MODICON REMOTE I/O OPTICAL COMMUNICATION MODEMS USER'S MANUAL

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CHAPTER 1

DESCRIPTION AND SPECIFICATION

1.1   INTRODUCTION

Phoenix Digital's family of Modicon AEG Remote I/O Optical Communication
Modems (OCM) provide the most advanced, comprehensive, state-of-the-art fiber
optic communication capabilities on the market today.   Phoenix Digital's OCM
modems translate the Remote I/O electrical interface into an optical network
medium, transparent to the communication protocol and configurable for dis-
tribution by the user in ring, bus, star, or point-to-point network installa-
tions. 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 annuncia-
tion of impending communication failures (Fault Predictive), 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 measurement technologies.

The following table provides correspondence between OCM Model # and Modicon
Remote I/O network compatibility. The user should check the OCM Model # label
located on the bottom side of the OCM enclosure in order to verify network
interface compatibility.

OCM Model #	Modicon Network Compatibility
OCM-MRI-xx(1)-E-(2)-(3)-(4)-(5)	Remote I/O Communications

(1) "xx" = 85 for 850 nanometer wavelength
                    selection
          = 13 for 1300 nanometer wavelength
                    selection (extended distance)
(2) "D"   = Fault Diagnostic Outputs
    blank = No Fault Diagnostic Outputs
(3) "ST" = ST Fiber Optic Connector Style
    "SMA" = SMA Fiber Optic Connector Style
(4) "24V" = 24VDC Operation
    "125V" = 125VDC Operation
    blank = 110/220VAC, 50/60Hz Operation
(5) "SM" = Singlemode Operation (Available
                    with 1300nm Wavelength and ST
                    Connector Options Only)
    blank = Multimode Operation

A summary of selected OCM features is given below:

o Supports a Wide Range of Communication Distances (up to and beyond 16 miles/25 kilometers between nodes)

o Fault Tolerant Communication: Provides On-line Diagnostic Monitoring and High Speed, Self Healing Communication Recovery

o Fault Predictive Communication: Provides In-line Optical Signal Strength Monitoring and Annunciation of Impending Communication Failures

o Fault Diagnostics: Locates Fault and Impending Fault Conditions

o Selectable Wavelengths: 850 nanometers, 1300 nanometers

o Singlemode or Multimode Operation

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. OCM modems will self heal around communication failures in ring, bus, star, or point-to-point network configurations. Figure 1 illustrates Examples of Typical OCM Network Configurations.

The ultra-high speed, self healing communication technology on each OCM modem will automatically redirect network traffic around points of failure (wrapback communication). In a failed condition the OCM 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 OCM communication modem. An example of how an OCM network provides self healing communication wrapback is illustrated in Figure 2. Diagnostic monitoring circuitry at each node will continuously monitor the integrity of the communication carriers present at the receive 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 primary communication channel receive input (Node 3/Channel A) the high speed, self-healing communication switch will immediately redirect communication by retransmitting data received from the secondary receive input (Node 3/Channel
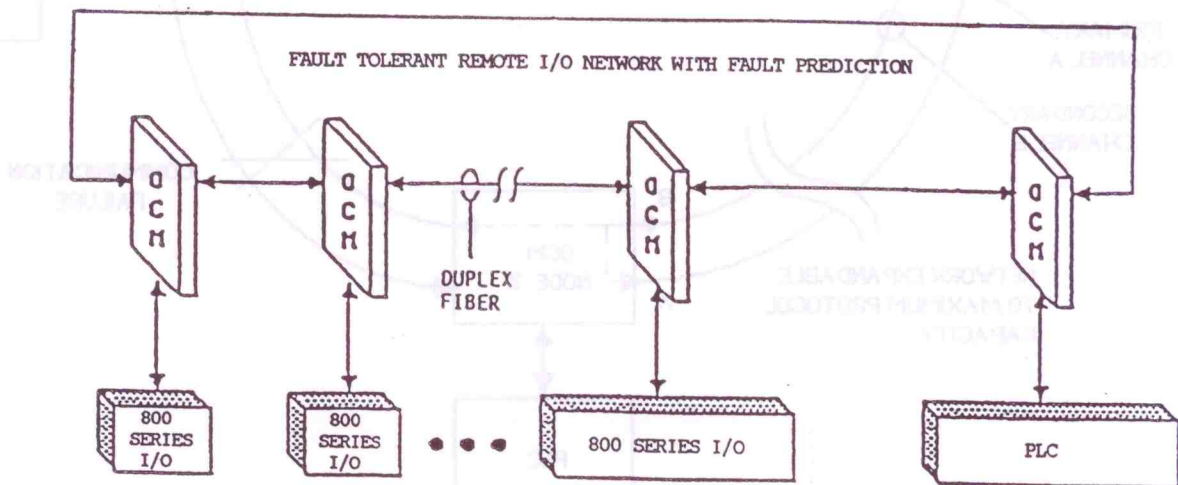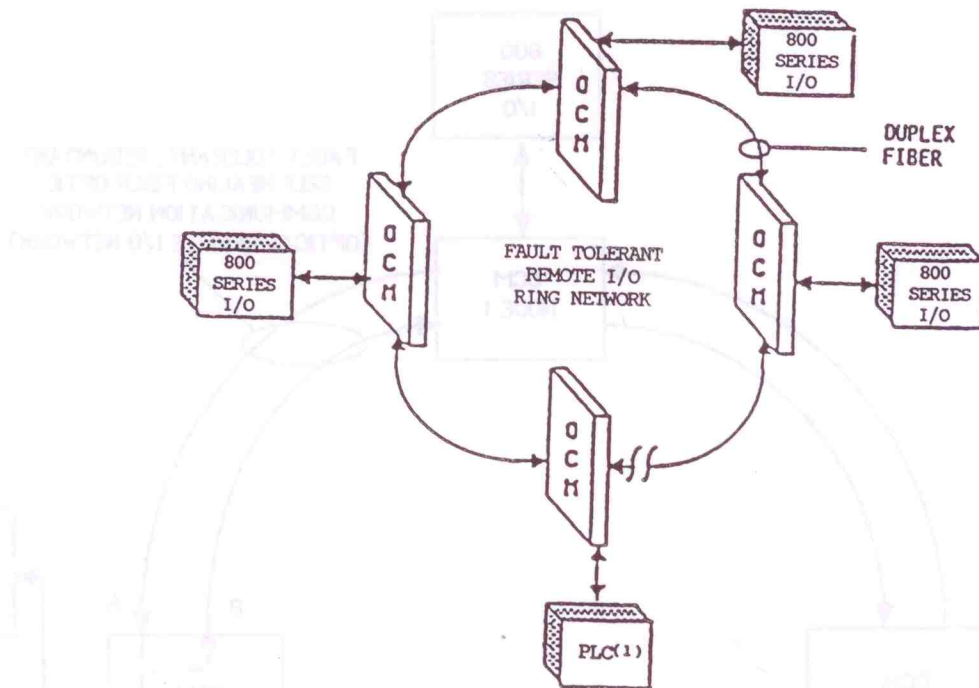
EXAMPLES OF TYPICAL OCM NETWORK CONFIGURATIONS
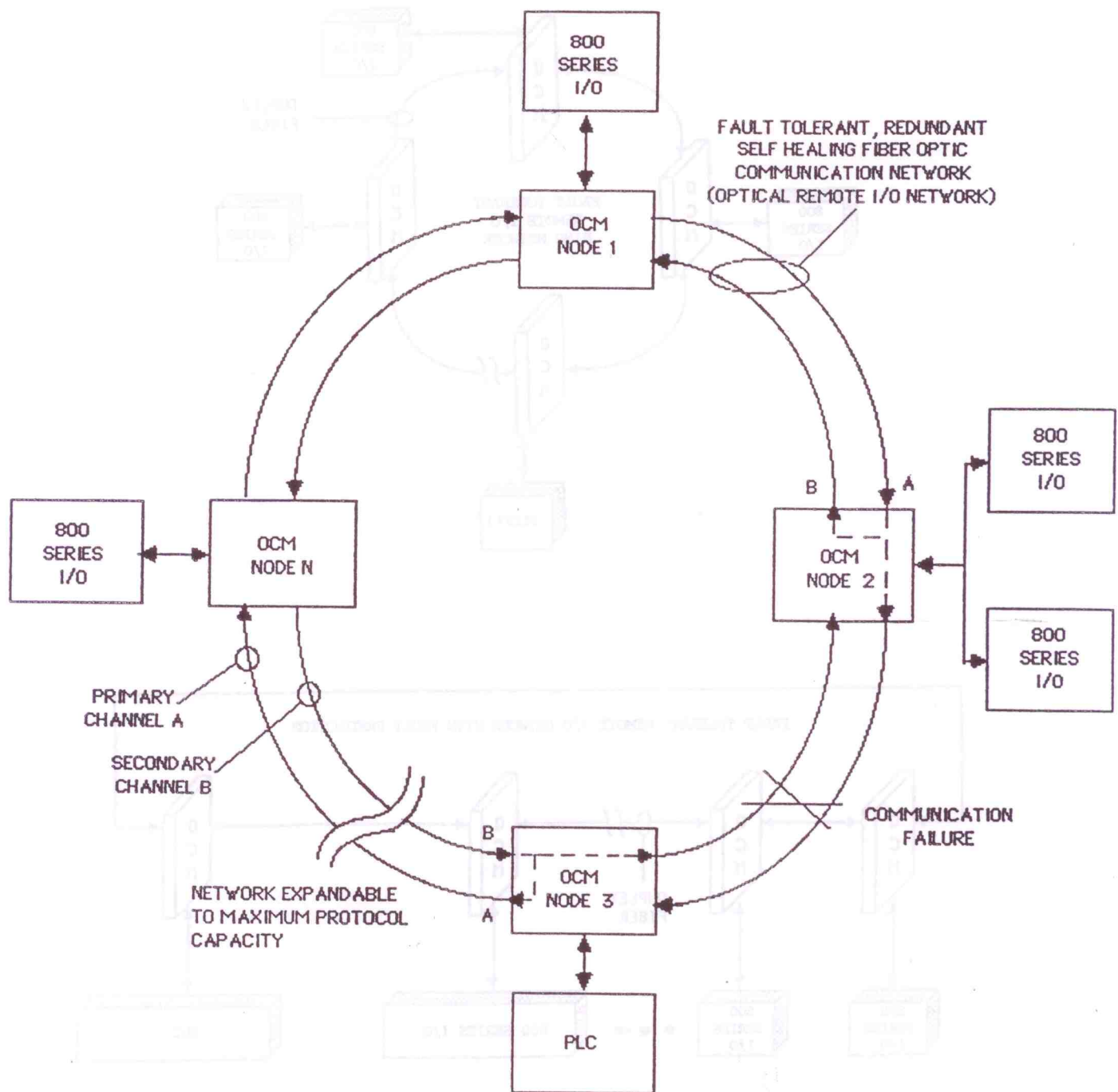
FIGURE 1

OCM NETWORK ILLUSTRATING SELF HEALING
COMMUNICATION WRAPBACK

FIGURE 2

B) on both the primary and secondary transmit outputs. Analogously, when a fault is detected on the secondary communication channel receive input (Node 2/Channel B) the self-healing communication switch will redirect communication by retransmitting data received from the primary receive input (Node 2/Channel A) on both transmit outputs. The fault condition simulated between nodes 2 and 3 is effectively isolated on one side by node 2 which redirects channel A data back via channel B, and on the other side by node 3 which redirects channel B data back via channel A. Essentially the network dynamically reconfigures to form a new ring 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 isolation. In addition to providing network fault tolerance, OCM modems enable maintenance personnel to locate fault conditions (remote status monitoring), add/delete nodes, and splice/terminate/replace media on-line, without disrupting network communications.

Communication continuity will be unconditionally maintained by OCM modems in the event of either node or media failure. When the source of the network failure is corrected, OCM modems will automatically restore the communication network to its' original traffic patterns. Remote I/O networks may be implemented in any combination of hardwire multi-drop and fiber optic daisychain network configurations.

1.2.2 FAULT PREDICTIVE COMMUNICATION

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. The OCM modem monitors impending fault conditions by continuously measuring the actual in-line signal strength (optical power) of the data communications at each receive input on the modem. The OCM modem continuously compares 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 OCM modem will automatically detect and annunciate the impending failure condition via visual indicators on the front of the modem. The OCM also provides hardwired diagnostic outputs for remote monitoring, detecting, and locating impending fault conditions (remote status monitoring). In addition the OCM modem provides a linear DC voltage representation (analog) of the actual in-line signal strength (normalized for a 0 to +10 volt range) for more precise monitoring of communication link status (gradient analysis, intelligent diagnostic monitoring, etc.). Thus, communication link status is continuously monitored and impending failure conditions are annunciated by the OCM modem before the communication failure actually occurs, enabling maintenance personnel to perform Predictive Maintenance on the fiber optic communication network at-large.

1.2.3 WAVELENGTH SELECTION FOR LONG DISTANCE COMMUNICATION

The OCM modem provides three options for wavelength selection. The economical 850 nanometer wavelength may be selected for data communication networks with less than two miles (3.3 kilometers) between communication nodes. The higher performance 1300 nanometer multimode wavelength 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 nanometer singlemode wavelength may be selected, extending communication distances to over 16 miles (25 kilometers) between communication nodes!

## 1.3   PRODUCT SPECIFICATIONS

1.3.1 DEVICE INTERFACE SPECIFICATIONS

OCM Device Interface Port connection is provided on the front of the OCM modem (designated as J1 - see Figure 3). This connection is provided by a single BNC connector (female).

Each hardwired Remote I/O network stub connected to an OCM requires 75 ohm termination resistors at both ends for hardwired linear network installations (taps but no splitter), and at all three ends for split network installations (splitter with taps). These resistors may be provided externally or may be internal to certain types of Modicon equipment. (Caution: Insure that only two termination resistors are provided on each OCM network stub. Additional termination resistors may cause intermittent communication failures.) In addition, a 75 ohm in-line resistor must be provided at the end of the drop cable leading from each hardwired Remote I/O tap. A 75 ohm in-line termination resistor must also be provided at the OCM J1 connector if no Remote I/O devices are connected to the OCM. (For instance, at network locations where the OCM is used only as an active repeater.)

A maximum of 10 OCMs may be interconnected together on a single fiber optic bus or fault tolerant ring topology network. A maximum of 20 OCMs may be interconnected together on a non-fault tolerant ring topology network. Star topology network configurations may be provided by locating the Remote I/O Scanner (PLC Processor) at the central hub of the network and Remote I/O bases at the points on the "star". Consult the factory for mixed topology network configurations, for higher capacity OCM network applications.

The OCM does not include internal termination or in-line resistors. Therefore, if resistors are required at the OCM location an external resistor must be provided by the user. Consult Modicon System Planning and Installation Guides for detailed information regarding Remote I/O installation, hardwired cabling, coaxial cable type, connectors, termination resistors, termination hardware, and grounding procedures.

FRONT VIEW
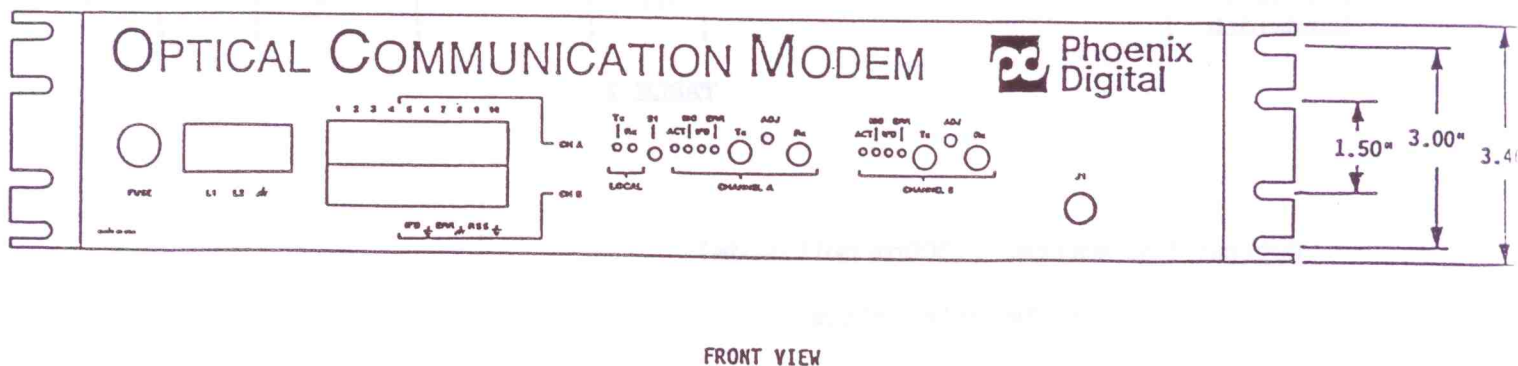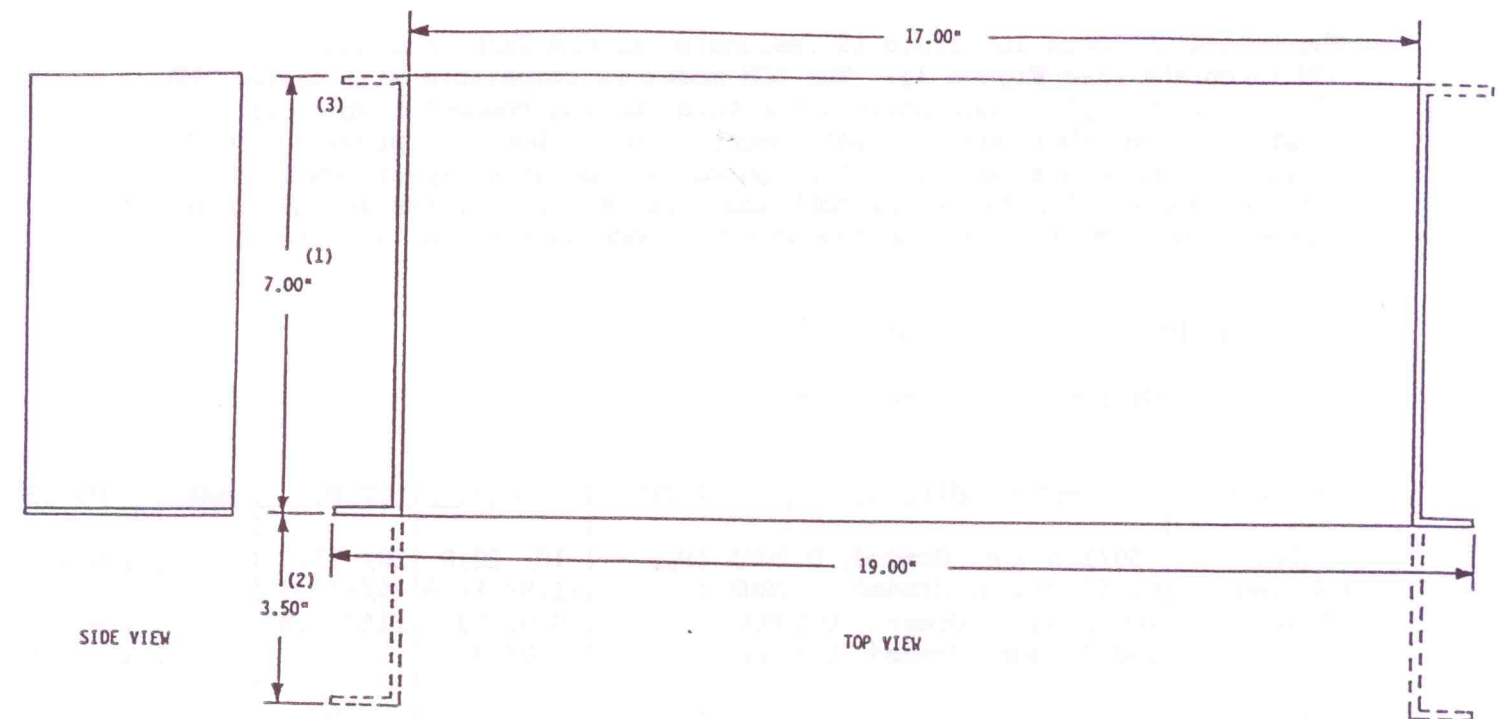
(1)   Brackets may be mounted as shown for flush rackmount.
(2)   Brackets may be extended forward for recessed rackmount.
(3)   Brackets may be reversed for flush panelmount.

REMOTE I/O OCM MOUNTING SPECIFICATION

FIGURE 3

1.3.2 OPTICAL NETWORK INTERFACE SPECIFICATIONS

The Optical Network Interface is designated as ChA Tx/Rx and ChB Tx/Rx on the OCM faceplate (see Figure 3). The OCM modem is compatible with either SMA 905/906 or ST style fiber optic connectors (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, and 1300nm singlemode wavelengths are provided below:

  Optical Transmitter (850nm)

    Electro-Optical Characteristics

Parameter	Test Condition	SYM.	MIN.	TYP.	MAX.	UNITS
Fiber Coupled Power	50/125 μm, Graded, 0.20NA	P_{oc}	10/-20.0	20/-17.0		μW/dBm
	62.5/125 μm, Graded, 0.28NA		21.9/-16.6	45/-13.5		μW/dBm
	100/140 μm, Graded, 0.29NA		58.0/-12.4	115/-9.4		μW/dBm
	200/230 μm, Graded, 0.37NA		320/-4.9			μW/dBm
Peak Wavelength		λ_P		850		nm
Spectral Bandwidth		$\Delta\lambda$		50		nm

TABLE 2

  Optical Transmitter (1300nm multimode)

    Electro-Optic Characteristics

Parameter	Test Condition	SYM.	MIN.	TYP.	MAX.	UNITS
Fiber Coupled Power	50/125 μm, Graded, 0.20NA	P_{oc}	25/-16.0			μW/dBm
	62.5/125 μm, Graded, 0.28NA		50/-13.0			μW/dBm
Wavelength		λ	1290		1350	nm
FWHM		$\Delta\lambda$			160	nm

TABLE 3

Optical Transmitter (1300nm singlemode)

Electro-Optic Characteristics

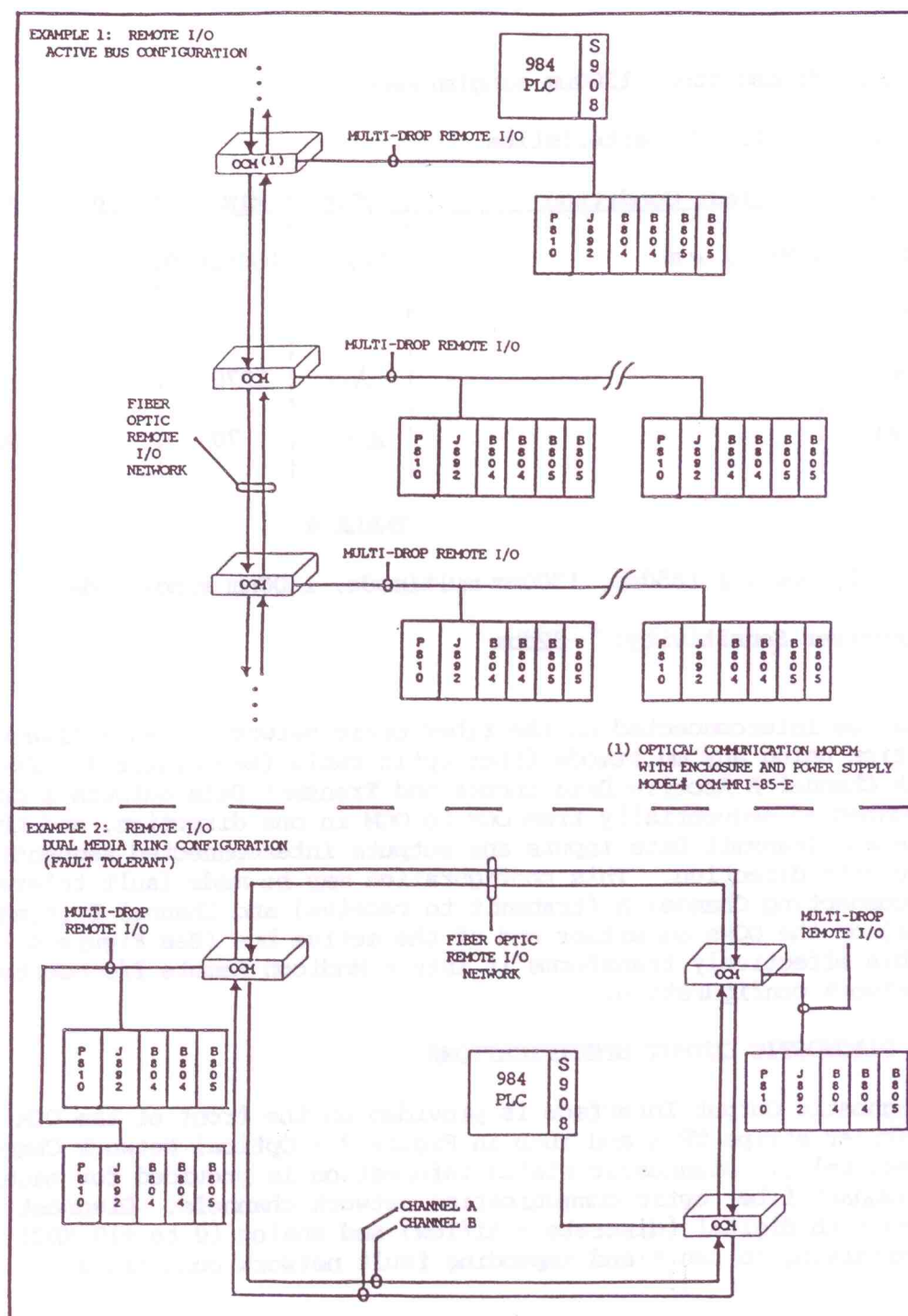| Parameter	Test Condition	SYM.	MIN.	TYP.	MAX.	UNITS
Fiber Coupled Power	9/125 μm	P_{oc}	16/-18.0			μW/dBm
Wavelength		λ	1270		1340	nm
Spectral Width		$\Delta\lambda$	70		90	nm

TABLE 4

Optical Receiver (850nm, 1300nm multimode, 1300nm singlemode)

Receiver Sensitivity: -32dbm

OCMs may be interconnected on the fiber optic network in an active bus configuration using any multimode fiber optic cable (See Figure 4 - Example 1). Network Channel A Receive Data inputs and Transmit Data outputs should be interconnected sequentially from OCM to OCM 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 (transmit to receive) and Channel B (transmit to receive) on the OCMs on either end of the active bus (See Figure 4 - Example 2). This effectively transforms it into a Modicon Remote I/O counter-rotating ring network configuration.

1.3.3 DIAGNOSTIC OUTPUT SPECIFICATIONS

The Diagnostic Output Interface is provided on the front of the OCM enclosure (see barrier strips TB-A and TB-B in Figure 3 - Optical Network Channels A and B respectively). Diagnostic status information is provided for each of the two redundant fiber optic communication network channels. Diagnostic status includes both digital (discrete - hi/low) and analog (0 to +10 VDC) information pertaining to fault and impending fault network conditions.

EXAMPLE 1: REMOTE I/O
            ACTIVE BUS CONFIGURATION

(1) OPTICAL COMMUNICATION MODEM
    WITH ENCLOSURE AND POWER SUPPLY
    MODEL# OCM-MRI-85-E

EXAMPLE 2: REMOTE I/O
            DUAL MEDIA RING CONFIGURATION
            (FAULT TOLERANT)

TYPICAL OCM INSTALLATION CONFIGURATIONS

FIGURE 4

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OCM terminal barrier strip designations are the following:

Terminal Barrier Strip/Terminal #	Signal Name
TB-A/1	Isolated +VDC
TB-A/2	Isolated -VDC (Signal Ground)
TB-A/3	NC
TB-A/4	NC
TB-A/5	ChA Impending Fault Detect (IFD)
TB-A/6	Signal Ground (-VDC)
TB-A/7	ChA Communication Error (ERR)
TB-A/8	Chassis Ground
TB-A/9	ChA Receive Signal Strength (RSS)
TB-A/10	RSS Return
TB-B/1	NC
TB-B/2	NC
TB-B/3	NC
TB-B/4	NC
TB-B/5	ChB Impending Fault Detect (IFD)
TB-B/6	Signal Ground (-VDC)
TB-B/7	ChB Communication Error (ERR)
TB-B/8	Chassis Ground
TB-B/9	ChB Receive Signal Strength (RSS)
TB-B/10	RSS Return

General purpose discrete electrical outputs (activate low true), two per optical network receive input, are provided for network diagnostic conditions of Impending Fault Detection and Communication Error. These outputs may be utilized to activate optical bypass switches on the network, for control system monitoring of diagnostic network conditions, or merely to annunciate network diagnostic status (alarm, pilot light, etc.). These outputs are labeled IFD and ERR (independent outputs are provided for each network channel - ChA, ChB). They are optoisolated for overvoltage protection, and operate from an isolated, external DC power supply (Terminal barrier strip designations TB-A/1 = Isolated +VDC, TB-A/2 = Isolated -VDC). A functional description for each of these outputs is provided in Section 2.6. Electrical specifications are the following:

Discrete Outputs (ChA IFD, ERR; ChB IFD, ERR)

Isolated Power Supply (TB-A/1,2)

$$V_{ps} = 32.0 \text{ VDC (max)}$$
$$4.0 \text{ VDC (min)}$$

Electrical Isolation

$$V_{ISO} = 1500 \text{ VDC}$$

Outputs (Activated Low True)

$$R_8 = 4.7k \text{ Ohm}$$
$$I_{OL} = 100 \text{ ma (max)}$$
$$V_{OL} = 1.5 \text{ VDC (max @ } I_{(out)} = 100 \text{ ma)}$$

Linear voltage outputs (analog) are also provided, one per optical network receive input. These outputs provide an absolute +DC voltage representation of the optical power level for each network receive input. They are labeled as ChA RSS and ChB RSS, respectively (RSS = Receive Signal Strength), and are buffered for increased drive current capability. RSS output specifications are the following:

Linear Outputs (ChA RSS, ChB RSS)

Voltage Range (V_{out}) = 0 to +10 VDC

Drive Current (I_{out}) = 20 ma (max)

Network Optical Power-In Versus RSS Voltage-Out (Analog)

Optical Power In (dbm @ 850nm)	Optical Power In (dbm @ 1300nm)	RSS $V_{(out)}$*
-18.0	-20.0	10.0
-18.2	-20.2	9.5
-18.4	-20.5	9.0
-18.7	-20.7	8.5
-19.0	-20.9	8.0
-19.2	-21.2	7.5
-19.5	-21.5	7.0
-19.9	-21.8	6.5
-20.2	-22.2	6.0
-20.6	-22.5	5.5
-21.0	-23.0	5.0
-21.5	-23.4	4.5
-22.0	-23.9	4.0
-22.6	-24.5	3.5
-23.2	-25.2	3.0
-24.0	-26.0	2.5
-25.0	-26.9	2.0
-26.2	-28.2	1.5

*Accuracy: $\pm$ 1.0 volt ($0°$to $60°$C).

TABLE 5

Chassis ground and signal ground connections are also provided on the OCM terminal barrier strips for IFD, ERR, and RSS (TB-A/TB-B 6, 8, 10). It is recommended that chassis ground be used for shielding all signal cables, Signal Ground (-VDC) be used as the isolated reference for IFD and ERR, and RSS Return be used as the common reference for RSS analysis. (It can also be used as the negative signal reference for differential analysis of RSS).

1.3.4 MECHANICAL, ENVIRONMENTAL, AND ELECTRICAL SPECIFICATIONS

Dimensions (HxWxD): 3.5"H x 17.0"W x 7.0"D (see Figure 3 for more detailed information)

Temperature   : Operating $0°$to $60°$C
                        Storage $-20°$C to $+70°$C

Relative Humidity : 0 to 90% (non-condensing)

1.3.4.1 110/220 VAC POWER SUPPLY:

Input Voltage Range	:	85 VAC to 264 VAC
Input Frequency Range	:	47 Hz to 440 Hz
Conducted RFI	:	FCC limit B and VDE limit A
Hold-up Time	:	12 milliseconds
Power Consumption UL, CSA, VDE Approved	:	30 watts per OCM (approximate)
Fuse	:	3 AMP, 250 VAC, SLO BLO

1.3.4.2 +24 VDC POWER SUPPLY

Power Supply Input	:	18 VDC to 30 VDC
Regulation (Load and Line)	:	.6% (min.)
Input Transient Protection	:	200 microfarad Capacitor
Isolation Voltage	:	500 VDC
Power Consumption	:	30 watts (approximate)
Fuse	:	3 AMP, 250 VAC, SLO BLO

1.3.4.3 +125 VDC POWER SUPPLY

Input Voltage Range	:	120 VDC to 370 VDC
Power Consumption UL, CSA, VDE Approved	:	30 watts per OCM (approximate)
Fuse	:	3 AMP, 250 VAC, SLO BLO

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, diagnostic input/output connections, and power connections.

2.1   UNPACKING INSTRUCTIONS

The OCM is shipped from the factory in shock absorbing materials. Remove the OCM 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

The OCM should be inspected visually for damage upon removal from the shipping container.

2.3   INSTALLATION MOUNTING PROCEDURE

The OCM may be rack or panelmounted with the universal mounting rails supplied with each OCM. OCMs may also be recess rack mounted by extending the mounting rails beyond the front panel, to provide protection for the fiber optic connectors. OCMs are convection cooled, requiring no fan or forced air cooling. An unobstructed air space must be maintained above and below the OCM (6 inches minimum) to insure adequate convection airflow. The rack and panel mounting specifications for OCMs are contained in Figure 3. The air at the bottom of the OCM enclosure may not exceed 60 degrees celsius (140 degrees F).

2.4   DIAGNOSTIC STATUS INDICATOR DEFINITION (REFERENCE FIGURE 3 FOR OCM NOMENCLATURE AND DESIGNATIONS).

   (i)   Tx (Local) - Illuminates when the transmit data output (transmit data from the Device Interface/J1 to the local device) is active.

   (ii)   Rx (Local) - Illuminates when the receive data input (transmit data from the local device to the Device Interface/J1) is active.

(iii) ACT (ChA, B) - Illuminates when the corresponding optical network receive input is receiving valid data.

(iv) ISD (ChA, B Initial Signal Detect) - Illuminates when the corresponding optical network receive input is initialized (see Chapter 3 for Initialization Procedure).

(v) IFD (ChA, B Impending Fault Detect) - Illuminates when the corresponding optical network receive input power level drops 1.5 decibel-milliwatts (optical) below the Initial Signal Strength.

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

2.5 IFD POTENTIOMETERS

(i) ADJ (Potentiometers) - Initializes Impending Fault Detection thresholds for the corresponding optical network receive inputs (see Chapter 3 for Initialization Procedure).

2.6 DIAGNOSTIC STATUS INPUT/OUTPUT CONNECTIONS

(i) IFD (ChA, B Initial Fault Detect) - Switches (low true) when the corresponding optical network receive input power level drops 1.5 decibel-milliwatts (optical) below the initial signal strength.

(ii) ERR (ChA, B Communication Error) - Switches (low true) when the corresponding optical network receive input fails to detect valid data communications.

(iii) RSS (ChA, B Receive Signal Strength) - Provides a linear voltage representation (analog - scaled from 0 to +10 VDC) for the corresponding optical network receive input.

(iv) Isolated ±VDC Power Supply - Connection for external DC power supply for isolated IFD, ERR operation.

2.7 OCM AC POWER DEFINITION (REFERENCE FIGURE 3 FOR OCM NOMENCLATURE AND DESIGNATIONS)

2.7.1 AC POWER INPUTS

(i) L1, L2 (AC High, Low respectively) - Provides 110/220 VAC, 60/50 Hz operation.

2.8   OCM DC POWER DEFINITION

2.8.1 DC POWER INPUTS

   (i)   +V, -V (+24 VDC, Reference Ground, respectively) - Provides 24 VDC operation.

   (ii) +V, -V (+125 VDC, +125 VDC Return, respectively) - Provides +125 VDC operation.

CHAPTER 3

IMPENDING FAULT
INITIALIZATION PROCEDURE

The OCM modem provides the unique capability to detect impending optical
communication faults on the fiber optic network before they actually occur.
This impending fault monitoring capability, together with the self healing,
fault tolerant features described in Chapter 1, makes Phoenix Digital's OCM
modem the most reliable, user friendly, "maintenance friendly" optical modem
on the market today.

The OCM impending fault monitoring circuitry must be initialized upon system
start-up. Thereafter, the OCM impending fault detection threshold charac-
teristics will be maintained indefinitely. The impending fault initialization
procedure is accomplished through the simple adjustment of two potentiometers,
one per optical network communication channel, located on the front of the OCM
modem. No meters, gauges, or any other type of electrical or optical measure-
ment equipment is required for OCM initialization. The initialization proce-
dure is accomplished by first connecting the OCM modem optical receive inputs
to the optical transmit outputs of adjacent OCM modem(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 OCM impending fault
monitoring circuitry to the final communication link characteristics.) The
adjacent OCMs (adjacent on the fiber optic network) must be powered during the
initialization process to provide a receive signal reference (communication
data carrier) to the OCM undergoing initialization. OCMs 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 indicators on the front of the
OCM modem the ADJ potentiometers should be turned counterclockwise if the cor-
responding green ISD indicators are off, or clockwise if they are on, until
the ISD indicators switch state (either turning on to off or off to on).
Then, as the final step, the ADJ potentiometers should be turned 1/4 turn
counterclockwise, at which point the corresponding ISD indicators should be
maintained continuously on.

The OCM 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 indicator may occasionally
flash on 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 fault condition which causes the optical network receive power
level to drop by more than 1.5 decibel-milliwatts (optical power) relative to
the initialization power level will cause the corresponding Impending Fault
Detect (IFD) indicator (red) to illuminate. Thus, the impending fault

monitoring circuitry will detect and annunciate impending optical communication faults resulting from any number of different optical network fault conditions; media deterioration, transmitter degradation, etc. 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 OCMs will require that the initialization procedure be repeated for each OCM 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.)