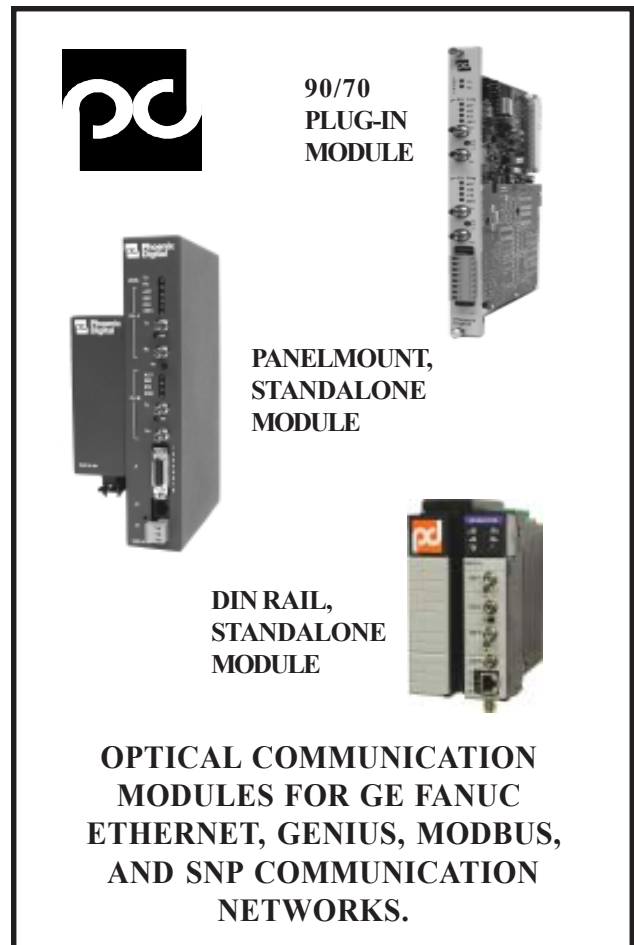# OPTICAL COMMUNICATION For GE FANUC ETHERNET, GENIUS, MODBUS, and SNP Networks

Phoenix Digital

Phoenix Digital provides Redundant, Fault Tolerant, **MULTIDROP** Fiber Optic Communications for GE Fanuc **Ethernet, Genius™, Modbus, and Series 90™ Protocol (SNP)** Communications. Optical Communication Modules are available for GE FANUC Series 90-70 Chassis Installation, or in modular Standalone Enclosures for Panelmount or DIN Rail Installation. . . with integral 120/220 VAC, 24 VDC, or 125 VDC power supplies.

FEATURES

- Fiber Optic Communications. . .
    - Noise Immunity.
    - Intrinsically Safe.
    - Topology Independent (Ring, Bus, Star).

- Dependable Data Communications. . .
    - On-Line Error Checking.
    - Fault Prediction.
    - Fault Location.
    - Fault Tolerant.
    - Redundant Fiber Media.

- Network-Wide Diagnostics. . .
    - Locates Fault and Impending Fault Conditions.

- Ethernet Modules Support TCP/IP Communications. . .
    - IEEE 802.3 CSMA/CD Networks.

- Extended Capacity Fiber Optic Ethernet. . .
    - **MULTIDROP** over 30 Fiber Optic Modules on a Single Bus or Ring Network.

- Mix and Match Etherent 10 Base-T, 10 Base-2, 10 Base-5 Media Options. . .
    - Connect via Twisted Pair, Thin-Net, or Thick-Net Coax

- Genius Modules Support Top End, Extended Data Rate. . . 153K Extended.

- Plugs Into GE FANUC 90/70 Chassis for Genius, Modbus, and SNP Protocols.

90/70 PLUG-IN MODULE

PANELMOUNT, STANDALONE MODULE

DIN RAIL, STANDALONE MODULE

OPTICAL COMMUNICATION MODULES FOR GE FANUC ETHERNET, GENIUS, MODBUS, AND SNP COMMUNICATION NETWORKS.

- **UL CLASS I, DIVISION 2 RATING** on all DIN Rail, Standalone Modules.

- Short or Long Distance. . .
    - 6 Feet (2 Meters) to 6 Miles (10 Kilometers) Apart - Multimode Operation.
    - Over 16 Miles (25 Kilometers) Apart - Singlemode Operation.

- Selectable Wavelengths. . .
    - 850 nm, 1300 nm, 1550 nm.

- Compatible with Both Singlemode and Multimode Fiber, and with Industrial Fiber.

- Ruggedized Industrial Fiber Optic Cable. . .
    - Available only from Phoenix Digital.

DESCRIPTION

Phoenix Digital's family of Optical Communication Modules for GE Fanuc Ethernet, Genius, Modbus, and SNP networks provide the most advanced, comprehensive, fiber optic communication capabilities on the market today. Phoenix Digital's fiber optic modules provide optical communication media, transparent to the communication protocol and configurable for distribution by the user in ring, bus, star, tree, or point-to-point network installations. Fiber optic cable is now the media of preference for harsh industrial network environments due to the inherent benefits of high reliability, electrical noise immunity, and intrinsic safety. Phoenix Digital's fiber optic modules provide continuous on-line error checking for jitter, pulsewidth distortion, carrier symmetry, and optical signal strength. All of this, together with comprehensive self-test diagnostics, optimizes the overall integrity of Ethernet, Genius, Modbus, and SNP communication networks at-large, providing Dependable Data Communications.

Optical communication network options include features not found in even the most expensive communication network installations:

— On-line Diagnostic Monitoring.
— Self Healing Communication Recovery.
— In-line Signal Monitoring.
— Locates Fault and Impending Fault Conditions.
— Ethernet Modules Fully Compatible with IEEE 802.3.
— Connect over 30 Ethernet Fiber Optic Modules on a Single Multidrop Bus or Redundant Ring Network.
— Each Ethernet Module Provides Integral Hub Functionality... Extra Ports for On-Line Programming, Monitoring, and Diagnostics.
— UL Class I Division 2 Rating on all Ethernet DIN Rail, Standalone Fiber Optic Modules.
— Ethernet, Genius, Modbus, and SNP Modules are Fully Compatible with Network Protocols.

— Genius Modules Support Top End, Extended Genius Data Rate.
— Full Duplex Modbus Communication.
— Modbus Modules Compatible with Phoenix Digital's complete line of Modbus Port Expanders, Network Servers, and Communication Controllers.
— Annunciation of Low Signal Level.
— Wavelength Selection.
— Extended Communication Distances.

Phoenix Digital's fiber optic modules may be used together in the same physical network to connect GE Fanuc PLCs, Genius I/O Blocks, Host Computers, Honeywell DCS, etc. Phoenix Digital makes all of this possible, in the price range of a conventional communication modem, through application of its patented self healing communication switch and advanced optical technologies.

OPERATION

FAULT PREDICTIVE... Phoenix Digital's fiber optic modules provide fault prediction thru diagnostic monitoring and detection of impending communication failures resulting from gradual degradation of the communication link itself. The fiber optic modules monitor for impending fault conditions by continuously measuring the actual in-line signal strength (optical power) of the data communications at the receive data inputs on the module. The fiber modules continuously compare these actual in-line measurements to preset optical power reference thresholds. If the actual in-line data communication signal strength degrades below these power thresholds the fiber modules will detect and annunciate the impending failure condition via indicators on the front of the module. Phoenix Digital's fiber optic modules also provide hardwired diagnostic outputs (discrete and analog) for detecting and locating impending fault conditions, and for on-line optical power measurement. Thus, communication network status is continuously monitored, and impending failure conditions are annunciated and located before the communication failure actually occurs. This enables maintenance personnel to perform Predictive Maintenance on fiber

optic Ethernet, Genius, Modbus, and SNP communication networks at-large!

FAULT MANAGEMENT... Phoenix Digital's fiber optic modules provide fault tolerant, self healing communications through diagnostic monitoring of the communication signal waveforms at each node on the network, and ultra-high speed detection and isolation of points of communication failure anywhere on the network. The fiber optic modules self heal around communication failures in ring, bus, star, tree, or point-to-point network configurations. They automatically redirect network traffic around points of failure until the failure conditions are corrected, and then automatically restore the communication network to its original traffic patterns. Thus, communication continuity is unconditionally maintained by the fiber modules in the event of either node or media failure! In addition, the Phoenix Digital's fiber optic modules provides diagnostic outputs to locate network fault conditions, enabling maintenance personnel to splice/terminate/replace fiber media, add/delete nodes, etc. on-line, without disrupting network communications! All of this is transparent to the operation of Ethernet, Genius, Modbus, and SNP communication networks.

INTERACTIVE DIAGNOSTICS... Phoenix Digital's fiber optic modules provide advanced, system-level interactive diagnostics. These diagnostics may be used to assist in troubleshooting a wide variety of different types of network problems:

> — Detect and Locate Fault Conditions
>   Throughout the Network.
> — Trap-and-Hold, and Locate Intermittent
>   Communication Failures.
> — Detect and Locate Impending Fault
>   Conditions Throughout the Network.

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

EXTENDED DISTANCES... Phoenix Digital's fiber optic modules provide optional wavelength selection for extended distance applications. The economical 850 nanometer wavelength may be selected for data communication networks with less than 12,000 feet (3,650 meters) between nodes. The higher performance 1300 and 1550 nanometer multimode wavelengths may be selected for longer distance applications, extending communication distances between nodes to over 6 miles (10 kilometers). The 1300 and 1550 nanometer singlemode wavelengths may be selected for extended distance applications, extending communication distances between Genius, Modbus, and SNP nodes to over 16 miles (25 kilometers)! (Consult the factory for extended distance Ethernet applications exceeding 2 miles/3 kilometers.)

INSTALLATION

Phoenix Digital's Ethernet, Genius, Modbus, and SNP Optical Communication Modules are available in modular Panelmount, Industrial Enclosures. Ethernet Fiber Optic Modules are also available in modular DIN Rail, Industrial Enclosures. Plug-In 90/70 fiber modules are available for Genius, Modbus, and SNP networks.

Phoenix Digital's fiber optic modules may be interconnected on the fiber optic network in an active bus configuration, using either multimode or singlemode fiber optic cable (See Figures on Pages 5 and 6.). 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 end-to-end Channel A (Ch A Transmit to Ch A Receive) and Channel B (Ch B Transmit to Ch B Receive) on the fiber optic modules on either end of the active bus. (See Figures on Pages 7 and 8.). This effectively transforms it into a counter-rotating ring for Ethernet, Genius, Modbus, or SNP networks, without requiring any other action by the user.

ORDERING INFORMATION

Model Number [1]   **Description**

OCM-ETH [2]   ETHERNET Optical Communication Module
OCM-GEN [3]   GENIUS Optical Communication Module
OCM-MOD [3]   MODBUS Optical Communication Module
OCM-SNP [3]   SNP Optical Communication Module

OCX-ETH [2, 4]   ETHERNET Optical Communication Module

OCM-CBL-A1-10   Ethernet 10 Base-T PLC to OCM/OCX(J1) Interconnect Cable (10 ft/3 mtr)
OCX-CBL-A1-10   Ethernet 10 Base-T PLC to OCX(J2) Interconnect Cable (10 ft/3 mtr)
OCM-AUI-A1   Ethernet 10 Base-T Transceiver

(1) Add suffix "-85" for 12,000 feet/3,650 meters between nodes (850 nm Multimode Wavelength).
     Add suffix "-13" for 32,000 feet/10 kilometers between nodes (1300 nm Multimode Wavelength).
     Add suffix "-15" for 43,000 feet/13 kilometers between nodes (1550 nm Multimode Wavelength).
     Add suffix "-P" to OCM modules for Panelmount, Standalone Module Enclosure. (Optional for
        OCM-GEN, OCM-MOD, and OCM-SNP. Required for OCM-ETH modules.)
     Add suffix "-R" to OCX modules for DIN Rail, Standalone Module Enclosure.
        (Required for OCX-ETH modules.)
     Add suffix "-D" for Real Time Diagnostic Option. (Required for OCX Class I, Div 2 Rating.)
     Add suffix "-ST" for ST Fiber Optic Connector Style.
     Add suffix "-SMA" for SMA Fiber Optic Connector Style. (Available only with the
        850 Nanometer Wavelength.)
     Add suffix "-24V" for 24 VDC Operation.
     Add suffix "-125V" for 125 VDC Operation.
     Add suffix "-ACV" for 120/220 VAC Operation.
     Add suffix "-A1" to OCM-ETH and OCX-ETH Modules for 10 Base-T Operation.
        (Two "-A1" suffixes may be added to OCM-ETH and OCX-ETH model numbers for dual,
        integral 10 Base-T Transceiver Operation.)
     Add suffix "-A2" to OCM-ETH and OCX-ETH Modules for 10 Base-2 Operation.
     Add suffix "-EXT" for Networks with 10 or More OCM-ETH and/or OCX-ETH Modules.
     Add suffix "-SM" for Singlemode Operation. (Available with 1300 Nanometer Wavelength,
        1550 Nanometer Wavelength, and ST Connector Options Only.)
     Add suffix "-422" to OCM-MOD Modules for RS-422 Modbus communications.
     Add suffix "-485" to OCM-MOD Modules for RS-485 Modbus communications.
     Add suffix "-FD" to OCM-MOD Modules for Full Duplex, Point-to-Point Communications.

(2) Consult the factory for more information on Ethernet communication networks with distances
        over 2 miles/3 kilometers.

(3) Available as 90/70 Plug-In Modules. (Add suffix "-P" for Panelmount, Standalone Enclosure.)

(4) OCX-ETH modules are rated for use in Class I, Division 2 Hazardous Locations.

Consult the factory for additional information on fiber optic modules for other Open Standard Net-
works; other Open and Proprietary Control Networks; 19" Rackmount/Panelmount Modems; Industrial
Fiber Optic Cable (indoor, outdoor, aerial, burial, etc.); and **MODBUS PORT EXPANDERS**, multi-
plexers, network servers, and communication controllers for MODBUS networks.

Genius and Series 90 are registered trademarks of GE FANUC Automation.

SPECIFICATIONS

Fiber Optic Cable Type   : Multimode or Singlemode
Mating Connector   : ST or SMA
Transmit Launch Power   : -l5 dbm (Typical, Multimode); -18 dbm (Singlemode)
Receive Sensitivity   : -32 dbm
Power Supply   : 120/220 VAC, 24 VDC, or 125 VDC.... 10 to 15 Watts
Environmental
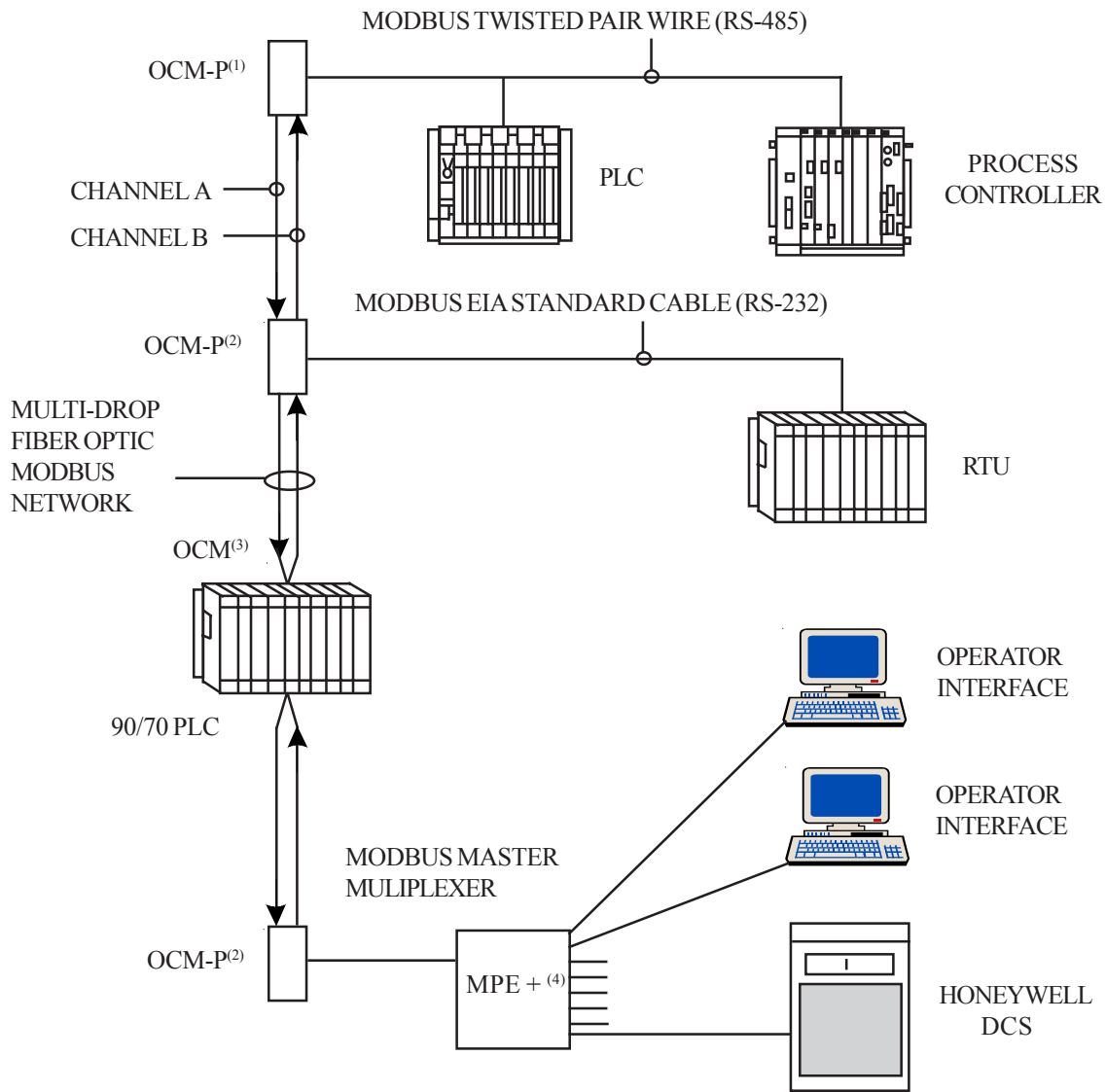   Operating Temperature   : 0º to 60º C (32º to 140º F)
    Storage Temperature   : -40º to 85º C (-40º to 185º F)
    Relative Humidity   : 0 to 95% RH, non-condensing
Dimensions
    Series 90-70 Plug-In Modules   : Single Slot, GE Fanuc Series 90-70 Module
    Panelmount, Standalone Modules   : 10.38" H x 3.50" W x 7.00" D
       for Genius, SNP, Modbus   (26.36cm H x 8.90cm W x 17.78cm D)
    Panelmount, Standalone Modules   : 10.38" H x 3.50" W x 6.14" D
       for Ethernet   (26.36cm H x 8.90cm W x 15.60cm D)
    DIN Rail, Standalone Modules   : 6.10" H x 3.10" W x 5.50" D
       for Ethernet   (15.49cm H x 7.87cm W x 13.97cm D)
Hazardous Location Approval   : UL AND UL/C Class I, Div 2 Groups A, B, C, D
                                    (All OCX modules have the US and Canadian
                                    UL Mark for use in Class I, Div 2 Groups
                                    A, B, C, and D Hazardous Locations.)

European Union Directives   : CE

SERIES 90 PROTOCOL (SNP) ACTIVE BUS CONFIGURATION

OCM-P[1]

CHANNEL A

CHANNEL B

OCM[2]

90/70 PLC

90/30 PLC   90/30 PLC   90/30 PLC

MULTI-DROP
FIBER OPTIC SNP
NETWORK

OPERATOR
INTERFACE

OCM-P[1]

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

(2) OPTICAL COMMUNICATION MODULE
    MODEL # OCM-SNP-85-D-ST
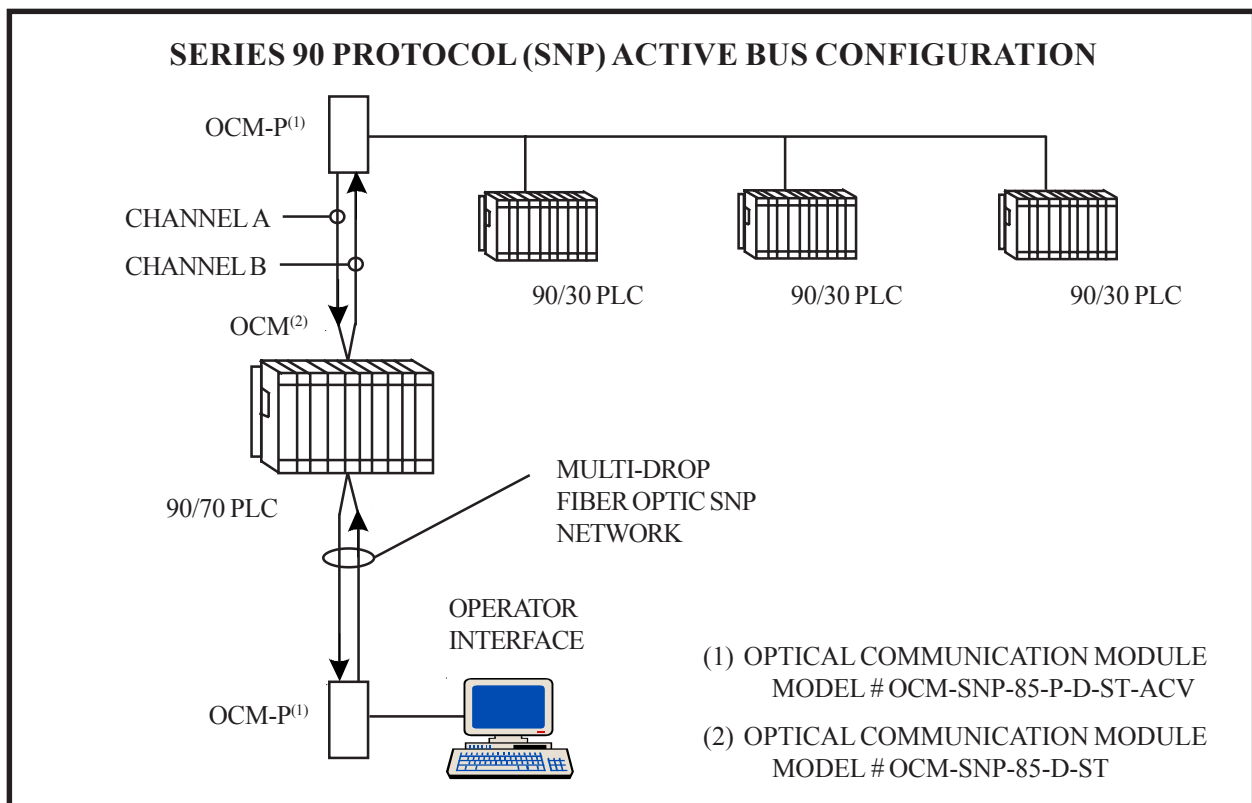
TYPICAL SNP OCM INSTALLATION CONFIGURATION

MODBUS ACTIVE BUS CONFIGURATION

MODBUS TWISTED PAIR WIRE (RS-485)

OCM-P[(1)]

CHANNEL A

CHANNEL B

PLC

PROCESS
CONTROLLER

MODBUS EIA STANDARD CABLE (RS-232)

OCM-P[(2)]

MULTI-DROP
FIBER OPTIC
MODBUS
NETWORK

RTU

OCM[(3)]

90/70 PLC

OPERATOR
INTERFACE

OPERATOR
INTERFACE

MODBUS MASTER
MULIPLEXER

OCM-P[(2)]

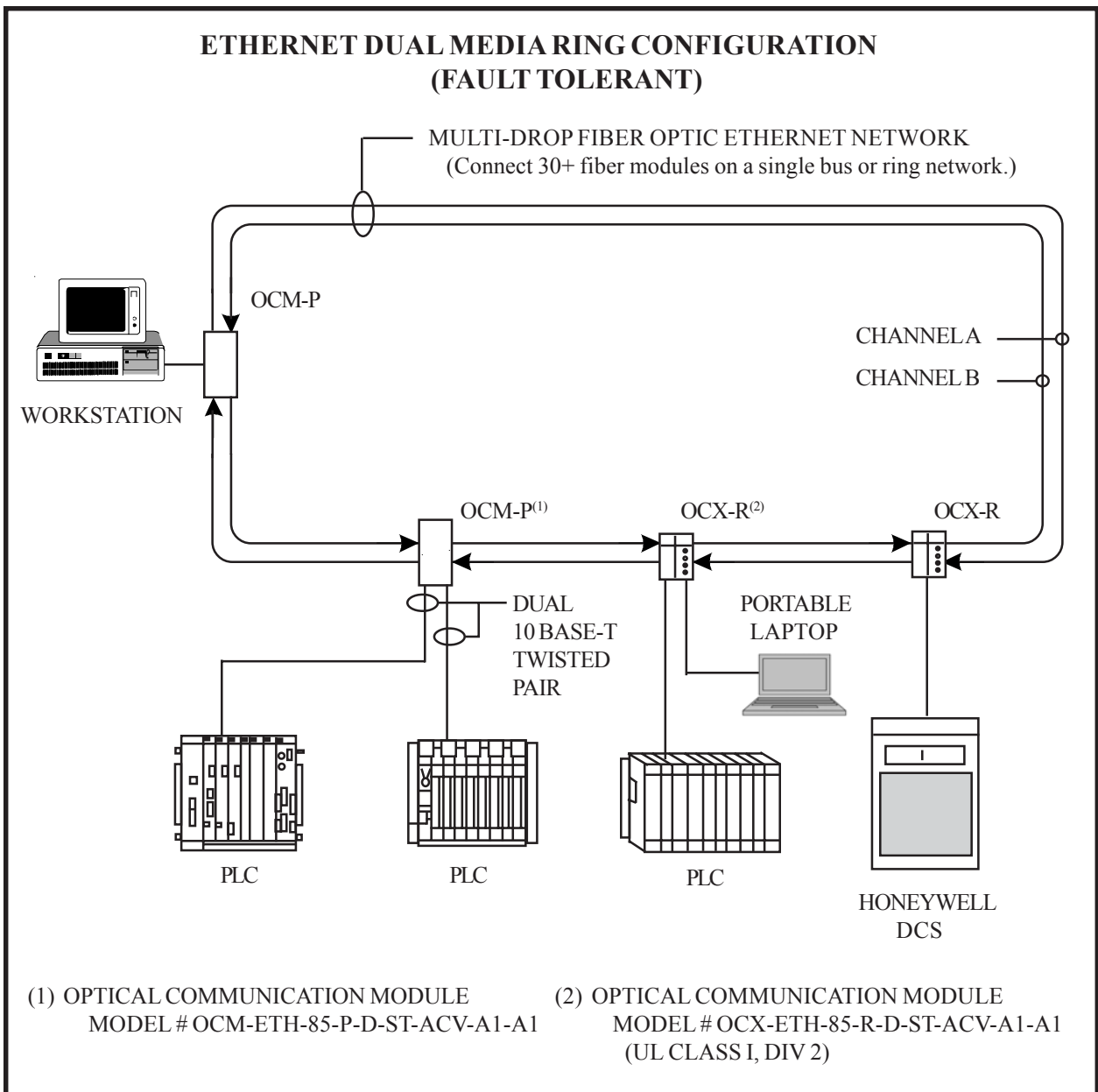MPE + [(4)]

HONEYWELL
DCS

(1) OPTICAL COMMUNICATION MODULE
     MODEL # OCM-MOD-85-P-D-ST-ACV-485

(2) OPTICAL COMMUNICATION MODULE
     MODEL # OCM-MOD-85-P-D-ST-ACV

(3) OPTICAL COMMUNICATION MODULE
     MODEL # OCM-MOD-85-D-ST

(4) MODBUS PORT EXPANDER PLUS
     MODEL # MPE + - ACV
     (Consult the factory for more
     information on Phoenix Digital's
     complete line of Modbus Port
     Expanders, Network Servers, and
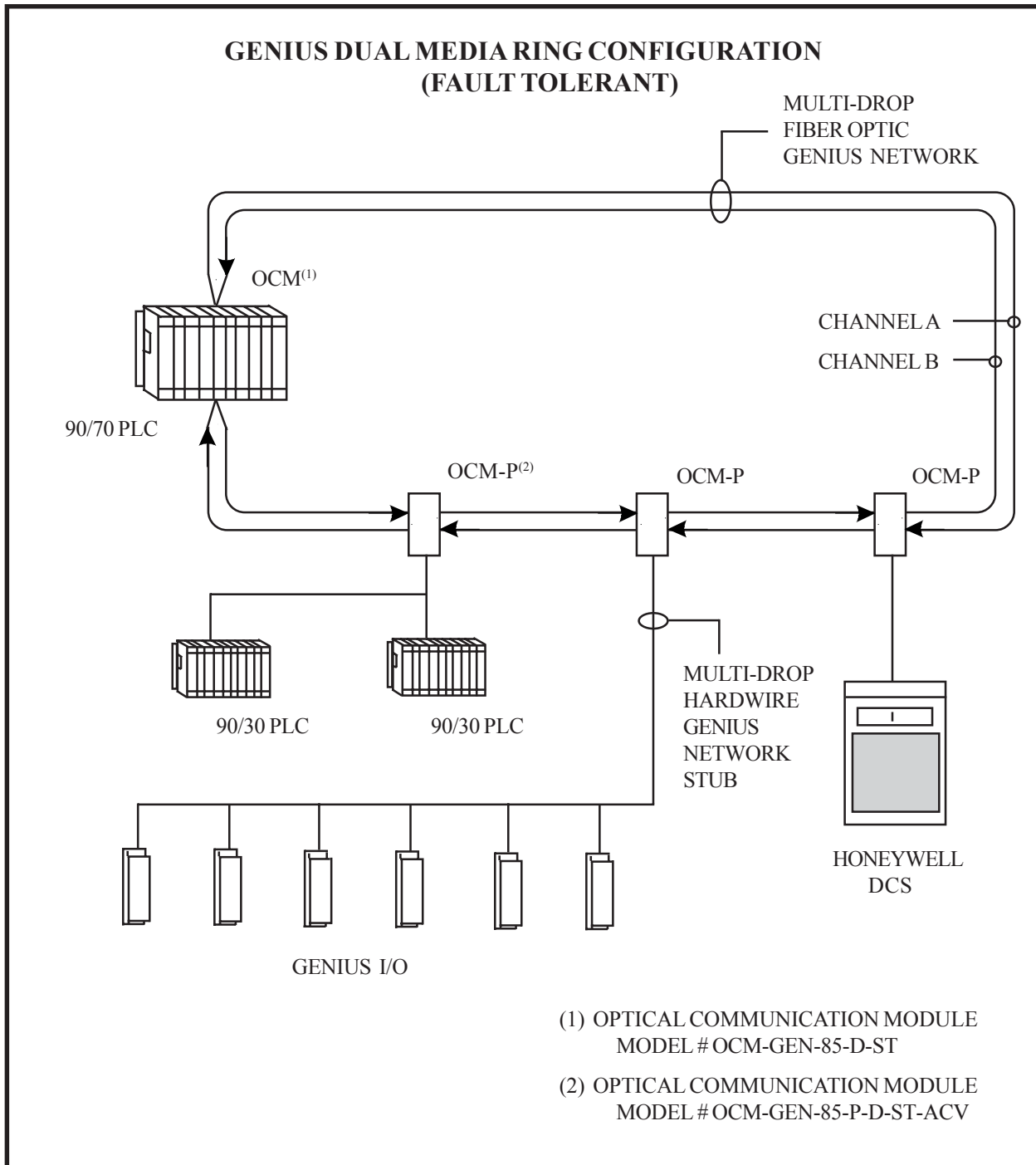   Communication Controllers.)

TYPICAL MODBUS OCM and MPE+ INSTALLATION CONFIGURATION

ETHERNET DUAL MEDIA RING CONFIGURATION
(FAULT TOLERANT)

MULTI-DROP FIBER OPTIC ETHERNET NETWORK
(Connect 30+ fiber modules on a single bus or ring network.)

OCM-P

CHANNEL A

CHANNEL B

WORKSTATION

OCM-P[1]   OCX-R[2]   OCX-R

DUAL
10 BASE-T
TWISTED
PAIR

PORTABLE
LAPTOP

PLC   PLC   PLC

HONEYWELL
DCS

(1) OPTICAL COMMUNICATION MODULE
    MODEL # OCM-ETH-85-P-D-ST-ACV-A1-A1

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

TYPICAL ETHERNET OCM/OCX INSTALLATION CONFIGURATION

Phoenix Digital

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Scottsdale, AZ 85260
(480) 483-7393 Phone
(480) 483-7391 Fax
email: phxdigital@aol.com
internet: http://www.phoenixdigitalcorp.com

GENIUS DUAL MEDIA RING CONFIGURATION
(FAULT TOLERANT)

MULTI-DROP
FIBER OPTIC
GENIUS NETWORK

OCM[1]

CHANNEL A

CHANNEL B

90/70 PLC

OCM-P[2]   OCM-P   OCM-P

90/30 PLC   90/30 PLC

MULTI-DROP
HARDWIRE
GENIUS
NETWORK
STUB

HONEYWELL
DCS

GENIUS I/O

(1) OPTICAL COMMUNICATION MODULE
MODEL # OCM-GEN-85-D-ST

(2) OPTICAL COMMUNICATION MODULE
MODEL # OCM-GEN-85-P-D-ST-ACV

TYPICAL GENIUS OCM INSTALLATION CONFIGURATION

Phoenix Digital