PHOENIX DIGITAL CORPORATION

SIEMENS SIMATIC TI505 OPTICAL COMMUNICATION MODULE

USER'S MANUAL

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SIEMENS SIMATIC TI505 OPTICAL COMMUNICATION MODULE USER'S MANUAL

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CHAPTER 1

DESCRIPTION AND SPECIFICATION

1.1 INTRODUCTION

Phoenix Digital's family of Siemens/TI Optical Communication Modules (OCM) provide the most advanced, comprehensive, state-of-the-art fiber optic communication capabilities on the market today. Interfacing to Siemens/TI Remote I/O, TIWAY, or PEERLINK networks, Phoenix Digital's OCM modules translate these interfaces into an optical network medium, transparent to the communication protocol and configurable for distribution by the user in ring, bus, star, 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), fault and impending fault location, 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 Siemens/TI network compatibility. The user should check the OCM Model # label located on the component side of the plug-in OCM module, or on the side of the stand-alone, panelmount enclosure, to verify network interface compatibility.

OCM Model #	Network Compatibility
OCM-TRI-xx(1)-(2)-(3)-(4)-(5)-(6)	Remote I/O Communication
OCM-TWY-xx(1)-(2)-(3)-(4)-(5)-(6)	TIWAY Communication
OCM-PER-xx(1)-(2)-(3)-(4)-(5)-(6)	PEERLINK Communication
OCM-CBL-RI-(7)-(8)	Remote I/O Interconnect Cable
OCM-CBL-TP-(7)-(8)	TIWAY/PEERLINK Interconnect Cable

(1) "xx" = 85 for 850 nanometer wavelength selection
= 13 for 1300 nanometer wavelength selection (extended distance)

(2) "P" = Panelmount OCM Module (with enclosure)
blank = Simatic 505 Plug-In Module

(3) "D" = Diagnostic Outputs
blank = No Diagnostic Outputs

(4) "ST" = ST Fiber Optic Connector Style
"SMA" = SMA Fiber Optic Connector Style

(5) "ACV" = 110/220VAC, 50/60Hz Operation
"24V" = 24VDC Operation
"125V" = 125VDC Operation

(6) "SM" = Singlemode Operation (Available with 1300 nanometer wavelength and ST Connector Options Only)
blank = Multimode Operation

(7) "D" = Diagnostic Cable Option ("Y" Cable... 6 Foot/1.8 Meter Diagnostic Cable Pigtail)
blank = No Diagnostic Cable Pigtail

(8) "10" = 10 Foot/3 Meter OCM Interconnect Cable Length
blank = 9 Inch/23 Cm OCM Interconnect Cable Length

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

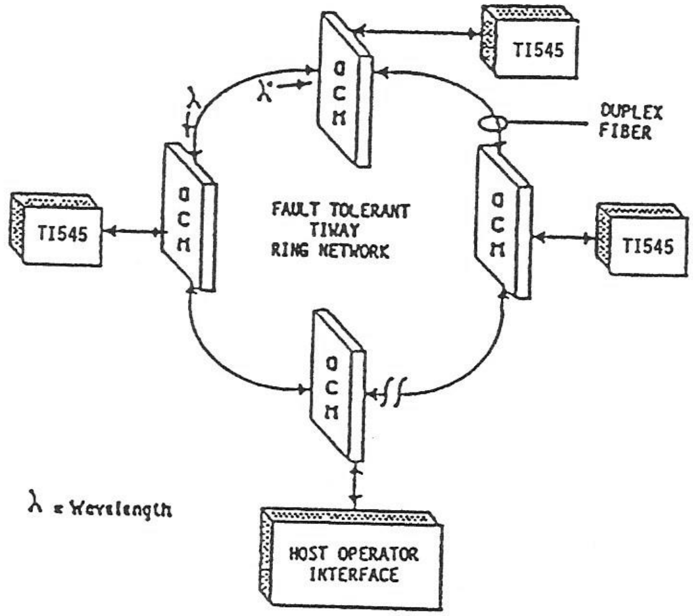
- o Selectable Wavelengths: 850 nanometers, 1300 nanometers
- o Singlemode or Multimode Operation
- o Easy to see, visual indication of Communication Diagnostic Status

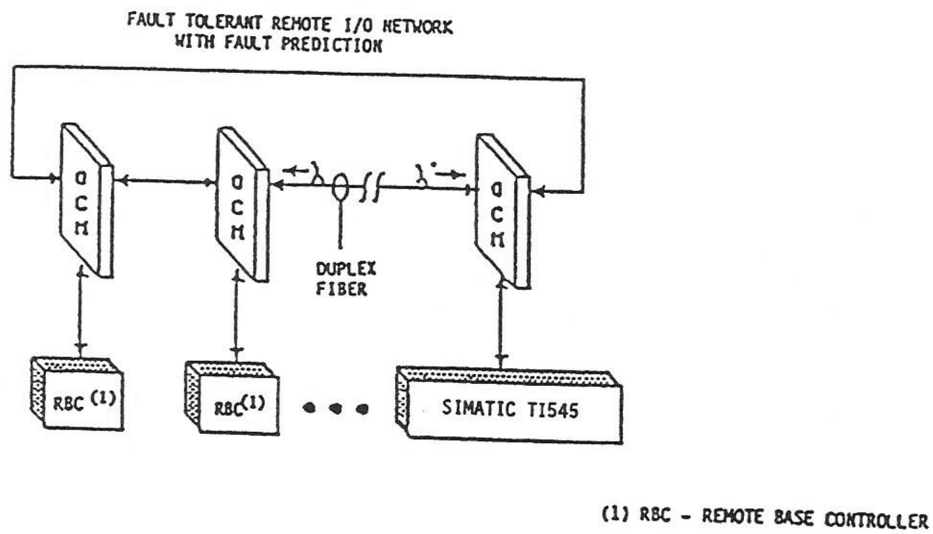
1.2 PRODUCT DESCRIPTION

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 modules 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.

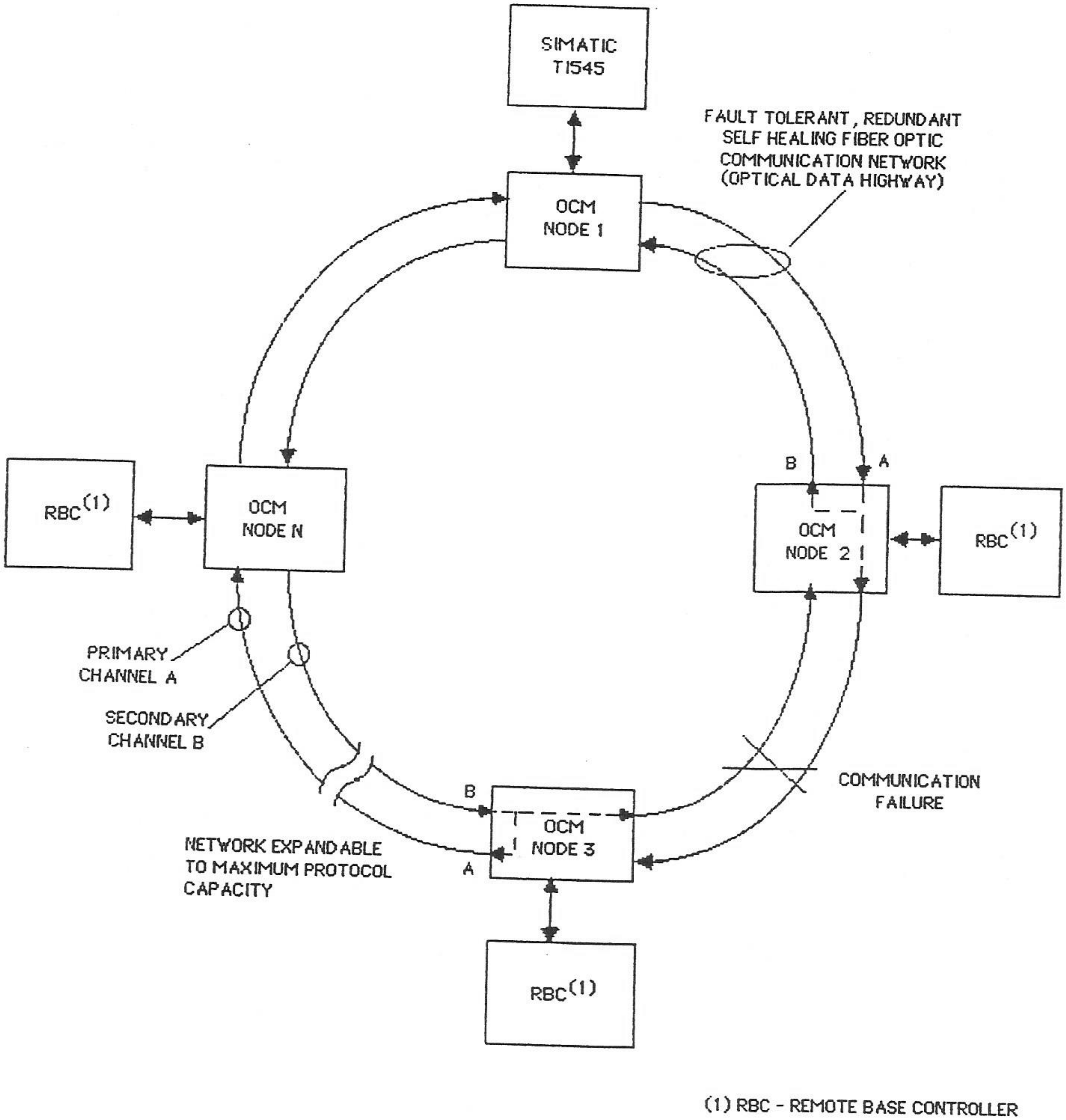
The ultra-high speed, self healing communication technology on each OCM module will automatically redirect network traffic around points of failure (wrapback communication). In a failed condition the OCM communication network will self heal around a fault by redirecting data communications around the 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 module. 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 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 modules enable maintenance personnel to add/delete nodes and





EXAMPLES OF TYPICAL OCM NETWORK CONFIGURATIONS

FIGURE 1



OCM NETWORK ILLUSTRATING SELF HEALING COMMUNICATION WRAPBACK

FIGURE 2

splice/terminate/replace media on-line, without disrupting network communications.

Communication continuity will be unconditionally maintained by OCM modules in the event of either node or media failure. When the source of the network failure is corrected, OCM modules will automatically restore the communication network to its original traffic patterns. Remote I/O, TIWAY, and PEERLINK networks may be implemented in any combination of hardwire multi-drop and fiber optic daisy chain 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 module 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 module. The OCM module 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 module will automatically detect this condition, and annunciate the impending failure condition via visual indicators on the front of the module. The OCM also provides hardwired diagnostic outputs for remote monitoring, detecting, and locating impending fault conditions (remote status monitoring). In addition, the OCM module 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 module 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 multimode fiber optic modules with the "-D" Diagnostic Option.)

1.2.3 WAVELENGTH SELECTION FOR LONG DISTANCE COMMUNICATION

The OCM module 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 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!

The maximum aggregate distance which a communication signal may travel on a Remote I/O, TIWAY, or PEERLINK fiber optic communication network is a function of both the number of OCM nodes on the network (OCMs function as active repeaters on the network) and the distances between nodes. The number of OCMs which may be connected on a Remote I/O or TIWAY communication network is virtually unlimited, and is a function of the network protocol. The maximum aggregate distance of a Remote I/O or TIWAY network is limited only by the finite speed of light and the resulting latency of the network communication signals (OCM module latency is negligible). The number of OCMs which may be connected in a PEERLINK network is limited to 5. The maximum aggregate distance of a PEERLINK network is 2 miles (3.3 kilometers). (Refer to Section 2.7.3 for Configuration Instructions to configure PEERLINK OCMs for Network Distance vs. Number of OCMs.) Consult the factory for custom network configurations and for higher aggregate distances.

1.3 PRODUCT SPECIFICATIONS

1.3.1 DEVICE INTERFACE SPECIFICATIONS

OCM Device Interface Port connections are provided on the front of the OCM module (designated as J1 - see Figure 3 for Simatic 505 Plug-In OCM, see Figure 4 for Standalone, Panelmount OCM). Specifications detailing the OCM device interface port pin-out is given below:

J1 Connector Pin Numbers(1)	Remote I/O Connector Pin Numbers(2)	Signal Name (Orientation - DCE)
1	5	Shield (See Table 6)
2	8	Signal + (Positive Bias)
21	3	Signal - (Negative Bias)
6,7,8,13,14,16,18,19,20,23	NC	Optional Diagnostic Outputs(3)

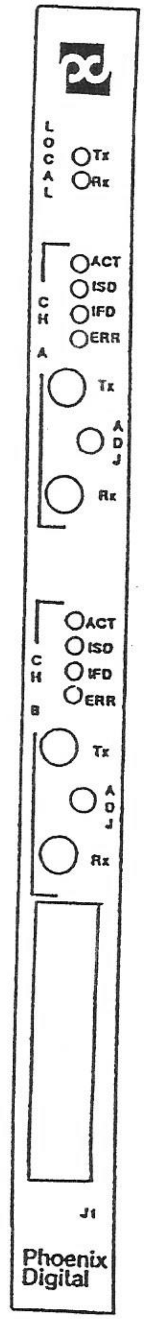
OCM-TRI DEVICE INTERFACE SPECIFICATIONS

TABLE 1A

(1) All undesignated pin numbers should remain unconnected to any external electrical signals

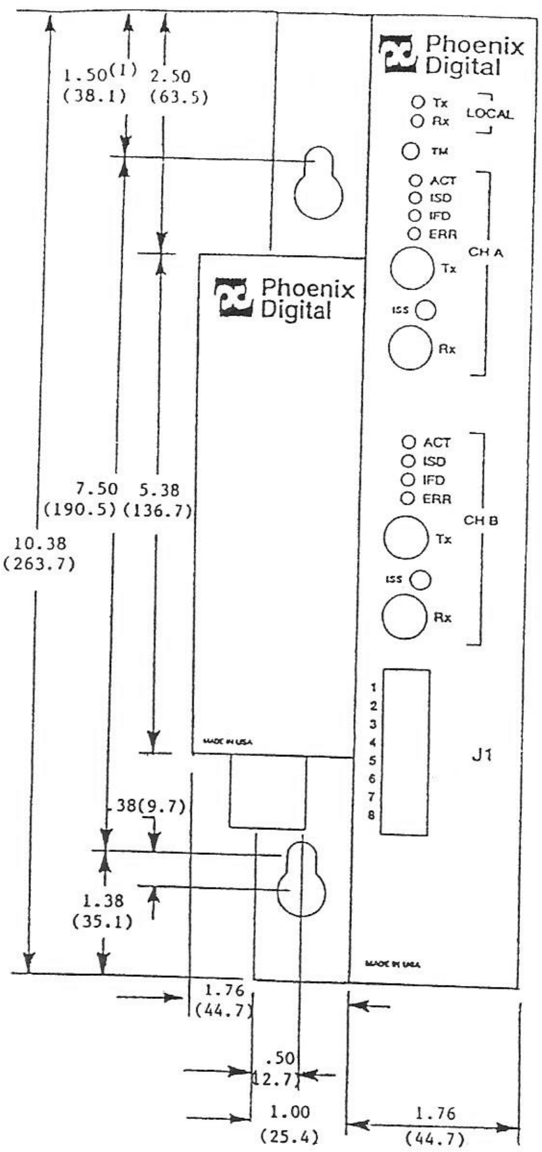
(2) Siemens Simatic 505 RBC Modules

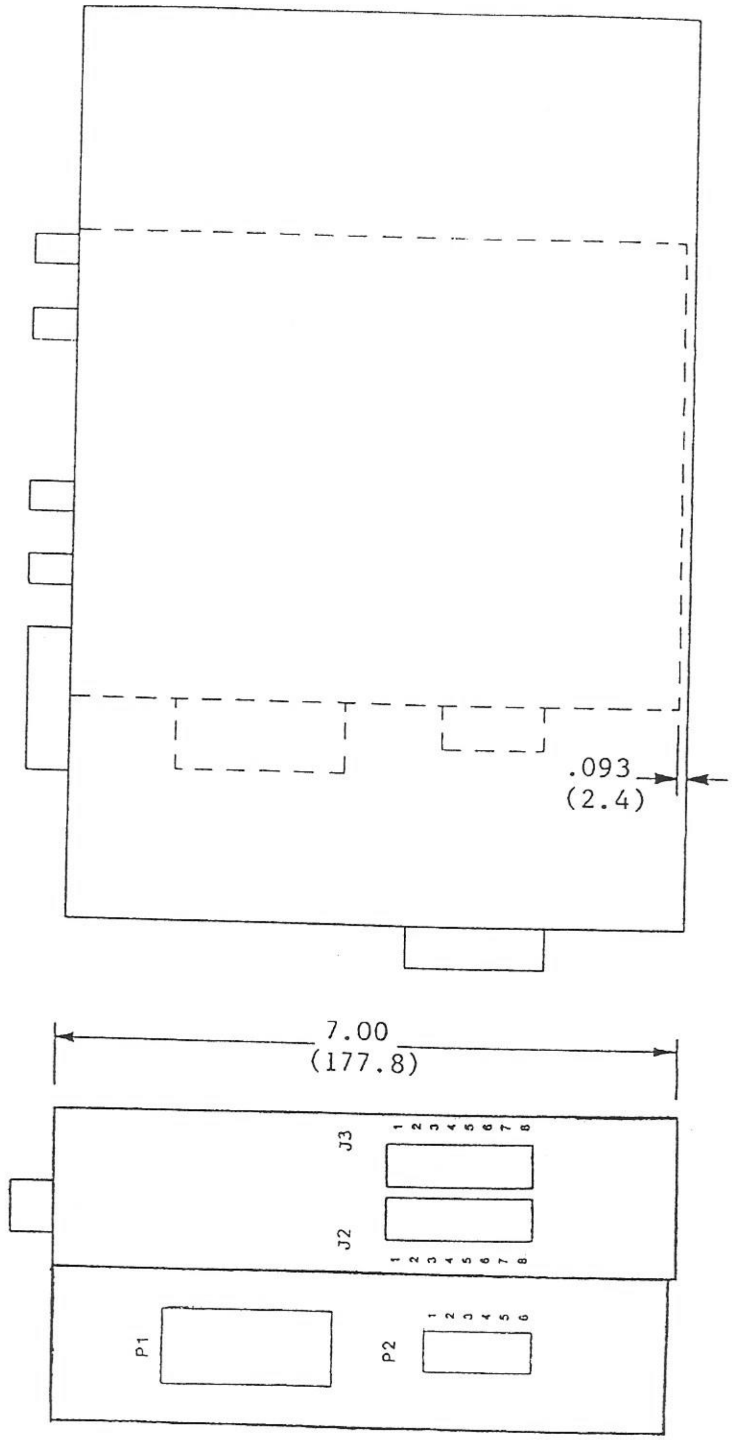
(3) See Section 1.3.3 for more information on Diagnostic Outputs ("-D" Option)



SIEMENS/TI SIMATIC 505 PLUG-IN OCM FACEPLATE DESIGNATIONS

FIGURE 3





(1) ALL DIMENSIONS SHOWN IN INCHES (MILLIMETERS) ± 2%

STANDALONE, PANELMOUNT OCM MOUNTING SPECIFICATIONS

FIGURE 4

J1 Connector Pin Numbers(1)	Local Line TIWAY/ PEERLINK Conn. Pin Numbers	Signal Name (Orientation - DCE)
2	6	LLM+ (Positive Bias)
12	3	Shield (Signal Common)
21	9	LLM- (Negative Bias)
6,7,8,13,14,16,18,19,20,23	NC	Optional Diagnostic Outputs(3)

OCM-TWY, OCM-PER DEVICE INTERFACE SPECIFICATIONS

TABLE 1B

(1) All undesignated pin numbers should remain unconnected to any external electrical signals

(2) Siemens Simatic 505 TI545 and NIM Modules

(3) See Section 1.3.3 for more information on Diagnostic Outputs ("-D" Option)

OCM model number OCM-TRI provides fiber optic Siemens/TI Remote I/O communications (See Configuration Instructions for Remote I/O Master/Slave selection). Plug-in OCM-TRI modules should be located adjacent to each CPU or RBC module on the Remote I/O network (one per CPU/RBC module). OCM model numbers OCM-TWY and OCM-PER provide fiber optic TIWAY (Local line) and PEERLINK communications respectively. (See Configuration Instructions for TIWAY/PEERLINK Master/Slave, TIWAY baud rate, and PEERLINK Network Distance vs. Number of OCMs configuration). Plug-In OCM-TWY, OCM-PER modules should be located adjacent to each TIWAY/PEERLINK module on the TIWAY/PEERLINK network (one per TIWAY/PEERLINK module).

The user must follow all Siemens/TI cable termination procedures for cabling from Siemens/TI modules to OCMs. User may purchase 9 inch (23 cm) or 10 foot (3 meter) OCM interconnect cables from Phoenix Digital... Model# OCM-CBL-RI for Remote I/O (includes one 120 ohm internal termination resistor connected across Signal+ and Signal-) and Model# OCM-CBL-TP for TIWAY/PEERLINK (includes two 68 ohm internal termination resistors... one from LLM+ to Shield and one from LLM- to Shield). (Add "-D" Option to cable for 6 foot (1.8 meter) Diagnostic Pigtail... for direct wiring to DC Input module and/or external alarm.)

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 Figures 3 and 4). The OCM module 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 Multimode)

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		Δλ	70		90	nm

TABLE 4

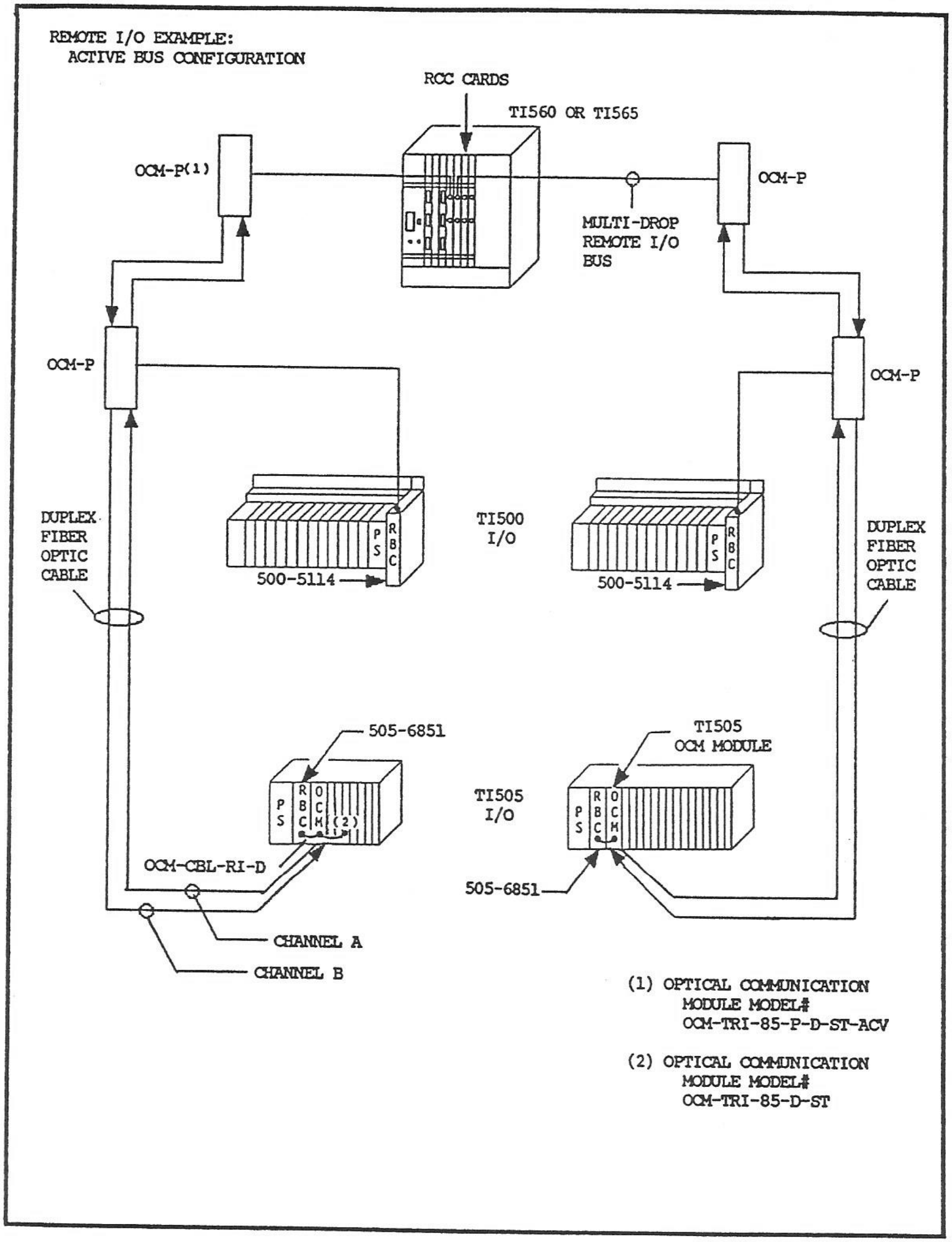
Optical Receiver (850nm multimode, 1300nm multimode, and 1300nm singlemode)

Receiver Sensitivity: -32dbm

OCMs 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 OCM to OCM in one direction, and Channel B Receive and Transmit Data inputs and outputs interconnected sequentially in the opposite direction (See Figure 5). 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 OCMs on either end of the active bus (See Figure 6). This effectively transforms the network into a Siemens/TI Remote I/O, TIWAY, or PEERLINK counter-rotating ring network configuration.

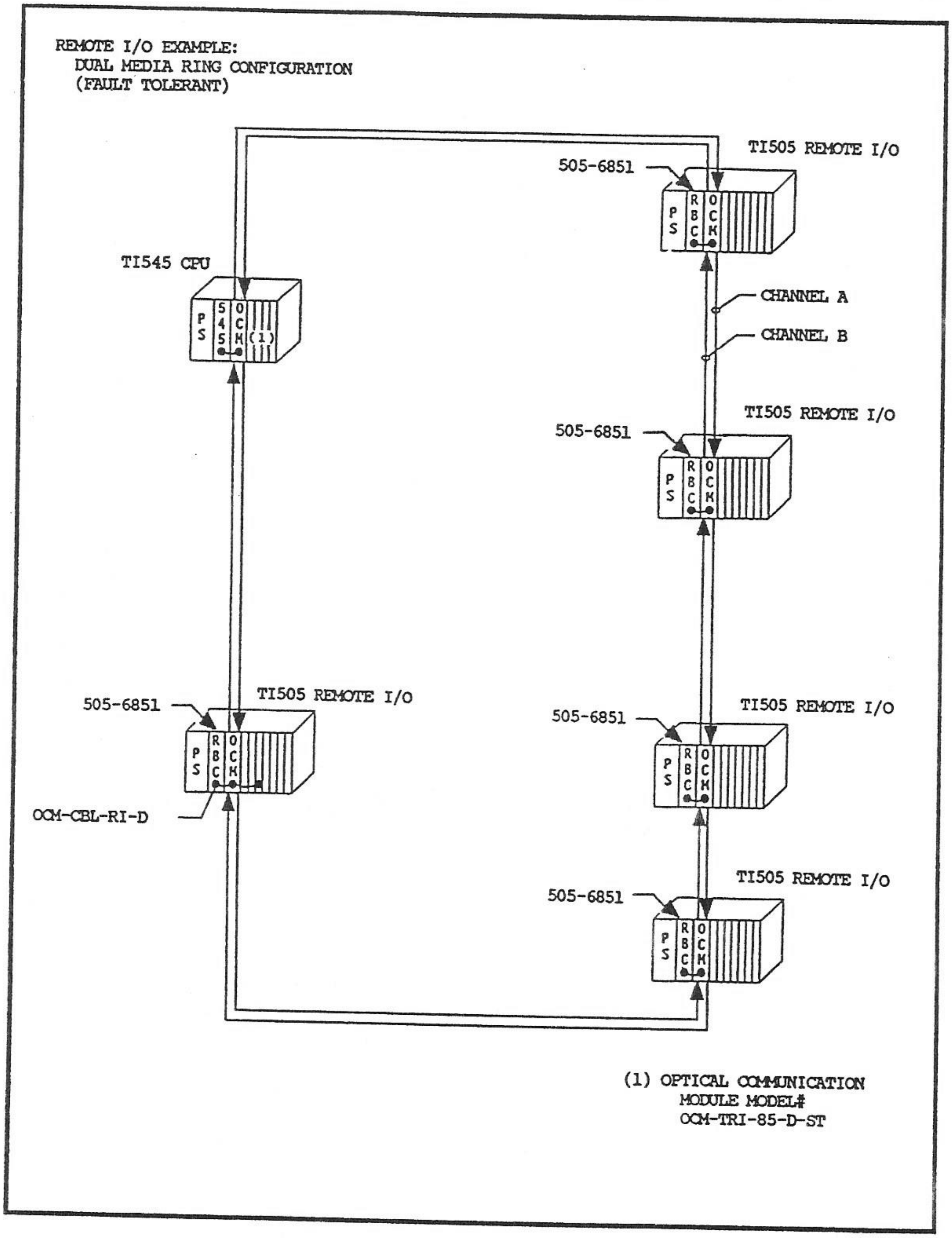
1.3.3 DIAGNOSTIC OUTPUT SPECIFICATIONS (Available with "-D" Option Only)

The Diagnostic Output Interface is provided on the front connector of the OCM module (see connector designation J1 in Figures 3 and 4), and also on the bottom of the Standalone, Panelmount OCM enclosure (secondary connection... see connector designations J2 and J3 in Figure 4). 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 information pertaining to fault and impending fault network conditions.



TYPICAL OCM INSTALLATION CONFIGURATION

FIGURE 5



TYPICAL OCM INSTALLATION CONFIGURATION

FIGURE 6

OCM J1 Connector Diagnostic Output pin number designations are the following:

J1 Connector Pin Numbers(1)	Signal Name
1	Shield (RIO)(2)
2	Signal+ (RIO), LLM+ (TIWAY, PEERLINK)(2)
21	Signal- (RIO), LLM- (TIWAY, PEERLINK)(2)
12	Shield (TIWAY, PEERLINK)(2)
8	Isolated +VDC
23	Isolated -VDC (Signal Ground)
20	ChA Communication Error (ERR)
19	ChB Communication Error (ERR)
18	ChA Impending Fault Detect (IFD)
14	ChB Impending Fault Detect (IFD)
13	ChA Receive Signal Strength (RSS)
6	ChA RSS Return
16	ChB Receive Signal Strength (RSS)
7	ChB RSS Return

(1) All undesignated pin numbers should remain unconnected to any external electrical signals.

(2) See Section 1.3.1 for more information on Device Interface.

TABLE 5(A)

Standalone, Panelmount OCM J2/J3 Barrier Strip Diagnostic Output/DC Power pin number designations ("OCM-P" Model Numbers) are the following:

J2/J3 Connector Pin #	DC Power/ Diagnostic Output Signal Name
J2/1	Channel A Impending Fault Detect (IFD)
J2/2	Signal Ground (IFD/ERR Reference Ground)
J2/3	Channel A Communication Error (ERR)
J2/4	Chassis Ground
J2/5	Primary +5VDC (Primary Input Power)
J2/6	Primary COM (Primary Input Power Common)
J2/7	Primary +12DC (Primary Input Power)
J2/8	Primary -12DC (Primary Input Power)
J3/1	Isolated +VDC (Diagnostic Input Power)
J3/2	Isolated -VDC (Signal Ground)
J3/3	Channel B Impending Fault Detect (IFD)
J3/4	Signal Ground (IFD/ERR Reference Ground)
J3/5	Channel B Communication Error (ERR)
J3/6	Channel A Receive Signal Strength (RSS)
J3/7	ChA/B RSS Return
J3/8	Channel B Receive Signal Strength (RSS)

OCM DIAGNOSTIC OUTPUT/DC POWER PIN DEFINITIONS

TABLE 5(B)

The Standalone, Panelmount OCM may be ordered for operation from either a 110/220 VAC, 24 VDC, or 125 VDC power source. The OCM power supply is attached to the left side of the OCM enclosure and is prewired at the factory to the OCM Module Primary DC power inputs on J2 connector pin numbers 4 thru 8. (See Section 1.3.4 for more detailed information.)

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.). (Independent outputs are provided for each network channel - ChA, ChB). They are optoisolated for overvoltage protection, and are configured at the factory (factory default) to operate from an isolated, external DC power supply. A functional description for IFD, ERR, and Isolated ±VDC is provided in Section 2.6. Electrical specifications are the following:

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

Isolated Power Supply

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

Electrical Isolation (Assuming Isolated ±VDC Operation)

V_{Iso} = 1500 VDC

Outputs (Activated Low True)

R_S = 4.7k Ohm
I_{OL} = 100 ma (max)
V_{OL} = 1.5 VDC (max @ $I_{(out)}$ = 100 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 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 (ChA RSS, ChB RSS)

Standalone, Panelmount Modules

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

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

Simatic 505 Plug-In Modules

Voltage Range (V_{out}) = 0 to +3.5 VDC

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

Network Optical Power-In Versus RSS Voltage-Out (Analog)
(Standalone, Panelmount Modules)

Optical Power In (dbm @ 850nm)	Optical Power In (dbm @ 1300nm, multimode)	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

*Proportional Accuracy: ± 1.0 volt (0°to 60°C).

TABLE 6(A)

Network Optical Power-In Versus RSS Voltage-Out (Analog)
(Simatic 505 Plug-In Modules)

RSS $V_{(out)}$*	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	

*Proportional Accuracy: ± .3 volt (0° to 60° C).

TABLE 6(B)

Chassis ground and signal ground connections are also provided on the OCM terminal barrier strips for IFD, ERR, and RSS. 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).

All diagnostic outputs on the OCM are active. Therefore, the user must insure electrical compatibility before connection to controller input modules.

1.3.4 POWER SUPPLY AND GROUNDING SPECIFICATIONS

1.3.4.1 SIMATIC 505 PLUG-IN OCM

+5VDC @ 1.5 amps
-5VDC @ 200 milliamps

1.3.4.2 STANDALONE, PANELMOUNT OCM POWER SUPPLY AND GROUNDING SPECIFICATIONS

The OCM module may be ordered with either a 120/220 VAC, 24 VDC, or 125 VDC power supply. The power supply will be attached to the left side of the OCM enclosure.

1.3.4.2.1 110/220 VAC OCM POWER SUPPLY SPECIFICATION

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 limit A
Hold-Up Time	:	12 milliseconds
Power Consumption UL, CSA, VDE Approved	:	10 watts per OCM (approximate)
AC Fuse[1]	:	2 AMP, 250 VAC, SLO BLO (.8 inch/20 millimeter)

[1] The AC Fuse is mounted on the internal printed circuit board of the AC Power Supply. For fuse access the user must remove the Power Supply from the side of the base OCM enclosure.

1.3.4.2.2 +24 VDC OCM POWER SUPPLY SPECIFICATIONS

Input Voltage Range	:	+18 VDC to +30 VDC
OCM Input Current	:	.6 Amps
Regulation (Load and Line)	:	.6% (min)
AC Fuse(1)	:	3 AMP, 250 VAC, SLO BLO (.8 inch/20 millimeter)

(1) The Fuse is mounted on the internal printed circuit board of the 24 VDC Power Supply. For fuse access the user must remove the Power Supply from the side of the base OCM enclosure.

1.3.4.2.3 +125 VDC POWER SUPPLY SPECIFICATIONS

Input Voltage Range	:	120 VDC to 370 VDC
Power Consumption UL, CSA, VDE Approved	:	30 watts per OCM (approximate)
Fuse(1)	:	3 AMP, 250 VAC, SLO BLO

(1) The Fuse is mounted on the internal printed circuit board of the 125 VDC Power Supply. For fuse access the user must remove the Power Supply from the side of the base OCM enclosure.

1.3.4.2.4 POWER SUPPLY P1 BARRIER STRIP PIN DESIGNATIONS

Tables 7 and 8 provide input power pin definitions (respectively) for the OCM power supply P1 barrier strip (see Figure 4):

P1 Barrier Strip Pin Designation	Signal Name (Pin Definition)
L1	AC Power In (High Line)
L2	AC Power In (Neutral)
⏚	Chassis Ground

AC INPUT POWER BARRIER STRIP PIN DEFINITIONS

TABLE 7

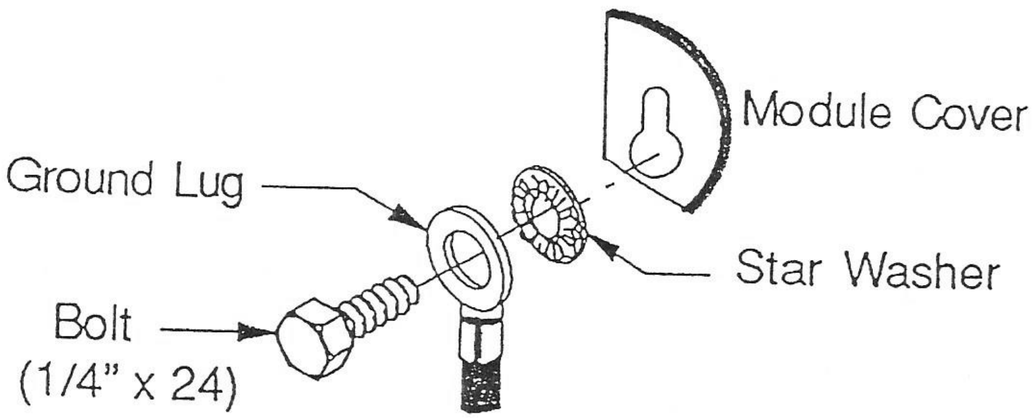
P1 Barrier Strip Pin Designation	Signal Name (Pin Definition)	
	+24VDC	+125VDC
+VDC	+24VDC In	+125VDC In
-VDC	+24VDC Reference	+125VDC Reference
⏚	Chassis Ground	Chassis Ground

24VDC AND 125VDC INPUT POWER BARRIER STRIP PIN DEFINITIONS

TABLE 8

1.3.4.2.5 **ELECTRICAL GROUNDING**

The OCM enclosure must be electrically connected to earth ground. This may be accomplished by connecting the Chassis Ground on either the base OCM J2 connector or Power Supply P1 connector to earth ground, or by attaching a ground electrode directly to the module cover. Figure 7 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.



OCM ENCLOSURE ELECTRICAL GROUNDING PROCEDURE

FIGURE 7

1.3.5 MECHANICAL, ENVIRONMENTAL, AND ELECTRICAL SPECIFICATIONS

Simatic 505 Plug-In Module
Dimensions (LxW) : Single Slot, Siemens Simatic TI505 System Chassis
160mm x 234mm

Standalone, Panelmount Module
Dimensions (HxWxD): 10.38"H x 1.76"W* x 7.00"D
(26.36cm H x 4.47cm W* x 17.78cm D)
*Add 1.00" (2.54cm) for rear panel flange
(see Figure 4 for more detailed information)

Temperature : Operating 0° to 60° C
Storage -20° C to +70° 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 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 Plug-In OCM plugs directly into the Siemens Simatic TI505 Chassis and requires no special installation mounting. The Standalone OCM must be panel-mounted. OCMs are convection cooled, requiring no fan or forced air cooling. An unobstructed air space must be maintained above and below OCMs (6 inches/15.24cm minimum) to insure adequate convection airflow. Panelmounting specifications for standalone OCMs are contained in Figure 4. 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 FIGURES 3 AND 4 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 ISS POTENTIOMETERS

(i) ISS (Initial Signal Setting 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.

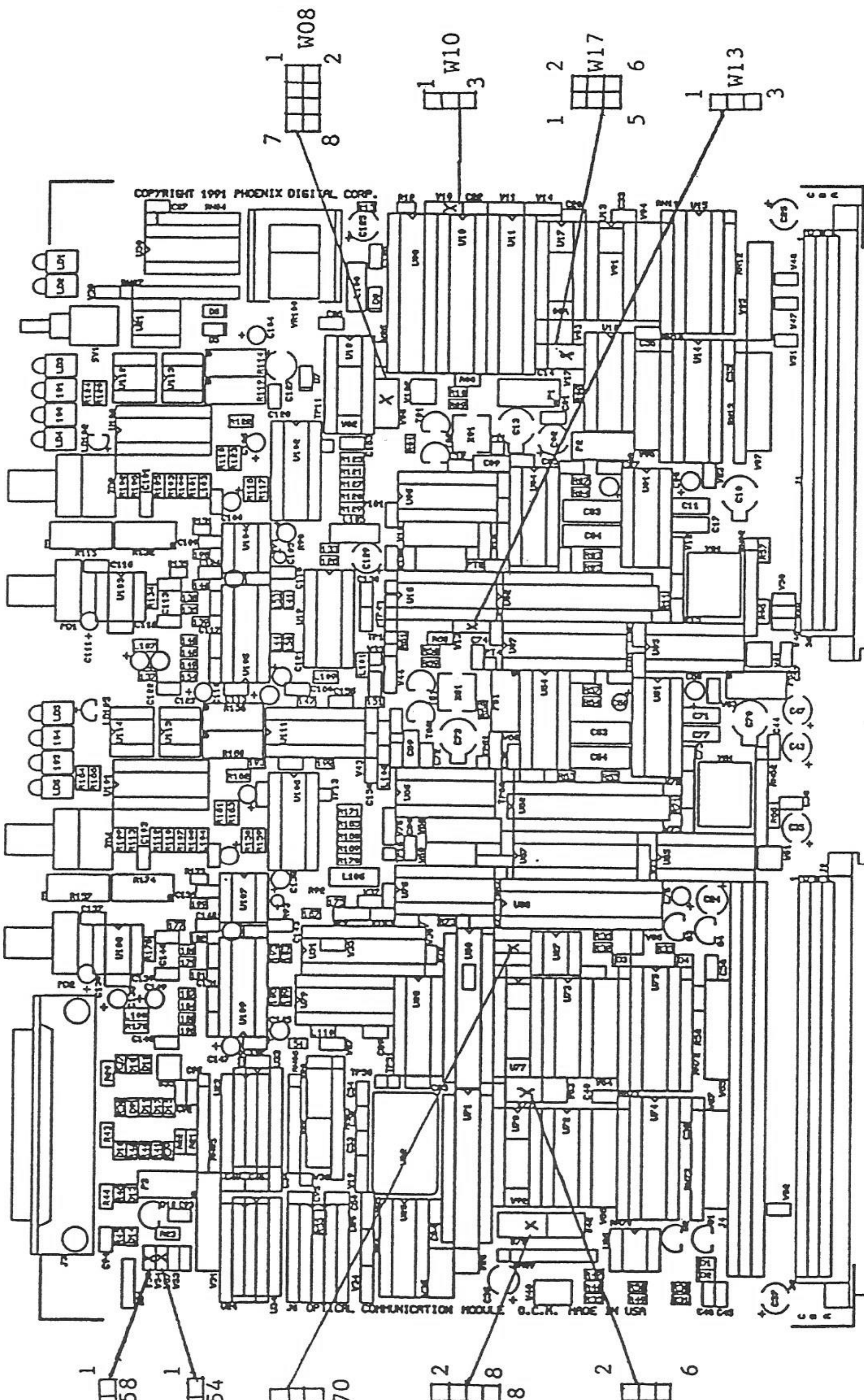
(iii) RSS (ChA, B Receive Signal Strength) - Provides a linear voltage representation (analog - scaled from 0 to +10 VDC) for the corresponding optical network receive input.

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

2.7 CONFIGURATION INSTRUCTIONS

All OCM jumper locations and designations are identified on the overview of the OCM module (component sides) depicted in Figures 8 and 9.

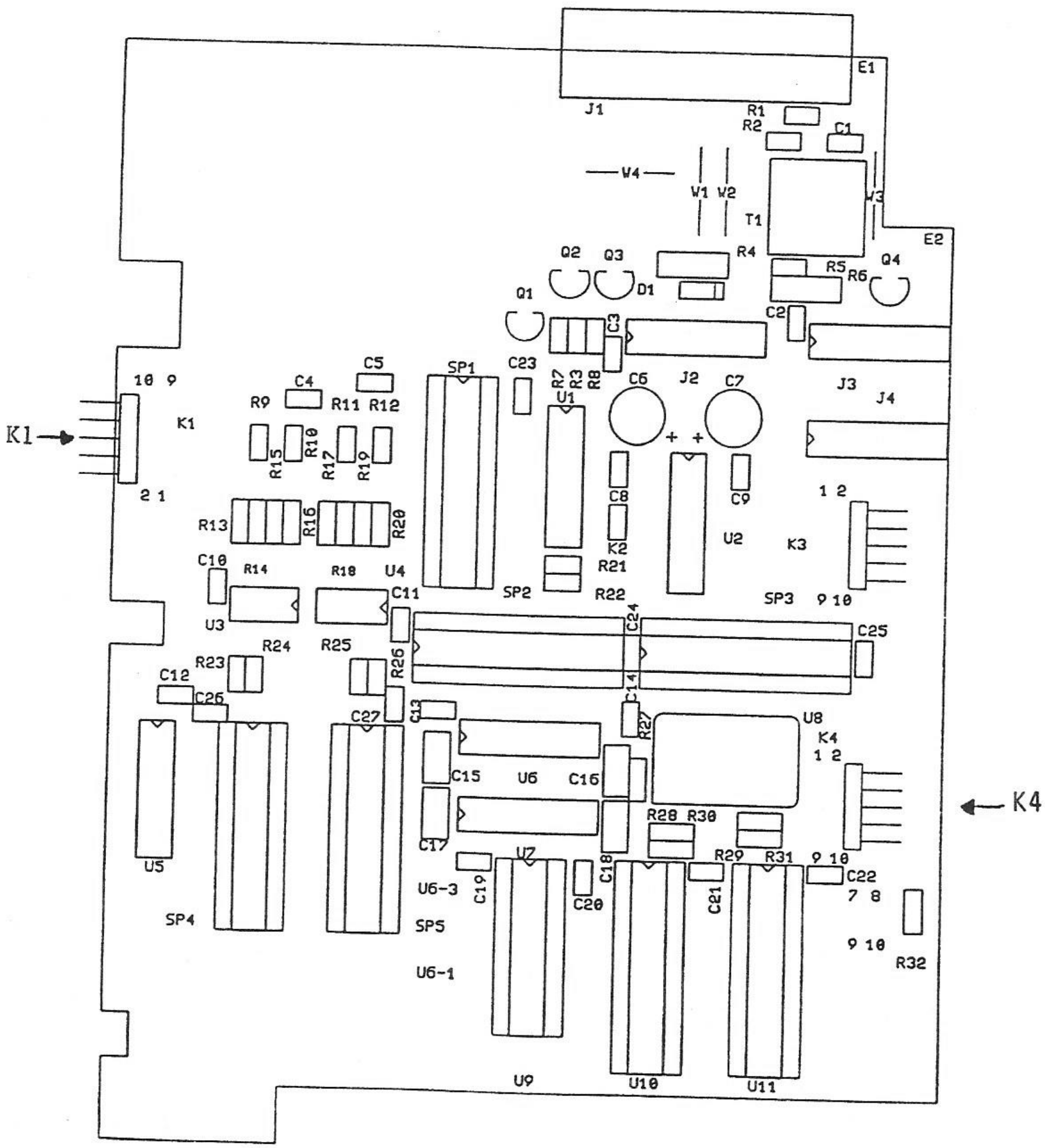
OCM INTERNAL MODULE ORIENTATION:
COMPONENT SIDE



OCM JUMPER CONFIGURATION OVERVIEW - BASE MODULE

FIGURE 8

OCM INTERNAL MODULE OPERATION:
COMPONENT SIDE



OCM JUMPER CONFIGURATION OVERVIEW - DAUGHTERBOARD

FIGURE 9

2.7.1 REMOTE I/O OCM CONFIGURATION

Remote I/O OCMs must be jumper configured by the user for communication with either the PLC Central Processing Unit (CPU) or one of the Remote Base Controllers (RBC). Remote I/O Device jumper configurations are given in Table 9:

Communication Type	Jumper Designation(1)			
	W10 1-2	W10 2-3	W13 1-2	W13 2-3
CPU	Jumper In		Jumper In	
RBC(2)		Jumper In		Jumper In

(1) See Figure 8
(2) Factory Default Setting

REMOTE I/O OCM DEVICE JUMPER CONFIGURATIONS

TABLE 9

Remote I/O OCMs must also be configured by the user for proper shield installation at the device interface (J1). If a PLC CPU is connected to the device interface (as either a single device or together with RBCs in a multi-drop installation) then it should be configured for Shield 1 (see Table 10). If only RBCs are connected to the device interface then it should be configured for Shield 2. Remote I/O Shield jumper configurations are given in Table 10:

Shield Type	Jumper Designation(1)	
	W54 1-2	W58 1-2
Shield 1(2)	Jumper Out	Jumper In
Shield 2	Jumper In	Jumper Out

(1) See Figure 8
(2) Factory Default Setting

REMOTE I/O OCM SHIELD JUMPER CONFIGURATIONS

TABLE 10

2.7.2 TIWAY/PEERLINK OCM MASTER/SLAVE AND BAUD RATE CONFIGURATION

Local Line TIWAY/PEERLINK modules must be jumper configured by the user for master/slave communications. TIWAY is a hosted network, providing master/slave data communications. The OCM module located at the TIWAY network primary node (host) should be jumper configured as the master module. All other OCM modules on the TIWAY network should be configured as slaves. Siemens/TI PEERLINK networks provide peer-to-peer communication and have no fixed network protocol master. However, one OCM on every PEERLINK network must be jumper designated as the master module, and the rest as slaves. This master OCM may be located at any node on the PEERLINK network (location independent). TIWAY/PEERLINK master/slave jumper configurations are given in Table 11.

Communication Type	Jumper Designation(1)			
	W10 1-2	W10 2-3	W13 1-2	W13 2-3
Master Module	Jumper In		Jumper In	
Slave Module(2)		Jumper In		Jumper In

(1) See Figure 8
(2) Factory Default Setting

TIWAY/PEERLINK OCM MASTER/SLAVE JUMPER CONFIGURATIONS

TABLE 11

Local Line TIWAY OCMs must be jumper configured to operate at one of three different baud rates (Baud rate options are provided for TIWAY only. OCM baud rate must be set to 115.2K baud for PEERLINK communications): 115.2K baud, 57.6K baud, or 38.4K baud. Both the OCM and the corresponding TIWAY module must be set to the same communication baud rate for proper operation (it is recommended that 115.2K baud always be used, for maximum performance). TIWAY baud rate jumper configurations are given in Table 12.

Baud Rate	Jumper Designations[1] K4 1-2	K4 3-4	K4 5-6
115.2K baud[2]	Jumper In		
57.6K baud		Jumper In	
38.4K baud			Jumper In

(1) See Figure 9
(2) Factory Default Setting

TIWAY OCM BAUD RATE JUMPER CONFIGURATION

TABLE 12

2.7.3 PEERLINK OCM CONFIGURATION... DISTANCE VS NUMBER OF OCMS

PEERLINK OCMs must be jumper configured by the user for overall network distance versus maximum number of OCMs on the network. PEERLINK OCM Distance vs Maximum Number of OCMs jumper configurations are given in Table 13.

PEERLINK Distances/ Maximum Number of OCMs	Jumper Designations[1] K1 5-6	K1 7-8	K1 9-10
4 Miles/2 OCMs[2]			Jumper In
2 Miles/3 OCMs[2]			Jumper In
1.25 Miles/4 OCMs		Jumper In	
.5 Miles/5 OCMs	Jumper In		

(1) See Figure 9
(2) Factory Default Setting

PEERLINK DISTANCE VS MAXIMUM NUMBER OF OCMS

TABLE 13

2.8 OCM AC POWER DEFINITION (REFERENCE FIGURE 4 AND TABLE 7 FOR OCM NOMENCLATURE AND DESIGNATIONS)

2.8.1 AC POWER INPUTS

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

2.9 OCM DC POWER DEFINITION (REFERENCE FIGURE 4 AND TABLE 8 FOR OCM NOMENCLATURE AND DESIGNATIONS)

2.9.1 DC POWER INPUTS

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

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

CHAPTER 3

IMPENDING FAULT INITIALIZATION PROCEDURE

The OCM module 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 module the most reliable, user friendly, "maintenance friendly" fiber optic module on the market today.

The OCM impending fault monitoring circuitry must be initialized upon system start-up. Thereafter, the OCM impending fault detection threshold characteristics 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 module. No meters, gauges, or any other type of electrical or optical measurement equipment is required for OCM initialization. The initialization procedure is accomplished by first connecting the OCM module optical receive inputs to the optical transmit outputs of adjacent OCM 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 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 module the ISS potentiometers should be turned counterclockwise if the corresponding 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 ISS 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.)

APPENDIX A

OCM TRAP MODE OPERATION

Phoenix Digital's OCMs provide fault tolerant network communications. OCMs self heal communication failures on the fiber optic network by wrapping back communication around points of failure. In this way Phoenix Digital's OCMs detect, isolate, and correct failures anywhere on the network grid. Once the source of a network failure is corrected the OCMs automatically restore the fiber optic network to its original configuration. (See Section 1.2.1 for more detailed information.)

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). The diagnostic outputs of the OCM enable network maintenance personnel to quickly locate this type of failure. However, 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.

Phoenix Digital's OCMs are jumper configured at the factory for automatic recovery from communication failures. In the Auto-Recovery Mode of operation OCMs automatically detect, isolate, and correct communication failures by switching the network around the points of failure, and then automatically restore the network to its original configuration when the source of the failures is corrected. However, as an alternative to Auto-Recovery Mode, OCMs may be jumper configured by the user for TRAP Mode Operation. In Trap Mode, OCMs help detect and locate intermittent fiber optic communication failures. Trap Mode OCMs will continue to automatically detect, isolate, and correct communication failures, just as in Auto-Recovery mode. But when the source of the failures is corrected the Trap Mode OCMs will **NOT** automatically restore the network to its original configuration. Instead, the network will remain trapped in the failed condition until the source of the failures is corrected **AND** the trapping OCMs are reset. Thus, intermittent failures will be continuously trapped by the OCMs (latched), providing maintenance personnel with the necessary time to locate and correct the source of the network failures.

When Trap Mode is selected (OCM jumper selection) OCMs must be initialized for network communications in the following manner:

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

2. Apply power to all of the OCMs on the network. (At this point all of the OCMs configured for Trap Mode operation should indicate a failed condition on both channels... Ch A, B ERR).

3. Depress the TM Pushbutton on the front panel of each Trap Mode OCM on the network. This will switch the OCM into an active, on-line, error free mode of operation, until such time as an intermittent communication failure occurs and the OCM traps the failure. (See Figure 3 for the OCM TM Pushbutton front panel designation.)

4. Trap Mode OCMs may be subsequently reset (after trapping an intermittent failure) by depressing the TM Pushbutton.

Figure A-1 provides an overview of the OCM internal module, illustrating the Trap Mode jumper locations. Table A-1 provides instructions for Auto-Recovery/Trap Mode jumper selection.

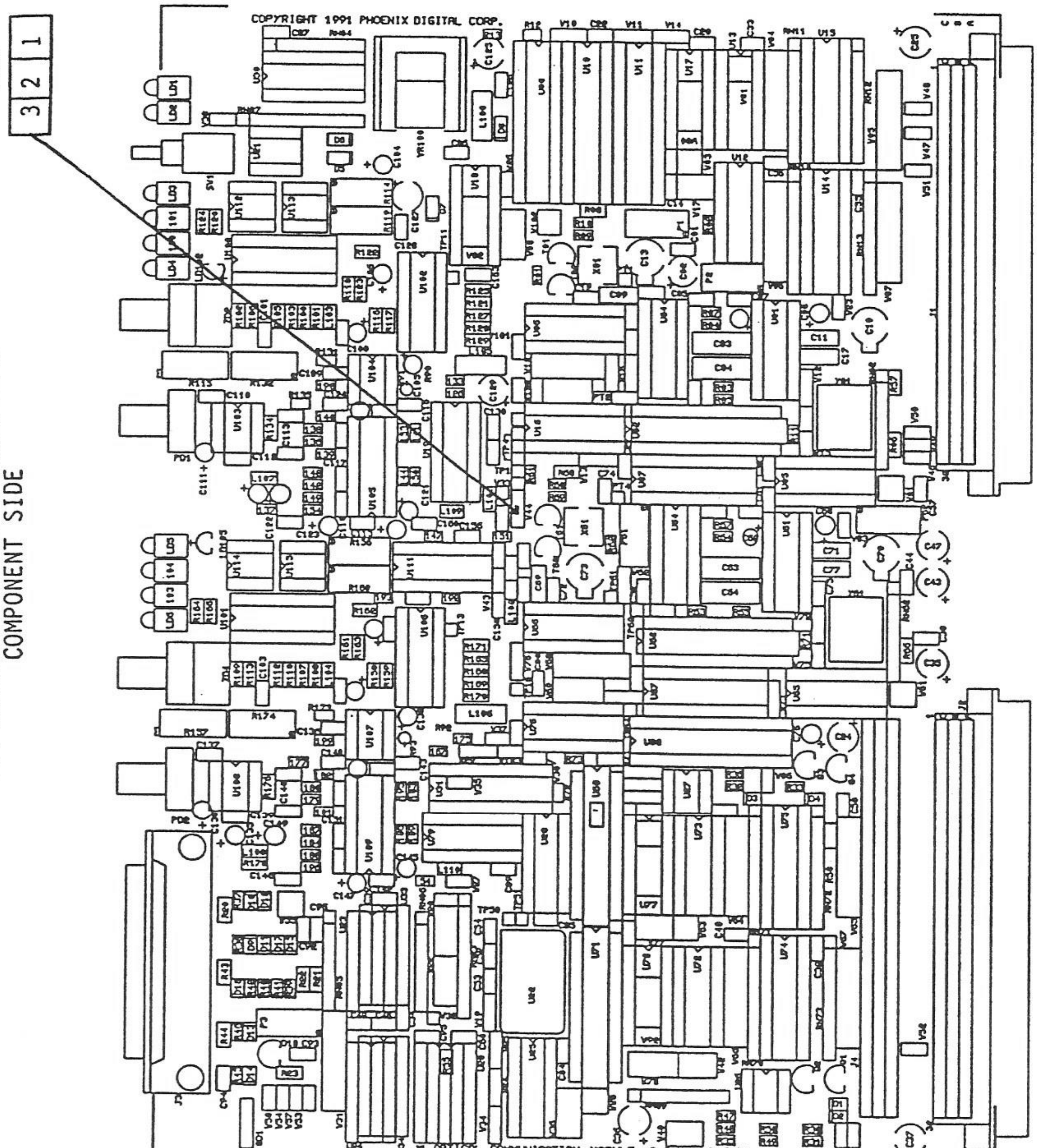
Auto-Recovery/ Trap Mode Selection	Jumper Designations(1) W44 1-2	W44 2-3
Auto-Recovery(2)	Jumper Out	Jumper In
Trap Mode	Jumper In	Jumper Out

(1) See Figure A-1
(2) Factory Default Setting

AUTO-RECOVERY/TRAP MODE SELECTION

TABLE A-1

OCM INTERNAL MODULE ORIENTATION:
COMPONENT SIDE

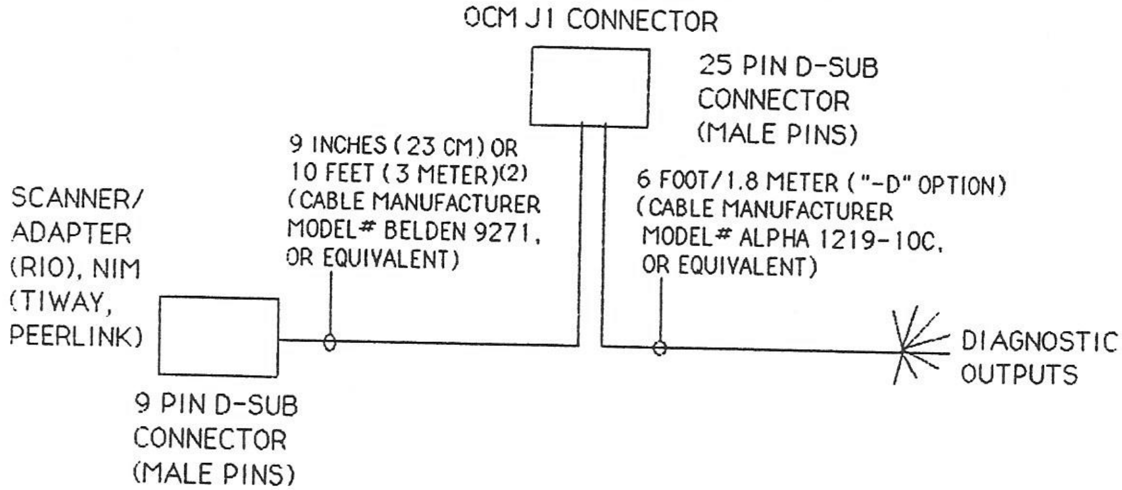


OCM JUMPER CONFIGURATION OVERVIEW - BASE MODULE

FIGURE A-1

APPENDIX B

OCM-CBL-RI-D, OCM-CBL-TP-D CABLE DRAWINGS(1)



CABLE MODEL#S OCM-CBL-RI-D, OCM-CBL-TP-D

OCM J1 Connector Pin #	Siemens/TI Remote I/O Scanner/Adapter Connector Pin # (OCM-CBL-RI)	Siemens TIWAY/ PEERLINK NIM or Connector Pin # (OCM-CBL-TP)	Signal Name	Diagnostic Output Wire Color Code ("D" Option)
1	5		Shield	NA
2	8		Signal +	NA
21	3		Signal -	NA
2		6	LLM+	NA
12		3	Shield	NA
21		9	LLM-	NA
8			Isolated +VDC	Red
23			Isolated -VDC	Black
20			Channel A ERR	White
19			Channel B ERR	Green
18			Channel A IFD	Blue
14			Channel B IFD	Yellow
13			Channel A RSS	Orange
6			Channel A RSS Return	Violet
16			Channel B RSS	Gray
7			Channel B RSS Return	Brown

(1) Cable for direct connection of Siemens/TI Controller Remote I/O or TIWAY/PEERLINK NIMs to Phoenix Digital OCMs (via the OCM J1 connector). (This cable may be ordered direct from Phoenix Digital... Order Cable Model# OCM-CBL-RI-D for Remote I/O with Diagnostics, and Model# OCM-CBL-TP-D for TIWAY/PEERLINK with Diagnostics.)

(2) "-10" Option = 10 Foot Length (3 Meters)

(3) All unused pin numbers should remain open and not connected to any external device.