User Manual

Allen-Bradley

Guardmaster® EtherNet/IP Network Interface

Catalog Numbers 440R-ENETR

Allen-Bradley • Rockwell Software

Rockwell Automation

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

⚠	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
⚠	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

⚡	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
♨	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
⚠	**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

Read this preface to familiarize yourself with the rest of the manual. It provides information concerning:

- who should use this manual
- the purpose of this manual
- related documentation
- conventions used in this manual

Who Should Use this Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use the 440R-ENETR Guardmaster® EtherNet/IP network interface.

Purpose of this Manual

This manual is a reference guide for the 440R-ENETR Guardmaster EtherNet/IP network interface, communications interface for Guardmaster Safety Relays. It describes the procedures you use to install, wire, configure, troubleshoot, and use these modules.

> **ATTENTION:** You must use firmware version 2 or later Guardmaster Safety Relays equipped with the optical bus with the interface. Firmware version 1 Guardmaster Safety Relays do not work with the interface.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

For Information About	See This Publication	Publication Number
Next Generation Safety Relays (GSR)	Next Generation Safety Relays Overview Brochure	EUSAFE-BR009A
Using EtherNet/IP for industrial control	EtherNet/IP Design Considerations Reference Manual	ENET-RM002
ControlLogix Ethernet communication interface modules	ControlLogix EtherNet/IP Bridge Module Installation Instructions	1756-IN019
	EtherNet/IP Modules in Logix5000 Control Systems User Manual	ENET-UM001
ControlLogix chassis and power supplies installation	ControlLogix Chassis and Power Supplies Installation Instructions	1756-IN005
ControlLogix systems	ControlLogix System User Manual	1756-UM001
RSLinx	RSLinx Classic Getting Results Guide	LINX-GR001
440R-ENETR interface installation	Guardmaster Ethernet/IP Network Interface Installation Instructions	440R-IN078
Installing an EtherNet/IP network	EtherNet/IP Media Planning and Installation Manual	ODVA

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Common Techniques Used in this Manual

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.

Rockwell Software products contain extensive tutorials and help screens. We recommend that you use these tutorials and help screens to learn about the products.

For more information about Rockwell Software products, visit the Rockwell Software website at http://www.rockwellautomation.com/software/.

Table of Contents

About the Interface

Overview

This chapter provides an overview of the Guardmaster EtherNet/IP Network Interface, its primary features, and how to use it.

You need to understand the concepts discussed in this chapter to configure your interface and use it in an EtherNet/IP control system.

This table lists where to find specific information.

Important Interface Considerations

Before you begin using your interface, note the following important considerations.

> ⚠ **ATTENTION:** You must use firmware version 2 or later Guardmaster Safety Relays equipped with the optical bus with the interface. Firmware version 1 Guardmaster Safety Relays do not work with the interface.

About the Interface

The Guardmaster EtherNet/IP Network Interface provide connectivity to EtherNet/IP networks for Guardmaster Safety Relays.

The interface is for the optical bus backplane that provides connectivity through two RJ-45 connectors for 2-port pass-through support of daisy chain or ring, and the existing star and tree network topologies.

Power Up a System

Each time the interface is powered up, the adapter compares the number of I/O modules present on its backplane to the chassis size value from non-volatile memory. The adapter does not allow any I/O connection until the number of I/O modules present equals the chassis size value minus one for the adapter itself.

On power up, the interface assigns an address to every Guardmaster Safety Relay (up to six) in the backplane. The addressing starts from left to right with the Guardmaster Safety Relay to the immediate right of the interface taking the first address of 1.

RIUP Situations

You must observe the following rules for Guardmaster Safety Relay system construction and the removal and reinsertion of safety relays.

- Actual Guardmaster Safety Relay identification (such as, electronic keying) is done when connection establishment requests are received from the controller or controllers. The interface will not allow any I/O connections until the number and type of Guardmaster Safety Relays match the configuration in the connection request.
- A Guardmaster Safety Relay removed under power disrupts communication of the other Guardmaster Safety Relays in the system. Connections to all safety relays are disallowed until the entire system, including the interface, is power cycled to initiate re-addressing the system.
- If safety relays of different types are removed and returned to the wrong locations, attempts to connect to these safety relays will fail during verification of the electronic ID (providing that keying has not been disabled).
- If safety relays of the same type are removed and returned to the wrong locations, they accept connections from the controller or controllers once they pass their electronic keying check.

Interface Features

Features of the interface include:

- Use of EtherNet/IP messages encapsulated within standard TCP/UDP/IP protocol
- Common application layer with ControlNet and DeviceNet networks
- Interfacing via Category 5 rated twisted pair cable

- Half/full duplex 10 Mbit or 100 Mbit operation
- DIN Rail mounting for 440R-ENETR interface
- Communication from Guardmaster Safety Relays on the same DIN Rail (mounted immediately to the right of the interface) as the 440R-ENETR interface (when each safety relay is mounted to the right of the interface and each unit is within 5 mm of the next) to controllers on the EtherNet/IP network
- Communication supported by RSLinx® software
- IP address assigned via standard BootP or DHCP tools
- Configuration via RSLogix 5000 software
- No network scheduling required
- No routing tables required
- Support of connections from multiple controllers simultaneously

You must use RSLogix 5000 to configure these features. For more details on configuration, see <u>Configuration Requirements</u> on in chapter <u>3</u>.

What the Interface Does

The interface performs the following primary tasks:

- Real-time input data (also known as implicit messaging) - the interface serves as a bridge between Guardmaster Safety Relays and the network
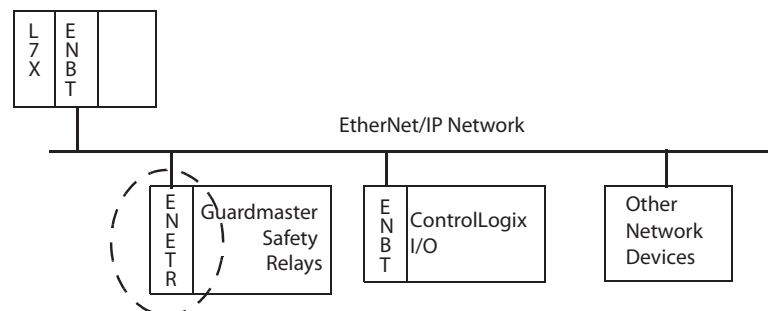
- Support of messaging data for programming information (also known as explicit messaging)

Hardware/Software Compatibility

The interface and the applications described in this manual are compatible with the following firmware versions and software releases.

Contact Rockwell Automation if you need software or firmware upgrades to use this equipment

Product	Firmware Revision/ Software Release
440R-ENETR interface	1.xx or later
1756-ENBT	2.3 or later
Logix controller	19 or later
RSLogix 5000 software	19 or later
RSLinx software	2.52 or later

Product	Firmware Revision/ Software Release
GSR DI (Catalog number 440R-D22R2)	2 or later
GSR DIS (Catalog number 440R-D22S2)	2 or later
GSR EM (Catalog number 440R-EM4R3)	2 or later
GSR EMD (Catalog number 440R-EM4R2D)	2 or later
GSR GLP (Catalog number 440R-GL2S1P)	2 or later
GSR GLT (Catalog number 440R-GL2S2T)	2 or later

Use of the Common Industrial Protocol (CIP)

The adapter uses the Common Industrial Protocol (CIP). CIP is the application layer protocol specified for EtherNet/IP, the Ethernet Industrial Protocol, as well as for ControlNet and DeviceNet networks. It is a message-based protocol that implements a relative path to send a message from the producing device in a system to the consuming devices.

The producing device contains the path information that steers the message along the proper route to reach its consumers. Since the producing device holds this information, other devices along the path simply pass this information; they do not store it.

This has the following significant benefits:

- You do not need to configure routing tables in the bridging modules, which greatly simplifies maintenance and module replacement.
- You maintain full control over the route taken by each message, which enables you to select alternative paths for the same end device.

Understand the Producer/ Consumer Model

The CIP producer and consumer networking model replaces the old source and destination (master and slave) model. The producer and consumer model reduces network traffic and increases speed of transmission. In traditional I/O systems, controllers poll input modules to obtain their input status. In the CIP system, input modules are not polled by a controller. Instead, they produce (multicast or unicast) their data either upon a change of state (COS) or periodically.

Multicast is the default mode for version 17 Logix and earlier controllers and unicast is the default for version 18 with multicast as a selectable option.

The frequency of update depends upon the options chosen during configuration and where on the network the input module resides. The input module, therefore, is a producer of input data, and the controller is a consumer of the data.

The controller also produces data for other controllers to consume. The produced and consumed data is accessible by multiple controllers and other devices over the EtherNet/IP network. This data exchange conforms to the producer and consumer model.

Specify the Requested Packet Interval (RPI)

The Requested Packet Interval or RPI is the update rate specified for a particular piece of data on the network. The RPI can be specified for the interface and include all of the Guardmaster Safety Relays in the system.

When you add an interface to the I/O configuration of a controller, you must enter the RPI as a parameter. This value specifies how often to produce the data for that device. For example, if you specify an RPI of 50 ms, it means that every 50 ms the device should send its data to the controller and the controller should send the consumed (output) data to the device.

Use RPIs only for devices that exchange data. For example, a ControlLogix EtherNet/IP bridge module in the same chassis as the controller does not require an RPI, because it is not a data-producing member of the system. Its use is only as a bridge to remote racks.

Support of Data Connections

TheGuardmaster EtherNet/IP Network Interface supports data connections.

A data connection to the interface is a grouping of data from one or more Guardmaster Safety Relays into a single block of data sent over a single connection at the same data rate.

See the EtherNet/IP Design Considerations Reference Manual, publicationENET-RM002 for more information on connections.

Chapter Summary

In this chapter, you were introduced to the features of the Guardmaster EtherNet/IP Network Interface, and considerations for installation and usage.

Notes:

Chapter 2

Install a Guardmaster EtherNet/IP Network Interface

Overview

This chapter describes how to physically install a Guardmaster EtherNet/IP network interface; and how to mount the interface to DIN Rail.

This table lists where to find specific information.

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Mount the Interface on a DIN Rail	15
Install the Interface	16
Wiring Requirements and Recommendations	16
Grounding Considerations	17

⚠️ **ATTENTION: Environment and Enclosure**

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC 60664-1), at altitudes up to 2000 m (6562 ft) without derating.

This equipment is not intended for use in residential environments and may not provide adequate protection to radio communication services in such environments.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA or be approved for the application if nonmetallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see the following:

- *Industrial Automation Wiring and Grounding Guidelines*, publication 1770-4.1, for additional installation requirements

- NEMA 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by enclosures

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⚠ **ATTENTION: Prevent Electrostatic Discharge**
This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation.
Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static
- Wear an approved grounding wrist strap
- Do not touch connectors or pins on component boards
- Do not touch circuit components inside the equipment
- Use a static-safe workstation, if available
- Store the equipment in appropriate static-safe packaging when not in use

Installation Summary

Do these steps to install a network interface.

1. Mount the Interface on a DIN Rail.

2. Install the Interface.

⚡ **SHOCK HAZARD:** To prevent electrical shock, disconnect the EtherNet/IP network interface from it power source before installing or servicing. Install in suitable enclosure. Keep free from contaminants.

⚠ **ATTENTION:** An incorrectly applied or installed EtherNet/IP network interface can result in damage to the components or reduction in product life. Wiring or application errors (e.g. supplying incorrect or inadequate supply voltage or operating/storing in excessive ambient temperatures) may result in malfunction of the product.

⚠ **ATTENTION:** Only personnel familiar with the EtherNet/IP network interface and associated machinery should plan to install, set up, and maintain the system. Failure to comply may result in personal injury and/or equipment damage.

⚠ **ATTENTION:** This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

Use the figure to identify the external features of your interface.

Figure 1 - Physical Features of the 440R-ENETR Interface
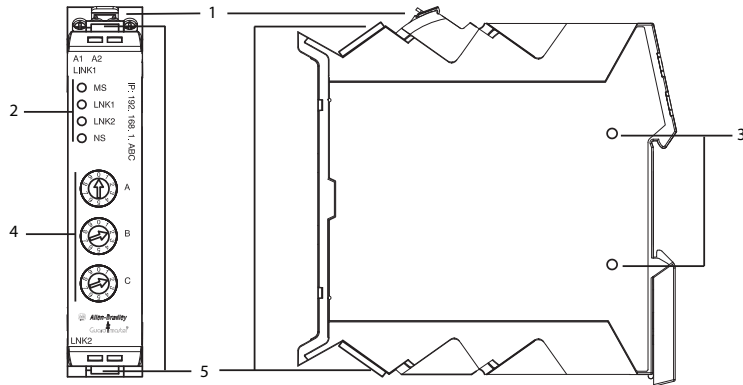
|	Description		Description
1	Removable terminal block	4	Network address rotary switches
2	Status indicators	5	Ethernet network RJ-45 connectors
3	Optical communications link		

Mount the Interface on a DIN Rail

Follow these steps to mount the interface on a DIN Rail.

> ⚠ **ATTENTION:** To avoid overheating, the unit must be mounted vertically and requires 37.4 mm (1.5 in.) of clearance at the top and the bottom to allow adequate ventilation. The temperature ratings for the unit will be derated if not mounted in this manner.

1. Position the adapter vertically above an IEC standard (35x7.5x1 mm) top-hat DIN Rail at a slight angle (DIN Rail: Cat. No. 199-DR1; 46277-3).
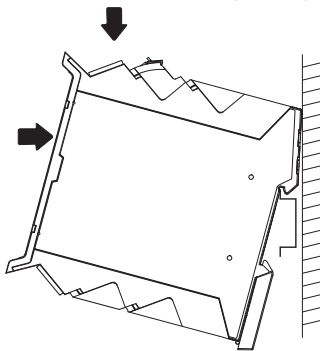
2. Press down firmly to install the interface on the DIN Rail.

3. Set the network address switches to the desired value. See Set the Network Address in chapter 3 for more details on setting the IP address.

To remove your interface from the DIN Rail, pry the DIN Rail latch downwards until there is separation from the latch and the DIN Rail.

Install the Interface

Install the interface to the left of Guardmaster Safety Relays equipped with an optical communication bus. There must be no more than 5 mm horizontal separation between two adjacent relays for the optical communication bus to operate properly.

Wiring Requirements and Recommendations

- Allow for at least 50 mm (2 in.) between I/O wiring ducts or terminal strips and the interface.
- Separate wiring by signal type. Bundle wiring with similar electrical characteristics together.
- Label wiring to all devices in the system. Use tape, shrink-tubing, or other dependable means for labeling purposes. In addition to labeling, use colored insulation to identify wiring based on signal characteristics. For example, you may use blue for DC wiring and red for AC wiring.

Refer to the following illustration to wire the interface.

A1 = Supply
A2 = Common
Ethernet RJ-45 connector

TOP VIEW
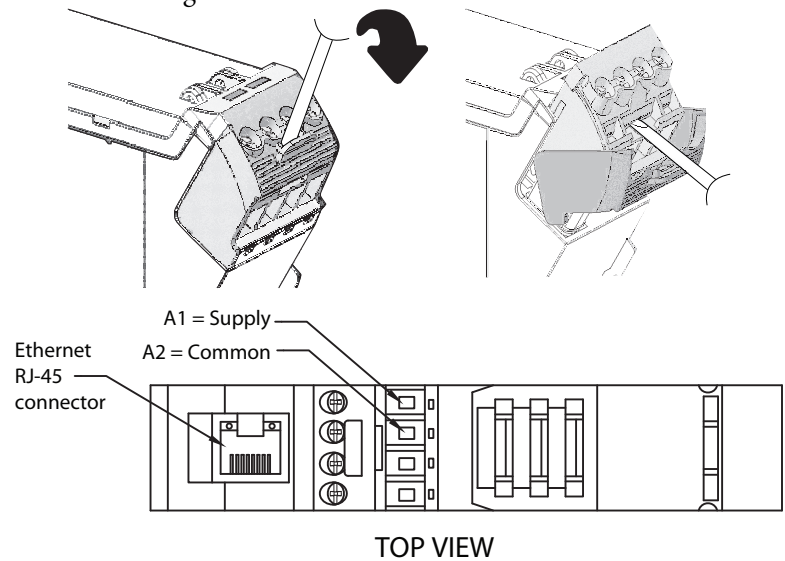
ATTENTION: Do not connect 120/240V AC power to the A1/A2 DC supply.

ATTENTION: Do not wire more than two conductors on any single terminal.

Table 1 - Wire Requirements

		Wire Size		
	Type	**Min**	**Max**	
440R- ENETR	Solid	0.14 mm^2 (26 AWG)	2.5 mm^2 (14 AWG)	Rated @ 90 ºC (194 ºF) insulation max
	Stranded		1.5 mm^2 (16 AWG)	

Grounding Considerations

The grounding and bonding must be of equal potential between all devices in the communication coverage area.

> ⚠️ **ATTENTION:** If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Chapter Summary

In this chapter, you learned how to install and wire your Guardmaster EtherNet/IP network interface. The following chapter describes how to configure your Guardmaster EtherNet/IP network interface to communicate on the EtherNet/IP network by providing an IP address, gateway address, and Subnet mask.

Notes:

Chapter 3

Configure the Interface for Your EtherNet/ IP Network

Overview

Before using your interface in an EtherNet/IP network, you need to configure it with an IP address, subnet mask, and optional Gateway address. This chapter describes these configuration requirements and the procedures for providing them. Here are ways you can do this:

- Use the Rockwell BootP/DHCP utility, version 2.3 or later, that ships with RSLogix 5000 or RSLinx software.
  - You can also use this utility to reconfigure a device with an IP address you must change.
- Use a third party DHCP server.
- Use the Network Address rotary switches.
- Have your network administrator configure the interface via the network DHCP server.

See the table for a list of where to find information in this chapter.

Configuration Requirements

Before you can use your interface, you must configure its IP address, its subnet mask, and, optionally, a gateway address. You can use the Rockwell BootP utility, version 2.3 or later, to perform the configuration. You can also use a DHCP server or the network address switches to configure these parameters.

> ⚠ **ATTENTION:** You must use firmware version 2 or later Guardmaster Safety Relays equipped with the optical bus with the interface. Firmware version 1 Guardmaster Safety Relays do not work with the interface.

If you need to reset the interface to factory defaults, set the network address rotary switches to 888 and perform a power cycle to the device.

IP Address

The IP address identifies each node on the IP network (or system of connected networks). Each TCP/IP node on a network (including the interface) must have a unique IP address.

The IP address is 32 bits long and has a Network ID part and Host ID part. Networks are classified A, B, C, (or other). The class of the network determines how an IP address is formatted.

	0	7 8	31
Class A	0	Network ID	Host ID

	0	15 16	31
Class B	10	Network ID	Host ID

	0	23 24	31
Class C	110	Network ID	Host ID

You can distinguish the class of the IP address from the first integer in its dotted-decimal IP address as follows:

Range of first integer	Class	Range of first integer	Class
0 1…127	A	192…223	C
128…191	B	224… 255	other

Each node on the same physical network must have an IP address of the same class and must have the same network ID. Each node on the same network must have a different Host ID thus giving it a unique IP address.

IP addresses are written as four decimal integers (0...255) separated by periods where each integer gives the value of one byte of the IP address.

> **EXAMPLE**   For example, the 32-bit IP address:
>
> 10000000 00000001 00000000 00000001 is written as 128.1.0.1

Gateway Address

This section applies to multi-network systems. If you have a single network system, refer to the next section.

The Gateway Address is the default address of a network. It provides a single domain name and point of entry to the site. Gateways connect individual physical networks into a system of networks.

When a node needs to communicate with a node on another network, a gateway transfers the data between the two networks. The figure shows gateway G connecting Network 1 with Network 2.
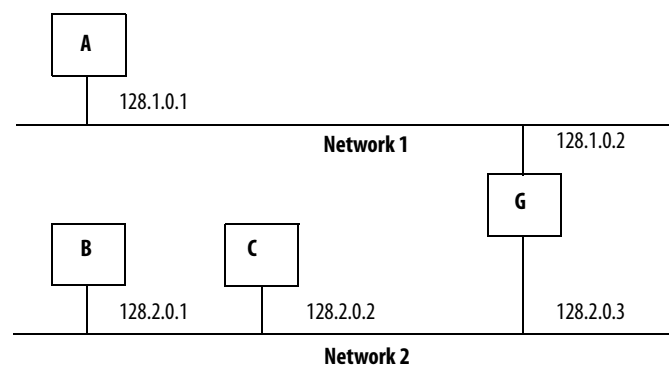
When host B with IP address 128.2.0.1 communicates with host C, it knows from C's IP address that C is on the same network. in an Ethernet environment, B can then resolve C's IP address into a hardware address (MAC address) and communicate with C directly.

When host B communicates with host A, it knows from A's IP address that A is on another network (the network IDs are different). In order to send data to A, B must use the IP address of the gateway connecting the two networks. In this example, the gateway's IP address on Network 2 is 128.2.0.3.

The gateway has two IP addresses (128.1.0.2 and 128.2.0.3). The first must be used by hosts on Network 1 and the second must be used by hosts on Network 2. To be usable, a gateway of a host must be addressed using a network ID matching its own.

Subnet Mask

The subnet mask is used for splitting IP networks into a series of subgroups, or subnets. The mask is a binary pattern that is matched up with the IP address to turn part of the Host ID address field into a field for subnets.


EXAMPLE   Take Network 2 (a Class B network) in the previous example and add another physical network. Selecting the following subnet mask would add two additional network ID bits, allowing for four physical networks:
11111111 11111111 **11**000000 00000000 = 255.255.192.0

These two bits of the Host ID are used to extend the netdwork ID.

Two bits of the Class B host ID are used to extend the network ID. Each unique combination of bits in the part of the Host ID where subnet mask bits are 1 specifies a different physical network.

The new configuration is:
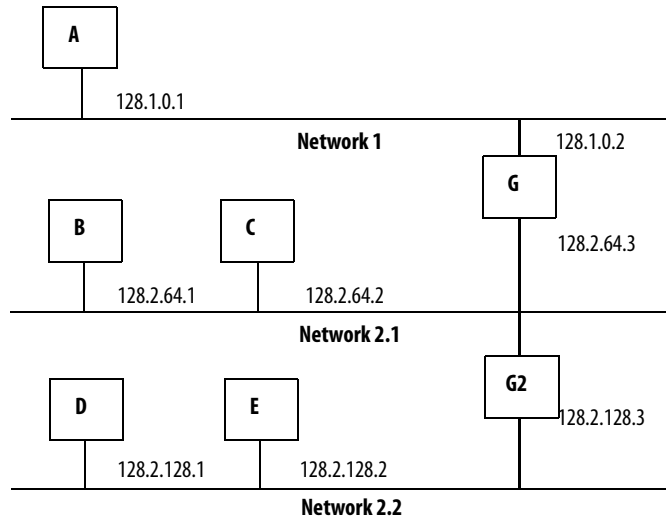
A second network with Hosts D and E was added. Gateway G2 connects Network 2.1 with Network 2.2.

Hosts D and E will use Gateway G2 to communicate with hosts not on Network 2.2.

Hosts B and C will use Gateway G to communicate with hosts not on Network 2.1.

When B is communicating with D, G (the configured Gateway for B) will route the data from B to D through G2.

Set the Network Address

The interface ships DHCP-enabled and with the switches set to 999. To change the network address, do the following.

Set the Network Address for Guardmaster EtherNet/IP Interface

- Adjust the switches in front of the module
- Use a Dynamic Host Configuration Protocol (DHCP) server such as Rockwell Automation BootP/DHCP
- Retrieve the IP address from non-volatile memory

The interface reads the switches first to determine if the switches are set to a valid number. Set the network address by adjusting the three switches on the front of the interface.

Figure 2 - Network Address Example

This example shows the network address set at 163.
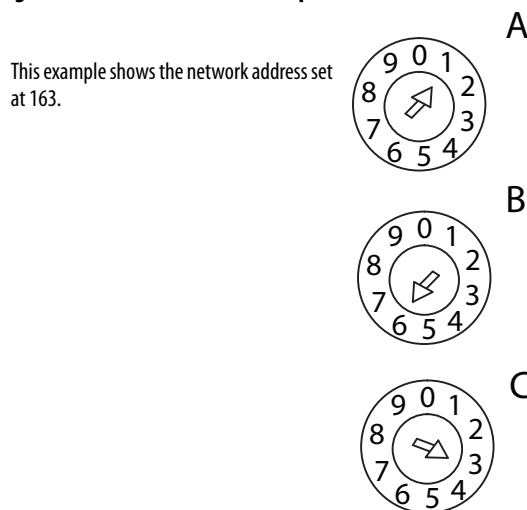
Use a small blade screwdriver to rotate the switches. Line up the small notch on the switch with the number setting you wish to use. Valid settings range from **001**…**254**.

When you use the switches to assign an address and set it to **001**, the interface gateway address is set to **0.0.0.0.** and the subnet mask is **255.255.255.0** . When you use the switches to assign an address and set it to a valid number between **002…254**, the interface gateway address is set to **192.168.1.1**.

If the switches are set to an invalid number (for example, 000 or a value greater than 254 excluding 888), the interface checks to see if DHCP is enabled. If DHCP is enabled, the interface requests an address from a DHCP server. The DHCP server also assigns other Transport Control Protocol (TCP) parameters.

If DHCP is not enabled, the interface uses the IP address, along with other TCP configurable parameters, stored in non-volatile memory.

Use the Rockwell BootP/ DHCP Utility

The Rockwell BootP/DHCP utility is a standalone program that incorporates the functionality of standard BootP software with a user friendly graphical interface. It is located in the Utils directory on the RSLogix5000 software installation CD. The interface must have DHCP enabled (factory default and the network address switches set to an invalid value) to use the utility.

To configure your interface using the BootP utility, perform the following steps:

1. Run the BootP software.

   In the BOOTP Request History panel you see the hardware addresses of devices issuing BootP requests.
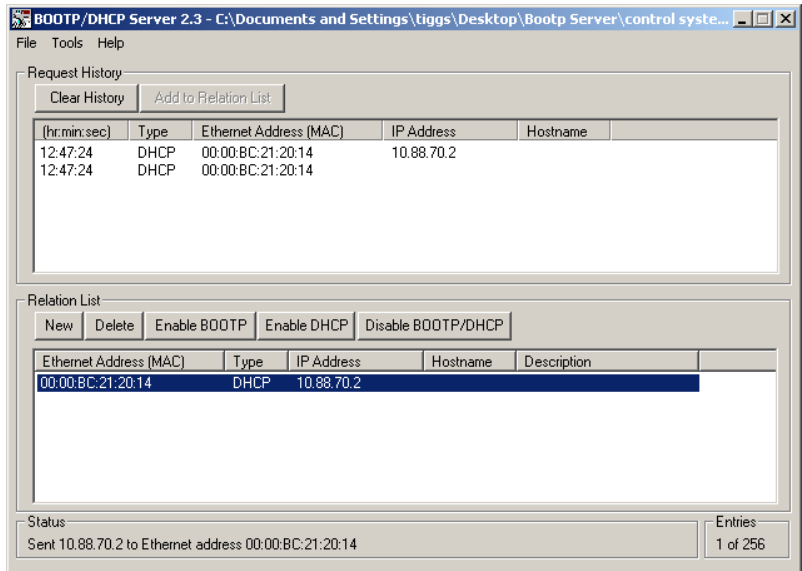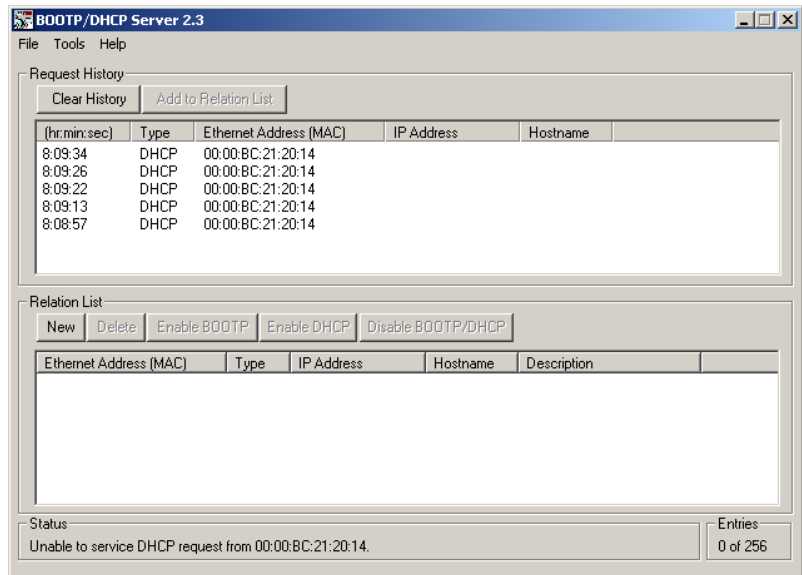
2. Double-click the hardware address of the device you want to configure.

   The New Entry dialog appears with the device's Ethernet Address (MAC).

New Entry	
Ethernet Address (MAC):	00:00:BC:21:20:14
IP Address:	10 . 88 . 70 . 2
Hostname:	
Description:	
	OK Cancel

3. Enter the IP Address you want to assign to the device and click OK. The device is added to the Relation List, displaying the Ethernet Address (MAC) and corresponding IP Address, Hostname, and Description (if applicable).

   BOOTP/DHCP Server 2.3 - C:\Documents and Settings\tiggs\Desktop\Bootp Server\control syste...

   File   Tools   Help

   Request History

   Clear History   Add to Relation List

(hr:min:sec)	Type	Ethernet Address (MAC)	IP Address	Hostname
12:47:24	DHCP	00:00:BC:21:20:14	10.88.70.2	
12:47:24	DHCP	00:00:BC:21:20:14		

   Relation List

   New   Delete   Enable BOOTP   Enable DHCP   Disable BOOTP/DHCP

Ethernet Address (MAC)	Type	IP Address	Hostname	Description	
00:00:BC:21:20:14	DHCP	10.88.70.2			

   Status   Entries
   Sent 10.88.70.2 to Ethernet address 00:00:BC:21:20:14   1 of 256

When the address displays in the IP Address column in the Request History section, the IP address assignment has been made.

4. To make this configuration static in the device, highlight the device in the Relation List panel, and click the Disable BOOTP/DHCP button.

   When power is cycled to the device, it uses the configuration saved in non-volatile memory and will not issue a DHCP request.
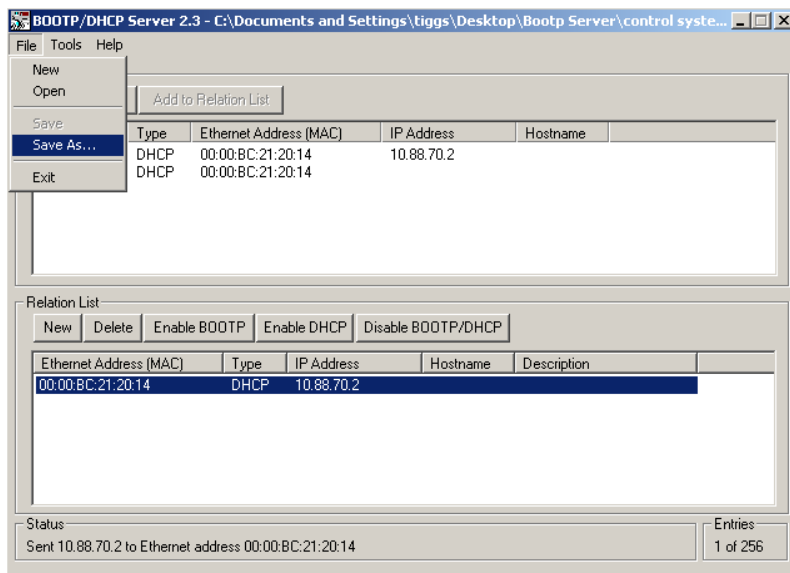
5. To enable DHCP for a device with DHCP disabled, highlight the device in the Relation List, and click the Enable DHCP button.

   You must have an entry for the device in the Relation List panel to re-enable DHCP.
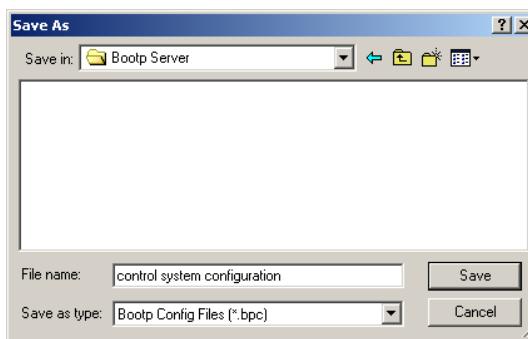
Save the Relation List

You can save the Relation List for later use. To save the Relation List, perform the following steps:

1. Select Save As... from the File menu.

The Save As dialog appears.

2. Select the folder where you want to save the Relation List.

3. Enter a File name for the Relation List, for example, control system configuration, and click Save.

You can leave the Save as type at the default setting: Bootp Config Files (*.bpc).

You now have the option to open the file containing the Relation List at a later session.

Use DHCP Software to Configure Your Interface

DHCP (Dynamic Host Configuration Protocol) software automatically assigns IP addresses to client stations logging onto a TCP/IP network.

DHCP is based on BootP and maintains some backward compatibility. The main difference is that BootP was designed for manual configuration, while DHCP allows for dynamic allocation of network addresses and configurations to newly attached devices.

Be cautious about using DHCP software to configure your interface. A DHCP server typically assigns a finite lease time to the offered IP address.

When 50% of the leased time has expired, the interface attempts to renew its IP address with the DHCP server.

The possibility exists that the interface will be assigned a different IP address, which would cause the interface to cease communicating with the ControlLogix controller.

> ⚠ **ATTENTION:** To avoid unintended control or loss of control, the interface must be assigned a fixed IP address. A dynamically provided IP address should be used only at initial configuration. If a DHCP server is used, it must be configured to assign the same IP address to your interface.
>
> Failure to observe this precaution may result in unintended machine motion or loss of process control.

Chapter Summary

This chapter provided instructions on how to configure Guardmaster EtherNet/IP Interface modules through the RSLogix 5000 software and included information on configuration requirements and setting the network address.

Notes:

Automation Controller Communications

Overview

This chapter describes and gives examples of how each type of EtherNet/IP messaging, I/O messaging and Explicit messaging, is used.

Ethernet Messaging

The Guardmaster EtherNet/IP network interface supports two types of EtherNet/IP messaging.

- I/O Messaging – Used for deterministic EtherNet/IP communications with ControlLogix®, CompactLogix™, SoftLogix™, and EtherNet/IP scanners. Its primary use is to read and write I/O data for control purposes.
- Logic Explicit Messaging – Used for non-deterministic communications in which data is not critical for control. Logic explicit messages have a lower priority compared to I/O messages and are used to read and write non-critical data.

I/O Messaging

RSLogix™ 5000 software is used to configure I/O messaging between an automation controller and a Guardmaster EtherNet/IP network interface on an EtherNet/IP network.

The following example provides the steps necessary to configure a Logix controller for I/O messaging.
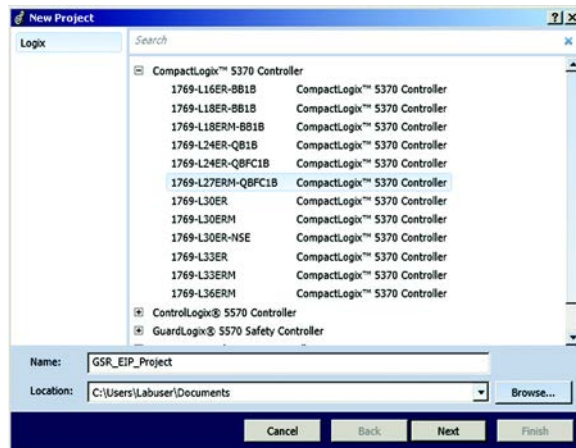
Logix Configuration

An Add-on Profile is available for the Guardmaster EtherNet/IP network inferface and can be used with RSLogix 5000 version 19 and higher. The profile can be downloaded from:

http://support.rockwellautomation.com/controlflash/LogixProfiler.asp

An existing project can be used or a new project can be created to configure EtherNet/IP I/O messaging. To create a new project, perform the following steps.

1. Select File > New from the RSLogix 5000 menu bar.

2. Select the controller type. Then, enter a name for the project and click Next.

3. Select the Security Authority and enter a description. Then, click Finish.

EtherNet/IP Network Configuration with Add-on Profiles

After the controller configuration, the Guardmaster EtherNet/IP Network Interface has to be added to the I/O Configuration.

1. Right-click on the EtherNet/IP bridge within the I/O Configuration folder, then select New Module to open the Select Module Type window
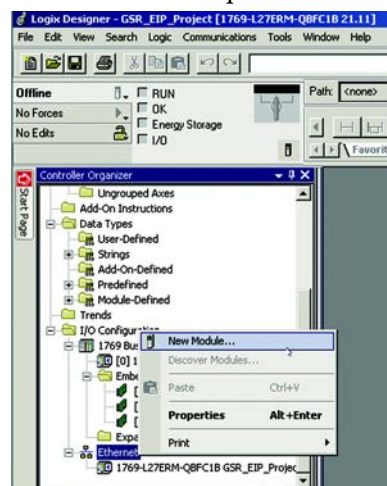
2. Select the 440R-ENETR, then click Create.
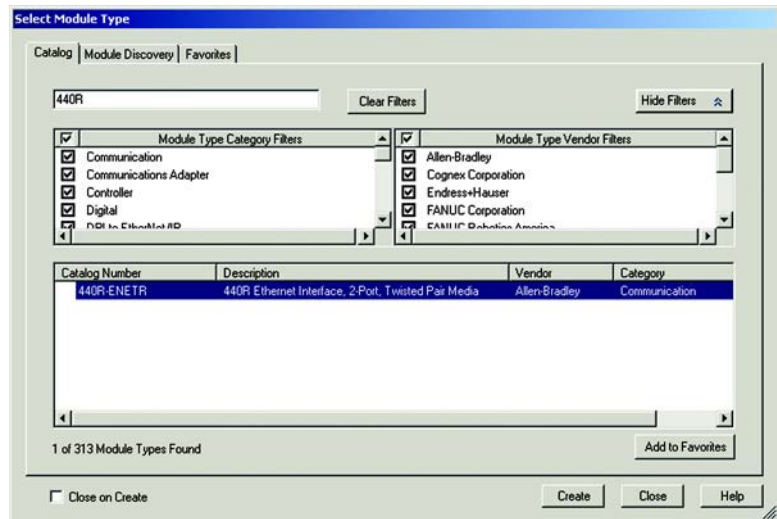
3. Enter a name for the Guardmaster EtherNet/IP network interface. The name will create tags in RSLogix 5000 that can be used to read data from the Guardmaster Safety Relays being scanned by the Guardmaster EtherNet/IP network interface.
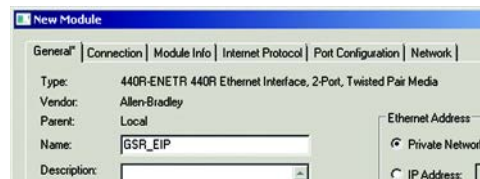
4. Enter the IP address of the Guardmaster EtherNet/IP network interface.
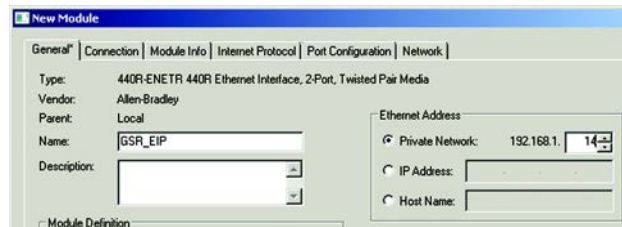
5. Select Change to configure the Guardmaster safety relays monitored by the Guardmaster EtherNet/IP network interface.

6. Right-click on an <Empty Slot> in the Module Definition dialog box and select the Guardmaster Safety Relay that is physically located in that slot position next to the Guardmaster EtherNet/IP network interface.

Note: Empty slots between Guardmaster Safety Relays are not supported by the Guardmaster EtherNet/IP network interface at run-time. Your configuration must represent the actual Safety Relays present beginning with the first slot and without any empty slots.
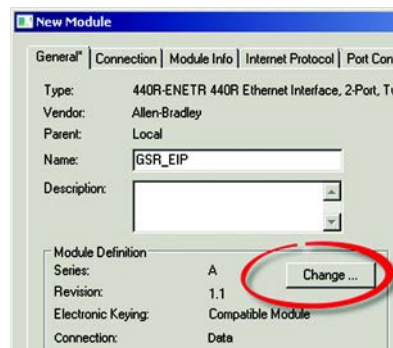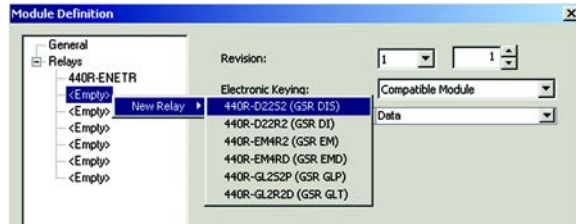
7. Once all Guardmaster Safety Relays monitored by the Guardmaster EtherNet/IP network interface have been added, Click OK.

8. Click OK at the next window to have RSLogix 5000 create the predefined tags. The Guardmaster EtherNet/IP network interface will now show as a module in the I/O Configuration folder.

Accessing Module Data with Add-on Profiles

With both the Logix controller and the EtherNet/IP network configured, the Logix controller can exchange data with the Guardmaster EtherNet/IP network interface.

1. Open the Controller tags window.

2. Select the Monitor Tags tab.

In the previous example, predefined input tags were created for the GSR DIS module in slot 1 of the configuration. For detailed information on the individual tag members and their meaning, see Appendix D.

Explicit Messaging

Data can be accessed from the Guardmaster EtherNet/IP network interface by non-Logix automation controllers that support EtherNet/IP explicit messaging.

This example shows the configuration of an explicit message from a MicroLogix™ 1100 controller to the Guardmaster EtherNet/IP network interface:

1. Set up the MSG instruction to read the data assembly from the Guardmaster EtherNet/IP network interface by configuring the following fields.
   - Channel: 1 (Integral) (this is the Ethernet port)
   - Communication Command: CIP Generic
   - Data Table Address (Receive): N7:0 (choose an address that supports 60 bytes)
   - Size in Bytes (Receive): 60
   - Extended Routing Info File(RIX): RIX10:0
   - Service: Read Assembly
   - Class: 04
   - Instance: 100 (64h)
   - Attribute: 03
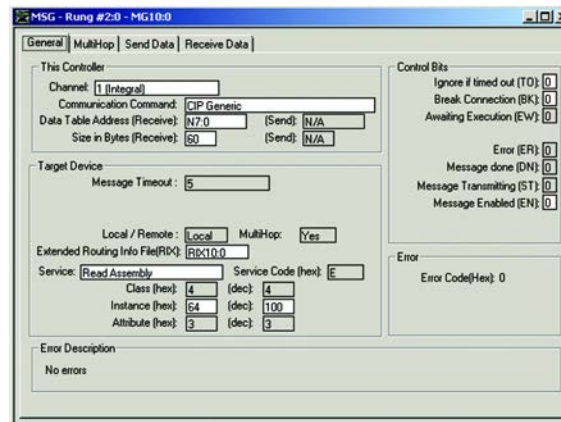
2. Set the Ethernet network address of the Guardmaster EtherNet/IP network interface as the target of the message instruction:
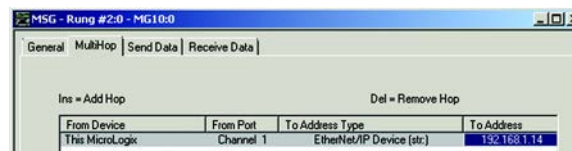
Appendix D describes the individual members of the data returned from the message instruction.

Notes:

Chapter **5**

Troubleshoot the Interface

Overview

This chapter describes the different status indicators available in the Guardmaster EtherNet/IP network interface and how to interpret these indicators to help troubleshoot the module.

The following table lists where to find specific information

Topic	Page
Interpret the Status Indicators	35
Status Indicators for the Interface	35

Interpret the Status Indicators

Read this chapter to learn about what the LED status indicators mean for the Guardmaster EtherNet/IP Network Interface.

Status Indicators for the Interface

The following describes the status indicators on the 440R-ENETR.
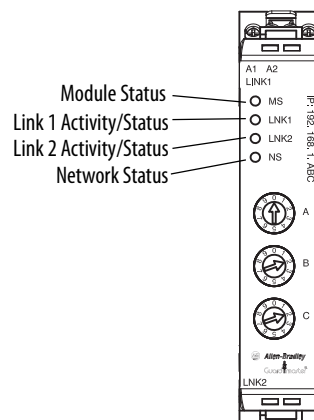
Table 2 - Status Indicators for 440R-ENETR Interface

	Status	**Description**
Module status	Off	No power applied to device
	Solid green	Device operating normally
	Flashing green	Device needs commissioning due to missing, incomplete, or incorrect configuration.
	Flashing red/green	Module self-test
	Flashing red	Recoverable fault. Complete firmware update, verify address switches. Check for monitored safety relay fault.
	Solid red	Unrecoverable fault, may require device replacement.
Network status	Off	Device is not online - Device has not completed Dup_MAC_ID test. - Device not powered - check module status indicator.
	Flashing green	Device is online but has no CIP connections in the established state.
	Solid green	Device online and has CIP connections in the established state.
	Flashing red	One or more CIP connections in timed-out state. Check for Guardmaster safety relay failure and controller operation.
	Solid red	Duplicate IP address detected. Verify IP address setting and correct, as needed.
Link 1 or Link 2 Activity / Status	Off	No link established.
	Solid green	One of the following conditions exist: • A 100 Mbps (full or half duplex) link exists. • The ring network is operating normally.
	Flashing green	Transmit or receive activity present on indicated port @ 100 Mbps.
	Solid yellow	One of the following conditions exist: • A 10 Mbps (full or half duplex) link exists. • The ring network is operating normally.
	Flashing yellow	Transmit or receive activity present on indicated port @ 10 Mbps.

EtherNet/IP Network Interface Specifications

Specifications

Following are specifications for the Guardmaster EtherNet/IP Network Interface

Table 3 - General Specifications – Guardmaster EtherNet/IP Network Interface

Specification	Description

Indicators	2 red/green status indicators:
	  – Module status
	  – Network status (Ports 1 and 2 combined)
	2 green/yellow status indicators:
	  – Link 1 status
	  – Link 2 status

Power consumption, max	2.2 W @ 26.4V DC
Power dissipation, max	0.8 W @ 26.4V DC
Thermal dissipation, max	2.7 BTU/hr @ 26.4V DC
Dimensions (HxWxD), approx.	111.4 x 22.5 x 113.6 mm (4.39 x 0.89 x 4.47 in.)
Enclosure type rating	None (open-style)
Terminal base screw torque	0.8 N•m (7 lb•in)
Weight, approx.	180 g (0.4 lb)
Wiring category[1]	1 – on power ports 2 – on communications ports
Wire size	**Power connections:** 0.34... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated @ 75 °C (167 °F) or greater, 1.2 mm (3/64 in.) insulation max. **Ethernet wiring:** RJ45 connector according to IEC 60603-7, 2 or 4 pair Category 5e min cable according to TIA 568-B.1 or Category 5 cable according to ISO/IEC 24702.
North American temp code	T6
IEC temp code	T6

(1) Use this conductor category information for planning conductor routing. Refer to publication 1770-IN041, Industrial Automation Wiring and Grounding Guidelines.

Table 4 - Environmental Specifications

Specification	Description
Temperature, operating	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20...+55 °C (-4...+131 °F)
Temperature, surrounding air, max	55 °C (131 °F)
Temperature, nonoperating	IEC60068-2-1 (Test Ab, Unpackaged Nonoperating Cold) IEC60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat) IEC60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock): -40...+85 °C (-40...+185 °F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Damp Heat): 5...95% non-condensing
Vibration	IEC 60068-2-6 (Test Fc, Operating): 5 g @ 10...500 Hz
Shock, operating	IEC60068-2-27 (Test Ea, Unpackaged Shock): 15 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity	IEC61000-4-2: 6 kV contact discharges 8 kV air discharges
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 10V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity	IEC 61000-4-4: ±4 kV @ 5 kHz on power ports ±2 kV @ 5 kHz on communications ports
Surge transient immunity	IEC 61000-4-5: ±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±2 kV line-earth (CM) on communications ports
Conducted RF immunity	IEC61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Table 5 - Certifications

Certifications (when product is marked)[1]	Value
cULus	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CE	European Union 2004/108/EC EMC Directive, compliant with: EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
EtherNet/IP	ODVA conformance tested to EtherNet/IP specifications

(1)   See the Product Certification link at http://www.rockwellautomation.com/products/certification/ for Declaration of Conformity, Certificates, and other certification details.

Interface Web Dialogs

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For Information About	Page
Work with the Home Page	39
Work with the Browse LSR Devices Page	41
Work with the Administrative Settings Pages	42
Use the Network Configuration Page	43
Use the E-mail Configuration Page	44

Work with the Home Page

Use the interface diagnostics home page to access other interface diagnostics web pages and see the following information.

- 440R-ENETR
  - Revision
  - Device IP address
  - Ethernet address (MAC)
  - Serial number
- Status
  - GSR connection status
  - GSR faults
  - Rotary switch status
  - Interface connection status
- Software versions
  - EtherNet/IP FW revision
  - Controller FW revision
- Configuration
  - Switch setting (startup/current)

To display and work with the interface diagnostics home page, follow these procedures.

IMPORTANT	Make sure that your PC Internet LAN setting and your TCP/IP settings are configured to access the subnet on which your interface communicates.

1. From your web browser, enter the interface IP address to see the Home page.

Enter the interface IP address to see the home page.

2. From the Home page, complete one of these, as desired.
- Click one of the following to access www.ab.com.
  - Allen-Bradley logo at the top of the page
  - Visit ab.com for additional information statement under Resources
- Click Rockwell Automation at the top right to go to www.rockwellautomation.com.
- Click the following to see additional diagnostics web pages.
  - Browse LSR devices
  - Administrative Settings: Network and Email Configuration

Work with the Browse LSR Devices Page

To work with the Browse LSR devices options, follow these procedures.

1. From the Home page, click Browse LSR Devices page. The Browse LSR Devices page opens.
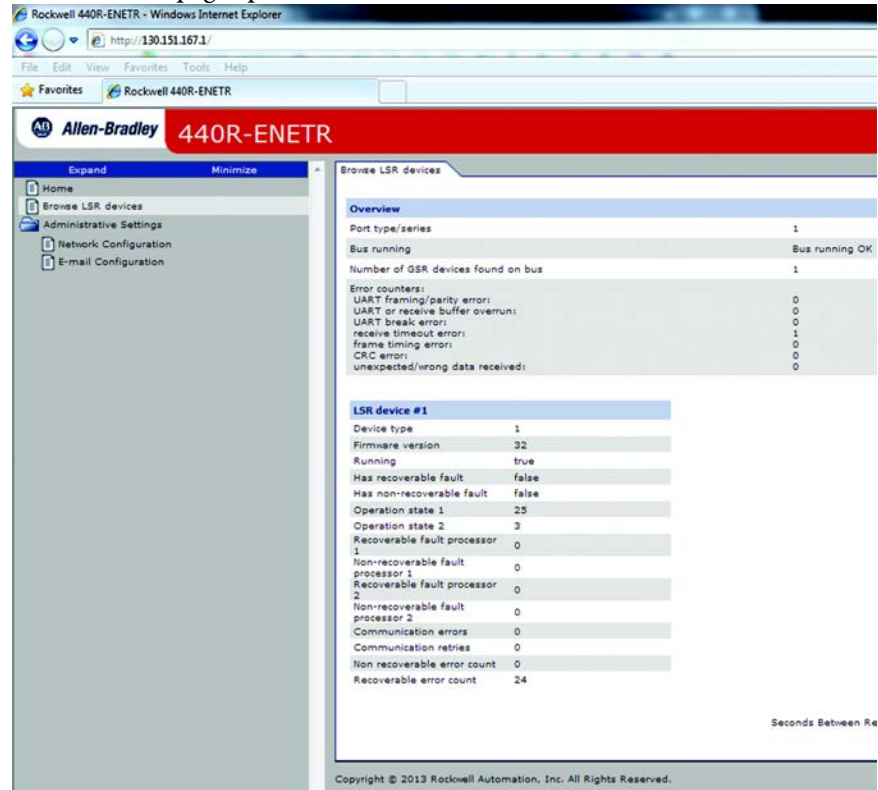
2. In the Refresh Rate field, you can type a refresh rate, noting that the default rate is 15 seconds.

3. From the Browse LSR devices page, view the following:

- Overview
  - Port type/series
  - Bus running
  - Number of GSR devices found on bus
  - Number of GSR devices found on bus
  - Error Counters
    - □ UART framing/parity error
    - □ UART or receive buffer overrun
    - □ UART break error
    - □ Receive timeout error
    - □ Frame timing error
    - □ CRC error
    - □ Unexpected/wrong data received

- LSR device #N (where N is 1-6 monitored safety relays)
  - Device type
  - Firmware version
  - Running
  - Has recoverable fault
  - Has non-recoverable fault
  - Operation state 1
  - Operation state 2
  - Recoverable fault processor 1
  - Non-recoverable fault processor 1
  - Recoverable fault processor 2
  - Non-recoverable fault processor 2
  - Communication errors
  - Communication retries
  - Non recoverable error count
  - Recoverable error count

Work with the Administrative Settings Pages

To work with the Administrative Settings pages, follow these procedures.

IMPORTANT	Administrative mode must be enabled to make changes to the Administrative pages. To enable Administrative mode set the network address rotary switches to the value 000.

1. From the Home page, click Administrative Settings or Expand to see the Administrative options, if needed.

2. From the Administrative Settings list, click one of these:

- Network Configuration
- E-mail Configuration

3. Refer to the section of this manual that describes which of these you clicked: Network Configuration, E-mail Configuration.

Use the Network Configuration Page

To use the Network Configuration page to make entries for enabling or disabling DHCP and setting TCP/IP parameters and Ethernet link operation, follow this procedure:

1. From the Web page, click the Network Configuration tab at the top of the page or panel on the left. You see the Network Configuration page.

2. From the Network Configuration tab, complete these entries.
   - For Initial Network Configuration DHCP
     - Static
     - DHCP enabled
   - For Network Interface, select form these choices.
     - IP Address
     - Subnet Mask
     - Default Gateway
     - Primary Name Server
     - Secondary Name Server
     - Default Domain Name
     - Host Name
   - For Ethernet Link, select from these choices
     - Ethernet Link Configuration P1
       - □ Auto
       - □ 10 HDX
       - □ 10 FDX
       - □ 100 HDX
       - □ 100 FDX

–   Ethernet Link Configuration P2
  □   Auto
  □   10 HDX
  □   10 FDX
  □   100 HDX
  □   100 FDX

Use the E-mail Configuration Page

To use the E-mail Configuration page to configure the interface to send e-mail messages and text notifications for different communication events, follow this procedure:

1. From the Web page, click the E-mail Configuration tab at the top of the page or panel on the left. You see the E-mail Configuration page.
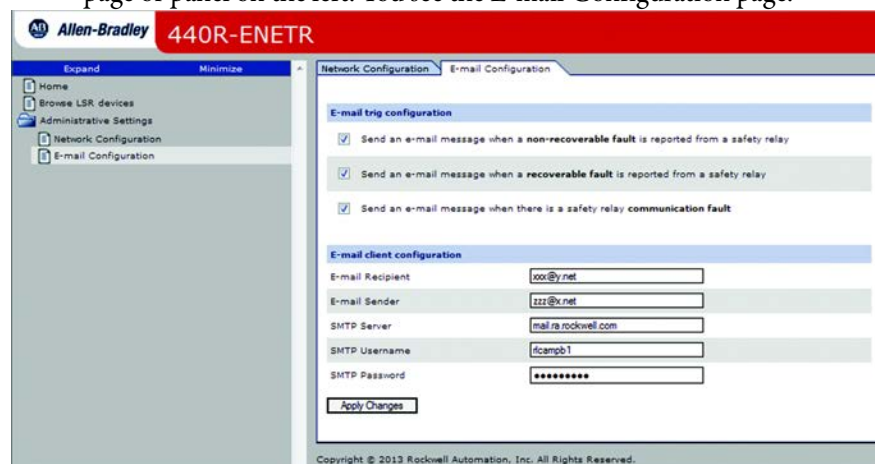

2. From the E-mail Configuration tab, complete these entries.
•   For E-mail trig configuration select:
    –   Send an e-mail message when a **non-recoverable** fault is reported from a safety relay
    –   Send an e-mail message when a **recoverable fault** is reported from a safety relay
    –   Send an e-mail message when there is a safety relay **communication fault**
•   For E-mail client configuration
    –   E-mail Recipient
    –   E-mail Sender
    –   SMTP Server
    –   SMTP Username
    –   SMTP Password
3. Click *Apply Changes* to save the modified values.

Configure the RSLinx Ethernet Communication Driver

Overview

To communicate with your adapter over your network, you must configure the RSLinx Ethernet Communication Driver (AB_ETH) or the EtherNet/IP driver (AB-ETHIP). You can configure the AB_ETH driver with the IP addresses of all the Ethernet devices on your system. You need one of these drivers to download the example application programs in this manual.

See the table for a list of the contents of this appendix.

For Information About	Page
Install the RSLinx Software	45
Configure the AB_ETH Driver	46
Configure the AB_ETH/IP Driver	48

Install the RSLinx Software

Use this procedure to install the RSLinx software on your computer.

1. Insert the CD in the CD-ROM drive.

   Note that the CD-ROM supports Windows Autorun. Once inserted into the CD-ROM drive, if you have Autorun configured, the installation automatically starts at the first setup screen.

   If Autorun is not configured for your CD-ROM drive, go to step 2.

2. From the Start menu, choose Run. The Run dialog opens.

3. Type D:/setup (if it does not appear automatically), where D: is your CD-ROM drive letter.

4. Click OK.
   The progress bar, followed by the welcome screen opens.

Configure the AB_ETH Driver

To configure the AB-ETH Ethernet communication driver perform the following steps:

1. Start the RSLinx software.

2. From the Communications menu, select Configure Drivers.
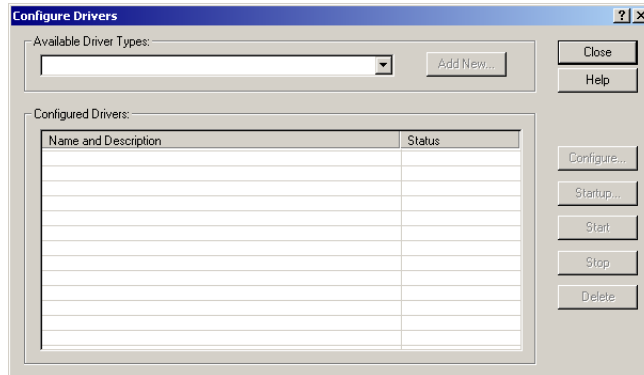
3. Select Ethernet Devices from the list and click Add/New...

4. Select the default driver name (for example, AB_ETH-1) or type in a name and click OK.

The Configure driver dialog opens.

5. Click Add New and enter the IP address or Host Name of your Ethernet device (for example, 10.88.70.4, Pump1).
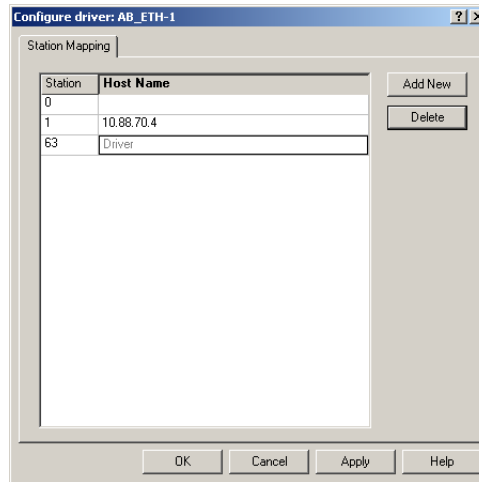
6. Repeat step 6 for each additional Ethernet device you need to access.

7. After entering the IP addresses, click Apply.

8. Click OK to close the Configure driver dialog.

The new driver appears in the list of configured drivers. Your list displays the drivers you configured on your workstation.
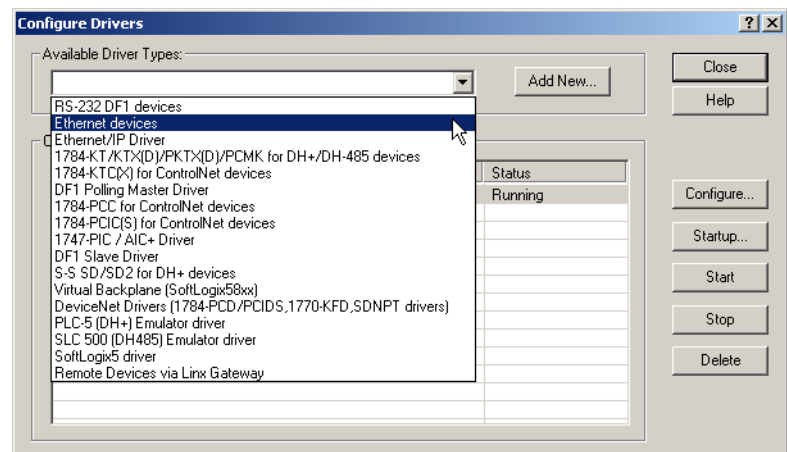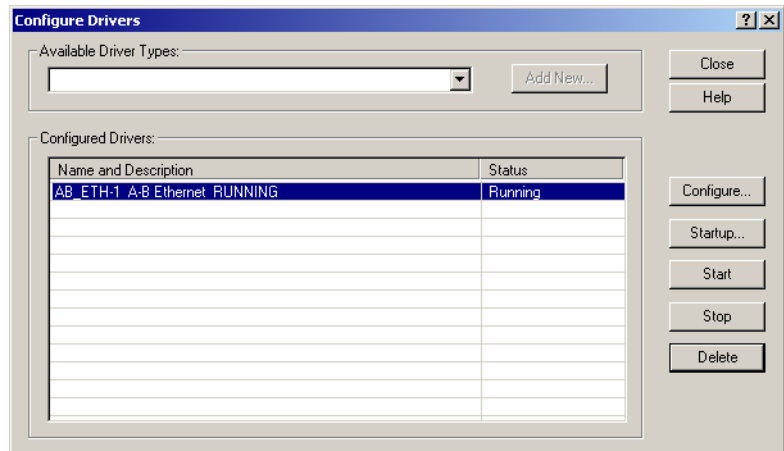

9. Close the RSLinx software.

Configure the AB_ETH/IP Driver

To configure the AB-ETHIP Ethernet communication driver, perform the following steps.
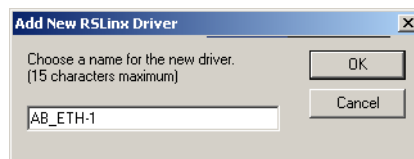
1. Start the RSLinx software.

2. From the Communications menu, select Configure Drivers.
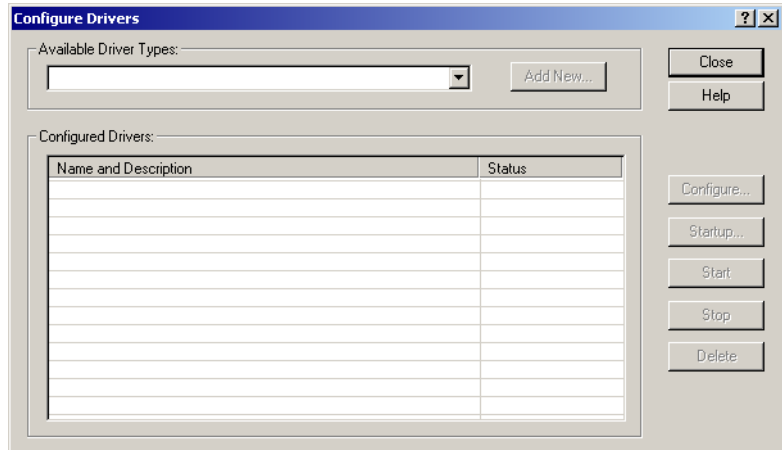
3. Select EtherNet/IP Devices from the list and click Add/New...
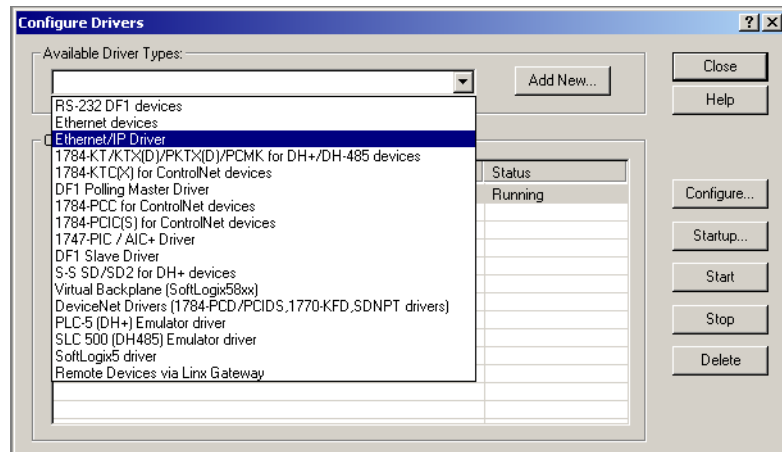
The Configure Driver dialog box opens.
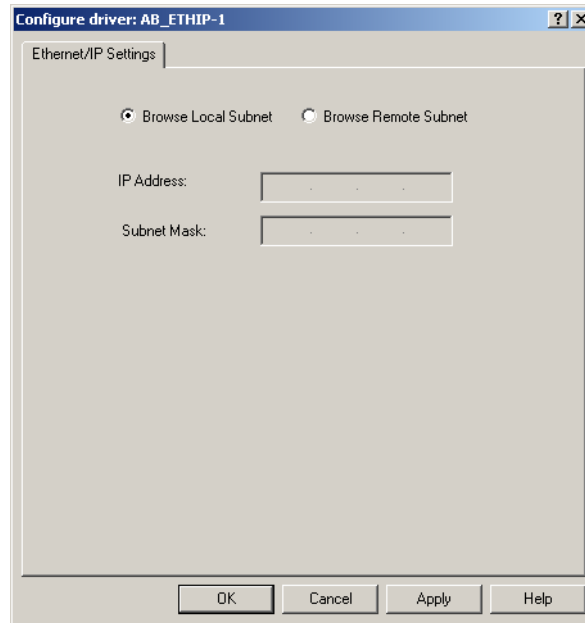
Make sure the Browse Local Subnet button is selected.

The RSLinx software browses your local subnet and automatically reads the IP address.

4. Click OK.

The AB-ETHIP driver is now configured and appears in the configured drivers window.

5. Close the RSLinx software.

Notes:

Tag Definitions

Table 6 - GSR DI(S) Module Input Tags

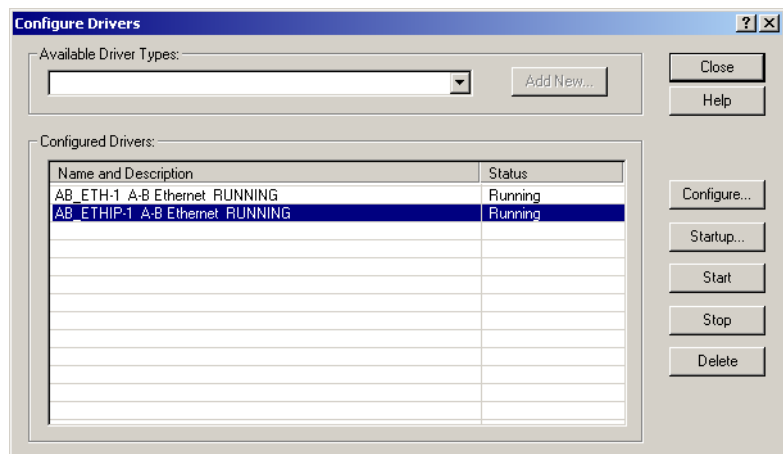| Name	Data Type	Definition
Slotx_GSR_DIS_IN01	BOOL	**IN01 Status** - Indicates whether input circuit 1 is On or Off. 0 = The input channel is Off. 1 = The input channel is On.
Slotx_GSR_DIS_IN02	BOOL	**IN02 Status** - Indicates whether input circuit 2 is On or Off. 0 = The input channel is Off. 1 = The input channel is On.
Slotx_GSR_DIS_SingleWireSafetyIn	BOOL	**Single Wire Safety Input Status** - Indicates whether the Single Wire Safety input (L12) is On or Off. 0 = The Single Wire Safety input signal is Off. 1 = The Single Wire Safety input signal is On.
Slotx_GSR_DIS_ResetRequired	BOOL	**Reset Required Indication** - This indication turns On (1) when all monitored input conditions are On and the safety relay Output is Off (0).
Slotx_GSR_DIS_CrossLoopOK	BOOL	**Cross Loop OK** - Indicates whether the safety relay is detecting a cross loop fault on one of the input circuits. 0 = Cross loop fault 1 = No fault
Slotx_GSR_DIS_SafetyOutput	BOOL	**Safety Output Status** – Indicates whether the safety output channels are On or Off. 0 = The safety output channels are Off. 1 = The safety input channels are On.
Slotx_GSR_DIS_RecoverableFault	BOOL	**Recoverable Fault Status** – Toggles On (1) for one scan when the safety relay has detected unexpected operation of a monitored safety device. See S12 OpenWire, S22 OpenWire, S32 OpenWire, S42 OpenWire, Cross Loop Fault, Invalid Switch Setting, and Reset Held On (page 52) for details. 0 = No fault 1 = Fault
Slotx_GSR_DIS_NonRecoverableFault	BOOL	**Non-Recoverable Fault Status** – Toggles On (1) for one scan when the safety relay has detected unexpected internal operation or failed a pulse check. See NonRecoverableFault_A and NonRecoverableFault_B (page 52) for details. 0 = No fault 1 = Fault
Slotx_GSR_DIS_S12	BOOL	**S12 Status** – Indicates whether terminal S12 of circuit IN01 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.
Slotx_GSR_DIS_S22	BOOL	**S22 Status** – Indicates whether terminal S22 of circuit IN02 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.
Slotx_GSR_DIS_S32	BOOL	**S32 Status** – Indicates whether terminal S32 of circuit IN02 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.

Table 6 - GSR DI(S) Module Input Tags

Name	Data Type	Definition
Slotx_GSR_DIS_S42	BOOL	**S42 Status** – Indicates whether terminal S42 of circuit IN02 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.
Slotx_GSR_DIS_L12	BOOL	**L12 Status** – Indicates whether terminal L12 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.
Slotx_GSR_DIS_S34	BOOL	**S34 Status** – Indicates whether terminal S34 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.
Slotx_GSR_DIS_NonRecoverableFault_A	SINT	**Non-Recoverable Fault Processor A** – Indicates a non-recoverable fault has been recorded by Safety Processor A. See Table 7 on page 52 for a list of non-recoverable fault codes.
Slotx_GSR_DIS_NonRecoverableFault_B	SINT	**Non-Recoverable Fault Processor B** – Indicates a non-recoverable fault has been recorded by Safety Processor B. See Table 7 on page 52 for a list of non-recoverable fault codes.
Slotx_GSR_DIS_S12OpenWire	BOOL	**S12 Open Wire** - Indicates S12 open (0) and closed (1) while S22 remained closed (1).
Slotx_GSR_DIS_S22OpenWire	BOOL	**S22 Open Wire** - Indicates S22 open (0) and closed (1) while S12 remained closed (1).
Slotx_GSR_DIS_S32OpenWire	BOOL	**S32 Open Wire** - Indicates S32 open (0) and closed (1) while S42 remained closed (1).
Slotx_GSR_DIS_S42OpenWire	BOOL	**S42 Open Wire** - Indicates S42 open (0) and closed (1) while S32 remained closed (1).
Slotx_GSR_DIS_CrossLoopFault	BOOL	**Cross Loop Fault** – Indicates whether the safety relay has detected a cross loop fault on one of the input circuits. 0 = No fault 1 = Cross loop fault
Slotx_GSR_DIS_InvalidSwitchSetting	BOOL	**Invalid Switch Settings** – Indicates the switch settings changed after power-up of the safety relay. 0 = No fault 1 = Fault
Slotx_GSR_DIS_ResetHeldOn	BOOL	**Reset Held On Fault** – Indicates the reset signal On (1) for longer than the maximum time of 3000 ms. 0 = No fault 1 = Fault

Table 7 - GSR DI(S) NonRecoverableFault_A and NonRecoverableFault_B Fault Codes

Fault Code	Description	Corrective Action
00H	No fault	None
01H	RAM test fault	Do one of the following: • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
02H	Stack over-/under-flow	
03H	Configuration mismatch between Processors A and B	
04H	Internal timing fault	
05H	EEPROM read/write failure	

Table 7 - GSR DI(S) NonRecoverableFault_A and NonRecoverableFault_B Fault Codes

Fault Code	Description	Corrective Action
06H	Safety mat wiring detected on one of the input pairs while the safety relay is configured for 'OR' logic	Do one of the following: • If there are no safety mats, check the input wiring (safety mat wiring is crossed from normal dual-channel device wiring) • Change the safety relay to 'AND' logic. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
07H	Mismatch between current switch settings and setting stored during power-up	Do one of the following: • Change the switch settings to the correct values. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
09H	SPI compare fault	Do one of the following: • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
0BH	ROM test failure	
0CH	Terminal S12 hardware input fault	
0DH	Terminal S22 hardware input fault	
0EH	Terminal S32 hardware input fault	
0FH	Terminal S42 hardware input fault	
10H	Terminal S34 hardware input fault	
11H	Pulse test fault on main transistor	Do one of the following: • Check wiring for shorts to 24V or other channels. • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
12H	Pulse test fault of transistor for safety output channel 1	
13H	Pulse test fault of transistor for safety output channel 2	
14H-1EH	Internal plausibility test fault	Do one of the following: • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
1FH	Different Single Wire Safety input signal detected at Processor A than Processor B	
20H, 21H	Internal program fault	
22H, 23H	Rotary switch read error	
24H	Cross fault at processor pins for safety outputs	
25H	Under voltage detected	Do one of the following: • Validate the electrical installation and appropriate supply voltage is provided. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
26H	Fault detected in the other Processor	If viewing the NonrecoverableFault_A tag, refer to NonrecoverableFault_B tag. If viewing NonrecoverableFault_B tag refer to NonrecoverableFault_A tag.

Table 8 - GSR EM Module Input Tags

Name	Data Type	Definition
Slotx_GSR_EM_SingleWireSafetyIn	BOOL	**Single Wire Safety Input Status** – Indicates whether the Single Wire Safety input (L12) is On or Off. 0 = The Single Wire Safety input signal is Off. 1 = The Single Wire Safety input signal is On.
Slotx_GSR_EM_SafetyOutput	BOOL	**Safety Output Status** – Indicates whether the safety output channels are On or Off. 0 = The safety output channels are Off. 1 = The safety input channels are On.
Slotx_GSR_EM_RecoverableFault	BOOL	**Recoverable Fault Status** – Toggles On (1) for one scan when the safety relay has detected unexpected operation of a monitored safety device. See RecoverableFaultA for details. 0 = No fault 1 = Fault
Slotx_GSR_EM_NonRecoverableFault	BOOL	**Non-Recoverable Fault Status** – Toggles On (1) for one scan when the safety relay has detected unexpected internal operation or failed a pulse check. See NonRecoverableFault_A and NonRecoverableFault_B for details. 0 = No fault 1 = Fault
Slotx_GSR_EM_NonRecoverableFault_A	SINT	**Non-Recoverable Fault Processor A** – Indicates a non-recoverable fault has been recorded by Safety Processor A. See <u>Table 10 on page 56</u> for a list of non-recoverable fault codes.
Slotx_GSR_EM_NonRecoverableFault_B	SINT	**Non-Recoverable Fault Processor B** – Indicates a non-recoverable fault has been recorded by Safety Processor B. See <u>Table 10 on page 56</u> for a list of non-recoverable fault codes.

Table 9 - GSR EMD Module Input Tags

Name	Data Type	Definition
Slotx_GSR_EMD_SingleWireSafetyIn	BOOL	**Single Wire Safety Input Status** – Indicates whether the Single Wire Safety input (L12) is On or Off. 0 = The Single Wire Safety input signal is Off. 1 = The Single Wire Safety input signal is On.
Slotx_GSR_EMD_B1State	BOOL	**B1 Status** – Indicates whether input B1 is On or Off. 0 = The input is Off. 1 = The input is On.
Slotx_GSR_EMD_SafetyOutput	BOOL	**Safety Output Status** – Indicates whether the safety output channels are On or Off. 0 = The safety output channels are Off. 1 = The safety input channels are On.
Slotx_GSR_EMD_RecoverableFault	BOOL	**Recoverable Fault Status** – Toggles On (1) for one scan when the safety relay has detected unexpected operation of a monitored safety device. See RecoverableFaultA for details. 0 = No fault 1 = Fault
Slotx_GSR_EMD_NonRecoverableFault	BOOL	**Non-Recoverable Fault Status** – Toggles On (1) for one scan when the safety relay has detected unexpected internal operation or failed a pulse check. See NonRecoverableFault_A and NonRecoverableFault_B for details. 0 = No fault 1 = Fault
Slotx_GSR_EMD_NonRecoverableFault_A	SINT	**Non-Recoverable Fault Processor A** – Indicates a non-recoverable fault has been recorded by Safety Processor A. See Table 10 on page 56 for a list of non-recoverable fault codes.
Slotx_GSR_EMD_NonRecoverableFault_B	SINT	**Non-Recoverable Fault Processor B** – Indicates a non-recoverable fault has been recorded by Safety Processor B. See Table 10 on page 56 for a list of non-recoverable fault codes.

Table 10 - GSR EM(D) NonRecoverableFault_A and NonRecoverableFault_B Fault Codes

Fault Code	Description	Corrective Action
00H	No fault	None
01H	RAM test fault	Do one of the following: • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
02H	Stack over-/under-flow	
03H	Configuration mismatch between Processors A and B	
04H	Internal timing fault	
05H	EEPROM read/write failure	
06H	B1 configuration fault	Do one of the following: • Check the wiring to terminal B1. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
07H	Mismatch between current switch settings (switch 1: Range) and setting stored during power-up.	Do one of the following: • Change the switch settings to the correct values. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
08H	Mismatch between current switch settings (switch 2: Time) and setting stored during power-up.	
09H	SPI compare fault	Do one of the following: • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
0BH	ROM test failure	
11H	Pulse test fault on main transistor	Do one of the following: • Check wiring for shorts to 24V or other channels. • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
12H	Pulse test fault of transistor for safety output channel 1	
13H	Pulse test fault of transistor for safety output channel 2	

Table 10 - GSR EM(D) NonRecoverableFault_A and NonRecoverableFault_B Fault Codes

Fault Code	Description	Corrective Action
14H-18H	Internal plausibility test fault	Do one of the following: • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
19H	Relay contact fault K1	
1AH	Relay contact fault K2	
1BH	Relay contact fault K3	
1CH	Relay contact fault K4	
1DH, 1EH	Internal plausibility test fault.	
1FH	Different Single Wire Safety input signal detected at Processor A than Processor B	
20H, 21H	Internal program fault	
22H, 23H	Rotary switch read error	
24H	Cross fault at processor pins for safety outputs.	
25H	Under voltage detected	Do one of the following: • Validate the electrical installation and appropriate supply voltage is provided. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
26H	Fault detected in the other Processor	If viewing the NonrecoverableFault_A tag, refer to NonrecoverableFault_B tag. If viewing NonrecoverableFault_B tag refer to NonrecoverableFault_A tag.
30H	Capacitor short detected	Do one of the following: • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support

Table 11 - GSR GLP Module Input Tags

Name	Data Type	Definition
Slotx_GSR_GLP_S12_S22_Status	BOOL	**S12, S22 Status** – Indicates whether two channel input channel S12/S22 is On or Off. 0 = The two channel input is Off. 1 = The two channel input is On.
Slotx_GSR_GLP_SingleWireSafetyIn	BOOL	**Single Wire Safety Input Status** – Indicates whether the Single Wire Safety input (L12) is On or Off. 0 = The Single Wire Safety input signal is Off. 1 = The Single Wire Safety input signal is On.
Slotx_GSR_GLP_LockRequest_S44	BOOL	**Lock Request S44 Indication** – This indication whether the Lock Request input (S44) is On or Off. 0 = The Lock Request input is Off. 1 = the Lock Request input is On.
Slotx_GSR_GLP_UnLockRequest_S54	BOOL	**Unlock Request S54 Indication** – This indication whether the Unlock Request input (S54) is On or Off. 0 = The Unlock Request input is Off. 1 = the Unlock Request input is On.
Slotx_GSR_GLP_RecoverableFault	BOOL	**Recoverable Fault Status** – Toggles On (1) for one scan when the safety relay has detected unexpected operation of a monitored safety device. See Gate Open Fault, Invalid Switch Setting, Lock Request Gate Open Fault, Overspeed SL2, Overspeed SL1, Lock Request Held On, and UnLock Request Held On (page 59) for details. 0 = No fault 1 = Fault
Slotx_GSR_GLP_NonRecoverableFault	BOOL	**Non-Recoverable Fault Status** – Toggles On (1) for one scan when the safety relay has detected unexpected internal operation or failed a pulse check. See NonRecoverableFault_A and NonRecoverableFault_B (page 59) for details. 0 = No fault 1 = Fault
Slotx_GSR_GLP_51	BOOL	**51 Status** – Indicates whether terminal 51 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.
Slotx_GSR_GLP_L61	BOOL	**L61 Status** – Indicates whether terminal L61 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.
Slotx_GSR_GLP_Y32	BOOL	**Y32 Status** – Indicates whether terminal Y32 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.
Slotx_GSR_GLP_S11	BOOL	**S11 Status** – Indicates whether terminal S11 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.
Slotx_GSR_GLP_S21	BOOL	**S21 Status** – Indicates whether terminal S21 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.
Slotx_GSR_GLP_L11	BOOL	**L11 Status** – Indicates whether terminal L11 is On or Off. 0 = The terminal is Off. 1 = The terminal is On.

Table 11 - GSR GLP Module Input Tags

Name	Data Type	Definition
Slotx_GSR_GLP_NonRecoverableFault_A	SINT	**Non-Recoverable Fault Processor A** – Indicates a non-recoverable fault has been recorded by Safety Processor A. See Table 12 on page 60 for a list of non-recoverable fault codes.
Slotx_GSR_GLP_NonRecoverableFault_B	SINT	**Non-Recoverable Fault Processor B** – Indicates a non-recoverable fault has been recorded by Safety Processor B. See Table 12 on page 60 for a list of non-recoverable fault codes.
Slotx_GSR_GLP_GateOpenFault	BOOL	**Gate Open Fault** - Indicates the Gate inputs, S12, S22, unexpectedly opened. 0 = No Fault 1 = Fault
Slotx_GSR_GLP_InvalidSwitchSetting	BOOL	**Invalid Switch Setting Fault** – The rotatory switch configuration does not match the configuration stored in the safety relay.
Slotx_GSR_GLP_LockRequestGateOpenFault	BOOL	**Lock Request/Reset Gate Open Fault** - Indicates the gate was open during a lock or reset request. 0 = No fault 1 = Fault
Slotx_GSR_GLP_Overspeed_SL2	BOOL	**Over-speed SL2 Fault** - Indicates the monitored speed exceeded the configured maximum speed limit settings for SL2. 0 = No fault 1 = Fault
Slotx_GSR_GLP_Overspeed_SL1	BOOL	**Over-speed SL1 Fault** - Indicates the monitored speed exceeded the configured maximum speed limit settings for SL1. 0 = No fault 1 = Fault
Slotx_GSR_GLP_LockRequestHeldOn	BOOL	**Lock Request Held On Fault** – Indicates the lock request signal On (1) for longer than the maximum time of 3000 ms. 0 = No fault 1 = Fault
Slotx_GSR_GLP_UnLockRequestHeldOn	BOOL	**Unlock Request Held On Fault** – Indicates the unlock request signal On (1) for longer than the maximum time of 3000 ms. 0 = No fault 1 = Fault

Table 12 - GSR GLP NonRecoverableFault_A and NonRecoverableFault_B Fault Codes

Fault Code	Description	Corrective Action
00H	No fault	None
03H	Jitter fault	
04H	Proximity Sensor 1 (P12) stuck at High fault: Potential damage or misalignment of the Proximity Sensor (e.g. exceeding maximum sensing distance, both sensors detecting a space).	Do one of the following: • Check the alignment and functionality of the Proximity Sensor. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
04H	Proximity Sensor 2 (P22) stuck at High fault.	
06H	Proximity Sensors cross fault.	Do one of the following: • Check connection of P12 and P22 against shorts to 24V or 0V and cross loop shorts. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
07H	Self test of terminal 51 failed.	Do one of the following: • Check connection of 51 or L61 against shorts to 24V or 0V and cross loop shorts. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
08H	Self test of terminal L61 failed.	
09H	Proximity Input Fault: Both Proximity inputs are Low simultaneously.	Do one of the following: • Check the alignment and functionality of the Proximity Sensors. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
0AH	Proximity Input Fault: Both Proximity inputs stuck at HIGH simultaneously.	
0BH	SPI compare fault	
0CH	Self test of Single Wire Safety outputs L11, L61 fault	Do one of the following: • Check connection of L11 or L61 against shorts to 24V or 0V and cross loop shorts. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
0DH	Current configuration does not agree with the safety relay memory: • Switch settings do not match required initial configuration or • X14 and X24 are connected to inputs S12, S22 but they are configured as safety outputs or • L1 and 51 connection has changed after configuration	Do one of the following: • Change the switch settings to the correct values. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support

Table 12 - GSR GLP NonRecoverableFault_A and NonRecoverableFault_B Fault Codes

Fault Code	Description	Corrective Action
0EH	Mismatch between current switch settings and setting stored during power-up.	Do one of the following: • Change the switch settings to the correct values. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
0FH	EEPROM read/write failure	Do one of the following: • Change the switch settings to the correct values. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
11H	Compare State Fault	
13H	L52 Fault	
16H	Cross Tran Fault	
18H	Gate Open Fault: Indicates the Gate inputs, S12, S22, unexpectedly opened.	
19H	Over Speed 1	
1EH	Terminal S12 hardware input fault	
1FH	Terminal S22 hardware input fault	
20H	Pulse test fault on main transistor	Do one of the following: • Check wiring for shorts to 24V or other channels. • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
21H	Over voltage detected	Do one of the following: • Validate the electrical installation and appropriate supply voltage is provided. • Power cycle the safety relay. • Reconfigure the safety relay. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support
22H	S54_S54 Autostart fault	
28H-39H	Rom Fault	Do one of the following: • Power cycle the safety relay. • Reconfigure the safety relay. • Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken. If the fault persists, contact your local Rockwell Automation technical support representative. For contact information, see: http://rockwellautomation.com/support

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support you can find technical and application notes, sample code, and links to software service packs. You can also visit our Support Center at https://rockwellautomation.custhelp.com/ for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/services/online-phone.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/rockwellautomation/support/overview.page, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to help ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.