



EOTec 2104 Installation Guide

Industrial Ethernet Ring Switch

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First Edition

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Standards and Safety

The EOTec 2104 Ethernet Ring Switch from Weed Instrument has been designed to meet the following standards.



Electrical safety – CSA C22.2/14; IEC61010-1

EMI emissions – FCC part 15, ICES 003, EN55022

EMC immunity – IEC61326-1

FM/cFM Class I, Division 2, Groups A, B, C, & D, T4
(-40°C To +85°C)

WARNING – EXPOSURE TO SOME CHEMICALS
MAY DEGRADE THE SEALING PROPERTIES OF
MATERIALS USED IN THE FOLLOWING DEVICES:

RELAYS K1, K2 & K3 – LCP resin housing with epoxy
resin seal

If the above devices are exposed to degrading
chemicals, it is recommended that periodic inspection
be performed and replacement of the unit occur if
degradation is found.

Install the Weed Ring Switch in accordance with local
and national electrical codes.

Lightning Danger: Do not work on equipment during
periods of lightning activity.

Do not connect a telephone line into the Ethernet RJ45
connectors.

Refer to the [Technical Specifications](#) section, at the end of this manual,
for complete specifications on agency approvals.

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and receiver; Connect the equipment into an outlet on a circuit different from that to which the receiver is connected; Consult the dealer or an experienced radio/TV technician for help.

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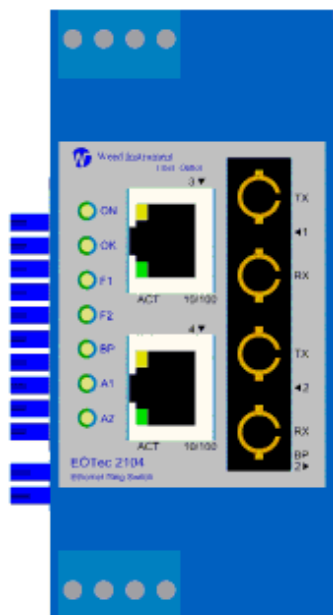
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Introduction

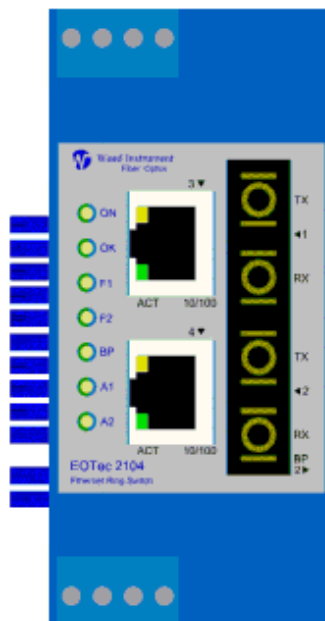
Thank you for purchasing the EOTec 2104 Ethernet Ring Switch from Weed Instrument Company. This manual describes how to install and wire the Ring Switch. By using a Weed Ring Switch, you can implement redundant paths in a network through the use of ring topology. The EOTec 2104 Ethernet Ring Switch is available in multimode and single-mode versions.

The Ring Switch supports 10BaseT (10 Mbps) and 100BaseTX (100 Mbps) on its RJ45 ports, depending on the model. Each of these ports independently auto-senses the speed, allowing you to interface to regular or fast Ethernet devices.

All models also have 100BaseFX (100 Mbps) fiber optic ports, which, depending on the model, can support maximum fiber optic cable lengths of 2, 15, 40, or 60 kilometers. The EOTec 2104 Ethernet Ring Switch is available with ST or SC fiber optic ports.



EOTec 2104 with ST Fiber Ports



EOTec 2104 with SC Fiber Ports

The EOTec 2104 Ethernet Ring Switches are truly plug and play so they are very easy to set up. In most applications, you can use the default settings for the ring switches without the need for configuration. Once you finish installing and wiring your ring switches, simply connect your Ethernet cables, apply power, and they will immediately begin to operate.

However, if you wish to enable advanced capabilities or try a different configuration, use the EOTec 2104 Switch Tools utility. The utility features comprehensive on-line help to assist you if you want to customize your port settings, ring configurations, message filtering, port mirroring and priority queuing.

To monitor the status of your Weed Ring Switch, use the EOTec 2104 Switch Status utility. This utility displays details such as port, power and ring states of each Ring Switch on your network, and also helps you determine the source of any breaks or problems on the network.

Refer to the *EOTec 2104 User Manual* for detailed information about the features, capabilities and operation of your Weed Ring Switch, including how to implement a fault-tolerant, redundant ring topology and monitor the status of your ring switch. The user manual also describes how to use the EOTec 2104 Switch Tools and Switch Status utilities. You can find the user manual as a PDF file on your CD-ROM.

Kit Contents

Your kit contains the following items:

- EOTec 2104 Ethernet Ring Switch
- *EOTec 2104 Installation Guide*
- EOTec 2104 CD-ROM, which contains the following items:
 - *EOTec 2104 User Manual* (PDF)
 - *EOTec 2104 Installation Guide* (PDF)
 - EOTec 2104 Switch Tools Utility
 - EOTec 2104 Switch Status Utility
 - Return Material Authorization Form
- Weed Instrument Product Warranty

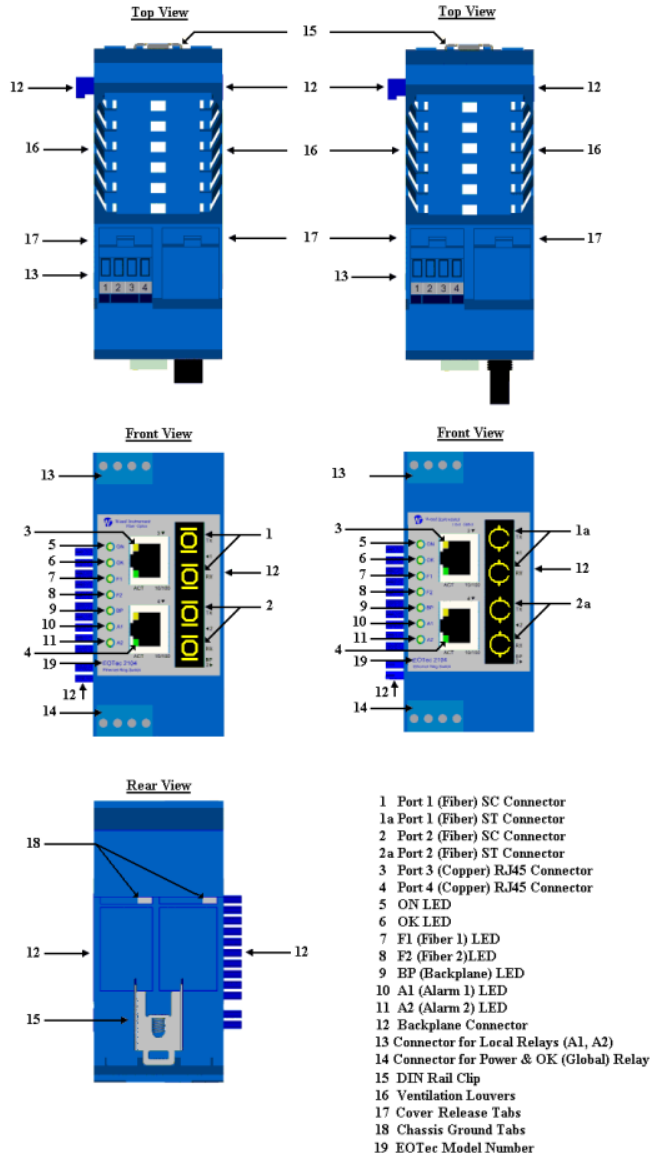
Performance Overview

These general specifications apply to the EOTec 2104 Ethernet Ring Switch. Complete technical specifications are given at the end of this document.

Specifications Summary	
Ports	4
Port types	10/100BaseT(X) shielded RJ45; 100BaseFX (ST or SC connectors)
Ethernet switch type	Intelligent store and forward, plus some management capabilities
Ethernet protocols supported	All IEEE 802.3
RJ45 operation	Auto-negotiation, Auto-crossover and Auto-polarity
Fiber operation	Multimode with distances up to 2 km, or single-mode with distances up to 15 km, 40 km, or 60 km, depending on the model.

Switch Layout

The Weed Ring Switch has communication LEDs for each port and a power LED. In addition, three LEDs (**OK**, **A1** and **A2**) provide switch and network status.



This section describes the functionality of the LEDs on the ring switch.

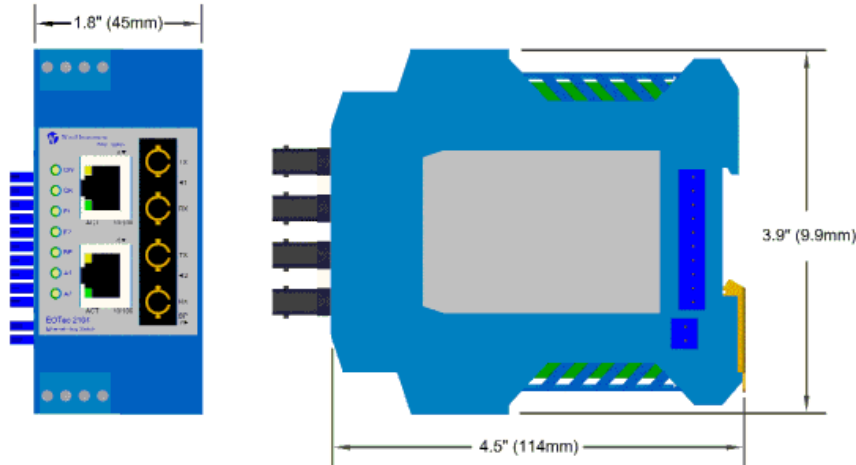
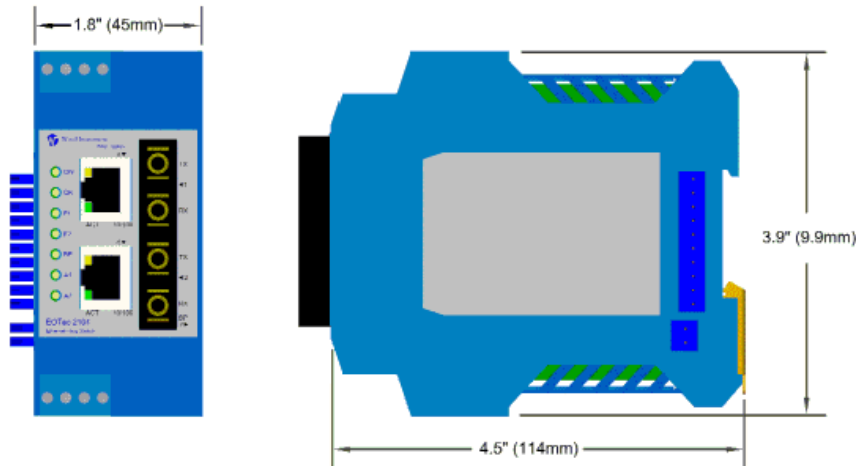
LED	Function	Description
ON	Power	Power ON – On solid green when power is applied. LED will turn off if the power supply fails.
OK	Switch Status	Global Ring Status – Indicates the operational status.
	Solid Green	GRN -ring OK – The ring has continuous ring integrity. No errors.
	Solid Red	Error – This switch has encountered a segment failure on any active rings where this switch is a member (Global Ring Alarm).
	Blinking Red	Long OFF, short red ON – If the OK LED is OFF for about 1.9 seconds and ON for 0.1 second, an internal error has occurred in the unit. Cycle power or reset the switch from the configuration utility to clear this error.
	Blinking Green	The OK LED can blink green at different rates. Continuous rapid green blinking – To verify communication and target switch selection, you can request the switch to “wink” its OK LED to visually identify the unit. Rapid green blinking, with a single short pause – Blinks rapidly for about 5 seconds and then pauses for about 1 second. <ul style="list-style-type: none"> • On power-up • When loading firmware • When resetting the switch

LED	Function	Description
F1, F2	Fiber Ports	Indicates status of the fiber optic port connections.
	Solid Green	ON-connected – A proper Ethernet connection (Link) exists between the port and another Ethernet device, but no communications activity is detected.
	Blinking Green	BLINK-activity – A proper Ethernet connection (Link) exists between the port and another Ethernet device, and there is communications activity.
	OFF Completely	A proper Ethernet connection (Link) does not exist between the port and another Ethernet device.
BP	Backplane	Indicates status of the Ethernet backplane port connections.
	Solid Green	ON-connected – A proper Ethernet connection (Link) exists between the port and another Ethernet device, but no communications activity is detected.
	Blinking Green	BLINK-activity – A proper Ethernet connection (Link) exists between the port and another Ethernet device, and there is communications activity.
	OFF Completely	A proper Ethernet connection (Link) does not exist between the port and another Ethernet device.

LED	Function	Description
A1, A2	Ring Status	Indicates the status of your local ring connections.
	Solid Green	GRN -normal – Its associated ring port is active and has a good link status.
	Solid Red	When both A1 and A2 are solid red , both ring ports have lost communication and the ring switch will not be able to communicate with other switches in the ring.
	Blinking Red	BLINK RED -ring port failure – A break has been discovered for its associated ring port. The break is at this location. Diagnostically speaking; in simple rings, the segment with the problem will be between the two switches with their ring port LEDs in the blink state. Also, you can ascertain the general location of where the segment error has occurred with a HMI, a master controller, or some other MODBUS Master through MODBUS/UDP polling.
	OFF Completely	The switch has not been configured for any rings.
ACT/LNK	Copper Ports	Each RJ45 copper port has Activity and Link LEDs.
	Green LED	Off: No link detected. On: Link detected but no activity. Flash: Activity at either 10 Mbps or 100 Mbps.
	Yellow LED	Off: Only 10 Mbps (10BaseT) connection is detected or no link detected. On: 100 Mbps (100BaseTX) connection is detected.

Dimensions

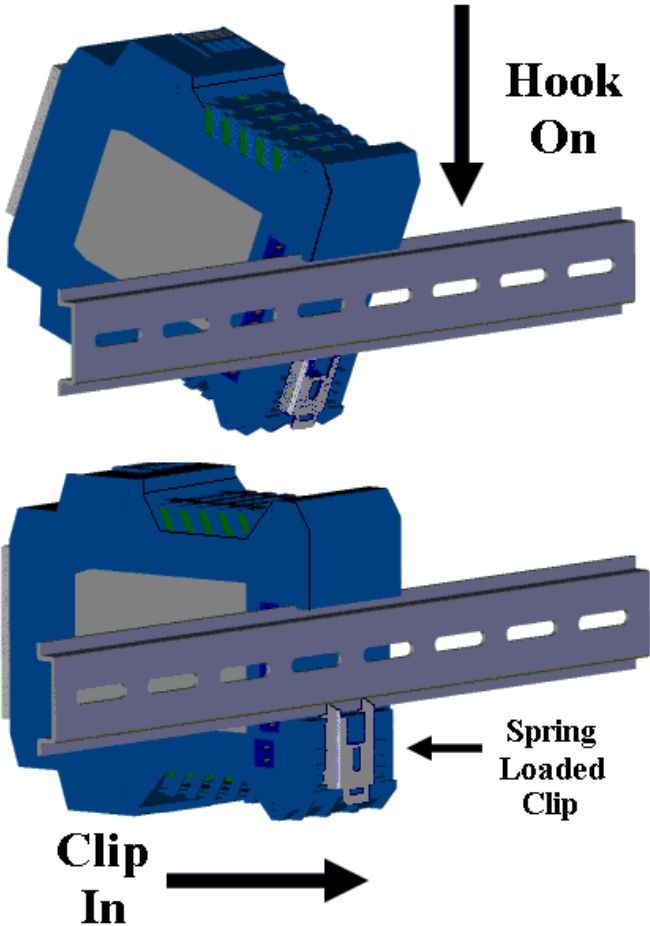
The following diagrams show the dimensions of the SC fiber port model (top) and the ST fiber port model (bottom).



Installation

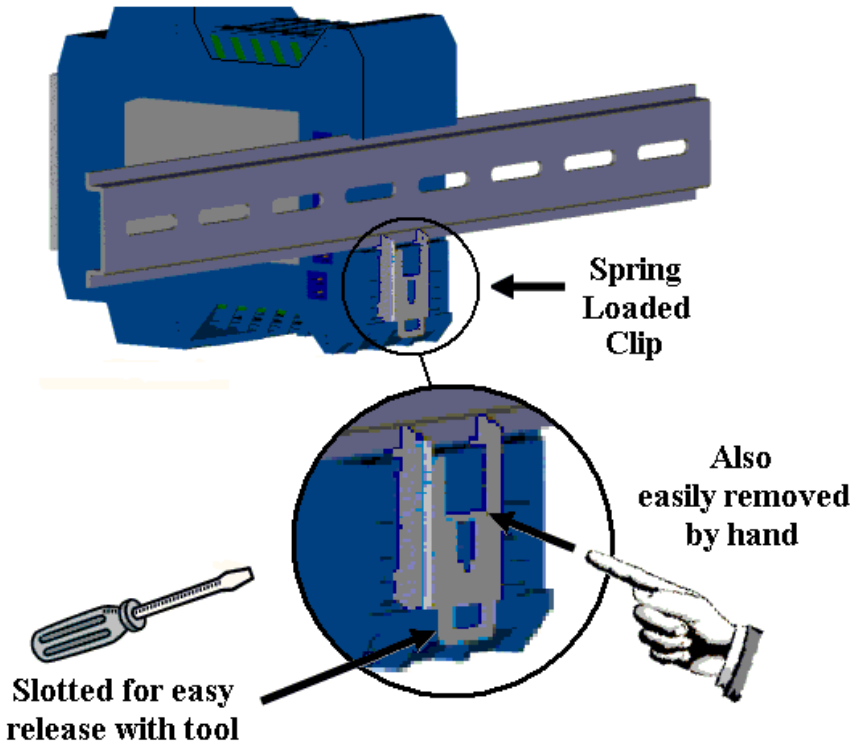
Fasten the Weed Ring Switch onto a standard DIN rail, as shown below. Hook the Ring Switch on top of the rail and push to clip it in on the bottom. Make sure to leave enough room to route the Ethernet cables.

Easy to Install



To remove the ring switch from the DIN rail, open the spring-loaded clip as shown below. Insert a screwdriver into the bottom slot on the clip to open it if the DIN rail is mounted directly to the wall. If the DIN rail is mounted on stand-offs, you can reach behind the device and pull down on the spring to release the clip by hand.

Easy to Release



Power Wiring

Weed Ring Switches can be powered from the same DC source that is used to power other Weed I/O devices. Weed Ring Switches are powered by +15 to +40 VDC. Power is applied to the bottom connector as shown in the illustration in the [OK Output Alarm \(Global Alarm Relay\)](#) section on page [14](#).

Alternatively, you can connect an EOTec Power Supply Module to the backplane of the EOTec 2104 Ethernet Ring Switch Module. The power supply module prevents possible down time resulting from power loss, and is available in several models from Weed Instrument.

Model	Input Power Requirements
2A06	85 to 240 VAC, 50/60 Hz 85 to 140 VDC, 250 mA
2A08	15 to 30 VDC @ 400 mA
2A16	85 to 240 VAC, 50/60 Hz 85 to 140 VDC, 250 mA Alarm relay output indicates loss of supply output.

Ethernet Wiring

Weed Ring Switches provides Ethernet and fiber connections to devices on the factory floor through star, daisy-chain, or ring topology. When wiring Weed Ring Switches in a ring topology, it is important to use *only* Weed Ring Switches for each node in the ring. With proper ring wiring, all nodes in the ring can maintain the same data connectivity should a path in the ring be cut.

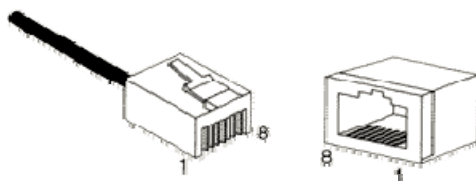
RJ45 Wiring Guidelines

Use data-quality (not voice-quality) twisted-pair cable rated category 5 or higher with standard RJ45 connectors. For best performance, use shielded cable. Straight-through or crossover category 5 cable can be used regardless of the type of device connected to the EOTec 2104 Ethernet Ring Switch. This is because the Weed Ring Switch supports auto-MDI/MDIX-crossover.

Ethernet Cable Pin-outs (for reference only)

Straight-through Cable Wiring		Crossover Cable Wiring	
Pin 1	Pin 1	Pin 1	Pin 3
Pin 2	Pin 2	Pin 2	Pin 6
Pin 3	Pin 3	Pin 3	Pin 1
Pin 6	Pin 6	Pin 6	Pin 2

Ethernet Connector Pin Positions

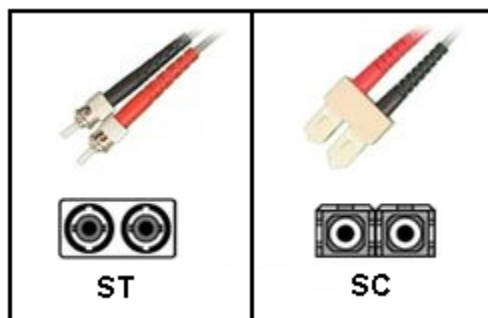


Ethernet Fiber Wiring Guidelines

The EOTec 2104 Ethernet Ring Switch also has a pair of multimode or single-mode fiber ports.

- For multimode, the maximum segment length is 2 km.
- Single-mode models can support maximum segment lengths of 15 km, 40 km, or 60 km.

Each fiber optic port on the switch is comprised of a pair of ST or SC connectors. For each fiber port there is a Transmit (TX) and Receive (RX) signal. When making your fiber optic connections, ensure that the Transmit (TX) port of the first switch connects to the Receive (RX) port of the second device, and the RX port of the first switch connects to the TX port of the second device. Fiber optic cables with color-coded ST or SC connectors are recommended because it is easier to ensure you connect one end to TX and the other end to RX.



The **ACT/LNK** LED is ON solid when you have made a proper connection.

Duplex Operation

The RJ45 ports auto-sense for full or half duplex operation. The fiber ports are configurable for full or half duplex operation through the EOTec 2104 Switch Tools utility.

Note: Fiber devices with half duplex settings should still communicate with the switch. If otherwise, contact Weed Instrument.

Network Device Check

The EOTec 2104 Ethernet Ring Switches support 10/100BaseT(X) (copper ports) and 100BaseFX (fiber ports). Only connect devices that support 10/100BaseTX or 100BaseFX to these switch models.

Note: All EOTec 2104 ring switches have four ports (two copper and two fiber) and an additional Ethernet backplane port that attaches on the side to other Weed modules near the back of each unit.

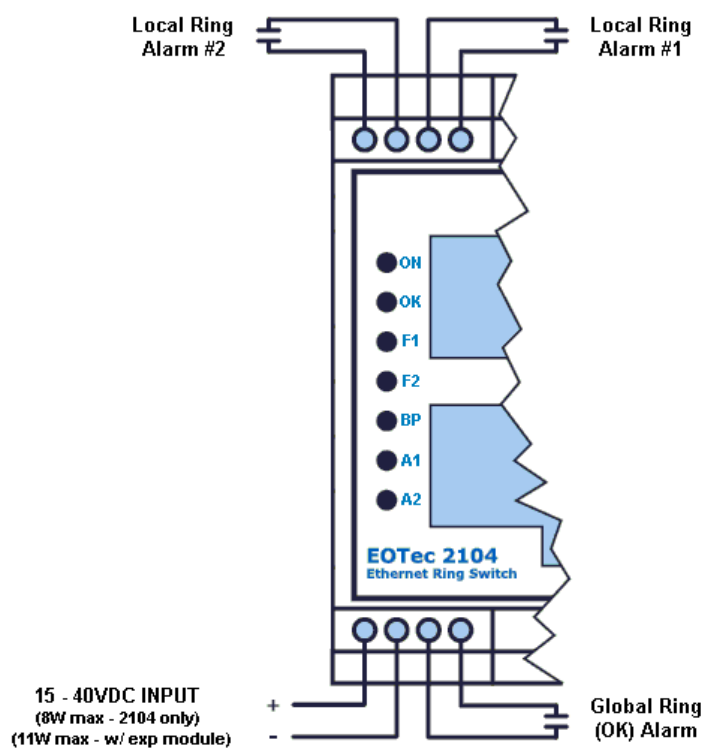
Alarm Wiring

Weed Ring Switches have three relay outputs that can be used to signal an error to a PLC, PC or other supervisory devices. By default, these outputs are normally closed when power input is present and there are no ring errors. All outputs will go open if power input fails. The Global Ring relay opens if a ring break is detected. The two Local Ring relays open when their respective ring ports lose a link.

OK Output Alarm (Global Alarm Relay)

All EOTec 2104 Ethernet Ring Switch models have an **OK** output alarm.

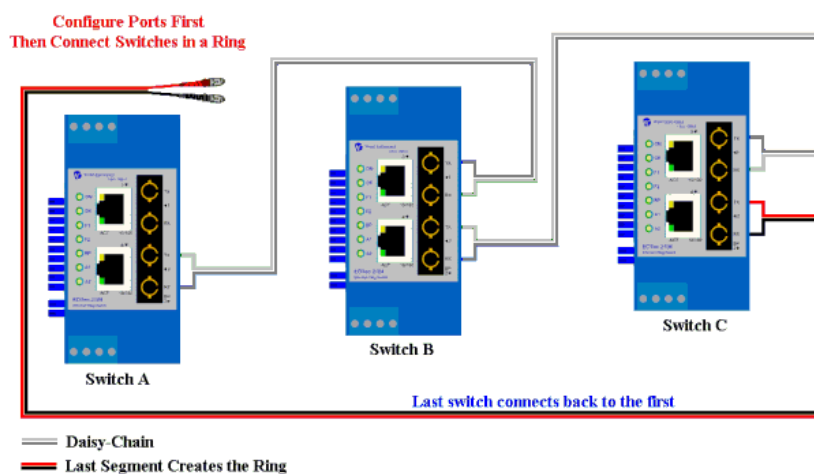
The **OK** output alarm normally is activated if any of the user-configurable alarm conditions occurs, such as a loss of primary DC power or a communication failure in the ring port(s). You can configure the functionality of this alarm using the EOTec 2104 Switch Tools utility.



Overview of Ring Connections

For ring operation, in most applications, no user configuration is necessary because ports 1 and 2 are preconfigured as ring ports. Just connect the ring-configured ports in a ring by connecting the last switch back to the first. Make sure you use **only** the ring-configured ports for your ring connections. Use the non-ring ports to connect your Ethernet devices such as PLCs, computers, and so on.

In the illustration below, the light gray path shows a daisy-chain path from Ring Switch A to B to C. Before connecting Ring Switch C back to Ring Switch A in order to complete a ring topology, all ports forming the ring **must** be configured as ring ports. If you want to use EOTec 2104 Ring Switches in a daisy-chain or star topology (for example, to add a separate branch that does not need the benefit of network redundancy), you would need to change any ring-configured ports to non-ring ports using the EOTec 2104 Switch Tools utility.



Note: Although this illustration shows port 2 of each device connected to port 1 of the next device in the ring, this is **not** a requirement. Just make sure you connect TX to RX, and RX to TX.

The online help and the *EOTec 2104 User Manual* have more details about valid ring topologies you can use to build your ring network.

Software Installation

1. Insert the EOTec 2104 CD into your CD drive and double-click **Setup.exe**. Administrative privileges are required for proper installation.
2. Accept the software license agreement. Optionally, you can print this document for your records.
3. Accept the suggested destination for the installation (recommended) or browse to select a preferred location.
4. Select whether to install both the EOTec 2104 Switch Tools utility and the EOTec 2104 Switch Status utility or just one of the utilities.
 - EOTec 2104 Switch Tools utility is the tool for configuring the EOTec 2104 Ethernet Ring Switch. It includes online help to guide you through the configuration process. Install this utility if you want to give users at this station the ability to modify the default settings and unlock the advanced capabilities of the EOTec 2104 Ring Switch.
 - EOTec 2104 Switch Status utility displays the status of all Weed Ring Switches detected on your ring network. This is a view-only utility that allows a user on this station to monitor the ring network but not make any changes to the configuration.
5. Both EOTec 2104 Switch Tools utilities require that you have WinPcap on your computer. Ensure the box is checked to **Install WinPcap v4.0.2** and click **Finish** to complete the installation.
6. The software is installed on your computer. You will be able to launch the software utilities from either of the following locations:
 - Icons for EOTec 2104 Switch Tools and EOTec 2104 Switch Status appear on your desktop.
 - If you accepted the default location for the installation, you can also find these tools by selecting **Weed Instrument** from your **All Programs** directory. Notice you can also select the online help separately from this location.

Technical Specifications



Copper RJ45 Ports: (10/100BaseTX)	
Connectors	Shielded RJ45
Protocols supported	All standard IEEE 802.3
Ethernet compliancy	IEEE 802.3, 802.3u, 802.3x, 802.3z, 802.1p and more
Auto crossover	RJ45 MDI/MDIX (you can use straight or cross-wired cables)
Auto negotiating	10BaseT and 100BaseTX
Auto sensing	Full or half duplex
Auto polarity	Yes, on the TD and RD pairs
Flow control	Yes, for full or half duplex
Full or half duplex	Yes, automatic or configurable
Ethernet isolation	1500 VRMS 1 minute
Plug and play	Yes, with factory pre-configuration available for special parameters
Cable requirements	Twisted pair (Cat. 5 or better) (shielded recommended)
Max. cable distance	100 meters

Backplane Port: (10/100BaseTX)	
Connectors	Standard EOTec 2000 backplane connector
Protocols supported	All standard IEEE 802.3
Ethernet compliancy	IEEE 802.3, 802.3u, 802.3x, 802.3z, 802.1p and more
Auto-crossover	Not applicable (no cable)
Auto-negotiating	10BaseT and 100BaseTX
Auto-sensing	Full or half duplex

Backplane Port: (10/100BaseTX)	
Auto-polarity	Not applicable (no cable)
Flow control	Yes, for full or half duplex
Full or half duplex	Yes, automatic or configurable
Ethernet isolation	1500 VRMS 1 minute
Plug and play	Yes, with factory pre-configuration available for special parameters
Cable requirements	Not applicable (no cable)
Max. cable distance	Not applicable (no cable)

ST or SC Fiber Ports: (100BaseF multimode or single-mode)	
100BaseFX ports	2
Fiber port mode	Multimode (MM) or single-mode (SM)
Fiber port connector	Duplex ST or SC
Optimal fiber cable	62.5/125 μm for MM; 9/125 μm for SM
Center wavelength	1300 nm
Max. distance (full duplex)	2 km with MM; 15 km with SM, 40 or 60 km with long haul SM
TX output power	2 km MM: -20 dBm; 15 km SM: -15 dBm; 40 and 60 km SM: Contact Weed Instrument.
RX sensitivity	2 km MM: -32 dBm; 15 km SM: 31 dBm; 40 and 60 km SM: Contact Weed Instrument.
Full and half duplex	Software configurable
Ethernet compliance	100BaseFX
Eye safety	IEC 60825-1, Class 1; FDA 21 CFR 1040.10 and 1040.11

General Specifications		
Operation	Intelligent store and forward, non-blocking	
Ethernet protocols supported	All IEEE 802.3	
Typical latency for 10 Mbps	16 μ s + frame time	Varies on load and settings
Typical latency for 100 Mbps	5 μ s + frame time	
MAC addresses supported	2 K	
Buffer memory	1 Mbits (128 Kbytes)	
Buffer allocation per port	Automatic and dynamic	
Memory bandwidth	3.2 Gbps for full-wire speed on all ports	
Address learning	Automatic	
Address aging	Remove old address after 300 seconds	
Address migration	Automatic	
Back pressure	Automatic for half-duplex	
Illegal frames	Dropped per 802.3	
Flow control	Yes, for full and half duplex	
Traffic prioritization	802.1p, QoS, CoS, ToS/DS	
Status Reporting	Power and operational status	
Modbus over Ethernet (UDP)	Modbus status registers	
OK, A1 and A2 relay contacts	30 VDC, 0.5 A Normally closed; opens on alarm	
Ring Features	Fault-tolerant loop support	
Max. switches in ring	50+	
Dual ring support	Yes	
Link loss recovery time	Less than 30 mS plus 5 mS per hop	

General Specifications		
Environmental		DIN rail mounting
Power input		Backplane and screw terminals
Input power (typical with all ports active)		8.0 W 11 W with expansion module
Input voltage		15-40 VDC
Transient protection		1500 W peak
Spike protection		5,000 W (10x for 1000 μ s) or 250 V (50x for 100 μ s)
Ethernet isolation		1500 VRMS 1 minute
Operating temperature range		-40 to +85 °C
Storage temperature range		-40 to +85 °C
Humidity (non-condensing)		5 to 95% RH
EMI / EMC		CFR 47 FCC part 15, IEC61326-1
Hazardous locations		FM/cFM Class I, Division 2, Groups A, B, C, & D, T4
Packaging (polyamide)		UL 94V-0
Dimensions		See Dimensions section in this manual.

Technical Support and Service

For technical support, please go to our website at:
www.weedinstrument.com/contact_us/technical.html

Installation and Operation

Our professionals guide you through the installation and operation of your new product so that it is efficiently operational in the minimum amount of time. Weed Instrument also helps you install options and upgrades to ensure that your product is successfully enhanced with more performance and new capabilities.

Troubleshooting

Should you have a question regarding the operation of your instrument or its perceived malfunction, the technical support experts will help you determine the issue and offer you the best possible solution. Go to www.weedinstrument.com/contact_us/tech_support/troubleshooting.html and determine if any of the troubleshooting tips solve your problem.

Service and Repair

If you need service or repair, please go to our website at:
www.weedinstrument.com/contact_us/tech_support/service.html

1. Click the link for the RETURN MATERIAL AUTHORIZATION FORM. This must be filled out completely in order to obtain a Return Material Authorization Number (RMA#) from Weed Instrument.
2. The RMA# must be marked on the outside of the box prior to shipping the unit to us for repair or calibration.
3. You are responsible for fully decontaminating your unit prior to shipment. If we receive a contaminated product we reserve the right to have it removed and destroyed by a HAZ MAT team at the owner's expense.
4. Once the form is complete, please send it to Weed Instrument by clicking on the **Submit** button. You will be given an RMA number within 24 hours. If you need the RMA# immediately, please call after sending it and a Service Administrator will give you the number verbally.

Part Number RM0900186
Revision 08/08