INDUSTRIAL COMMS

Industrial Fiber Optic Networking Product Catalog

For Factory Automation and Process Control

Fiber Optic Products

- PLC Modems & Repeaters
- Ethernet/IP Switches
- Analog & Digital Data Links
- Contact Closures
- Multiplexers

Ultra ELECTRONICS

Industrial Communication Products Ltd
Tel: +44 (0) 203 086 9569

Web: www.industrialcomms.co.uk
E-mail: sales@industrialcomms.com

Contents at a Glance
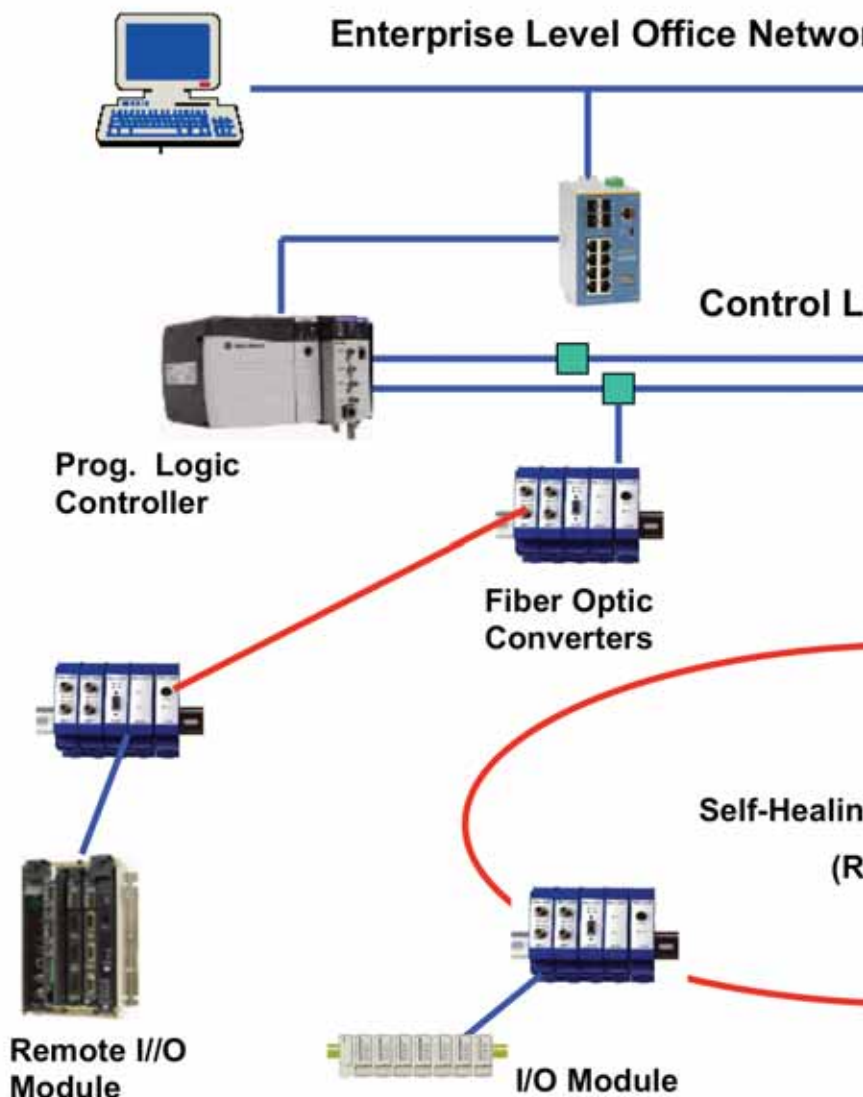
Overview of Networking System
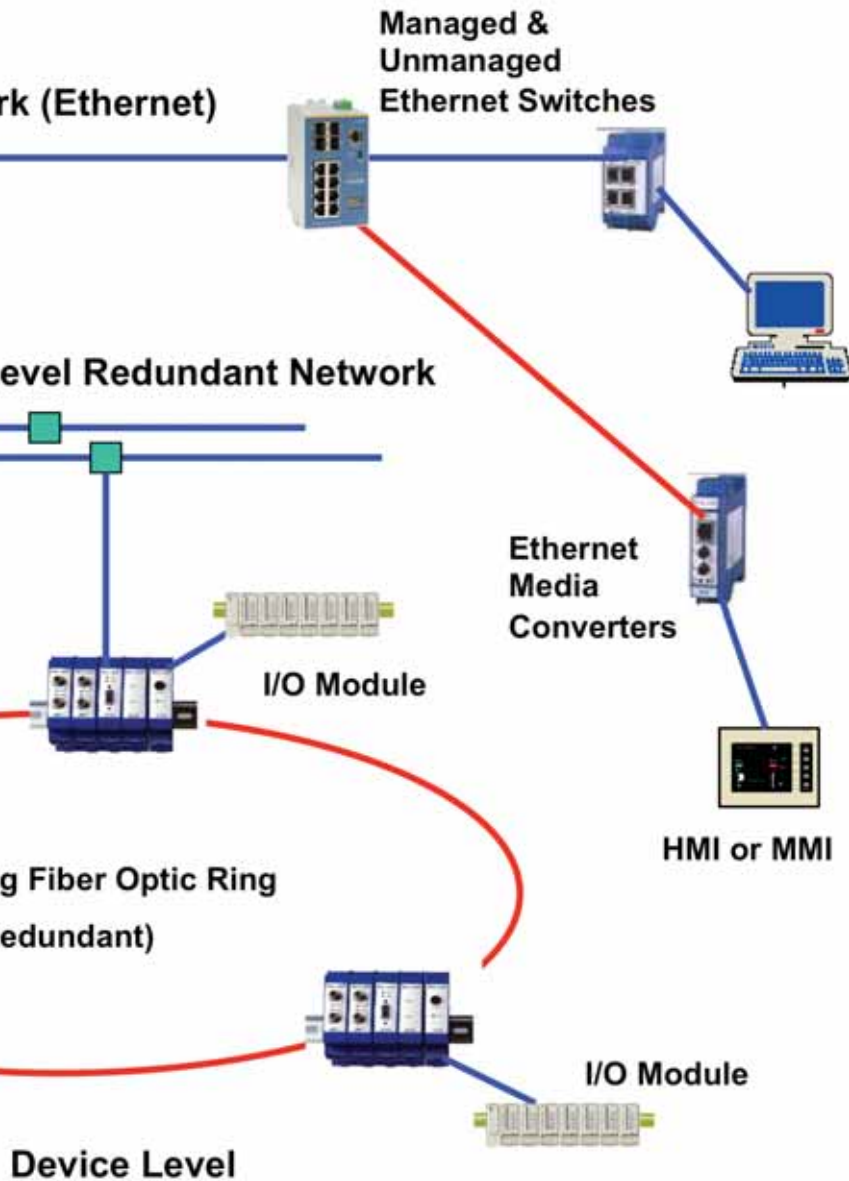
Why Fiber Optics?

Fiber optics can be found in many applications, from network backbones that power the Internet to manufacturing facilities, to subsea communication networks on drilling rigs. The information carrying capacity of an optical fiber is far greater than it is for copper wire, coaxial cables, and microwave links. Optical fibers are very small, lightweight, resist corrosion, and are immune to electrical noise from lightning storms and electromagnetic interference (EMI/RFI). In addition, fiber optic cables do not carry electrical energy and are approved for hazardous locations. The cost of fiber optic cable and its associated connectors and hardware has decreased steadily over the years. Today, the benefits of fiber optics can far outweigh the costs making fiber optic communications the preferred choice for industrial factory automation and process control networks.

Commercial vs. Industrial Fiber Optic Products

Most process plants and factories have unique requirements for communications networks that differ from those of a commercial network. Industrial network components must withstand harsher environmental conditions such as extreme temperature ranges, lightning strikes, electromagnetic interference, and hazardous locations just to name a few.

Mounting and space requirements are also an issue since industrial networking components must be mounted in the same control panel with other control equipment. At Ultra Electronics, Nuclear Sensors & Process Instrumentation, our goal is to meet the demanding requirements of industrial communication networks. The modular EOTec brand of industrially hardened fiber optic communication products addresses these issues and provides optimal solutions for factory automation and process control.

Managed &
Unmanaged
Ethernet Switches

rk (Ethernet)

evel Redundant Network

Ethernet
Media
Converters

I/O Module

g Fiber Optic Ring

edundant)

HMI or MMI

I/O Module

Device Level

Network Protocols

The PLC has been on the forefront of factory automation for several decades and there are many different network protocols in use today. Network protocols are either open or proprietary. Some prominent proprietary protocols supported by Ultra Electronics, Nuclear Sensors & Process Instrumentation are Rockwell Automation's DH+, Schneider Electric's Modbus Plus™ and GE Fanuc's Genius® Bus. Open protocols include Ethernet TCP/IP, Profibus and ControlNet™. Ultra Electronics, Nuclear Sensors & Process Instrumentation supports the most common protocols in use today for industrial PLC networks and Ethernet Connectivity.

Ethernet Connectivity

Ethernet is swiftly being adopted by the industrial automation and control industry. Ethernet addresses many of the requirements of proprietary PLC buses, with the added advantages of widespread usage and lower costs due to high volumes. Ultra Electronics, Nuclear Sensors & Process Instrumentation is continually developing new fiber optic products to support Ethernet and other emerging industrial network protocols.

EOTec 2000 Modular System

Power Supply Modules (PSM)

- 120/240 VAC, 125VDC or 24 VDC
- Optional Alarm Contacts
- Redundant Power Supply Capability
- Hot Swappable

Electrical Interface Module (EIM)

- Schneider Electric- Remote I/O, Modbus Plus
- Rockwell- Reliance R-Net, DH, DH+, DH-485, Remote I/O
- GE- Fanuc Genius Bus
- Open Protocols- ControlNet, RS-232/485, Profibus

Power Supplies

Power supplies for AC or DC power sources.

Electrical Interface Modules

Electrical Interface modules compatible with all major communications standards

Hot-Swappable, bus compatible Redundant Power Supplies with optional diagnostic outputs to eliminate single point of failure, reducing the risk of significant costly system down-time

Pluggable Screw Terminals or industry standard connectors for all copper cable connections

System diagnostic indicators for continuous monitoring during operation

35mm DIN-Rail mounting for compact efficient design with smaller space and less power

Lightweight interchangeable modules facilitate custom configurations, easy expansion and reconfiguration

Self-Healing Ring Module (SHR)

- Single & Dual- Channel Redundancy
- Largest selection of protocols supported

Optical Interface Modules (OIM)

- SMA or ST connectors
- Accepts 9, 50, 62.5, 100 and 200 μm fiber cable
- 850/1300 nm Multi-mode & 1300 nm Single mode
- Optional diagnostic output
- Up to 4 optical links per modem
- Single/Multi-mode conversion possible

Self-Healing Ring Modules

Patented Self-Healing Ring modules provide a "NO DATA LOSS" media redundancy

Optical Interface Modules

Cascade up to five optical engines on one power supply to achieve the popular STAR topology

Ethernet Connectivity

Ethernet to Fiber Media Converters, Switches

SMA or ST Connectors
Multi and Single Mode

Status indicators for functional optic/wire links and link activity indication

Continuous 4-20mA optical diagnostic output

SC or ST Connectors

Inter-module communications achieved via an integrated BUS-System, no external wiring
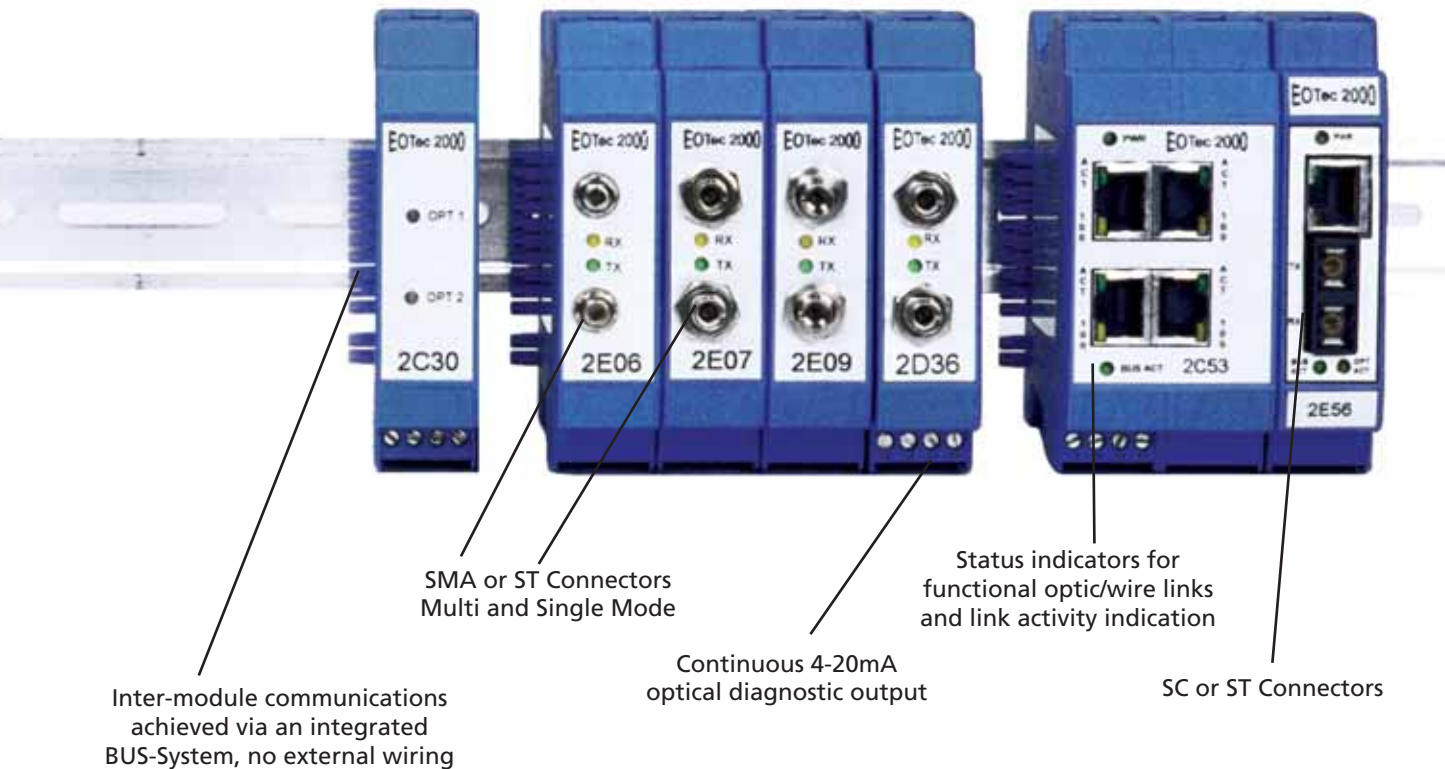
Network Topology capabilities beyond the limitations of wire-cable including Point-to-Point, Daisy Chain, Star and Self-Healing Ring

Optical and Electrical compatibility with most EOTec 6000 modems

7

EOTec 2000 Network Topologies

There are five basic network topologies possible with the EOTec 2000 system. Using these, many combinations can be created. Very similar topologies can be assembled with the other Ultra Electronics, Nuclear Sensors & Process Instrumentation fiber optic modems, the EOTec 6000.

Optical Repeater

Used for strengthening an EOTec optical signal that has traveled the maximum distance through a fiber optic cable. It is used for communicating over very long distances. In addition, this configuration can also convert multi-mode fiber to single mode, and vice versa.

Point-to-Point

Used to make simple connections from a PLC to a PLC or an I/O block.

PLC   PLC
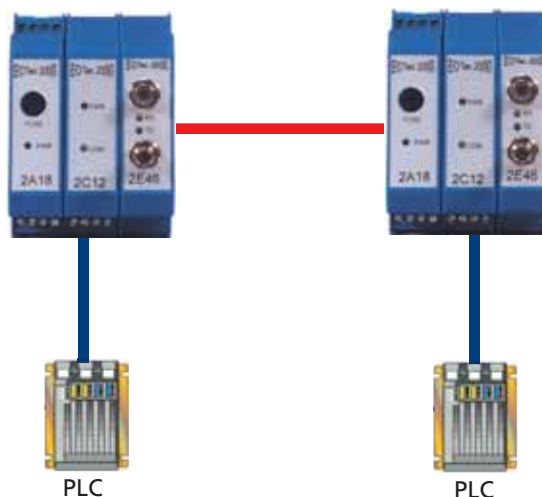
Daisy Chain

Used for multiple drops along a line.

PLC   PLC   PLC

Star Configuration

Used for branching from one point outward. As many as four branches can be made optically. A star system can be connected to another star system if more branches are required.

PLC

PLC   PLC   PLC   PLC
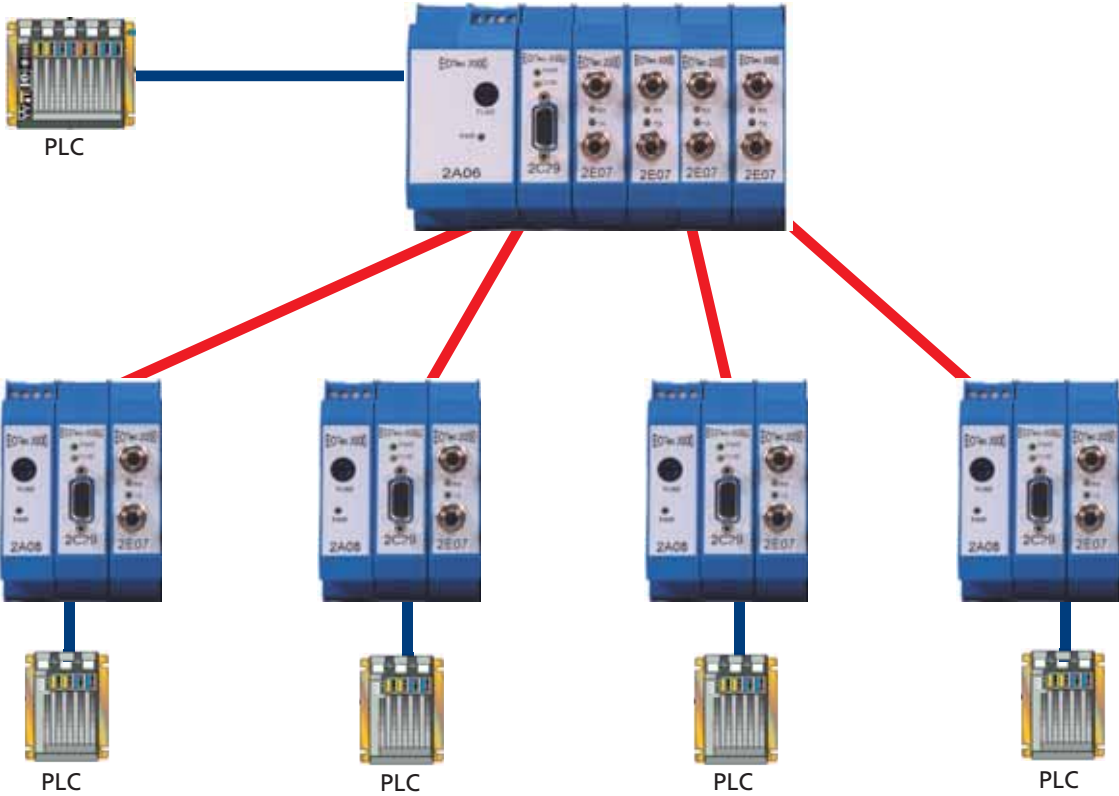
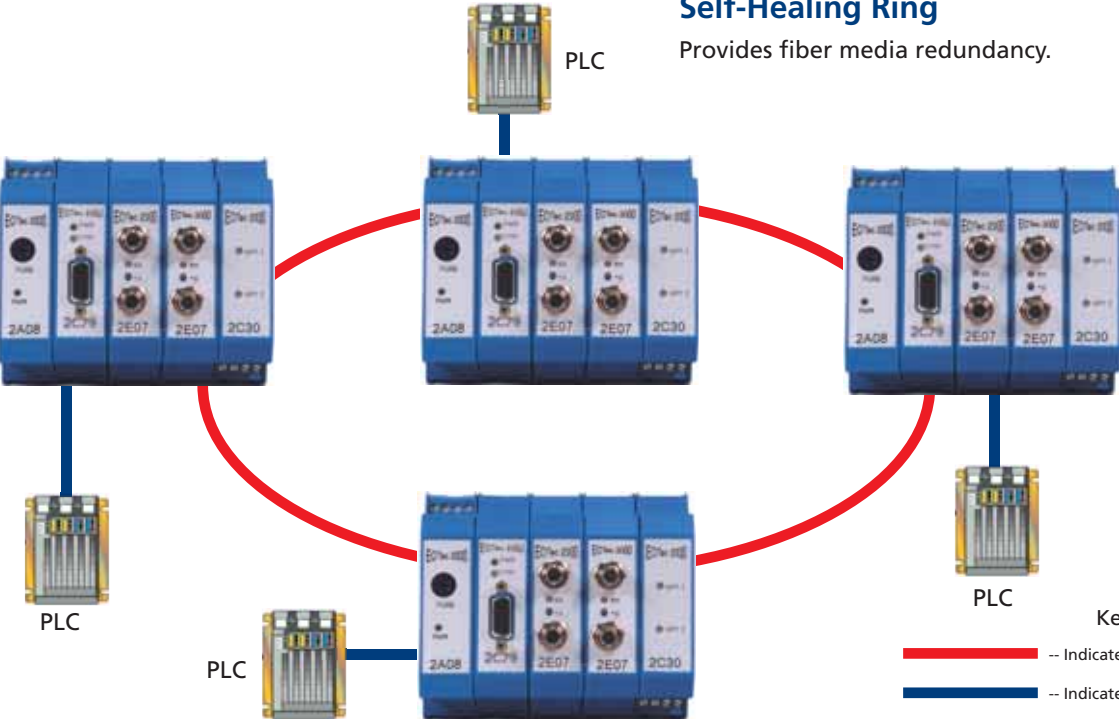## Self-Healing Ring

Provides fiber media redundancy.

PLC

PLC

PLC

PLC

PLC

Key

-- Indicates fiber optic cable

-- Indicates copper cable

9

Electrical Interface Modules

The Electrical Interface Module connects the EOTec 2000 system to factory networking communication devices. It provides electrical interface conditioning for data transmission over the fiber optic network.

The basic modem configuration consists of a Power Supply, an Electrical Interface, and an Optical Interface Module. However, additional modules may be added to configure Daisy Chain, Star and Self-Healing Ring topologies and provide redundancy.

RS-232
RS-485

Model Number	2C02	2C10
Protocol and extra features	GE Genius/Remote I/O	RS-232 or RS-485 Multi-drop
Communications Data Rate	153.6K Baud Extended	RS-232: 9.6K-115K Baud RS-485: 9.6K-230K Baud Half Duplex
Copper Cable Connector	Pluggable ScrewTerminal 12 to 24 AWG (0.5-2.4mm) Cage-Clamp	Pluggable Screw Terminal 12 to 24 AWG (0.5-2.4mm) Cage-Clamp
Copper Cable End Termination	User Supplied	RS-232: N/A RS-485: User Supplied
Maximum Devices and Copper Cable Length Supported per Module	32 Units, 3500ft (1km)	RS-232: 1 Unit, 50ft (15m) RS-485: 30 Units, 4000ft (1.2km)

Electrical Interface Modules - Common Features

Ambient Conditions: -40 to 85°C Operational, 0 to 95% Rel. Humidity Non-Condensing

Power Requirement (Bus): 9VDC @ 200mA Max per module

Power Indicator: Green LED

Communications Activity Indicator: Amber LED

Certifications: CE Marked, Class I, Division 2, Groups A, B, C & D (on selected models), US and Canada

Note: Ultra Electronics, Nuclear Sensors & Process Instrumentation is constantly developing new EOTec modules for different protocols. Please visit our website at www.ultra-nspi.com for an updated list of the most current modules.

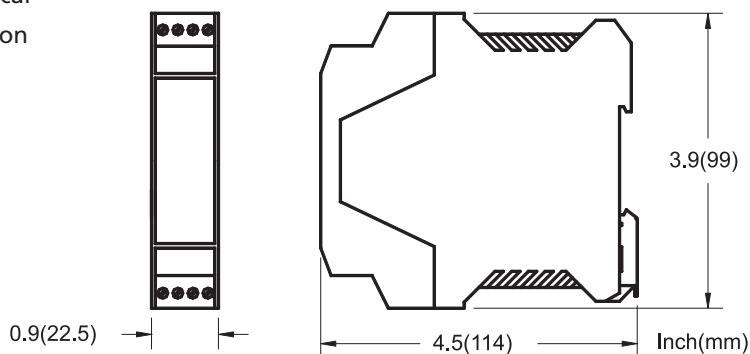| 2C14	2C29	2C22/2C23
Modicon Remote I/O	Modicon Modbus Plus	Profibus - DP 2C23 - Self-Healing Ring and External 24 VDC pwr.
1.54M Baud	1.0M Baud	9.6K, 19.2K, 45.45K, 93.75K, 187.5K, 500K, 1.5M, 3.0M, 6.0M and 12.0M
F-Type	DB-9 Pin	DB-9 Pin
Internal, 75 Ohms	User Supplied	User Supplied
Per Modicon Remote I/O Specifications	Per Modbus Plus Specifications	Per Profibus Specifications

Mechanical Specifications:

Single-width EOTec 2000 Modules
(Includes most Electrical and Optical
Modules). See Power Supply section
for double-width dimensions.
Mounting: 35mm DIN Rail
Weight: <9oz (250g)

0.9(22.5)

3.9(99)

4.5(114)   Inch(mm)

Rockwell Automation
Encompass™ Product Partner
Americas • Asia-Pacific

ControlNet™

Model Number	2C12	2C15	2C20
Protocol and extra features	A-B DH & DH+ & Remote I/O	A-B DH-485	ControlNet
Communications Data Rate	57.6K, 115.2K and 230.4K Baud Jumper selectable	19.2K Baud	5.0M Baud
Copper Cable Connector	Pluggable Screw Terminal 12 to 24 AWG (0.5-2.4mm) Cage-Clamp	Pluggable Screw Terminal 12 to 24 AWG (0.5-2.4mm) Cage-Clamp	BNC
Copper Cable End Termination	User Supplied	User Supplied	User Supplied
Maximum Devices and Copper Cable Length Supported per Module	60 Units, 10,000ft (3km)	Per DH-485 Specifications (32 Devices/4000 ft.)	Per ControlNet Specifications

Electrical Interface Modules - Common Features

Ambient Conditions: -40 to 85°C Operational, 0 to 95% Rel. Humidity Non-Condensing

Power Requirement (Bus): 9VDC @ 200mA Max per module

Power Indicator: Green LED

Communications Activity Indicator: Amber LED

Certifications: CE Marked, Class I, Division 2, Groups A, B, C & D (on selected models), US and Canada
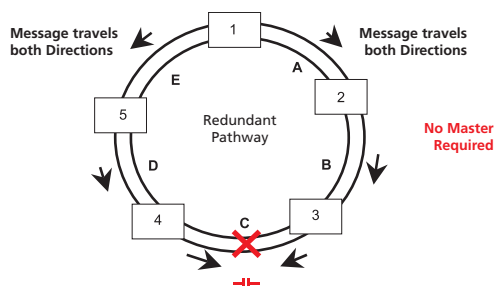
CE

2C30 Self-Healing Ring Module

A Self-Healing Ring (SHR) Module provides fiber media redundancy when utilized in each node or drop of a fiber optic ring-network. The SHR Module detects and redirects data to the secondary fiber path when a break in the fiber occurs between two adjacent nodes. The SHR automatically resets when the fiber path has been restored. Visible LED indicators in conjunction with relay contacts provide local and remote monitoring of the integrity of the fiber optic network.

Model Number	2C30
Description	SHR for PLC Networks (except ControlNet and Profibus)
Communications Data Rate	9.6K to 2M Baud
Hazardous Locations Certification	FM Approved Class I Division 2, Groups A, B, C & D
Compatible Electrical Modules	2C02, 2C10, 2C12, 2C14, 2C15, 2C29

Self-Healing Ring Topology

The use of fiber optic technology to replace copper communications cable provides many advantages for industrial control applications. In addition to EMI/RFI immunity, the ability to run fiber optic cable through hazardous areas and long distance communication runs, another benefit is the ability to achieve media redundancy without incurring the cost of duplicate hardware systems. By using the Ultra Electronics, Nuclear Sensors & Process Instrumentation Self-Healing Ring solution, a critical system can achieve uninterrupted communications, even in the event of a failure in the fiber optic communication lines.

Message travels both Directions

Message travels both Directions

Redundant Pathway

No Master Required

1 2 3 4 5 A B C D E

The configuration of a Self-Healing Ring modem consists of a Power Supply, an Electrical Interface, a Self-Healing Ring Module and two Optical Interface Modules. Inter-module communications and operating power is achieved through the integrated module backplane connections.

Features of the 2C30 module include:

- Independent of fiber optic cable size, communications protocol or baud rate
- Eliminates down time from fiber failure
- Fast network transparent fiber path switching
- System diagnostic indicators during operation
- Easy add-on upgrade to existing EOTec 2000 systems

Self Healing Ring Modules - Common Specifications

Status Indicator (Bi-color LED)	Green: Functional Optic Link Red: Loss of Optical Link
Relay Contact Rating:	175VDC, 0.25A Switching, 1A Continuous
Relay Connection:	Pluggable Screw Terminal, 12 to 24 AWG(0.5-2.4mm), Cage-Clamp
Ambient Conditions:	-40 to 85°C Operational, 0 to 90% Rel. Humidity, Non-Condensing

How it Works

The Ultra Electronics Patented Self-Healing Ring Module (SHR) provides fiber media redundancy when utilized in each node or drop of a fiber optic ring-network. Data will always be routed on the shortest possible path to reduce propagation delay through the system. The SHR accomplishes this by creating a "virtual" break in the ring at the link farthest from the originating node - please refer to the figure below. If Node 1 is the originating node of a message, a virtual break will be created on the fiber link C. If Node 2 is the originating node of a message, then a virtual link will be created on fiber link D. This virtual break is created on a packet by packet basis. The network therefore behaves as if it were in a Daisy Chain, preventing the delivery of the same packet to any node twice. When a real fiber break actually does occur, the SHR devices detect the break and a virtual break is no longer created since the real fiber break has done the function of putting the system into a Daisy Chain. The SHR automatically resets when the fiber path has been restored. Visible LED indicators in conjunction with relay contacts provide local and remote monitoring of the integrity of the fiber optic network.

CE

ControlNet Single and Dual Channel Self-Healing Ring Redundancy

The 2C31 and 2C32 ControlNet Self-Healing Ring Modules are designed to provide reliable operation in the harsh environments typically found in industrial, process and petrochemical applications. As shown on the following page in figures 1-1 (single ring) and 1-2 (dual ring), Ultra Electronics offers various solutions for creating redundant communication topologies. It's simple to create the ControlNet communication ring that meets your specific needs, both for single channel redundancy and for dual ring redundant applications. You can also combine ring topologies with existing point-to-point, daisy-chain and star topologies into one seamless network. Both the 2C31 and 2C32 support multi mode fiber for short to medium distances and single mode fiber for greater transmission distances.

Model 2C32

Remote Link Alarm Relay
Sets an alarm when the dual channel link has a communication fault

Dual Remote Power Alarm Relays
Sets an alarm when either input has a power fault

Dual +15 to 30VDC Power Inputs
Dual power inputs to insure a constant power source

Dual Channel Link Cable
Easily connects communication between optic fiber rings

Remote Global Alarm Relay
Sets a single alarm when any power or communication fault occurs in either fiber communication ring

Fiber 1 and Fiber 2 Remote Alarm Relays
Sets an alarm when either optic fiber has a communications fault

Real Time 4-20mA Outputs
Measures light intensity on both Fiber 1 & 2 to report real time optical fiber deterioration

High Resolution LEDs
Simplify local diagnostics

Standard ControlNet BNC
For a quick connection into any network

Small Form-Factor Pluggable (SFP)
Easy to remove 1310nm Fiber Optic Transceivers for both Single Mode and Multi-Mode applications

Ordering Information

Self-Healing Ring Modules (SHR):

- 2C31-LC-MM/MM   ControlNet™ Self-Healing Ring (SHR) Fiber Optic Communication Module, Multi-mode, LC connector
- 2C31-LC-SM/SM   ControlNet™ Self-Healing Ring (SHR) Fiber Optic Communication Module, Single Mode, LC connector

Dual Self-Healing Ring Modules (DSHR):

- 2C32-LC-MM/MM   ControlNet™ Dual Self-Healing Ring (DSHR) Fiber Optic Communication Module, Multi-mode, LC connector
- 2C32-LC-SM/SM   ControlNet™ Dual Self-Healing Ring (DSHR) Fiber Optic Communication Module, Single Mode, LC connector
- 2LNK-1M   Link cable for 2C32, 1 meter

EOTec 2C31 ControlNet Self-Healing Ring (SHR)
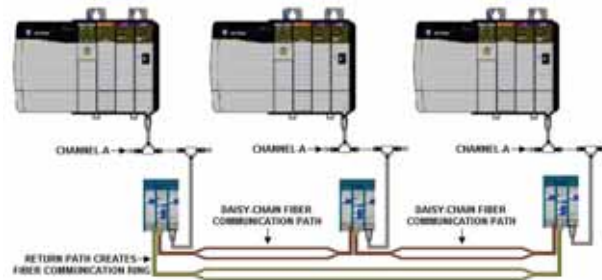
Figure 1-1

In ring topologies, an additional fiber path is added (shown in figure 1-1) to insure that communication is maintained should a fiber break occur. In a dual chain system (see figure 1-2), there is one fiber ring to support Channel-A and an entirely separate fiber ring to support Channel-B. The DSHR also provides a third or tertiary path to increase redundancy for network systems that cannot afford any unscheduled down time.

EOTec 2C32 ControlNet Dual Self-Healing Ring (DSHR)

Figure 1-2

15

Optical Interface Modules

Optical Interface Modules connect the EOTec 2000 modems to the fiber optic cable network, and transfer network data between nodes. Cascade different optical modules in a single modem stack and optically link modems utilizing 850/1300nm optical wavelengths, Multi-mode or Single mode fiber, and SMA or ST* connectors. Two optical modules can be used in one modem to form an optical repeater or to configure an optical daisy chain. Up to five optical modules can be cascaded in one modem to establish an optical star netwo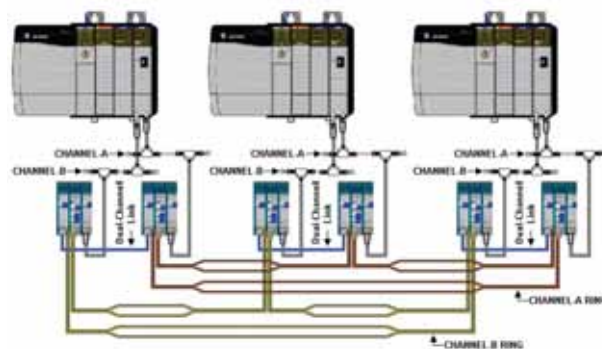rk system. Two optical modules combined with a Self-Healing Ring module provide optical media redundancy in critical applications. A maximum combination of five optical or electrical modules may be connected together in one modem stack. Inter-module communications and operating power is achieved through the integrated module backplane connections.

The basic modem configuration consists of a Power Supply Module, Electrical Interface Module, and an Optical Interface Module.

ST is a trademark of AT&T.

Model Number	2E06/2D06	2E07/2D07
Optical Wavelength	850nm	850nm
Optical Mode	Multi-mode	Multi-mode
Communications Data Rate	9.6K to 12M Baud	9.6K to 12M Baud
Optical Port Connection	SMA Compatible	ST Compatible
Optical Dynamic Range	21dB into 200/230µm	21dB into 200/230µm 12dB into 62.5/125µm 9dB into 50/125µm
Diagnostic Output 4-20 mA	2D06 only	2D07 only

Optical Interface Modules - Common Features

Ambient Conditions: -40 to 85°C Operational, 0 to 95% Rel. Humidity Non-Condensing

Emitter Type: Infrared LED - IEC 60825-1 Class 1 LED Products, FDA 21CFR1040.10 & 1040.11

Power Requirement (Bus): 9VDC @ 200mA Max per module

Optical Transmit Indicator: Green LED

Optical Receive Indicator: Amber LED

Certifications: CE Marked, Class I, Division 2, Groups A, B, C & D (on selected models), US and Canada

Diagnostic Output (2Dxx): 4-20mA

2E10/2D10	2E09/2D09	2E36/2D36	2E46/2D46
850nm	1300nm	1300nm	1300nm
Multi-mode	Multi-mode	Single Mode	Single Mode
9.6K to 12M Baud	9.6K to 12M Baud	9.6K to 12M Baud	9.6K to 12M Baud
ST Compatible	ST Compatible	ST Compatible	ST Compatible
23db into 200/230µm 17dB into 62.5/125µm 14dB into 50/125µm	12dB into 62.5/125µm 9dB into 50/125µm	10dB into 9/125µm	16dB into 9/125µm
2D10 only	2D09 only	2D36 only	2D46 only

2Dxx Optical Modules with 4-20mA Diagnostic Output:

(xx designates last two digits of Model Numbers)

2Dxx optical modules provide a full diagnostic output (4-20mA). The output is internally powered and is proportional to the received optical power. The output can be monitored and processed continuously in order to insure the integrity of the fiber optic link. This is beneficial for critical applications such as subsea networking where degradation of the optical signals can be detected before a complete loss of communication occurs. An output less than 4mA indicates loss of optical signal. A pluggable screw terminal connection on the bottom front of the module provides easy access to the output signal.

Power Supply Modules

The EOTec Power Supply Modules supply operating power to the EOTec 2000 modules. Several different universal modules are available to conform to a wide variety of power sources typically found in industrial control panel applications where wall mounted power supplies are unacceptable. Mix and match to provide the option of "Hot-Swappable" dual power supplies with diagnostic outputs, eliminating «Single Point of Failure» locations in the network.

The basic modem configuration consists of a Power Supply Module, Electrical Interface Module, and an Optical Interface Module.

Approved
Class I, Division 2
Groups A, B, C & D

Model Number	2A06/2A16	2A08/2A18	2A56
Input Power Range	90 to 250VAC, 50/60Hz, 250mA 120 to 250VDC, 250mA	24 VDC ± 20%, 400mA	90 to 250VAC, 50/60Hz, 250mA 120 to 250VDC, 250mA
Operating Power Output	Regulated, 9VDC 1.1A max	Regulated, 9VDC 1.1A max	Regulated, 9VDC 24 VDC, 425mA max
Input Fuse Type	400 mA slow-blow	400 mA slow-blow	400 mA slow-blow
Compatibility	All bus powered modules except FOT/FOR	All bus powered modules except FOT/FOR	Fiber Optic Transmitter Fiber Optic Receiver (FOT/FOR)
Ambient Conditions	-40 to 85°C Operational 0-95% Rel. Humidity Non-Condensing	-40 to 85°C Operational 0-95% Rel. Humidity Non-Condensing	-40 to 85°C Operational 0-95% Rel. Humidity Non-Condensing
Diagnostic Output Form-C Relay	2A16 only	2A18 only	

Power Supplies with
Diagnostic Alarm Relay Contacts:
The 2A16 and 2A18 are power supplies with diagnostic alarm relay contacts accessible via screw terminals on the bottom front of the module. Relay Contact Ratings: Form-C, 175VDC, 1A continuous.

3.9(99)

1.8(45)   4.5(114)   Inch(mm)
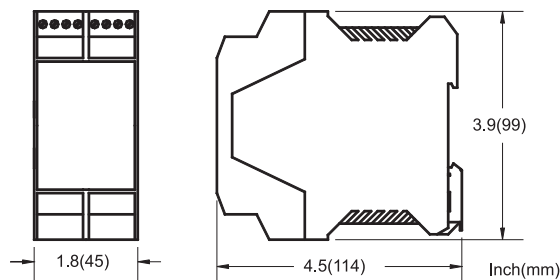
EOTec 2000 Power Supply Selection Chart

(xx designates last two digits of Model numbers)

Model #	Module Description
2C02	GE Genius Remote I/O
2C07	Reliance R-Net Remote I/O
2C10	RS-232/485
2C12	Allen Bradley DH+ & Remote I/O
2C14	Modicon Remote I/O
2C15	Allen Bradley DH-485
2C20	ControlNet
2C22	Profibus - DP
2C29	Modicon Modbus Plus
2C30	Self-Healing Ring for PLC networks except ControlNet, DeviceNet, and Profibus
2E06/2D06	Optical Module
2E07/2D07	Optical Module
2E09/2D09	Optical Module
2E10/2D10	Optical Module
2E36/2D36	Optical Module
2E46/2D46	Optical Module
2E54	Switched Media Converter 10/100 Base-T
2E56	Switched Media Converter 10/100 Base-T
2E58	Switched Media Converter 10/100 Base-T
2E60	Switched Media Converter 10/100 Base-T
2C52	Ethernet Switch 10/100 Mbps

2A06/2A16   2A08/2A18

OR

**The following modules can also be powered from a nominal 24VDC source via pluggable screw terminal blocks.
They will then provide operating power to any bus interconnected modules.**

2C23	Profibus with Self-Healing Ring
2C53	Ethernet Switch 10/100 Base-T
2E55	Switched Media Converter 10/100 Base-T
2E57	Switched Media Converter 10/100 Base-T
2E59	Switched Media Converter 10/100 Base-T
2E61	Switched Media Converter 10/100 Base-T
2Mxx	Multiplexer
2Hxx/2Kxx	Multi-Channel CC/Output Module
2Sxx/2Pxx	Multi-Channel CC/Input Module
CC	New Multi-Channel Contact Closure

2A06/2A16   2A08/2A18

OR   OR   External 24 VDC

2Txx	FOT Analog Link
2Rxx	FOR Analog Link

2A56

OR   External 24 VDC

Analog Data Links

The modular EOTec 2000 fiber optic analog data link provides reliable EMI/RFI and lightning immune transmissions of 4-20mA and 0-10VDC signals over a single fiber optic cable. It is an ideal solution for long run cable problems and has a system accuracy of 0.1%. Each transceiver has a single optical port which can be factory configured for multi-mode or single mode fiber optic cable at 850 nm or 1300 nm using industrialized ST/SMA connectors. LED indicators are provided for Power, Over Range, Under Range and LOCK conditions. The fiber optic receiver (FOR) has additional outputs for signal LOCK and OVER RANGE conditions that can be used to light a remote warning, engage a relay or provide go/no-go information to computer control systems. The FOT/FOR will accept power from an external 24VDC source connected directly to a pluggable screw terminal, or from a 120/240VAC power source when using the EOTec 2A56 Universal Power Supply. Applications for this device include long distance transmissions, lightning prone areas and transmissions through hazardous areas.

Model Number	Description*	Analog Signal	Wavelength	Optical Dynamic Range into 200/230 µm	Optical Dynamic Range into 62.5/125 µm	Optical Dynamic Range into 9/125 µm	Mating Receiver	Optical Mode	Fiber Connector
2T06	FOT	0-10VDC	850nm	37dB	N/A	N/A	2R06	MM	SMA
2T07	FOT	0-10VDC	850nm	37dB	25dB	N/A	2R07	MM	ST
2T09	FOT	0-10VDC	1300nm	37dB	25dB	N/A	2R09	MM	ST
2T10	FOT Hi-power	0-10VDC	850nm	43dB	31dB	N/A	2R07	MM	ST
2T12	FOT	4-20mA	850nm	37dB	N/A	N/A	2R12	MM	SMA
2T14	FOT	4-20mA	850nm	37dB	25dB	N/A	2R14	MM	ST
2T18	FOT	4-20mA	1300nm	37dB	25dB	N/A	2R18	MM	ST
2T20	FOT Hi-power	4-20mA	850nm	43dB	31dB	N/A	2R14	MM	ST
2T36	FOT	0-10VDC	1300nm	N/A	N/A	21dB	2R09	SM	ST
2T46	FOT Hi-power	0-10VDC	1300nm	N/A	N/A	29dB	2R09	SM	ST
2T72	FOT	4-20mA	1300nm	N/A	N/A	21dB	2R18	SM	ST
2T92	FOT Hi-power	4-20mA	1300nm	N/A	N/A	29dB	2R18	SM	ST
2R06	FOR	0-10VDC	850nm					MM	SMA
2R07	FOR	0-10VDC	850nm					MM	ST
2R09	FOR	0-10VDC	1300nm					MM/SM	ST
2R12	FOR	4-20mA	850nm					MM	SMA
2R14	FOR	4-20mA	850nm					MM	ST
2R18	FOR	4-20mA	1300nm					MM/SM	ST

* FOT: Fiber Optic Transmitter; FOR: Fiber Optic Receiver

Specifications Analog Data Links

Power Requirements: 12 to 30VDC at 400mA, or 120/240VAC to a 2A56 Power Supply

Input/Output Signals: 4-20mA or 0-10VDC

Wire Cable Connections: De-Pluggable, Cage-Clamp, Screw Terminal, accept 12 to 24 AWG

System Accuracy (FOT+FOR): ± 0.1% of span typical

System Response Time (FOT+FOR): < 2 ms (10% to 90% input step change) transfer rates to 800Hz

Additional Outputs (FOR):   OVER RANGE, output terminal turns on when analog signal supplied to transmitter is above
normal input range, open collector 5-30VDC @ 5mA

LOCK, output terminal turns on when FOR receives adequate light input from the FOT via fiber,
open collector 5-30VDC @ 5mA

LED Indicators: Green   - LOCK, receiving adequate optical signal strength from transmitter (FOR)

- PWR, power is applied to transmitter (FOT)

Red   - OVR, analog input signal at the mated transmitter is above 10VDC/20mA

- LOW, analog input signal is below 0VDC/4mA

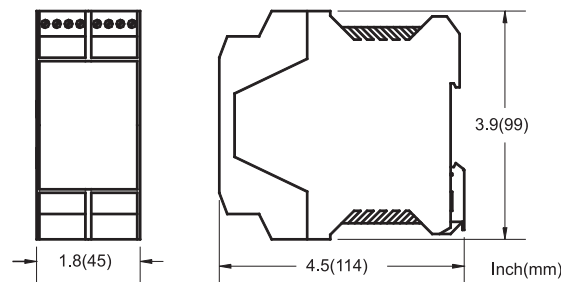**Ambient Conditions:**   - 40°C to 85°C Operational

- 0 to 95% Relative Humidity, Non-Condensing

Mounting: 35mm DIN-Rail

Weight/Unit: < 9oz (250g)

Housing Material: Plastic (UL94V-0)

Dimensions

1.8(45)   4.5(114)   Inch(mm)   3.9(99)

Power Supply Option - 2A56 - Power Supply, 90-250VAC, 50/60Hz or 120-250VDC

Features:

- No calibration required
- Transmission of 4-20mA or 0-10VDC analog signals over a single fiber optic cable
- Configurable with multi-mode or single mode optical fiber
- Alarm outputs provided for signal LOCK and OVR (over range) conditions
- Available with dual redundant, hot swappable power supplies

Fiber Optic Analog Data Link - Application Diagram

0-10 VDC Signal

2T46 Fiber Optic Transmitter (FOT)

9/125µm Single Mode Fiber Optic Cable up to 60 km distance

2R09 Fiber Optic Receiver (FOR)

0-10 VDC Signal

PLC

Key

-- Indicates fiber optic cable

-- Indicates copper cable
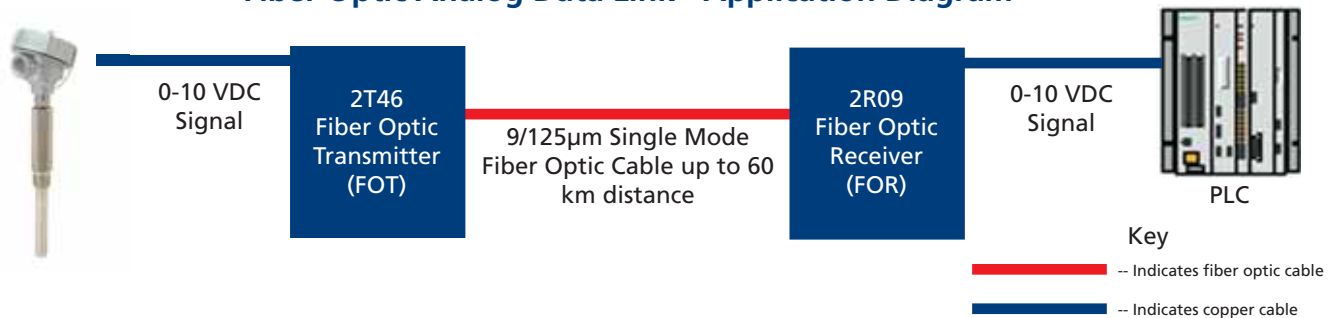
Multi-Channel Contact Closure

The EOTec 2000 fiber optic Multi-Channel Contact Closure modules are used to convert up to 10 contact closure inputs (switches, relays, etc.) into fiber optic signals for transmission over a single fiber optic link. Upon activation of the inputs, the receiver module receives the transmitted signals and de-energizes a corresponding, on-board relay operating in a fail-safe mode for switching critical systems.

Each transmit module includes two inputs and is capable of multiplexing up to 10 inputs by cascading additional dual channel input modules. An integrated backplane allows for communications between modules with no external intermodular connection. Power to all modules is derived from any standard EOTec 2000 power supply through the integrated BUS connector or from an external 24VDC source supplied directly to the transceiver module. New models carry CE, Class I, Div 2, Groups A, B, C and D. ATEX Zone-2, Category 3.
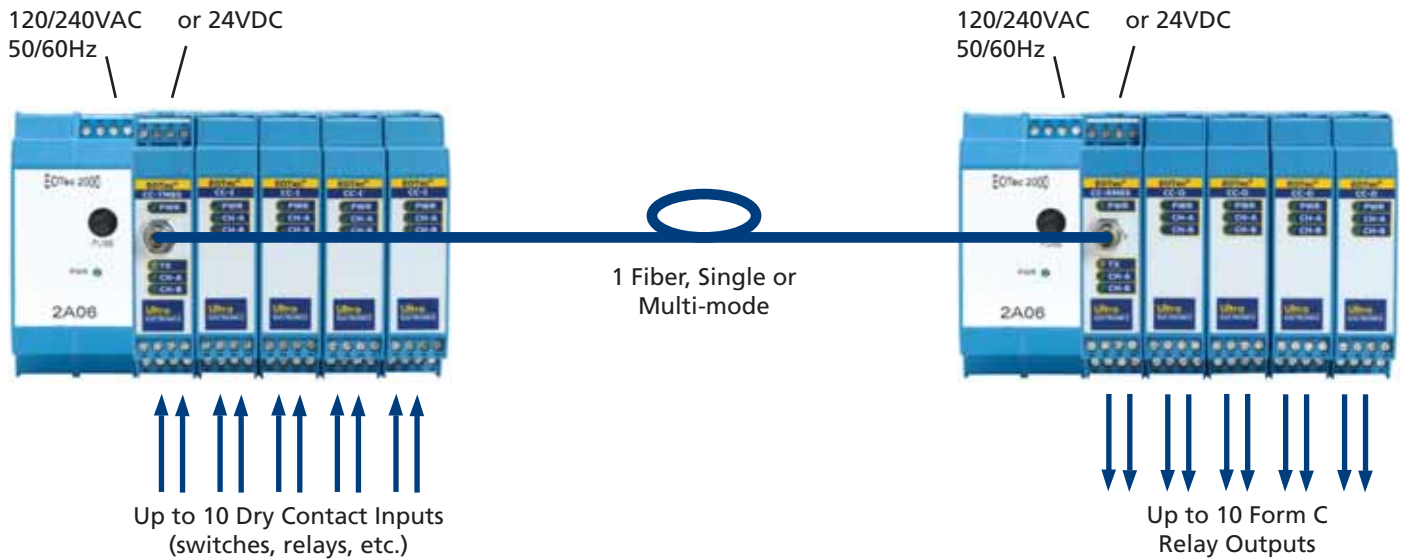
New Model	Legacy Model	Description	Optical Dynamic Range	Input/Output Type	Fiber Connector
CC-TM85	2S07	2-Channel, 850 nm, Multi-mode, Transmitter	12 dB	Dry Contact Input	ST
CC-TM13	2S09	2-Channel, 1300 nm, Multi-mode Transmitter	12 dB	Dry Contact Input	ST
CC-TM85H	2S10	2-Channel, 850 nm, Multi-mode Transmitter	17 dB	Dry Contact Input	ST
CC-TS13	2S36	2-Channel, 1300 nm, Single-mode Transmitter	10 dB	Dry Contact Input	ST
CC-TS13H	2S46	2-Channel, 1300 nm, Single-mode, Transmitter	16 dB	Dry Contact Input	ST
CC-RM85	2H07	2-Channel, 850 nm, Multi-mode, Receiver		Form C Relay Output	ST
CC-RX13	2H09	2-Channel, 1300 nm, Receiver (Multi-mode or Single mode)		Form C Relay Output	ST
CC-I	2P02	2-Channel, Input Module		Dry Contact Input	N/A
CC-O	2K02	2-Channel, Output Module		Form C Relay Output	N/A

New and legacy MCCC product families are not interoperable.

Specifications Multi-Channel Contact Closure

Power Requirements: 7.5 VDC via the BUS interconnections (from any EOTec 2000 power supply module)or 12 to 30VDC
@ 400mA, via a pluggable, screw terminal block on the CC-T/CC-R module

Relay Contact Output: SPDT Form C relay, via Pluggable Screw Terminal, 12 to 24 AWG(0.5-2.4mm) Cage-Clamp
60W, 125VA, maximum switching power
220VDC, 250VAC, maximum switching voltage
2A switching, 3A carry, maximum current
100,000,000 cycles, minimum operational life

Contact Closure Input: External Dry contacts connected via pluggable, screw terminal blocks
Accepts 12 to 24 AWG, 5VDC @ 1.4mA min. contact rating, 1K ohm max. resistance

LED Status Indicators: Power On Green, Ch. A Relay energized/input contact closed Green, Ch. B Relay
energized/contact input closed Green, Fiber Transmit - Amber

Data Update Rate: 15mS regardless of the number of channels utilized

Ambient Conditions: -40°C to 85°C Operational

Multi-Channel Contact Closure - Application Diagram

120/240VAC   or 24VDC
50/60Hz

120/240VAC   or 24VDC
50/60Hz

1 Fiber, Single or
Multi-mode

Up to 10 Dry Contact Inputs
(switches, relays, etc.)

Up to 10 Form C
Relay Outputs

Features/Benefits:

- Modular design for transmitting 2 to 10 contact closure signals
- Fail-safe operation
- Electrical isolation
- Reliable EMI, RFI free communications
- Cost-effective, low maintenance installation
- Available with dual redundant, hot swappable power supplies
- Designed for mounting on standard 35 mm DIN-Rail

Applications:

- Safety shutdown systems
- Remote transmission over long distances (up to 16 miles)
- Transmission through hazardous areas
- Alarm event triggering

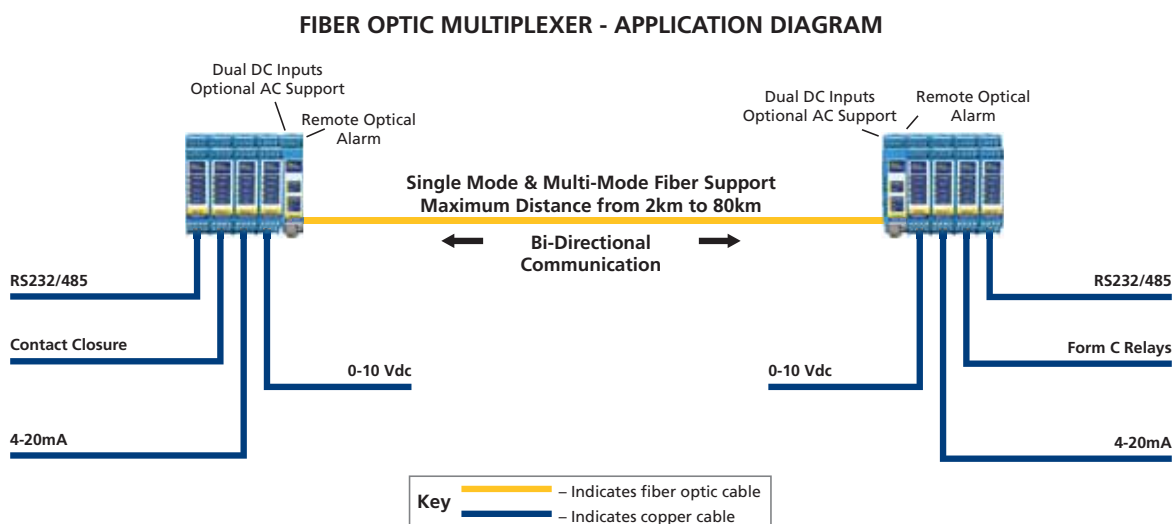| Condition	CC-R/CC-O Output Relay
1. Normal Condition, input closed	Channel relay Energized
2. Normal Condition, input open	Channel relay De-energized
3. Loss of power at TX	All channel relays De-energized
4. Loss of power at RX	All channel relays De-energized
5. Fiber loss (or disconnected)	All channel relays De-energized
6. Component failure at CC-T	All channel relays De-energized
7. Component failure at CC-R	All channel relays De-energized
8. Component failure on input module (CC-I)	Both channel relays De-energized
9. Component failure on output module (CC-O)	Both channel relays De-energized
10. Input module disengaged from backplane	Both channel relays De-energized

MX Series Multiplexers

EOTec 2000 Multiplexers can send up to sixteen channels of bi-directional electrical information over a pair of fiber optic cable. Input/Output module selections include 4-20mA, 0-10VDC, contact closure and RS-232/485. The base unit connects directly to the fiber optic cable and provides a visual indication of the fiber link status. Each base unit has a duplex optical port configured for use with 1300nm wavelength, multi-mode or single mode optical fiber. An integrated backplane allows for communications from the base unit to the input/output modules with no external inter-modular connection. No programming is required. Power is supplied through an external 24VDC power supply. Applications for Ultra Electronics fiber optic Mulitplexers include remote analog data acquisition, Continuous Emissions Monitoring Systems at coal fired power plants, data transmission on wind turbines and signal transmission in lightning prone locations and hazardous areas. See complete information on the web at www.ultra-nspi.com.

Overview

- MX Multiplexer Base Unit supports up-to 16 channels
- I/O Modules are available in 2 and 4 channel versions
  - o Maximum number of I/O modules per optical side - 4
  - o Maximum number of I/O devices per optical side - 16
- SFP Transceivers with LC connectors and patch cords available

Technical Solutions and Concepts

FIBER OPTIC MULTIPLEXER - APPLICATION DIAGRAM

Dual DC Inputs
Optional AC Support

Remote Optical
Alarm

Dual DC Inputs
Optional AC Support

Remote Optical
Alarm

Single Mode & Multi-Mode Fiber Support
Maximum Distance from 2km to 80km

Bi-Directional
Communication

RS232/485

Contact Closure

0-10 Vdc

0-10 Vdc

RS232/485

Form C Relays

4-20mA

4-20mA

Key — Indicates fiber optic cable
— Indicates copper cable

Signal Conversion Between I/O Modules

- 4-20mA module communicates and translates to 0-10Vdc module
- 0-10Vdc module communicates and translates to 4-20mA module
- RS232 and RS485 modules communicates to each other
- Dry Contact Input with Form-C Relay Output

Product Specifications

MX Base Module:

- Requires +15-30VDC input
  - o The Base passes +15-30Vdc to all I/O modules on the backplane
  - o Improved internal power distribution and reduced I/O module cost
- Alarm Output Relay
  - o Form-C (SPST)
  - o 1A @30Vdc
- Update Rate= 115.2kHz (8.68μs)
- LC style optical connector
  - o Adapter cables available
- Fiber Type
  - o Multimode- 2km
  - o Single-mode- 15, 40, 80km

RS-232/485 Module:

- Bi-directional Serial Communications
  - o RS-232: Half or Full Duplex
  - o RS-485: Half Duplex only
  - o RS-232 to RS-485: Half Duplex
- Baud Rates: 9.6k to 230.4k
- Maximum Devices
  - o RS-232: 1 device per 50ft (15m)
  - o RS-485: 30 devices per 2,000ft (600m)

4-20mA I/O Modules:

- Normal Operating Range
  - o 3.8 to 20.5mA
- Input Impedance 50 Ohms
- Max Loop Resistance 600 Ohms
- A to V Conversion
  - o 4mA = 0V; 20mA = 10V
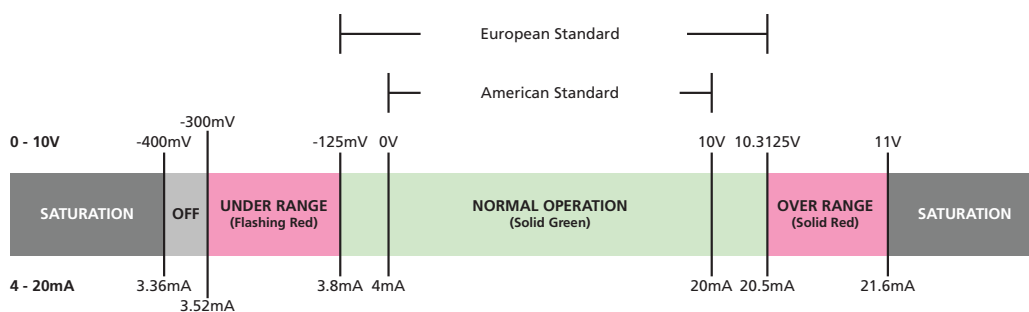 - o Scale: 1mA = 0.625V

0-10Vdc I/O Modules:

- Normal Operating Range
  - o 125mV to 10.3125V
- Input Impedance 7G Ohms
- Min. Output Resistance 40 Ohms
- A to V Conversion
  - o 0V = 4mA; 10V = 20mA
  - o Scale: 1V = 1.6V

All Analog I/O Modules:

- Signal Resolution = 16 bit
- Reference Accuracy = 0.01% @ 25°C
- Ambient Temp. Effect = 0.08%/50°C change

Meets International Specification

Contact Closure Input Modules:

- Input: Dry Contact (Relay, Switch)
- Max Input Resistance 1K Ohms
- Input Contact Rating:
  - o +3.3Vdc @ 1.4mA (min.)

Contact Closure Output Modules:

- Output Relay: Form-C (SPDT)
- Output Contact Rating:
  - o 220Vdc; 250Vac
  - o 2A Continuous
  - o 2A Switching

Regulatory Certifications

- CE
- Class I, Division 2, Groups A, B, C, D for the US and Canada
- ATEX, Zone-2, Category-3

Operating Temperature

- -40 to 85°C; 0 to 95% Humidity (Non-condensing)

Mounting

- All MX Multiplexer Modules mount on a 35mm Din Rail

Part Number Scheme

	New Model	Description	Transceiver	Mode	Connector	Max Distance	Legacy Model
Base/Optics	**MXB-MM2**	Multiplexer, Base Unit, 1300nm	SFP	MM	LC	2k	**2M55/2M57**
	MXB-SM15	Multiplexer, Base Unit, 1300nm	SFP	SM	LC	15k	**2M59**
	MXB-SM40	Multiplexer, Base Unit, 1300nm	SFP	SM	LC	40k	**2M61**
	MXB-SM80	Multiplexer, Base Unit, 1300nm	SFP	SM	LC	80k	
Contact Closure	**MXCC-IP2**	Contact Closure In - 2 channels					**2M13**
	MXCC-IP4	Contact Closure In - 4 channels					
	MXCC-OP2	Contact Closure Out (Form-C Relay) - 2 channels					**2M23**
	MXCC-OP4	Contact Closure Out (Form-C Relay) - 4 channels					
4-20mA	**MX420-IP2**	4-20mA In - 2 channels					**2M12**
	MX420-IP4	4-20mA In - 4 channels					
	MX420-OP2	4-20mA Out - 2 channels					**2M22**
	MX420-OP4	4-20mA Out - 4 channels					
0-10Vdc	**MX010-IP2**	0-10Vdc In - 2 channels					**2M11**
	MX010-IP4	0-10Vdc In - 4 channels					
	MX010-OP2	0-10Vdc Out - 2 channels					**2M21**
	MX010-OP4	0-10Vdc Out - 4 channels					
RS232/485	**MXRS-2**	RS232/485 - 2 channels					**2M30**
	MXRS-4	RS232/485 - 4 channels					

Existing and New Model Multiplexer product families are not interoperable.

Digital Data Links - Contact Closure

The FOT-CC and FOR-CC Fiber Optic Transmitter/Receiver can be used to transmit contact closure data over long distances. DINRail mount housings enable easy mounting on industry standard hardware. The FOT-CC Transmitter provides a closed contact signal to the FOR-CC Receiver, which activates a Single Pole Double Throw (SPDT) relay. These devices can be used with 50/125 to 200/230 µm fiber optic cable and provide ground loop isolation.

Model Number	Description	Input/Output	Optical Connector Type
FOT-CC 850 MM	Transmitter, Multi-mode, 850 nm	Dry Contact Input	ST
FOT-CC 1300 MM	Transmitter, Multi-mode, 1300 nm	Dry Contact Input	ST
FOT-CC 1300 SM STD	Transmitter, Single mode, 1300 nm, Standard power	Dry Contact Input	ST
FOT-CC 1300 SM HI	Transmitter, Single mode, 1300 nm, High power	Dry Contact Input	ST
FOR-CC 850 MM	Receiver, Multi-mode, 850 nm	Form-C Relay Output	ST
FOR-CC 1300 MM/SM	Receiver, Multi-mode or Single mode, 1300nm	Form-C Relay Output	ST
PSM-CC	Power Supply	100-250VAC Input, 24VDC @ 200mA Output	N/A

Features:

- Transmissions up to 5000 meters (16,400 ft)
- 50/125-200/230 µm fiber optic cable
- ST Fiber Connection
- Ground Loop Isolation
- Fail Safe Operation
- DIN - Rail Mount

Specifications - Digital Links

Power: 24VDC @ 50 mA

Optical Dynamic Range: 30dB into 200/230µm fiber, 18dB into 62.5/125µm fiber

Optical Wavelength: 850nm multi-mode (standard), 1300nm multi-mode and single mode (optional)

Relay Contact Rating (FOR-CC): Maximum Switching Voltage 100VDC, 250VAC, 5A @ 30VDC, 10A @ 125VAC, 6A @ 277VAC (Resistive Load)
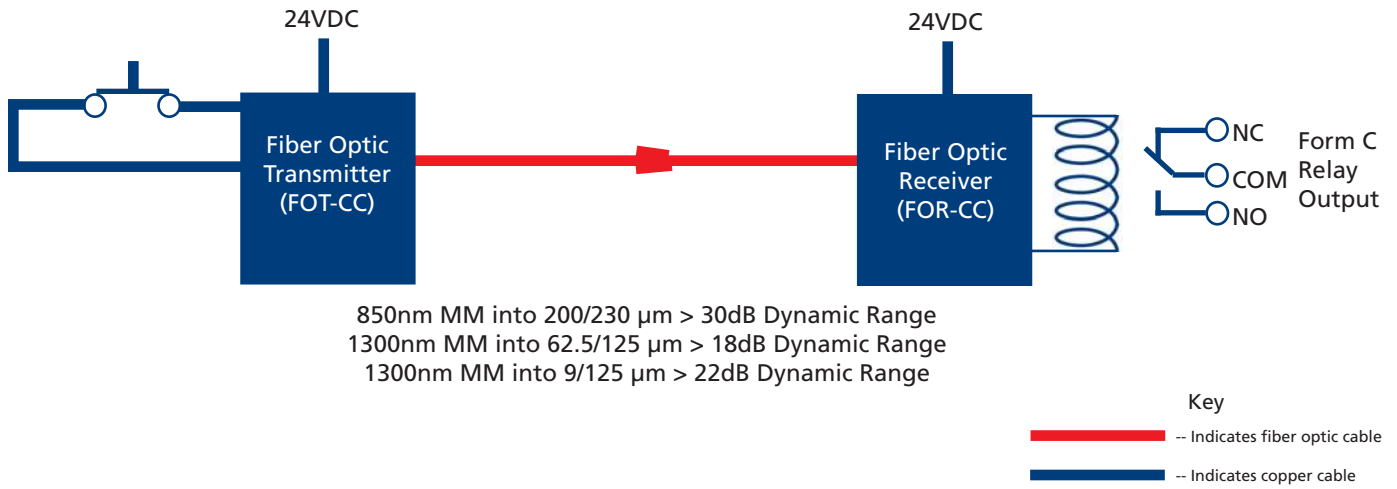
Connections: Cage-Clamp screw terminals, 12 - 24 AWG (0.5-2.4mm)

Indicators: Green LED - Power, Closed Contacts

Input (FOT-CC): Dry contacts, 10 ohms max. contact resistance

Ambient Conditions: -40 to 85°C Operational, 0 - 95% Rel. Humidity, Non-condensing

FOT/FOR - CC Application Diagram

850nm MM into 200/230 µm > 30dB Dynamic Range
1300nm MM into 62.5/125 µm > 18dB Dynamic Range
1300nm MM into 9/125 µm > 22dB Dynamic Range

Key
-- Indicates fiber optic cable
-- Indicates copper cable

FOT-CC/FOR-CC Single-Channel Version

The chart below indicates how the output relay contacts will operate on the FOR-CC provided the input contacts on the FOT-CC are wired in fail-safe mode (i.e. input contacts closed in a normal state):

Condition	FOR-CC Output Relay
1. Normal Condition, input closed	Energized
2. Normal Condition, input open	De-energized
3. Loss of power at TX	De-energized
4. Loss of power at RX	De-energized
5. Fiber loss (or disconnected)	De-energized
6. Component failure at TX	De-energized
7. Component failure at RX	De-energized

EOTec 2000 Ethernet Connectivity

Industrial Ethernet Switched Media Converters

The EOTec 2E54-2E63 Switched Media Converters provide fiber optic conversion to and from wire based Ethernet. The fiber ports operate at 100Mbps, Full Duplex. The RJ45 ports will autonegotiate data rates between 10/100 Mbps and Full/Half Duplex operation. These modules will automatically learn the addresses of the devices connected to each port (up to 1024) and will buffer and route messages accordingly. There is an additional Ethernet port in the module's integrated BUS, which provides connection for one additional EOTec 2000 Ethernet Switch or Switched Media Converter Module, assisting in forming Star or Daisy Chain network configurations.

Model Number	Description	Power Requirement	Optical Date Range	Optical Wavelength	Optical Mode	Optical Connector Type	Compatible Fiber	Fiber Distance
2E54/2E55	Unmanaged, Switched Media Converter, 10/100Mbps, 1-RJ45, 1 Fiber	2W max.	100Mbps, Full Duplex	1300nm	Multi-mode	ST	50-100 µm core diameter, glass	2km
2E56/2E57	Unmanaged, Switched Media Converter, 10/100Mbps, 1-RJ45, 1 Fiber	2W max.	100Mbps, Full Duplex	1300nm	Multi-mode	SC	50-100 µm core diameter, glass	2km
2E58/2E59	Unmanaged, Switched Media Converter, 10/100Mbps, 1-RJ45, 1 Fiber	2W max.	100Mbps, Full Duplex	1300nm	Single mode	SC	50-100 µm core diameter, glass	15km
2E60/2E61	Unmanaged, Switched Media Converter, 10/100Mbps, 1-RJ45, 1 Fiber	2W max.	100Mbps, Full Duplex	1300nm	Single mode	SC	50-100 µm core diameter, glass	40km
2E62/2E63	Unmanaged, Switched Media Converter, 10/100Mbps, 1-RJ45, 1 Fiber	2W max.	100Mbps, Full Duplex	1300nm	Single mode	SC	50-100 µm core diameter, glass	60km

Common Features: 2E54 - 2E63

Ethernet Compliance: IEEE 802.3 (U)(X) Compliant, All standard protocols

RJ45 Port Data Rate: 10 or 100Mbps (10/100Base-T(X)), Full or Half Duplex, Automatic wiring correction

Power Indicator: Green LED - On when proper power is connected

Data Indicator: Green LED - OFF when no connection is detected on port; ON when connection to port established; FLASHING to indicate activity on port

Port Speed Indicator: Amber LED - OFF when data rate is 10Mbps; ON when data rate is 100Mbps

Ambient Conditions: -40 to 85°C Operational, 5 to 95% Relative Humidity, Non-Condensing

Certifications: FM Approved for Class I Division 2, Groups A, B, C & D (most models)

Power to all modules is derived from any standard EOTec 2000 power supply through the integrated BUS connector or form an external 24VDC source supplied directly to the transceiver module. For models 2E55/57/59/61/63 and 2C53.

Industrial Ethernet Switch

EOTec 2000 Ethernet Switch is an industrially hardened, DIN-Rail mountable device, which allows you to extend your industrial Ethernet network.

The 2C52 and 2C53 10/100 BASE-T Ethernet Switches have four RJ45 twisted pair ports and one BUS port. The integrated BUS port provides a connection for one additional EOTec 2000 Ethernet Switch or Switched Media Converter assisting in forming star network configurations. Ethernet switches are unmanaged and require no user configuration. The data rate is automatically negotiated and the ports will auto-sense full or half duplex operation. The switches will automatically learn the addresses of the devices connected to each port and will buffer and route messages accordingly.

FM Approved for Class I
Division 2, Groups
A, B, C & D

**Ethernet Modules are
Configurable to Multiple
Interconnects**

Two 2E55 Switched
Media converters

2E55 Switched Media converter
with a 2C53 Ethernet Switch

Model Number	2C52/2C53
Description	Ethernet Switch 4 RJ45 ports 1 bus port
Power Requirements	4.5W max.
Communications Data	10/100 Base-T Full or Half Duplex
Ethernet Compliance	IEEE 802.3 (U)(X) Compliant, All standard protocols
Port Activity Indicators	Green LED: Off when no connection is detected on port, On when connection to port established, Flashing to indicate activity on port
Port Speed (RJ45) Indicator	Amber LED: Off when data rate is 10Mbps, On when data rate is 100Mbps
Ambient Conditions	-40 to 85°C Operational 5 to 95% RH, Non-Condensing

Two 2C53 Ethernet Switches

CE

EOTec 2104 Industrial Ethernet Ring Switch

The EOTec 2104 Industrial Ethernet Ring Switch is available in five different models. Each model features the ease of use of a typical unmanaged switch plus advanced capabilities that are only found in a managed switch, including ring functionality. When connected in a ring topology, an EOTec 2104 increases network reliability by providing an alternative path for message flow in the event of a network segment failure. When it detects a communications break, it quickly notifies the other switches in the ring and messages are automatically rerouted through the alternative ring path within milliseconds. The EOTec 2104 also has expansion capabilities through its unique "backplane port" with no external wiring necessary. Other advanced capabilities include priority queuing for prioritizing traffic, message rate filtering for broadcast

Power and switch status LED indicator
Global ring status alarm LED indicator
Expandable backplane
Remote status monitoring using Modbus over Ethernet (UDP)
15-40 VDC power input via screw terminals
Local & Global relay alarm contacts
Port Status ACT and LINK LEDs combined into one LED per port
Backplane port activity status LED indicator
Two SC or ST 100BaseFX (multimode and single mode) fiber optic ports

storm protection and port mirroring for diagnostics. For enhanced diagnostics, the EOTec 2104 has relay outputs that can be used to signal error conditions to a PLC, PC or other supervisory devices. These alarms include one Global alarm relay for ring status and two Local alarm relays, which will open when their respective ring ports lose a link.

Pre-configured for Redundant Self-Healing Ring Operation

The EOTec 2104 is pre-configured at the factory for redundant self-healing ring operation. No configuration software is necessary, although a simple configuration software program is provided so that any EOTec 2104 can be re-configured to fit almost any application. No IP address or complex set-up is required. The switches are ideal for use in many industrial applications, such as:

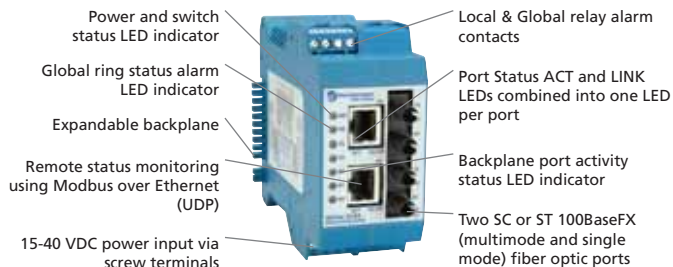- PLC and SCADA systems with critical operations to minimize down-time.

Redundant Ring

"Backup Path"

- Networks utilizing 10/100 Mbps redundant Ethernet backbones
- Factory (manufacturing) automation
- Industrial-rated indoor/outdoor transportation systems
- Security systems

Ordering Information

Base modules (All are 4-Port, (2 RJ45/2 Fiber):
- 2104-55   MM, ST, 2km
- 2104-57   MM, SC, 2km
- 2104-59   SM, SC, 15km
- 2104-61   SM, SC, 40km
- 2104-63   SM, SC, 60km

Optional Power Supply Module:
- 2A06   Universal Power Supply, 85-240VAC, 50/60Hz, 85-125VDC
- 2A16   Universal Power Supply, 85-240VAC, 50/60Hz, 85-125VDC, with alarm diagnostic output

Optional Expansion Modules:
- 2E54/2E55   2-port (1 RJ45/1 fiber), MM, ST, 2km
- 2E56/2E57   2-port (1 RJ45/1 fiber), MM, SC, 2km
- 2E58/2E59   2-port (1 RJ45/1 fiber), SM, SC, 15km
- 2E60/2E61   2-port (1 RJ45/1 fiber), SM, SC, 40km
- 2E62/2E63   2-port (1 RJ45/1 fiber), SM, SC, 60km
- 2C52/2C53   4-port RJ-45 (all copper)

Note: Odd part numbers accept 24VDC source via terminal screw input.

- 2A08   Redundant Power Supply, 24 VDC
- 2A18   Redundant Power Supply, 24 VDC, with alarm diagnostic output

Key Features of the 2104

High Performance Deterministic Technology

- Fault-tolerant Self-Healing Ring (SHR) with 30 mS plus 5 mS per hop recovery time
- Pre-configured from factory for SHR operation
- 10/100BASE-T(X) (RJ45), 100BASE-FX (SC or ST optical fiber connectors, Multi/Single mode)
- Supports IEEE 802.3/ 802.3u/ 802.3x/802.3z/ 802.1p
- Intelligent store and forward, non-blocking
- Full/Half-Duplex, MDI/MDIX auto crossover, auto negotiate, auto polarity

Enhanced Diagnostic

- Global and local relay alarm outputs and LED indication
- Status monitoring through simple Modbus over Ethernet (UDP)
- Expandable up to 8 ports

Industrial Design for High Reliability

- Operating temperature range -40 to +85 °C
- Long-haul transmit distances of 2, 15, 40 and 60km
- Real-time traffic prioritization
- 45mm wide, DIN rail mounted
- Universal redundant power supply available
- Low power consumption (8 W)

Approvals

Deterministic Performance/Broadcast Storm Protection

The EOTec 2104 utilizes a special algorithm that assures very fast recovery times. The recovery time can be estimated by multiplying 5 mS times the number of switches, and then adding 30 mS (for loss of link errors) or 60 mS (for message loss errors). For example, a ring of 10 switches would have a recovery time of 80 mS for the typical loss of link type errors. Many competitive switches and hubs may take several seconds or even minutes to recover when connected in a ring configuration.

Broadcast storms can bring a network to a stop if conventional switches or hubs are connected in a ring topology. This is due to broadcast message reproduction. Using EOTec 2104 Ring Switches in the loop will prevent broadcast storms because the switches have the intelligence to detect loops and to assign the necessary ports to be in the backup (disabled) state. A backup port will be quickly enabled if the primary path in the ring fails.

Expansion Modules Available for Additional Ethernet Ports
(Up to 8 Ports Possible)

Each switch comes with an integrated backplane that can

Easy Plug-In Connector

be used to expand the number of copper/fiber ports on the switch with no external wiring needed. Expansion modules increase the number of ports available for end devices to be connected to the ring network. The 2E5X and 2E6X Expansion Modules are available with one copper (RJ45) port and one MM or SM fiber port and support distances of 2km to 60km over fiber. The 2C52 and 2C53 Expansion Module is available with four copper (RJ45) ports to increase the number of ports on the ring switch to eight (6 copper, 2 fiber). A second EOTec 2104 Ring Switch can be connected to the expansion port to allow for the capability for increased port counts.

Mix or Match to Fit Your Application

EOTec G408M Industrial Gigabit Managed Ethernet Switch

The EOTec G408M is a fully managed 8 port Industrial Gigabit Ethernet Switch. The unit features advanced capabilities typically found in a managed switch plus a Self-Healing Ring function, which is compatible with Ultra's EOTec 2104 Industrial Ethernet Ring Switch (10/100 Mbps). Network traffic is rerouted in milliseconds when a fiber or cable break is detected on any of the ring ports. An alarm output, available on the terminal block, can be used to signal error conditions to a PLC or other supervisory devices. Ports 1-4 are copper only; ports 5-8 can be either copper or fiber ports. The fiber ports offer LC type connections and a variety of Small Form-factor Pluggable (SFP) fiber transceivers are available for various fiber types and distances. The aluminum housing comes ready to be panel or DIN rail mounted.

Key Features
- Eight 10/100/1000Mbps copper ports, four of which can be 100/1000Mbps Single and/or Multimode fiber ports
- Fault-tolerant Self-Healing Ring (SHR) with 30 ms plus 5 ms per hop recovery time
- Operating Temperature -40 to 75°C
- Long-haul fiber distances up to 80 km (49 miles)
- 10 to 30VDC operation, 15W
- Dual power inputs
- DIN rail mountable

Management Features
- Rapid Spanning Tree (RST)
- SNMPv1 and v2 network management
- SNMPv3 authentication & encryption for security
- SNMP notifications (traps) for report on event
- Priority Queuing (QoS/CoS) for real-time operation
- IGMP for Multicast filtering (snooping & querying)
- VLAN for convenient traffic segregation
- Broadcast & multicast storm protection
- RMON & port mirroring for advanced diagnostics
- Security with HTTPS, SSL, SSH, SNMPv3 & more
- Easy configuration via Web, Telnet or CLI

Deterministic Performance

The EOTec G408M utilizes a special algorithm to insure very fast recovery times. The recovery time can be estimated by multiplying 5 ms times the number of switches, and then adding 30 ms (for loss of link errors) or 60 ms (for message loss errors). For example, a ring of 10 switches would have a recovery time of 80 ms for typical loss of link-type errors. A ring of 8 switches would have a recovery time of 100mS for message loss errors. Many competitive switches and hubs may take several seconds or even minutes to recover when connected in a ring configuration.

Flexible Topologies

EOTec G408M

EOTec 2104

Gigabit

10/100 Megabit
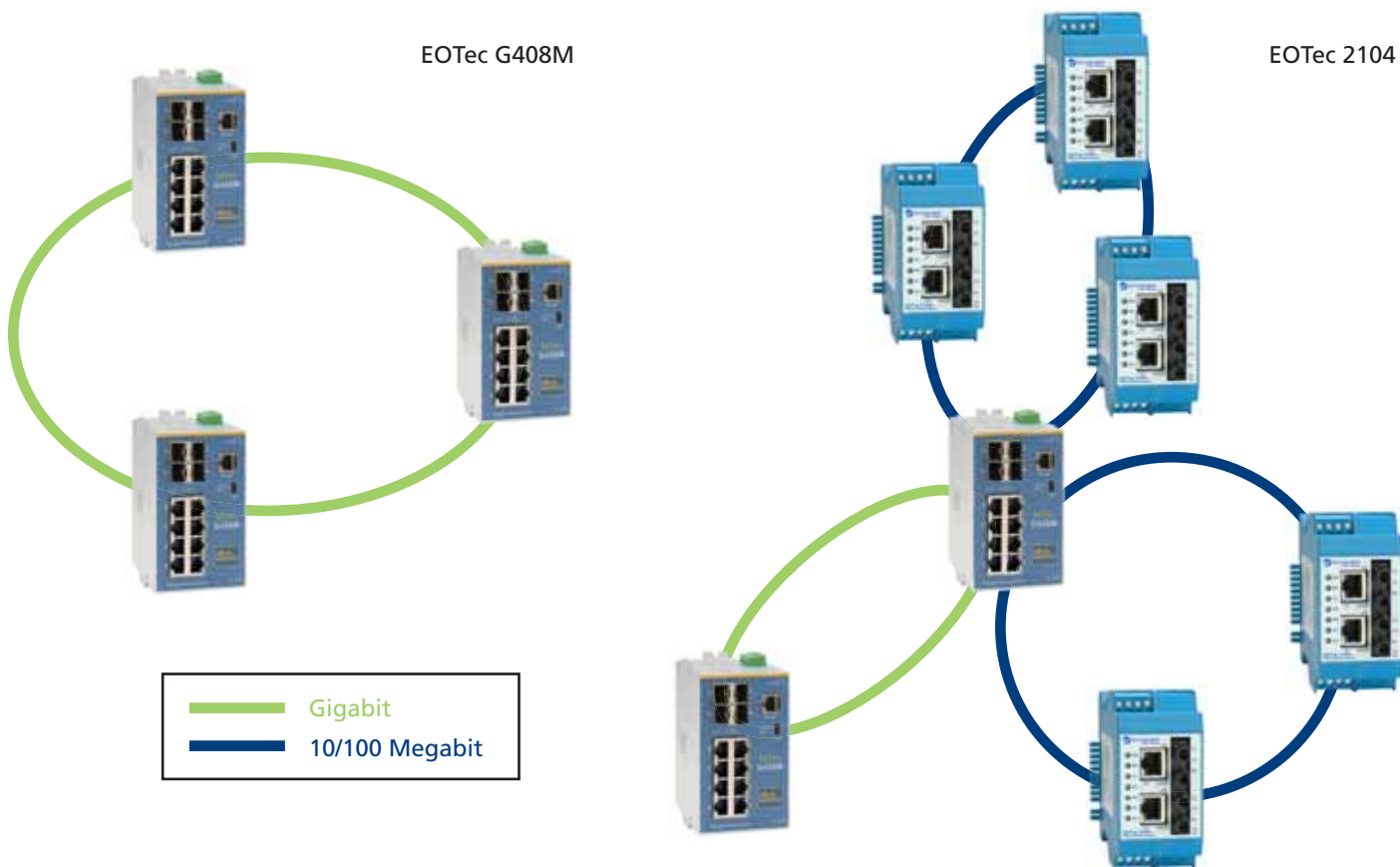
The EOTec G408M accepts both Single and Multimode 1Gbps and 100Mbps SFP Transceivers, making it compatible with the EOTec 2104 Industrial Ring Switch. Both switches offer the same fast recovery time and are configurable for all network topologies.

G408M Specifications

General

- Operation: Store and forward wire speed switching, non-blocking
- Modes: Full or half duplex operation with flow control supported on all ports
- Memory bandwidth: 32 Gbps
- Latency (typical): < 5 µs plus frame time
- Ethernet isolation: 1500 Vrms 1 minute
- Console ports: USB and RS232 (RJ45) with fixed settings: 9600, 8N1 (9600 bps, 8 data bits, parity = None, stop bits = 1, flow control)
- 8192 MAC addresses

RJ45 Copper Ports

- RJ45 ports: Eight RJ45 ports that are fully IEEE 802.3 compliant
- RJ45 speed & duplex: Configurable or 10/100/100 auto-detecting for speed & duplex (full or half)
- RJ45 MDI/MDIX: Auto-mdi/mdix-crossover automatically supports either straight or crossed cables
- RJ45 Polarity: Auto-polarity for automatic correction of crossed TXD and RXD pairs

Fiber Optic Ports

- Ports 5-8 can be configured with 1000 Mbps fiber optic transceivers for distances up to 80 km. These ports can also be ordered with Fast Ethernet (100 Mbps) fiber optic transceivers
- Other transceivers: Contact Ultra for special application transceivers
- Eye safety: IEC60825-1, Class 1; FDA 21 CFR 1040.10 and 1040.11

Networking & Management

- Devices supported: All IEEE 802.3 compliant devices are supported
- Protocols: SNMPv1/v2/v3, RMON, DHCP, SNTP, TFTP, STP, RSTP, QoS/CoS/ToS/DS, IGMPv1/v2, VLAN (tag and port based), HTTP, HTTPS (SSL & TSL), Telnet, SSH and more
- Industrial protocols supported: Modbus/TCP, EtherNet/IP, PROFInet, Foundation Fieldbus HSE and others

- Standards: IEEE 802.3, 802.3u, 802.3x, 802.1D/w, 802.1p, 802.1Q, 802.3ab/z
- Management interfaces: Text (Telnet & SSH), CLI (command line interface) and SNMP (see the user manual for supported MIBs)
- Open Source Linux: The Linux Advantage - contact Ultra for more information

Power & Alarm Output

- Power input: Dual redundant power inputs for redundant power supplies
- Input voltage range: 10 to 30 VDC
- Power consumption: Typical with all ports linked and active
  - o   12 W (with no fiber transceivers)
  - o   15 W (with four fiber transceivers)
- Industrial surge and spike protection: 15 kW peak, 5 kW (10 times for 10 µs)
- Self-test/alarm output: Same voltage as power input;
  0.5 Amps max.

Environmental

- Operating temperature: -40 to 75°C (cold startup at -40°C)
- Storage temperature: -40 to 85°C
- Humidity: 5 to 95% RH (non-condensing)
- Vibration: IEC 60068-2-6
- Shock: IEC 60068-2-27
- Freefall: IEC 60068-2-32

Standards & Certifications

- CE: Meets all applicable directives
- Electrical safety: UL 508 & CSA C22.2 No. 14 per CUL, EN 61010-1
- EMC: FCC part 15, ICES-003, EN 55022, IEC 61326-1
- Hazardous locations: UL 1604, CSA C22.2 No. 213 per CUL (Class I, Div. 2, Groups A, B, C, D); EN 50021/EN 60079-15 (Zone 2), ATEX Group II, Cat 3 (Zone 2), EEx nA II T4 X (-40°C ≤ Ta ≤ +85°C)
- MTBF: >1,000,000 hours
- RoHS and WEEE: RoHS (Pb free) and WEEE compliant
- ISO9001:2008: Certified "Total Quality" company
- Warranty: 3 years with product registration

Mechanical

- Case: Ready to be DIN rail or panel mounted
- Material: Corrosion-resistant aluminum with clear protective coating
- Protection: IP30 protection from dust and debris
- DIN rail mounting or direct to panel (no optional kits or accessories required)
- Weight: 12 oz. (0.34 kg)

Mechanical Drawing
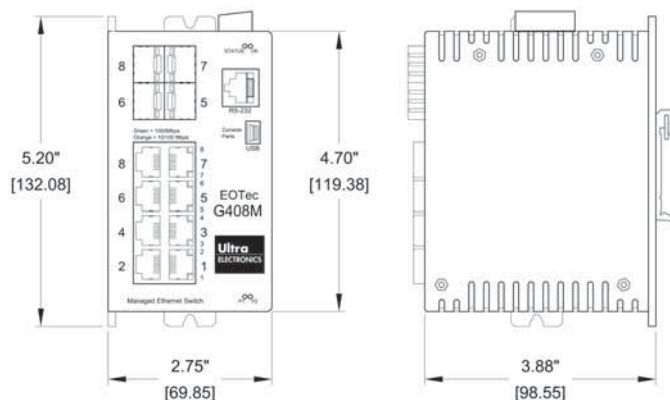
Ordering Information

Gigabit Ethernet Switch

Part Number	Description
G408M	Industrial Gigabit Managed Ethernet Switch

1Gbps SFP Transceivers

Part Number	Wavelength	Distance	Mode
SFP85-1G1/2K	850nm	550m	MM
SFP13-1G2K	1310nm	2km	MM
SFP13-1G20K	1310nm	20km	SM
SFP13-1G40K	1310nm	40km	SM
SFP15-1G80K	1550nm	80km	SM

100 Mbps SFP Transceivers

Part Number	Wavelength	Distance	Mode
SFP13-100M2K	1310nm	2km	MM
SFP13-100M15K	1310nm	15km	SM
SFP13-100M40K	1310nm	40km	SM
SFP15-100M80K	1550nm	80km	SM

Services

Custom and OEM Engineering

Ultra Electronics design engineers are experts in the fields of fiber optics, multiplexing, signal conditioning, and industrial control system design. If equipment is needed beyond our standard product lines, custom designs or modifications can be provided. The staff also has immediate access to other Ultra Electronics, Nuclear Sensors & Process Instrumentation experts in temperature and pressure sensing equipment and applications.

Our OEM customers include many of the world's leading suppliers of industrial automation and process control systems.

Field Support

Highly experienced technicians and engineers are available to assist in the installation, start-up, maintenance, and troubleshooting of fiber optic systems. They have extensive experience in many types of industrial manufacturing plants and power facility applications and are available for emergency dispatch or scheduled system start-ups. Our staff is equipped with the latest equipment such as OTDRs and digital scopes.

Training Seminars

Ultra Electronics provides both on-site training programs as well as comprehensive public seminars on topics ranging from the basics of fiber optic theory and system design to hands-on fiber termination and cable installation training. Training sessions can run from two hours to three days and can be custom designed to meet your specific needs. Training is focused on Instrumentation and Control applications, and is taught by Ultra Electronics's experienced staff.

Alliances and Corporate Profile

Alliances

Ultra Electronics works closely with the leading PLC manufacturers to ensure that our fiber optic modems interface correctly with their products. We are members of Rockwell Automation's Encompass program, GE-Fanuc's Accompany program, and Schneider Electric's Alliances program.

Corporate Profile

Since our founding in 1968, Ultra Electronics, Nuclear Sensors & Process Instrumentation (formerly Weed Instrument) has been a leading player in defining and growing several unique technology markets. From custom design, harsh environment fiber networking products for OEM applications to high performance products for the nuclear power generation and industrial automation markets, Ultra Electronics helps keep industry and business around the globe up and running.

Our typical customers and users include technicians, engineers and industrial automation network professionals - people who stake their reputation on the products and technologies we supply.

In addition to being ISO9001:2000 registered, we are compliant with the 10CFR50 Appendix B, 10CFR21, ANSI N45.2, ASME NQA-1, ASME NCA3800, CSA Can3-Z299.1 and AS 9100 quality standards.

Each of our finely tuned manufacturing cells is configured to provide our customers with the highest quality products, while maintaining lead times that are among the shortest in our industry. We extensively us Kaizens to drive continuous improvements in Safety, Quality, Delivery and Cost. The cutting-edge manufacturing principles we employ include 5S, Visual Management, Standard Work and Kanban.

Guiding all our efforts is a simple philosophy rooted in four customer focused priorities: Quality, Delivery, Cost and Innovation.

In 2008, Weed Instrument was acquired by Ultra Electronics Holdings plc. Ultra consists of specialist businesses that design, manufacture and support electronic and electromechanical systems, sub-systems and products for defense, security, aerospace and nuclear applications worldwide.

Industrial Communication Products Ltd
Tel: +44 (0) 203 086 9569
Web: www.industrialcomms.co.uk
E-mail: sales@industrialcomms.com

Ultra Electronics
NUCLEAR SENSORS & PROCESS INSTRUMENTATION
707 Jeffrey Way, PO Box 300
Round Rock, TX 78680-0300 USA
Tel: +1 512 434 2850
Fax: +1 512 434 2901
e-mail: fiberop@ultra-nspi.com
www.ultra-nspi.com