EOTec 2000 ControlNet™ Fiber Optic SHR/DSHR Communications Modules*

With Support for Single and Dual Channel Self-Healing Rings

Key Features

➤ **Single and Dual Channel Self Healing Rings for High Reliability**
- Highest number of nodes supported
- Fully compliant with the ControlNet™ specification
- Robust Multi-Break Management algorithm

➤ **Small Form Factor, High Performance Laser Optics**
- 1310nm lever-latch SFP laser transceiver
- Real-time indication of fiber optic health
- Single/Multi-mode conversion available

➤ **Global Ring Failure Alarm with Comprehensive Diagnostics**
- Indicator and relay monitor
- Four additional alarm relay outputs
- Minimizes downtime

➤ **Compact Enclosure**
- Reduced installation space required
- Stand alone 35 mm DIN-rail mounting

➤ **Industrial Design**
- Designed for use in Class I, Division 2 hazardous locations**
- CE approved

➤ **Accessories Available**
- Duplex patch cords (LC to ST, LC to SC, etc.)
- Link cables
- Spare SFP transceivers

CE FC

Rockwell Automation
Encompass™
Product Partner
Americas • Asia-Pacific

EOTec 2000 ControlNet Fiber Optic Communications Modules

Patents pending
**Certification pending*

Weed Instrument
Fiber Optics

Overview

The EOTec 2000 ControlNet™ Fiber Optic SHR/DSHR Communications Modules provide the highest assurance of network performance for any ControlNet™ network. Self-Healing Ring networks for both the Channel A and the Channel B are supported simultaneously providing multiple pathways for data routed to the end nodes in the system. Network errors are communicated through advanced diagnostics to give the operator early indication of communication faults without losing any communications to the ControlNet™ end nodes.

The Model 2C31 is intended for Single Self-Healing Ring applications, while the Model 2C32 is designed for Dual Self-Healing Ring systems. Weed also manufactures modules for other ControlNet™ topologies, including copper to fiber conversion (Point-to-Point), STAR, Daisy Chain and Cascading Tree.

Model 2C31 Self-Healing Ring Module


Model 2C32 Dual Self-Healing Ring Module

The Technology of Reliability – Single and Dual Self-Healing Rings

Many industrial processes require very precise control. Failure of communications between the various elements of a control system may cause serious problems. Therefore, the communication systems employed have to be robust.

Weed's 2C31 and 2C32 Self-Healing Ring Modules address this need by providing multiple communication paths between the various elements of the system, and utilize advanced Downstream Multicasting technology. In the event of a failure on one communication path, communications are still maintained along a secondary path or, in the case of a dual ring, tertiary paths.

Downstream Multicasting transmits an incoming message in multiple directions and insures that while directing the message toward all nodes in the ring it is never retransmitted

Single-Ring Data Flow Key
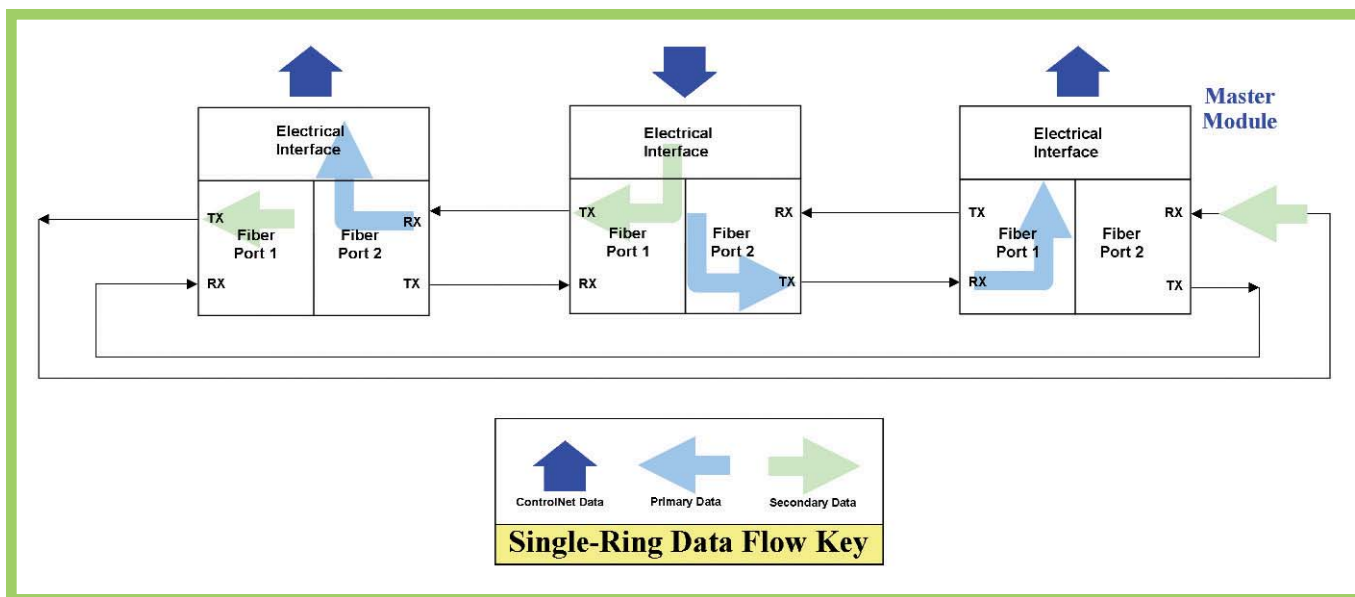
back to the point of origin. This communication method employs a "Master" or ring control module which will direct traffic and guard against duplicate message delivery. Each fiber ring must include one master module to insure proper communication between all nodes in the ring.

As shown in the Model 2C31 single ring diagram on page 2, data enters the ring in the middle node. Primary and secondary data flow in two separate directions around the ring.

Primary data is defined as the data that arrives at the module first. When a data packet flows around the ring, the primary data is delivered to other ControlNet™ segments. Secondary data will only be used in the case of fiber break.

For critical applications the Model 2C32 provides a highly robust, dual-channel ControlNet™ solution. As with the single ring, Downstream Multicasting insures that data is delivered to all consumers within the appropriate network update time. In this configuration, not only is a second ring provided to support both Channel A and B ControlNet data packets, a third or tertiary communication path is also available. Because there is an additional path, more fiber breaks are supported without any loss in either communication channel.

Because redundant systems are typically used in operations that can't afford a loss in data or any downtime, the 2C31 and 2C32 are supplied as standard with an extensive set of powerful diagnostic tools to warn against any faults or impending system failures.


Dual-Ring Data Flow Key
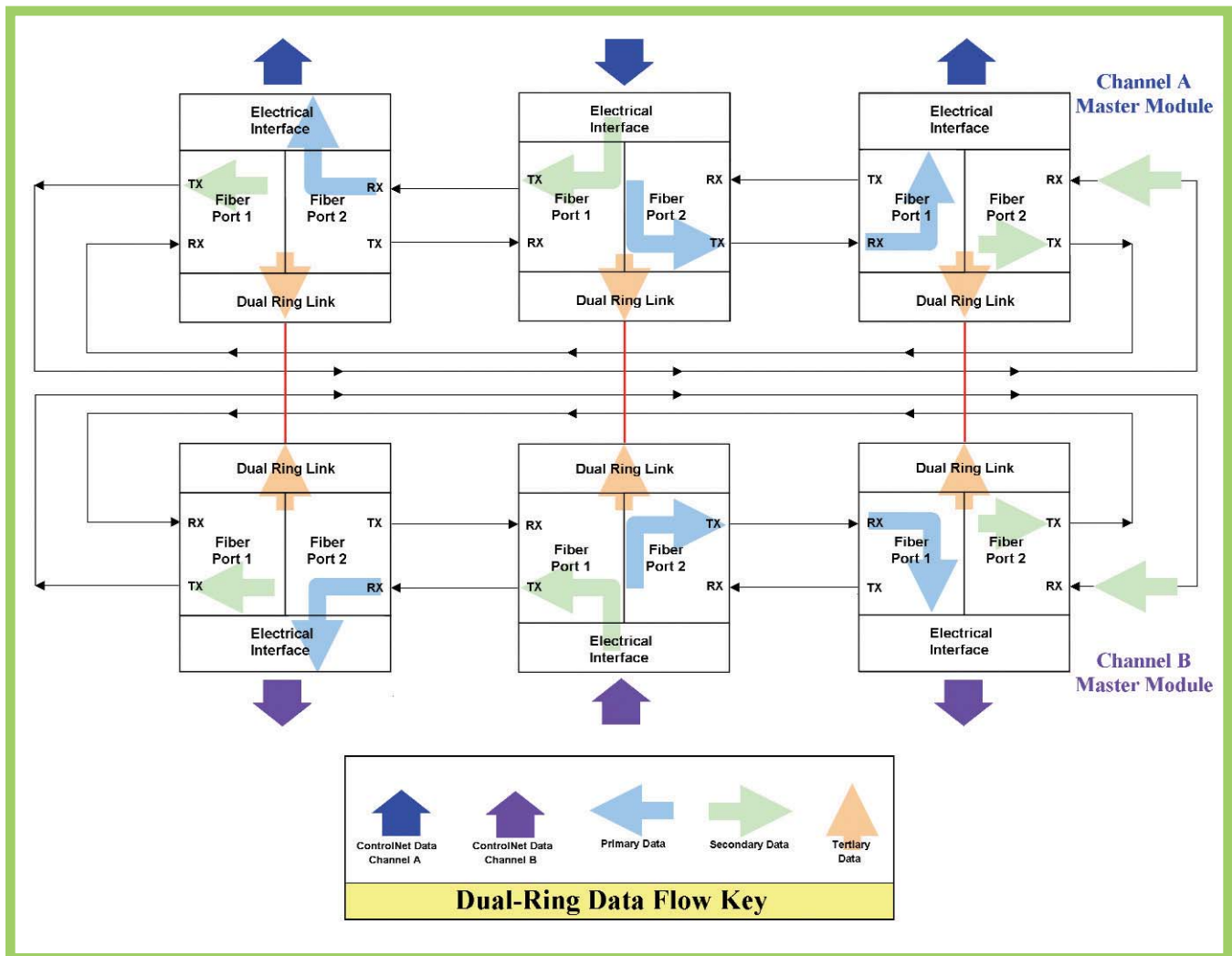
Powerful Diagnostics Enhance Reliability and Support Preventative Maintenance

Power Input Quality:

Continuous monitoring of the power input is crucial when redundant communications are required. Loss of power can isolate a node and sever communication of important applications running on your network. To help insure your network against this type of node isolation, two power inputs are provided on each self-healing ring module. The module alerts you if power falls outside the proper voltage range (+15 to 30VDC) on one or both power inputs.

Relay contacts are provided for each power input and will close in the alarm condition. LEDs on each unit will also turn red which allows maintenance personnel to quickly isolate the source of the problem. A power alarm is one of three fault conditions that will set a Global Alarm.
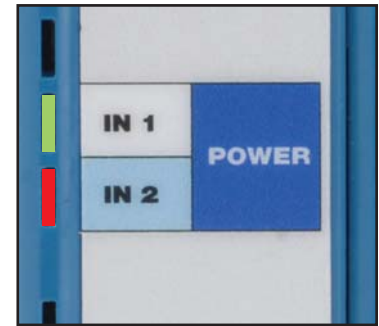
Optical Fiber Fault:

Fiber is used to create a physical link between all self-healing ring modules. A fiber ring provides a redundant path of communication in case a fiber fails or is broken. To continue to insure this redundancy it is very important to keep this ring intact. Data on the optical fiber lines is constantly monitored by the module. If a fiber fails to transfer light or is broken an alarm is instantly activated.

A set of relay contacts is provided for each optical receiver and will close in the alarm condition. Local identification of the source of the fiber failure is simple since there is a red LED indicator for each of the optical fiber ports. A fiber alarm is one of the three fault conditions that will set a Global Alarm.
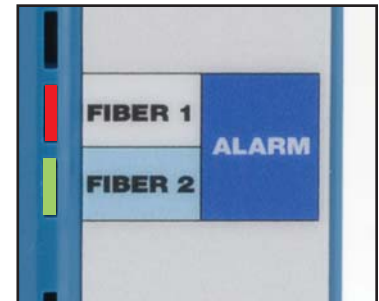
Dual-Ring Link:

This feature is specific to the Model 2C32. It provides an additional interface that creates dual redundant communications. It is an additional communication channel between the two redundant rings and creates additional communication rings between all adjacent self-healing ring modules. As this channel is the key to dual redundancy, it is very important to insure communication so the module continuously monitors the data.

A set of relay contacts is provided for the dual-ring communication channel and will close in an alarm condition. The link alarm is also one of the three fault conditions that will set a Global Alarm.

Global Alarm:

This feature is provided on both the 2C31 and 2C32. The global alarm is unique because it is passed between all modules. A set of relay contacts is provided on every module and will close in an alarm condition. As a result, only one module needs to be connected to a remote alarm to alert when a fault has occurred. There are three fault conditions that set the Global Alarm:

- *Power Alarm:* one or both power inputs are not between the specified input voltage or one has failed completely. The alarm is supported by two local LEDs and two remote screw terminal connections.
- *Fiber Alarm:* no data is received at a fiber port. Both fiber ports have an independent remote alarm. This condition is accessed by two local LEDs and two remote screw terminal connections.
- *Link Alarm:* no data is received at the link port (Model 2C32 only). The alarm is supported by a local LED and a remote screw terminal connector.
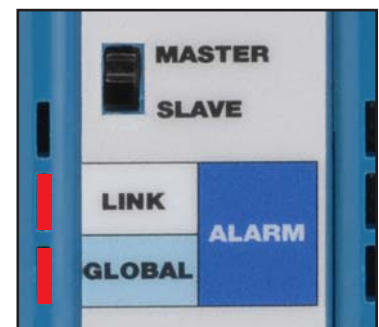
4-20mA Output:

The 4-20mA output is a diagnostic interface that measures the light intensity at the receiver input of each of the fiber ports and converts it into an analog output . At 4mA there is no light received indicating bad or broken fiber. As the power or light intensity increases this measurement moves toward 20mA. These outputs are easily accessed at a terminal block connector on the front of each module. This important feature allows for real-time analysis of fiber signal strength to identify deteriorating fiber conditions and make replacements before a failure occurs.

The 4-20mA output is also a useful tool during installation since it can be read via a handheld meter and will provide an indication of signal strength. This helps in finding loose or faulty connections and locating bad fiber links.

Technical Specifications

Cabling and Operation

ControlNet Specifications/Requirements Apply

Maximum nodes
48 (using coax cable length of 250m)

Maximum coax cable length
1000m (assuming 2 nodes)

Trunk connection
Anywhere on the trunk via ControlNet Tap with 1m drop cable required

Coax cable connection
BNC

Data rate
5M baud

Propagation delay
1µs maximum per module

Fiber propagation delay
5µs/km
1.5µs/1000ft

Power indicator
Green LED illuminates with power applied. Solid red LED when voltage <15VDC or >30VDC

Com indicator
Green LED for normal condition. Flashing red/green LED, with data errors, Solid red LED for jabber condition

Environmental & Safety

DIN rail mounting

Power input
15-30VDC, Dual Power Inputs

Input power, maximum
8 Watts

Transient Spike Protection
1500W 25°C (10 X 1000µs)

Operating temperature range
0 to +60 °C

Storage temperature range
-40 to +85 °C

Humidity (non-condensing)
5 to 95% RH

Electrical Safety
CSA C22.2 No. 142 (1987), IEC 60950

EMC immunity
IEC61326-1:1998

Hazardous locations
Designed for Class I, Division 2, Groups A, B, C, D *(certification pending)*

Packaging (polyamide)
UL 94V-0

Optical Interface

Optical Wavelength
1310nm

Communications Data Range
Up to 155 Mbps

Optical Port Connection
Duplex LC connector (other connector options available, see accessories)

Optical Dynamic Range
See table below.

Optical Transmit Indicator
Solid green LED for normal condition. Off when no transmit

Optical Receive Indicator
Solid green for normal condition. Solid red when no receive, Flashing red/green when data errors received

Link Interface (2C32 only)

Green LED when connected. Red LED when cable is disconnected. Red/green flashing LED when there are data errors

Optical Interface Table				
Model	**Fiber Type**	**Fiber Connector**	**Max Optical Dynamic Range, Fiber Size**	**Typical Max Distance (mi/km)**
2C31-LC-MM/MM	Multi-mode	LC	11 dB into 62.5/125µm fiber 7.5 dB into 50/125µm fiber	2.5mi/4km 1.9mi/3km
2C31-LC-SM/SM	Single mode	LC	19 dB into 9/125µm fiber	12.4mi/20km
2C32-LC-MM/MM	Multi-mode	LC	11 dB into 62.5/125µm fiber 7.5 dB into 50.5/125µm fiber	2.5mi/4km 1.9mi/3km
2C32-LC-SM/SM	Single mode	LC	19 dB into 9/125µm fiber	12.4mi/20km

Note: SM/MM available on the same SHR module. Please consult factory for additional information.

Mechanical Dimensions
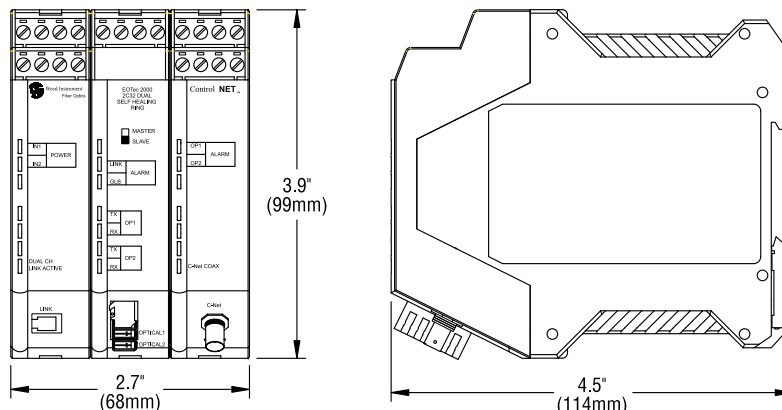
Ordering Information

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
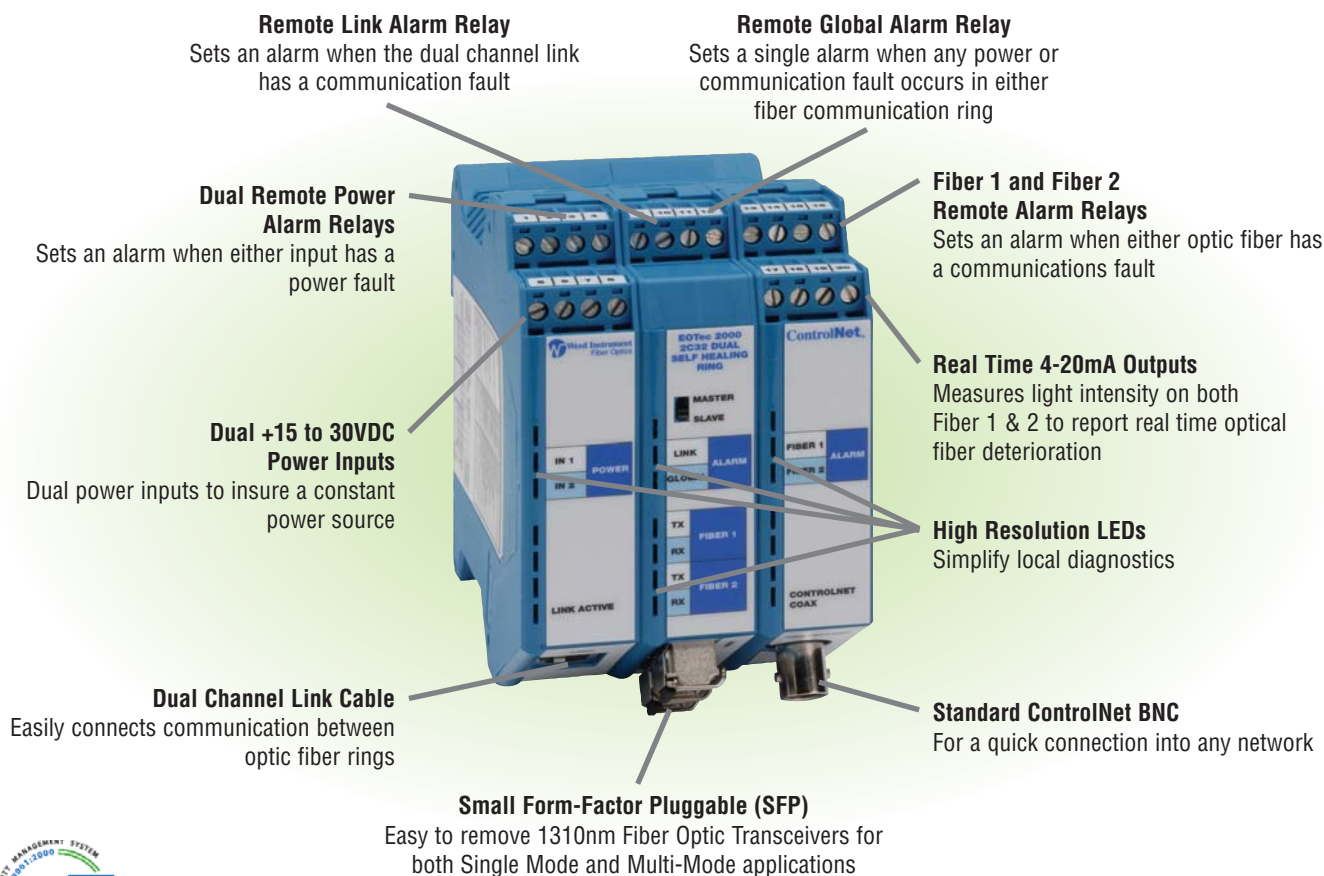
Dual Self-Healing Ring Modules (DSHR):

- **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

Accessories:

- **2LNK-1M** — Link cable (for DSHR only), 1 meter
- **62-LC-ST-2M** — Duplex Fiber Patch Cord, MM 62.5/125µm, LC-ST, 2 meter
- **62-LC-LC-2M** — Duplex Fiber Patch Cord, MM 62.5/125 µm, LC-LC, 2 meter
- **62-LC-SC-2M** — Duplex Fiber Patch Cord, MM 62.5/125 µm, LC-SC, 2 meter
- **50-LC-ST-2M** — Duplex Fiber Patch Cord, MM 50/125 µm, LC-ST, 2 meter
- **50-LC-LC-2M** — Duplex Fiber Patch Cord, MM 50/125 µm, LC-LC, 2 meter
- **50-LC-SC-2M** — Duplex Fiber Patch Cord, MM 50/125 µm, LC-SC, 2 meter
- **9-LC-ST-2M** — Duplex Fiber Patch Cord, SM 9/125µm, LC-ST, 2 meter
- **9-LC-LC-2M** — Duplex Fiber Patch Cord, SM 9/125µm, LC-LC, 2 meter
- **9-LC-SC-2M** — Duplex Fiber Patch Cord, SM 9/125µm, LC-SC, 2 meter

Model 2C32

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

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

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

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

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

High Resolution LEDs
Simplify local diagnostics

Dual Channel Link Cable
Easily connects communication between optic fiber rings

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

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