User Manual

Original Instructions

Allen-Bradley

Guardmaster EtherNet/IP Network Interface

Catalog Numbers 440R-ENETR (Series B)

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).

This user manual is a reference guide for the 440R-ENETR Guardmaster® EtherNet/IP™ network interface, communications interface for Guardmaster safety relays. It describes the procedures that you use to install, wire, configure, troubleshoot, and use this module.

This user manual describes the following:

- The features of the 440R-ENETR interface.
- Examples of how to add the ENETR interface to an existing network.
- Information that can be gathered from the GSR safety relays.
- Information on the control signals that can be sent to the GSR relays.
- RSLogix™ examples of how to use the ENETR interface.

Who Should Use this Manual

Use this manual if your responsibilities include the design, installation, programming, or troubleshooting of control systems that use the 440R-ENETR Guardmaster EtherNet/IP network interface.

To add a catalog number 440R-ENETR EtherNet/IP network interface to an existing network successfully, you must be familiar with EtherNet/IP networks and the RSLinx® and BootP/DHCP utilities. You must also have a basic understanding of electrical circuitry and familiarity with safety-related control systems. If you do not, obtain the proper training before using this product.

Summary of Changes

This manual contains the following new and updated information.

Topic	Page
Updated information for the Series B interface	Throughout
Added Definitions section	6
Updated Additional Resources table	6
Updated Relay Arrangement text.	13
Added Important table after Table 1	40

Definitions

Publication AG-7.1 contains a glossary of terms and abbreviations that are used by Rockwell Automation to describe industrial automation systems. The following is a list of specific terms and abbreviations that are used in this manual.

Term/Abbreviation	Definition
AOP (Add-on Profile)	A collection of parameters of a device that can be added to the Controller Tags of a Rockwell Automation® controller in the Studio 5000® application (and earlier versions that are called the RSLogix 5000® application).
Electrical Mechanical Safety Switch (EMSS)	A type of tap that interfaces with safety devices that have redundant voltage-free contacts. The tap generates pulse tests to detect short circuits to the DC power supply, short circuits to the DC common, and shorts circuits between the two contacts.
ENETR	The Guardmaster EtherNet/IP network interface (catalog number 440R-ENETR).
GSR	A Guardmaster safety relay.
N.C. (Normally Closed)	An electrical contact whose normal state (that is, no pressure or electrical potential applied) is in the closed position.
N.O. (Normally Open)	An electrical contact whose normal state (that is, no pressure or electrical potential applied) is in the open position.
OLink	The optical communication bus between GSR relays.
PLC	A programmable logic controller or a programmable automation controller.
Reaction Time	The time between the true states of one input to the ON state of the output.
Recovery Time	The time required for the input to be in the LO state before returning to the HI state.
Reset	The GSR safety relay offers two types of reset: monitored manual and automatic/manual.
Monitored Manual	The GSR safety relay performs a reset function when the reset signal goes from OFF to ON and then back to OFF in a prescribed time-period. The reset occurs on the trailing edge.
Automatic/Manual	The GSR safety relay performs a reset function if the reset input is ON. If the reset input is connected directly to 24V, the reset function is executed immediately when the inputs become closed or active. If a contact (push button or equivalent device) is used in the reset input, the reset function is executed on the leading edge of the reset signal (if the inputs are closed or active).
Response Time	The time between the trigger of one input to the OFF state of the output. Throughout this manual, the safety outputs can be described as turning OFF immediately, which means that the safety outputs turn OFF within the response time.
Output Signal Switching Device (OSSD)	A pair of solid-state signals that are pulled up to the DC source supply. The signals are tested for short circuits to the DC power supply, short circuits to the DC common and shorts circuits between the two signals.
Single Wire Safety (SWS)	A unique, safety-rated signal that is sent over one wire to indicate a safety status. The SWS can be used in safety systems that require Category 4, Performance Level e, per ISO 13849-1 and safety integrity level (SIL) 3, per IEC 62061 and IEC 61508. When an SWS signal is present, this document describes this state as ACTIVE or ON. This signal is also referred to as the logic link signal.

Additional Resources

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

Resource	Description
ENETR Declaration of Conformity, publication SAFETY-CT004	Provides declarations of conformity, certificates, and other certification details.
Allen-Bradley Industrial Automation Glossary, publication AG-7.1	A glossary of industrial automation terms and abbreviations.
Ethernet Design Considerations, publication ENET-RM002	An overview of the design considerations when designing an EtherNet/IP network.
RSLinx Classic Getting Results Guide, publication LINX-GR001	Guides you with information on how to install and navigate the RSLinx Classic software.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website: rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/overview.page.

Product Overview

About the Interface

The Guardmaster EtherNet/IP network interface is catalog number 440R-ENETR (referred to as 'ENETR interface' throughout this manual). The ENETR interface provides connectivity to EtherNet/IP networks from the Guardmaster safety relays (GSR).

This user manual describes the Series B version of the ENETR interface, which was released in mid-year 2018.

Two significant differences between the Series A and B interface include:

- Webpage was discontinued to meet Internet security requirements.
- A faster optical bus was added to accommodate the DG relay and GuardLink® designs.

The ENETR interface communicates to the GSR safety relays over two optical buses that are on the side of the housing. EtherNet/IP connectivity is provided through two RJ45 connectors for 2-port pass-through support of daisy chain or ring, and the existing star and tree network topologies.

Figure 1 on page 9 shows the key features of the ENETR interface and the locations of the two optical buses. Opto bus 3 communicates with the DG safety relay. Opto bus 2 communicates with the DI, DIS, EM, EMD, GLP, GLT, and SI safety relays.

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 nonvolatile memory. The adapter does not allow I/O connections until the number of I/O modules present equals the chassis size value minus one for the adapter itself.

On powerup, 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

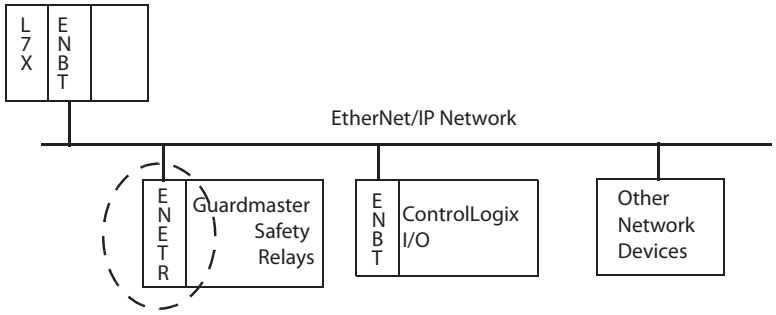
You must observe the following rules for Guardmaster safety relay system construction and the removal and reinsertion of safety relays.

- Actual Guardmaster safety relay identification (such as, electronic keying) is done when connection establishment requests are received from the controller or controllers. The interface does 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 that is removed under power disrupts communication of the other Guardmaster safety relays in the system. Connections to all safety relays are disallowed until power to the entire system, including the interface, is cycled to initiate readdressing the system.
- If safety relays of different types are removed and returned to the wrong locations, attempts to connect to these safety relays fails 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.

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)

Interface Features

Features of the interface include:

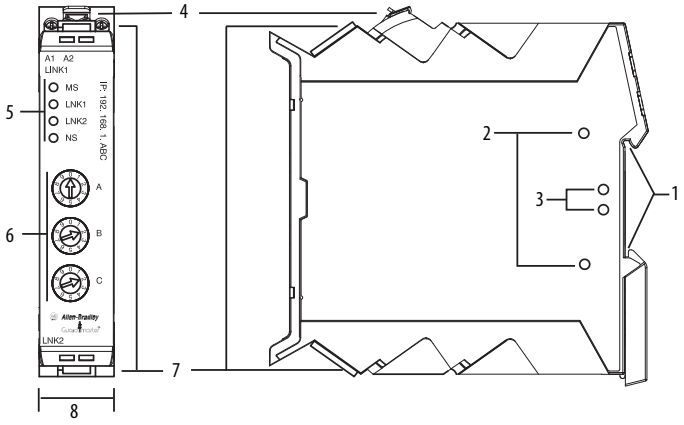
- Use of EtherNet/IP messages encapsulated within standard TCP/UDP/IP protocol
- Common application layer with ControlNet and DeviceNet networks
- Interfacing via Category 5 rated twisted-pair cable
- Half/full duplex 10 Mbit or 100 Mbit operation
- DIN Rail mounting for 440R-ENETR interface
- Communication from Guardmaster safety relays on the same DIN rail (mounted immediately to the right of the interface) as the ENETR interface to controllers on the EtherNet/IP network

> **IMPORTANT** Each safety relay must be mounted to the right of the interface within 5 mm [0.2 in.] of the next safety relay.

- Communication supported by RSLinx software
- IP address that is 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 software to configure these features. For more details on configuration, see Overview on page 17.

Figure 1 - Key Features of the 440R-ENETR Interface



Item	Description	Item	Description
1	35 mm (1.38 in.) DIN rail mounting	5	Status Indicators
2	Optical communications bus (OLink) 2.0	6	EtherNet/IP address rotary switches
3	Optical communications bus (OLink) 3.0	7	Two Ethernet network RJ45 connectors
4	Removable terminal block	8	22.5 mm (0.89 in.) wide housing

Hardware/Software Compatibility

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

Contact your Rockwell Automation sales office or Allen-Bradley distributor if you need software or firmware updates 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
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 that is specified for EtherNet/IP, the Ethernet Industrial Protocol, and 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 configuration has the following significant benefits:

- You do not need to configure routing tables in the bridging modules, which greatly simplify maintenance and module replacement.
- You maintain full control over the route that each message takes, 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, a controller does not poll input modules. 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 that are 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 that is specified for a particular piece of data on the network. The RPI can be specified for the interface and includes all 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 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 one block of data that is sent over one connection at the same data rate.

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

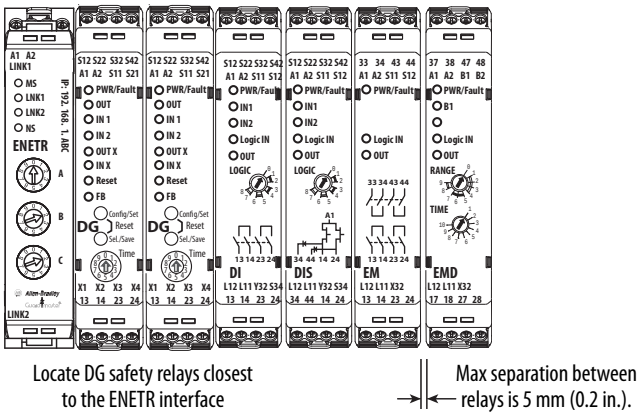
Notes:

Installation

Relay Arrangement

Figure 2 shows a typical setup. The ENETR interface must be at the leftmost position. Up to a maximum of six GSR safety relays can be mounted to the right of the ENETR interface. When OLink 3.x devices (for example, Guardmaster DG safety relays) are used, they must be located next to the ENETR interface. The other OLink 2.0 relays can be mounted in any order. The DG safety relay has both OLink 2.0 and 3.x, so it can pass information from OLink 2.0 devices to the ENETR interface.

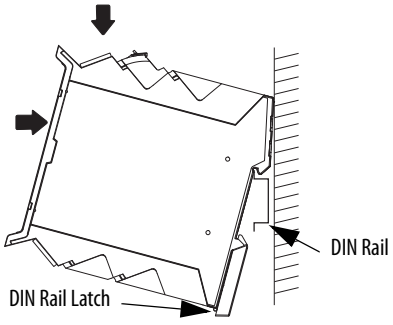
Figure 2 - Typical Arrangement of ENETR Interface and GSR Relays



Mount on DIN Rail

Follow these steps to mount the ENETR interface on a DIN rail.

1. Position the adapter vertically above an IEC standard (35x7.5x1 mm [1.38x0.3x0.04 in.]) DIN rail at a slight angle (DIN rail catalog number 199-DR1; 46277-3).



2. Press down firmly to install the interface on the DIN rail.

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.

Removable Terminal Block

The ENETR interface has one removable terminal block. Use a screwdriver (or your thumb) as a lever to remove the blocks. As shown in Figure 3, insert the screwdriver into the slot and pry up.

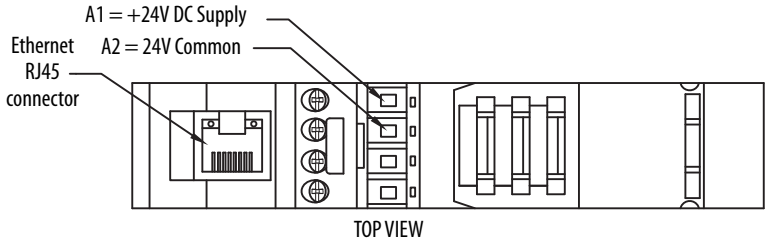
Figure 3 - Terminal Block Removal

Power Connections

The ENETR interface requires only a 24V DC connection and common. Connect 24V DC to terminal A1 and the 24V common to terminal A2 as shown in Figure 4.

The 24V supply must provide power to the ENETR interface and the GSR relays that it is monitoring. If a power cycle is required to clear a fault on a GSR relay, then power also has to be cycled to the ENETR interface to re-establish the optical link communications. Having one power supply eliminates the need for two power cycles to clear a fault and re-establish the optical communications.

Figure 4 - Power Connections



Wire Size

Each terminal accommodates copper wire with size from 0.14...2.5 mm2 (26...14 AWG). Use copper wire that withstands 60...75 °C (140...167 °F).

Each terminal can accommodate up to two wires.

Terminal Torque

Torque terminals to 0.4 N•m (4 lb•in).

Network Connections

The ENETR interface has two network connections, using standard RJ45 connectors. The connection that is labeled LNK1 is on the top of the housing, and the LNK2 connection is on the bottom of the housing. Connection can be made to either LNK1 or LNK2. The network connection is a repeater; the signal coming into one Link is repeated at the other Link. Figure 5 shows an example of a system with both LNK1 and LNK2 connections.

Figure 5 - Example Showing Link 1 and Link 2 Network Connections

Enclosure Considerations

Most applications require installation in an industrial enclosure to reduce the effects of electrical interference and environmental exposure. Pollution Degree 2 is an environment where normally only non-conductive pollution occurs except that occasionally temporary conductivity that is caused by condensation can be expected. Overvoltage Category II is the load level section of the electrical distribution system. At this level, transient voltages are controlled and do not exceed the impulse voltage capability of the product insulation.

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 considered Group 1, Class A industrial equipment according to IEC/CISPR 11. Without appropriate precautions, there can be difficulties with electromagnetic compatibility in residential and other environments due to conducted and radiated disturbances.

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 are present and appropriately designed to help prevent personal injury that results from accessibility to live parts. The enclosure must have suitable flame-retardant properties to help prevent or minimize the spread of flame, complying with a flame spread rating of 5VA, V2, V1, V0 (or equivalent) if non-metallic. The interior of the enclosure must be accessible only by use of a tool. Subsequent sections of this publication contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

Other helpful publications can be found in Additional Resources on page 6.

Preventing Excessive Heat

For most applications, normal convective cooling keeps the ENETR interface and relays within the specified operating range. Confirm that the specified temperature range is maintained. Spacing of 50.8 mm (2 in.) above, below, and in front of components within an enclosure is usually sufficient for heat dissipation.

In some applications, other equipment inside or outside the enclosure produce a substantial amount of heat. In this case, place blower fans inside the enclosure to help air circulation and to reduce "hot spots" near the ENETR interface and safety relays.

Additional cooling provisions might be necessary when high ambient temperatures are encountered. Do not bring in unfiltered outside air. Place the controller in an enclosure to help protect it from a corrosive atmosphere. Harmful contaminants or dirt could cause improper operation or damage to components. In extreme cases, the use air conditioning to help protect against heat buildup within the enclosure may be required.

Set the IP Address

Overview

Before using your ENETR interface in an EtherNet/IP network, you must configure it with an IP address, subnet mask, and optional Gateway address. The ENETR interface must be assigned a fixed IP address to maintain continued communication with its network.

There are four ways of assigning a fixed IP address:

- Use the ABC rotary switches to set a 'Private' IP address (see Set a Private IP Address on page 17).
- Use the Rockwell BootP/DHCP tool, version 2.3 or later, that ships with Studio 5000 (RSLogix 5000) or RSLinx software (see Use BootP/DHCP Server on page 18).
- Use a third-party DHCP server and RSLinx software to set the IP address (see Use Third-party DHCP and RSLinx Software on page 22).
- Have your network administrator configure the ENETR interface via the network DHCP server.

Upon power-up, the ENETR interface reads the switches to determine what actions to take.

Reset to Factory Default

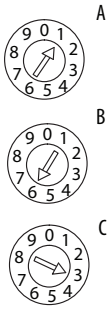
At any time, the ENETR interface can be set to the factory default by setting the ABC rotary switches to 888 and cycling the power. The ENETR interface is reset after 10 seconds. The indicators remain OFF during the reset process. You must then assign a new IP address by setting the ABC switches and cycling the power again. The ENETR interface comes up as DHCP enabled unless the ABC switches are set to a value of 001...254 or 888.

Set a Private IP Address

Use a small screwdriver to rotate the switches. Align the small arrow on the switch with the number setting you wish to use. Setting the ABC switches to a value of 001 to 254 assigns a fixed private IP address of 192.168.1.ABC.

Figure 6 on page 18 shows an example with the ABC switches set to 163. Upon power-up, the ENETR interface assigns itself a fixed IP address of 192.168.1.163.

Figure 6 - Network Address Example



When you use the switches to assign an address and set it to 001, the gateway address of the ENETR interface 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 gateway address of the ENETR interface is set to 192.168.1.1, and the subnet mask is 255.255.255.0.

Since the IP address is fixed, the ENETR interface does not show up on the DHCP/BootP Utility. The ENETR interface is listed on RSLinx program when a compatible driver is selected.

Use BootP/DHCP Server

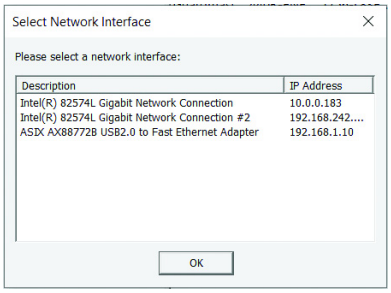
When received from the factory, the ABC switches are set to 999, and the ENETR interface is DHCP enabled. If the ENETR interface was previously assigned an IP address and you want to change it with the BootP/DHCP server, then set the ENETR interface back to its factory default setting. Set the ABC switches to 888 and cycle power and then set the ABC switches to 999 and cycle the power.

TIP The ENETR interface goes into DHCP mode for any switch settings except 1...254 and 888. Common practice is to set the switches to 999 or 000.

The following example uses BootP/DHCP Version 3.02.00. In this example, the network is 192.168.2.xxx.

1. Upon opening, the BootP/DHCP server may prompt for a network interface similar to the window shown in Figure 7. This window does not appear if there is only one network connection available. For this example, the 'USB2.0 to Fast Ethernet Adapter' with IP address 192.168.2.10 is selected.

Figure 7 - Select the BootP/DHCP Network Interface

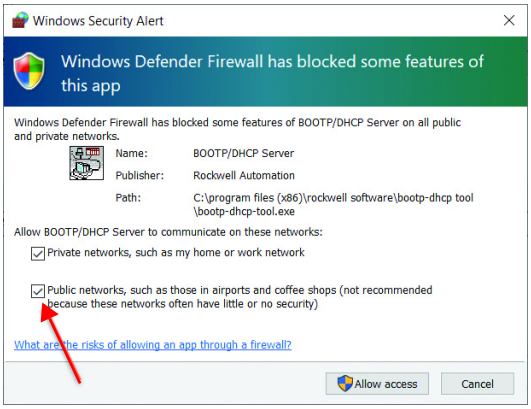


2. The first time the BootP/DHCP server is used, you must select the types of networks you can connect to. Figure 8 is an example of this request in Windows 10.

   Select Public networks and click Allow Access.

IMPORTANT If the BootP/DHCP server is not functioning properly, check the firewall settings and adjust if necessary.

Figure 8 - Windows Firewall Settings



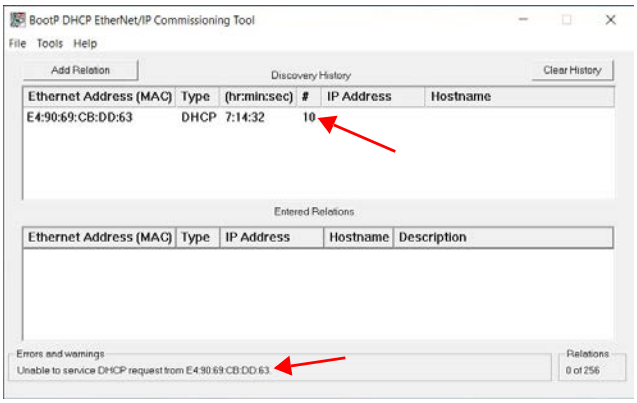
The BootP/DHCP window appears.

3. Cycle the power to the ENETR interface and the discovery process begins automatically. In Figure 9, the MAC address of the ENETR interface appears in the Discovery History window and the type of connection is DHCP.

   The # column shows the number of times the ENETR interface has requested an IP address. The Error and warnings section shows that it cannot service the request because you have not told it what address to use.

   Double-click the listing to open the New Entry window.

Figure 9 - BootP/DHCP Commissioning Tool

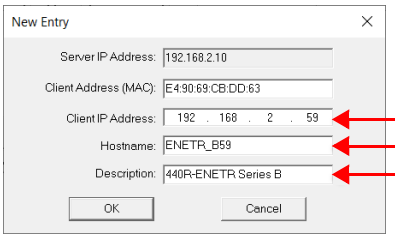


4. As shown in Figure 10, the New Entry window opens showing the server IP address and client MAC address. Type in the desired client IP address, hostname, and description.

   At this point, only the client IP address is required. Although the other fields are optional, they are imported into the Studio 5000 program.

   Click OK.

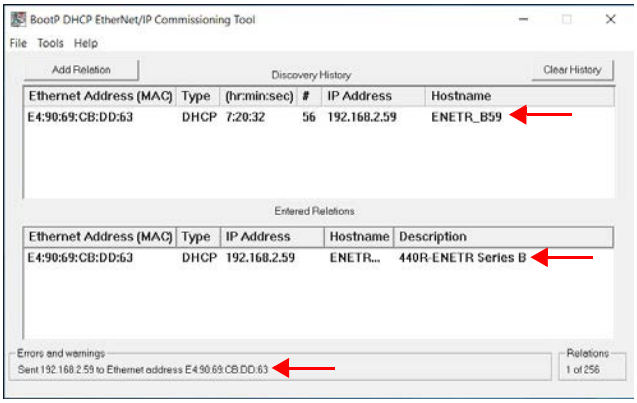
Figure 10 - New Entry — Set the IP Address



The Commissioning window is updated as shown in Figure 11.

- The IP address and hostname appear in the Discovery History.
- The new entry appears the Entered Relations.
- The Error and Warning show the IP address as sent to the ENETR interface.

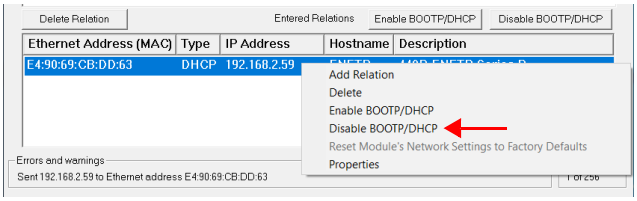
Figure 11 - IP Address Sent to ENETR Interface



5. Right-click the Relation and click Disable BOOTP/DHCP, as shown in Figure 12.

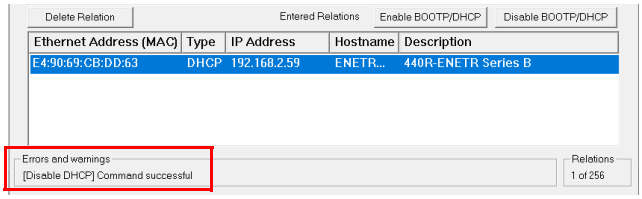
IMPORTANT The Disable BOOTP/DHCP button does not work.

Figure 12 - Right-click Relation



In Figure 13, the Errors and Warnings show that the Disable command was successful. Now, you can cycle power to the ENETR interface and this IP address remains configured.

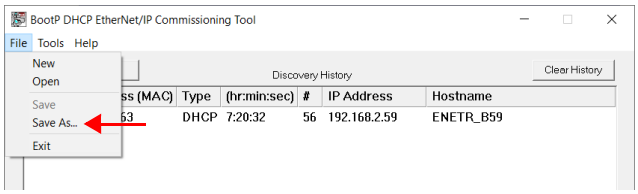
Figure 13 - Disable DHCP Command Successful



6. Save the relation. This step is optional but highly recommended. This feature allows you to save your list of assigned IP address to help prevent duplicate IP addresses. Also, if you have to repeat this process, you can open the file, and the utility automatically sends the IP address to the device.

   Click File and then Save As, as shown in Figure 14. Then, follow the instructions in each of the subsequent windows to save the file.

Figure 14 - Save the Relation



Use Third-party DHCP and RSLinx Software

To perform this process, the ENETR interface and your host computer must be connected to a third-party DHCP server. See publication LINX-GR001 for more information on RSLinx software.

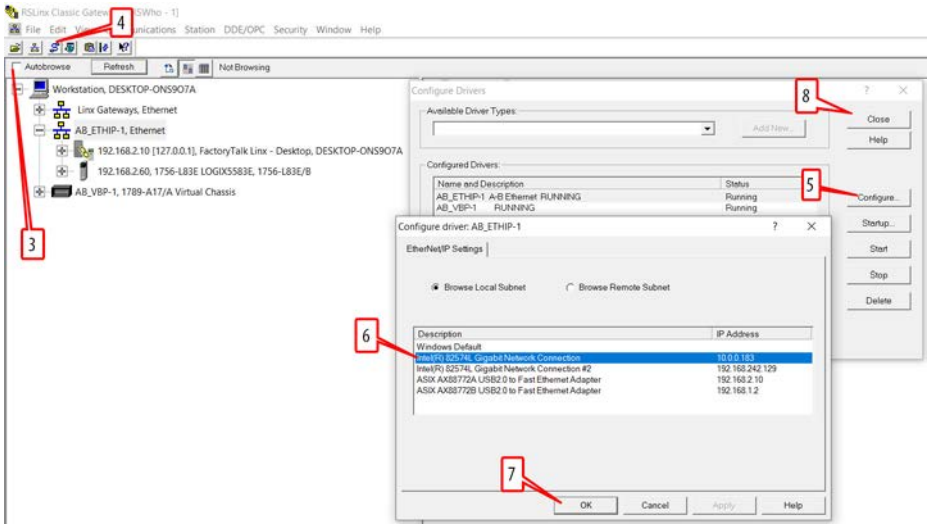
In the following example, we want to add an ENETR interface to our network, and we want to assign it an IP address of 192.168.2.59.

1. To reset the ENETR interface to the factory default setting, set the ABC switches to 888 and cycle the power. All indicators remain OFF after the power cycle. Leave the power ON for at least 10 seconds to allow the reset to finish.
2. Set the ABC switches to 999 and cycle power.
3. Open your RSLinx software and configure the driver. See Figure 15.
   a. Uncheck the Autobrowse feature. (This step is optional.)
   b. Notice the two connections:

Connection	Description
192.168.2.10	The FactoryTalk® Linx connection from your computer. This connection is a USB to Ethernet adapter.
192.168.2.60	A L83E Logix controller.

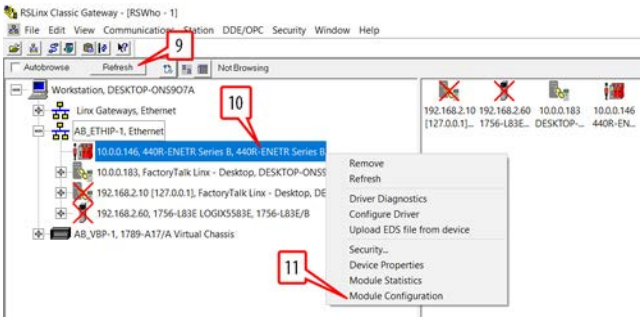
4. To configure the RSLinx drivers, click the icon.
5. With AB_ETHIP-1 highlighted, click Configure.
6. Highlight the IP address that is the DHCP server. In this example, the DHCP server is 10.0.0.183.
7. Click OK.
8. Click Close to close the Configure Drives window.

Figure 15 - Configure Driver



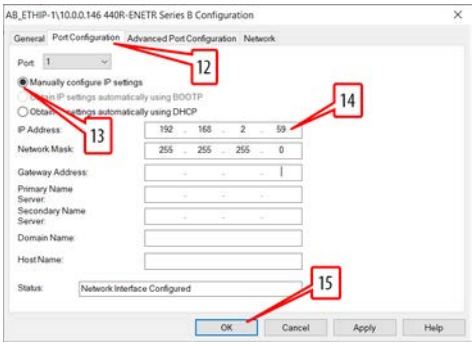
9. Click Refresh to update the RSLinx window. After a short while, Figure 16 shows the ENETR interface with its new IP address, and a new FactoryTalk Linx connection. The 192.168.2.xx devices cannot be recognized, for now.
10. Right-click the ENETR interface description.
11. Select Module Configuration.

Figure 16 - ENETR Interface Assigned an IP Address



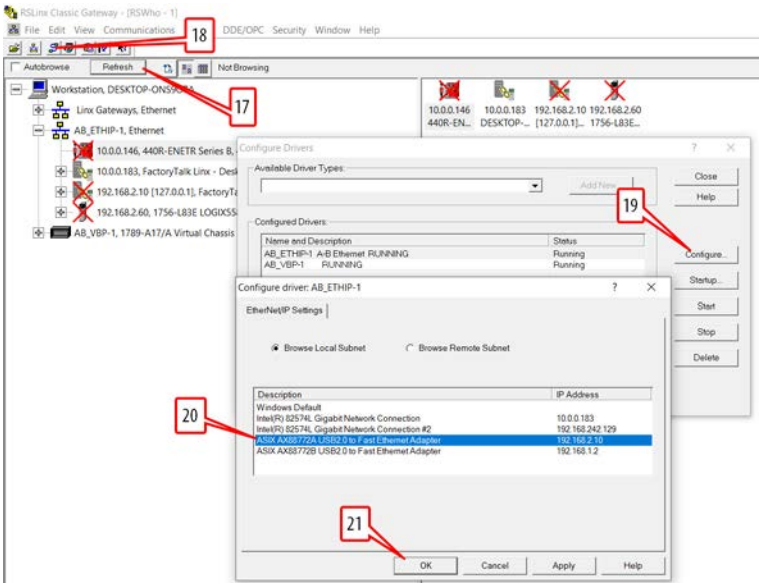
12. In Figure 17, click the Port Configuration tab.
13. Click the Manually configure IP settings.
14. Enter the desired IP address. In this example, we want 192.168.2.59. Leave the Network Mask as 255.255.255.0 and clear out all other fields.
15. Click OK.
16. Click Yes at the next prompt (not shown).

Figure 17 - Reassign the IP Address



17. In Figure 18, click Refresh. The RSLinx window is updated, the ENETR interface at 10.0.0.146 can no longer be found.
18. Click the Configure Driver icon.
19. With the ETHIP-1 highlighted, click Configure.
20. Select the Ethernet adaptor with IP address 192.168.2.10.
21. Click OK.

Figure 18 - Reconfigure the Driver



22. In Figure 19, click Refresh.
23. The ENETR interface now has a fixed IP address of 192.168.2.59. You can right-click and delete the two connections that are not used.

Figure 19 - Now Available

Download and Install the Add-on Profile

When using Rockwell Automation controllers, an Add-on Profile (AOP) can be added to the Controller Tags to facilitate the use of the performance characteristics of the GSR relays.

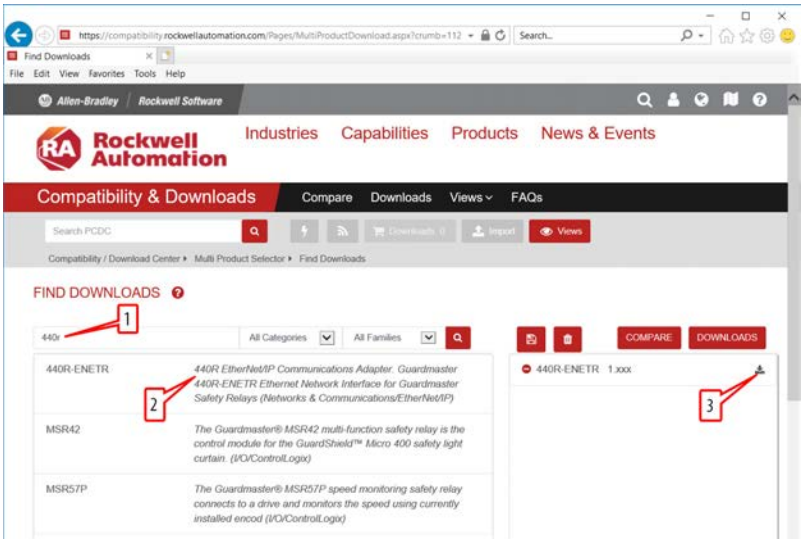
To use the ENETR interface in a Logix Designer application, you must download and install the AOP. Download firmware, associated files (such as AOP, DTM, and EDS), and access product release notes from only the Product Compatibility and Download Center (PCDC): http://www.rockwellautomation.com/rockwellautomation/support/pcdc.page.

Download the AOP

Complete the following steps after you go to the Compatibility and Downloads webpage (Figure 20): https://compatibility.rockwellautomation.com/Pages/MultiProductDownload.aspx?crumb=112

1. Type 440r in the 'search...' box.
2. Click the box that contains the 440R-ENETR.
3. Click the Downloads icon.

Figure 20 - Compatibility and Downloads Webpage



The available ENETER interface Add-on Profiles are shown (Figure 21).

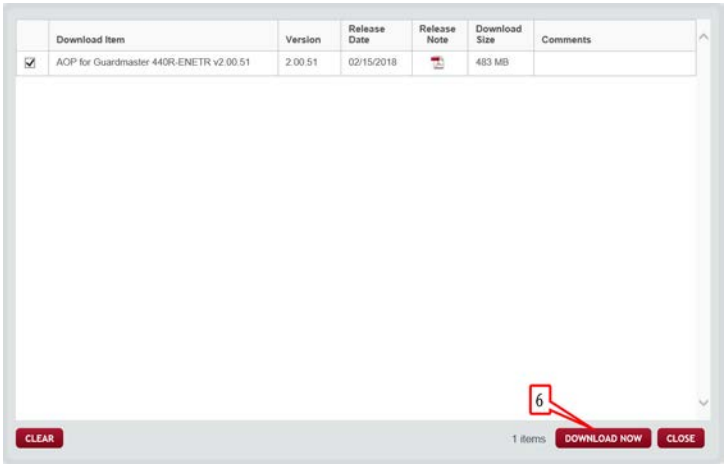
4. Check the v2 option.
5. Click Downloads

Figure 21 - AOP Offerings – Select v2

The Download Cart window (Figure 22) appears.

6. Click Download Now.
7. Sign in (not shown)
8. Accept the terms (not shown).
9. Use the Managed Download or Direct Download option (not shown)

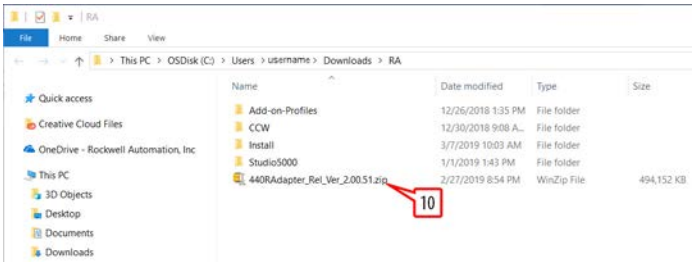
Figure 22 - Download Now



The downloaded file is named 440RAdapter_Rel_Ver_2.00.51.zip, and shows the desired version (Figure 23).

10. Extract the file.

Figure 23 - ZIP File Downloaded

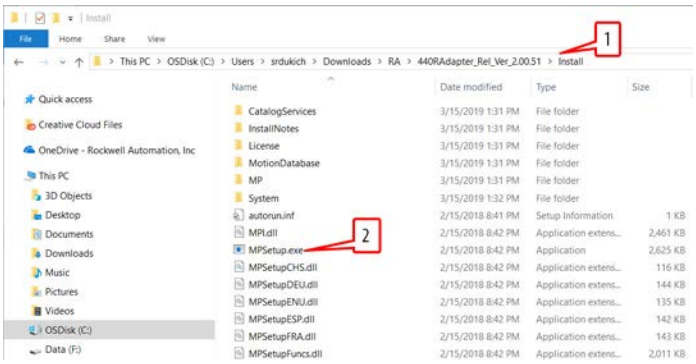


Install the AOP

In this example, the zip file was extracted to a directory with the same name.

1. In Figure 24, expand that directory and expand the Install directory.
2. To install the AOP, click the MPSetup.exe file.

Figure 24 - Run MPSetup



The installation begins with the Profile Setup Wizard (Figure 25).

3. Click Next.

Figure 25 - Profile Setup Wizard

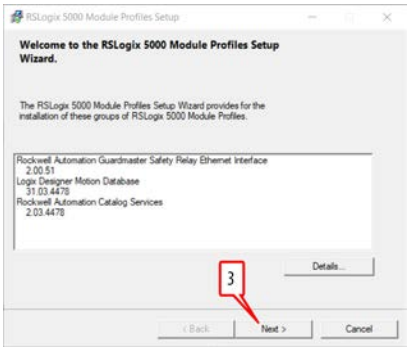


Figure 26 on page 28 shows the License Agreement.

4. Click “I accept...”
5. Click Next.

Figure 26 - Accept License Agreement

Figure 27 shows the Program Maintenance window.

6. To install from media, click Next.

Figure 27 - Install from Media

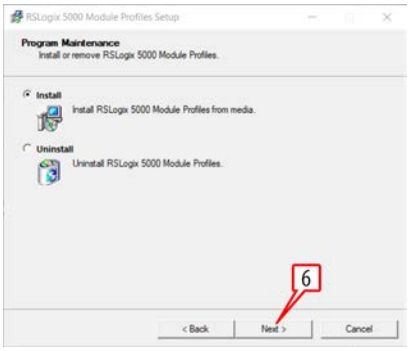


Figure 28 shows the module profiles to be installed.

7. Click Install to begin the installation.

Figure 28 - Click Install to Begin

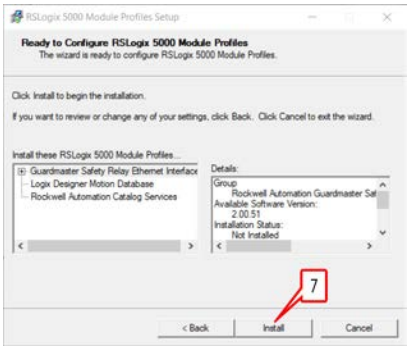


Figure 29 on page 29 shows that the install was successful.

8. Click Next.

Figure 29 - Installation Succeeded

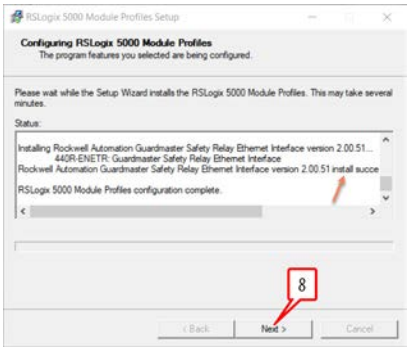
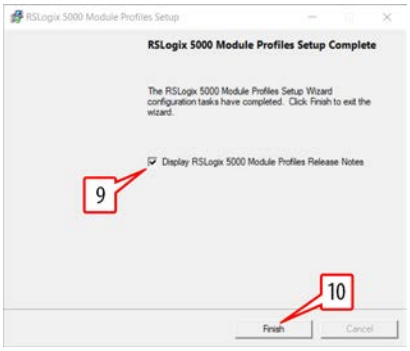


Figure 30 shows the completion of the setup.

9. Check "Display RSLogix 5000..." to show the release notes after finishing.
10. Click Finish.

Figure 30 - Finish



The release notes are displayed.

Notes:

Add the AOP to a Studio 5000 Project

This chapter describes how to add the ENETR Add-on Profile to a Studio 5000 Project. In this example, version 32 of Studio 5000 is used.

Figure 31 shows the Controller Organizer in Studio 5000.

Add AOP

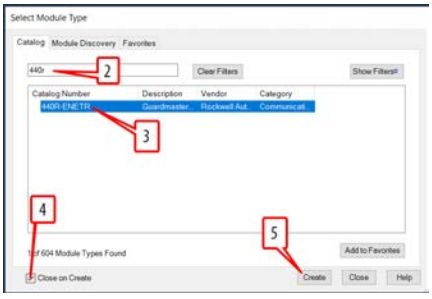
1. Right-click Ethernet and select New Module.

Figure 31 - New Module

The Select Module Type window opens.

2. In the "Enter Search Text for Module Type..." field, type '440R', as shown in Figure 32. The list of available catalog numbers is reduced to one module.
3. Click the 440R-ENETR (the selection is now highlighted in blue).
4. Check the Close on Create box.
5. Click Create.

Figure 32 - Select Module Type



Upon creation, the New Module window appears, as shown in Figure 33.

6. Type in the name of the module.
7. Type in a description, if desired (optional).
8. Type in the IP address.
9. The Module Definition box shows the six safety relays as being undefined.
10. To specify the safety relays, click Change.

IMPORTANT At least one safety relay must be specified.

Figure 33 - New Module – General Setup

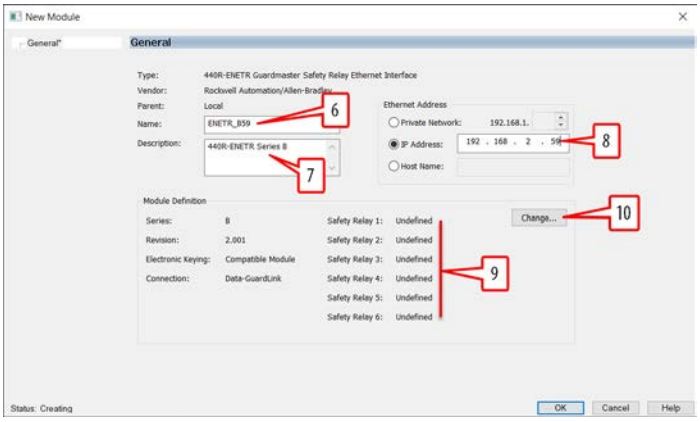
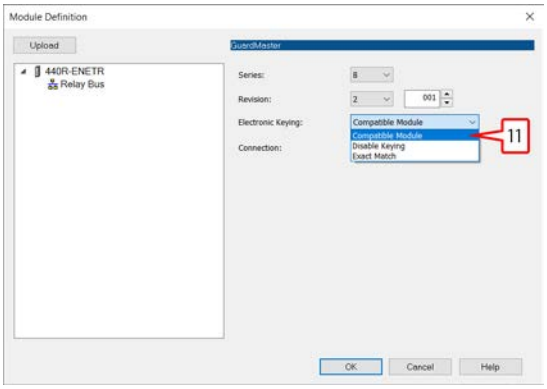


Figure 34 shows the possible selections for electronic keying.

11. Select the desired electronic keying.
    - Compatible Module: The series letter must be correct, but the revision level is ignored.
    - Disable Keying: The series letter and revision level are not used to determine if the module is correct.
    - Exact Match: Both the series letter and revision level must be correct to use the module.

Figure 34 - Electronic Keying



Add Relays to the ENETR Interface

There are two ways to add relays to the ENETR interface.

- Upload Method

  This preferred method requires the physical system to be complete, including relays, taps, and communications with the ENETR interface.

- Manual Method

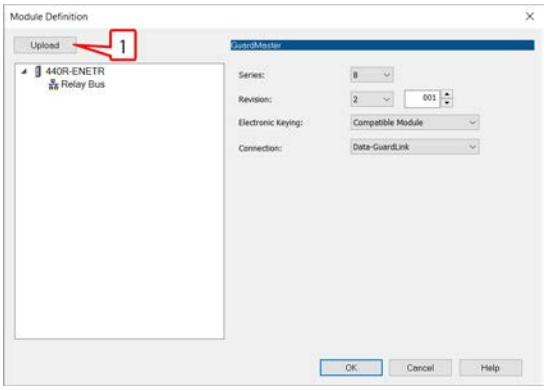
  This method can be used before the physical system being complete. This method requires you to select each relay in its specific location. If a DG safety relay is used, you must also select the type of tap and its specific location in the GuardLink circuit. For more information, see Manual Method on page 36.

Upload Method

The steps of the upload method follow steps 1...11 on pages 31...32.

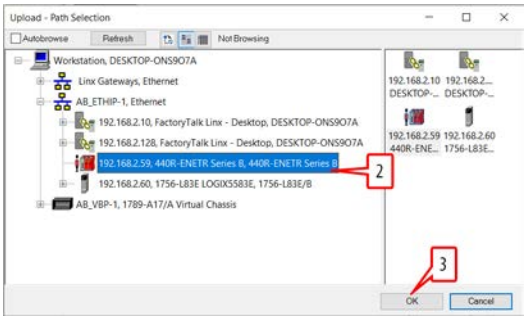
1. Click Upload (Figure 35).

Figure 35 - Module Definition



2. To select the upload path, click the ENETR interface (Figure 36).
3. Click OK.

Figure 36 - Select Path



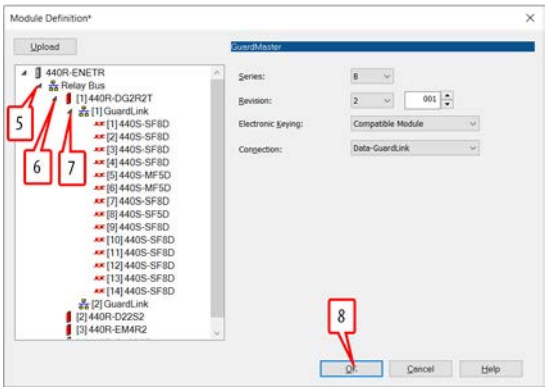
The Upload Complete message (Figure 37 on page 34) confirms the operations.

4. Click OK.

Figure 37 - Upload Complete

5. Expand the Relay Bus and confirm the number of relays and type of relay is correct for each slot (Figure 38).
6. Expand the DG relay (440R-DG2R2T) and confirm how many GuardLink circuits are used. In this example, a GuardLink circuit is used on input 1. Input 2 is a standard dual channel circuit.
7. Expand the GuardLink circuit and confirm the number of taps and types of taps are correct for each location.
8. Click OK.

Figure 38 - Confirm the Configuration



9. Click Yes to confirm the change to the module definition (Figure 39).

Figure 39 - Confirm Module Definition Change

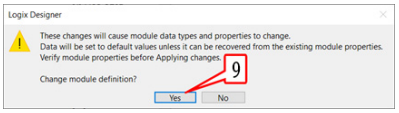
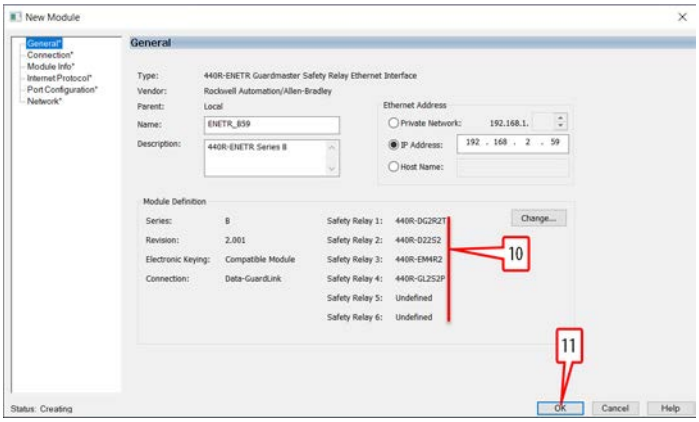


Figure 40 on page 35 shows the results of the setup.

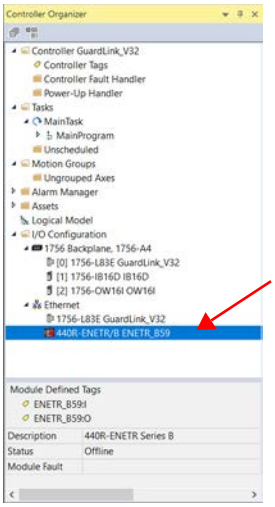
10. Verify the number and type of safety relays.
11. To add the ENETR interface to the project, click OK.

Figure 40 - Confirm Setup



The ENETR interface is added to the project in the Controller Organizer (Figure 41).

Figure 41 - ENETR Interface Added to the Controller Organizer



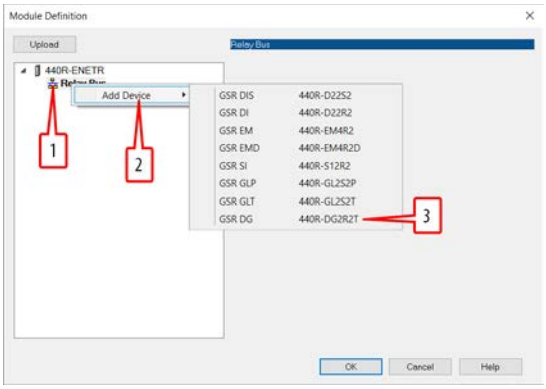
Manual Method

The manual method follows steps 1...11 on pages 31...32. The following steps come after Figure 34 on page 32.

In this method, the safety relays and GuardLink taps are manually added to the ENETR interface.

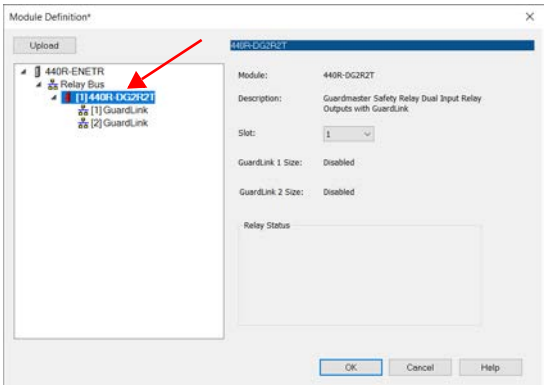
1. Right-click Relay Bus (Figure 42).
2. Click Add Device.
3. Click one of the devices in the list that appears. You can select multiple devices, but the DG safety relays must be together and closest to the ENETR interface. For this example, click the DG safety relay.

Figure 42 - Module Definition - Add a DG Safety Relay



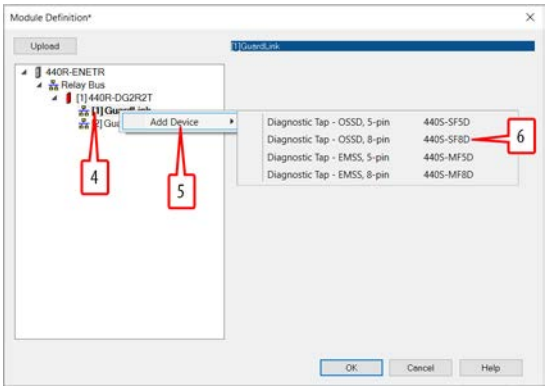
The DG relay is added and located in Slot 1 (Figure 43). The GuardLink circuits are added with the default status as disabled; both inputs are configured as standard dual-channel.

Figure 43 - DG Relay Added



4. To add taps to the GuardLink circuit (Figure 44), right-click [1]GuardLink.
5. Click Add Device.
6. Click one of the taps.

Figure 44 - Add a Tap

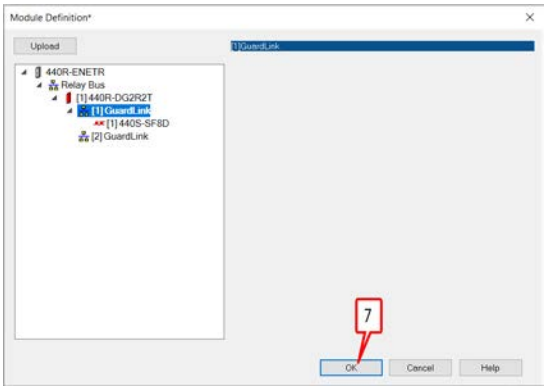


The tap is added to the GuardLink circuit (Figure 45).

IMPORTANT Repeat steps 1…6 to add more relays and taps. The number and location of the relays and taps must be the same as the physical setup.

7. Click OK.

Figure 45 -

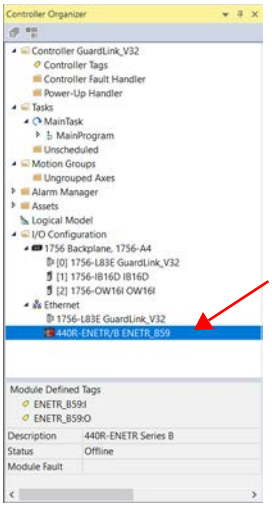


8. Confirm the change to the change in the module definition (Figure 46) and click Yes.

Figure 46 - Change Module Definition

The ENETR interface is added to the project in the Controller Organizer (Figure 47).

Figure 47 - ENETR Interface Added to the Controller Organizer



AOP Controller Tags

This chapter contains the controller tags and nonrecoverable fault codes for each the ENETR interface, the GSR safety relays, and the GuardLink taps.

The Controller tag names have a prefix, which is shown in the title of each table.

- The name that you have assigned to the ENETR interface replaces the 'ENETRname'.
- Relay1...Relay6 replaces the 'Relayx'.
- GuardLink1 or GuardLink2 replaces the 'GuardLinkx'.

General Instructions for Faults

The GSR relays have both recoverable and nonrecoverable. External events generally cause the recoverable faults, and most of the recoverable faults can be cleared by following the recommended actions. Internal events generally cause the nonrecoverable faults and require power to be cycled after the recommended action to clear the fault.

Follow these steps when trying to clear a fault:

1. Perform the recommended action, if stated.
2. Cycle power to the relay and GuardLink circuit to clear the fault.
3. If the fault is not cleared, reconfigure the relay.
4. If the fault continues, try to remove possible sources of electromagnetic interference in the grounding and wiring/cabling.
5. If the fault persists, replace the relay or tap.

TIP The AOP in Studio 5000 sets the fault code style to Decimal. If a -1 appears as the fault code, change the style to Hexadecimal to get the value.

ENETR Input Tags

Table 1 - ENETR Input Tags (Tag name prefix: ENETRname:I.)

Name	Data Type	Definition
ConnectionFaulted	BOOL	Indicates whether the ENETR interface is communicating with an Ethernet network. 0 = No connection. 1 = Communication is active.
EthernetLink1Sts	BOOL	Indicates whether an Ethernet connection is communicating on LNK1. 0 = No communications. 1 = Communication is active.
EthernetLink2Sts	BOOL	Indicates whether an Ethernet connection is communicating on LNK2. 0 = No communications. 1 = Communication is active.
OpticalLinkSts	BOOL	Indicates whether an ENETR interface is communicating to the GSR relays over Optical Link 2 and Optical Link 3. Cycling the power to an individual GSR relay causes this bit to go to 0. The Module Status (MS) indicator is flashing red. Cycle power to the ENETR interface to restore the communications. 0 = No communications on one or both optical links. 1 = Communication is active on both Optical Link 2 and 3.
OpticalLink2Sts	BOOL	Indicates whether an ENETR interface is communicating to the GSR relays over Optical Link 2. 0 = No communications. 1 = Communication is active.
OpticalLink3Sts	BOOL	Indicates whether an ENETR interface is communicating to the GSR relays over Optical Link 3. 0 = No communications. 1 = Communication is active.
Relay1Connected	BOOL	Indicates whether Relay 1 is connected (monitored by Optical Link 2 or 3) 0 = No relay connected. 1 = Relay is connected.
Relay2Connected	BOOL	Indicates whether Relay 2 is connected (monitored by Optical Link 2 or 3) 0 = No relay connected. 1 = Relay is connected.
Relay3Connected	BOOL	Indicates whether Relay 3 is connected (monitored by Optical Link 2 or 3) 0 = No relay connected. 1 = Relay is connected.
Relay4Connected	BOOL	Indicates whether Relay 4 is connected (monitored by Optical Link 2 or 3) 0 = No relay connected. 1 = Relay is connected.
Relay5Connected	BOOL	Indicates whether Relay 5 is connected (monitored by Optical Link 2 or 3) 0 = No relay connected. 1 = Relay is connected.
Relay6Connected	BOOL	Indicates whether Relay 6 is connected (monitored by Optical Link 2 or 3) 0 = No relay connected. 1 = Relay is connected.

IMPORTANT If six relays are configured on the optical bus (for example, 1. DG, 2. DG, 3. DI, 4. GLP, 5. EMD, 6. EM) and a FaultReset (or power cycle) is performed on an OLink 3.x device, the tags RelayxConnected behind the OLink 3.x device momentarily go to 0 and come back after the FaultReset (or power cycle).

ENETR Output Tags

Table 2 - ENETR Output Tags (Tag name prefix: ENETRname:O.Relayx.)

Name	Data Type	Definition
Reset1	BOOL	Sends a reset command to the relay, which is equivalent to pressing a push button connected to the reset terminal on a relay. The reset command only operates on Optical Link 3. Those relays that have only Optical Link 2 cannot be reset by the command. The duration of the reset signal must be between 0.25…3 s. 0 = The reset command is OFF. 1 = The reset command is ON.
FaultReset	BOOL	Sends a fault reset command to the relay, which is equivalent to cycling the power to the relay. The reset command only operates on Optical Link 3. Those relays that have only Optical Link 2 cannot be reset by the command. 0 = The fault reset command is OFF. 1 = The fault reset command is ON.
GuardLinkx.UnlockCmd	DINT	Sends an unlock command to one or more GuardLink taps. -1 = sends an unlock command to all GuardLink taps. 0 = Clears the unlock command to all GuardLink taps. DINT = sends lock command to one or more GuardLink taps. For example, 23 = sends unlock command to taps 1, 2, 3, and 5.
GuardLinkx.LockCmd	DINT	Sends a lock command to one or more GuardLink taps. -1 = sends a lock command to all GuardLink taps. 0 = Clears the lock command to all GuardLink taps. DINT = sends lock command to one or more GuardLink taps. For example, 23 = sends lock command to taps 1, 2, 3, and 5.
GuardLinkx.FaultResetCmd	DINT	Equivalent to cycling the power to a GuardLink tap and also to the device connected to the tap. Use this command to clear a fault on the tap or a fault on a device that is connected to the tap. Only one tap can be sent a fault reset command at a time.

Dual GuardLink (DG) Tags

DG safety relays have GuardLink input capability. The AOP includes tags that are related to the DG relay (see Table 3) and tags related to the GuardLink circuits (see Table 5 on page 46).

Table 3 - DG Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_DG.)

Name	Data Type	Definition
SafetyInput01	BOOL	Safety Input 1 Status - Indicates whether safety input circuit 1 is ON or OFF. 0 = The input channel is OFF. 1 = The input channel is ON.
SafetyInput02	BOOL	Safety Input 2 Status - Indicates whether safety input circuit 2 is ON or OFF. 0 = The input channel is OFF. 1 = The input channel is ON.
PtS12	BOOL	S12 Status - Indicates whether terminal S12 of circuit IN01 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
PtS22	BOOL	S22 Status - Indicates whether terminal S22 of circuit IN02 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
PtS32	BOOL	S32 Status - Indicates whether terminal S32 of circuit IN02 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
PtS42	BOOL	S42 Status - Indicates whether terminal S42 of circuit IN02 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
PtS11	BOOL	S11 Status - Indicates whether terminal S11 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
PtS21	BOOL	S21 Status - Indicates whether terminal S21 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
PtX1	BOOL	X1 Status - Indicates whether terminal X1 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
PtX2	BOOL	X2 Status - Indicates whether terminal X2 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
PtX3	BOOL	X3 Status - Indicates whether terminal X3 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
PtX4	BOOL	X4 Status - Indicates whether terminal X4 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
Pt13_14	BOOL	13/14 Status - Indicates whether output relays contacts at terminals 13/14 are closed or open. 0 = The contacts are open. 1 = The contacts are closed.
Pt23_24	BOOL	23/24 Status - Indicates whether output relays contacts at terminals 23/24 are closed or open. 0 = The contacts are open. 1 = The contacts are closed.
ResetRequired1	BOOL	Reset Required Indication – Indicates whether the DG relay shows all monitored input conditions (both IN1 and IN2, as configured) are ON and the safety relay Output is OFF (0). 0 = No reset required. 1 = Waiting for reset signal at terminal X4.

Table 3 - DG Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_DG.)

Name	Data Type	Definition
ResetHeldOn1	BOOL	Reset Held On Fault - Indicates that the reset signal at terminal X4 was held ON (1) for longer than the maximum time of 3000 ms. 0 = No fault 1 = Fault
NonRecoverableFault	BOOL	Nonrecoverable Fault Status - Indicates whether the DG safety relay has detected unexpected internal operation. 0 = No fault 1 = Fault
Fault	BOOL	Fault Status - Indicates whether the DG safety relay has detected unexpected operation of a monitored safety device. 0 = No fault 1 = Fault
FaultCode	INT	Fault Code - When a nonrecoverable fault occurs, the DG safety relay generates a value to help indicate the potential cause of the fault. See Table 4 for a list of DG fault codes.
Config	INT	Configuration ID - Each configuration of the DG safety relay has a unique ID. You can use this tag to determine if the configuration changed.
ValueRotarySwitch	SINT	Value of Rotary Switch - The DG safety relay provides a unique value of each position of the timer rotary switch.
GuardLink1	AB:GSR_DG_GL:I:0	GuardLink1 Input and Output
GuardLink2	AB:GSR_DG_GL:I:0	GuardLink2 Input and Output

DG Fault Codes

Table 4 - DG Relay Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
01 (01)	Pulse test output A stuck at 24V or 0V	Check the wiring and voltage at terminal S11.
02 (02)	Pulse test output B stuck at 24V or 0V	Check the wiring and voltage at terminal S21.
03 (03)	Power Fault	Terminal A1 is over 27V or under 20V. Measure and adjust the voltage at terminal A1 to 20.4…26.4V under all electrical load conditions.
04 (04)	Internal VCC (3.3V) is out of range	
06 (06)	Internal fault	Follow the general instructions for faults.
10 (0A)	Internal relay feedback error	The internal force-guided relay has a feedback error. Replace unit.
13 (0D)	Pulse test output cross fault	Check for a short circuit between ChA S11/S12 and ChB S21/S22.
16 (10)	Terminal fault S11	Terminal issue when configured as output like Test Pulse Output A. Check the wiring at terminal S11.
17 (11)	Terminal fault S21	Terminal issue when configured as output like Test Pulse Output B. Check the wiring at terminal S21.
19 (13)	Terminal fault S22	Terminal issue when configured as GuardLink. Check wiring on terminal S22.
21 (15)	Terminal fault S42	Terminal issue when configured as GuardLink. Check wiring on terminal S22.
23 (17)	Terminal fault X2	Terminal issue when configured as OSSD/SWS. Check the wiring at terminal X2.
64 (40)	GuardLink-CH[0] no termination	Check and install terminator at end of GuardLink[0] circuit.
65 (41)	GuardLink-CH[1] no termination	Check and install terminator at end of GuardLink[1] circuit.
66 (42)	GuardLink-CH[0] no communication	Check wiring - brown wire is connected to 24V, blue wire is connected to ground, white wire is connected to S12, and black wire is connected to S22.
67 (43)	GuardLink-CH[1] no communication	Check wiring - brown wire is connected to 24V, blue wire is connected to ground, white wire is connected to S32, and black wire is connected to S42.

Table 4 - DG Relay Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
68 (44)	GuardLink-CH[0] more than 32 taps	Reduce the number of taps on the GuardLink circuit to no more than 32.
69 (45)	GuardLink-CH[1] more than 32 taps	
257 (101)	GuardLink-CH[0] Tap 1 comm error	No or corrupted GuardLink channel communications from the specified Tap. Check the tap and the wiring that is located before the tap.
258 (102)	GuardLink-CH[0] Tap 2 comm error	
259 (103)	GuardLink-CH[0] Tap 3 comm error	
260 (104)	GuardLink-CH[0] Tap 4 comm error	
261 (105)	GuardLink-CH[0] Tap 5 comm error	
262 (106)	GuardLink-CH[0] Tap 6 comm error	
263 (107)	GuardLink-CH[0] Tap 7 comm error	
264 (108)	GuardLink-CH[0] Tap 8 comm error	
265 (109)	GuardLink-CH[0] Tap 9 comm error	
266 (10A)	GuardLink-CH[0] Tap 10 comm error	
267 (10B)	GuardLink-CH[0] Tap 11 comm error	
268 (10C)	GuardLink-CH[0] Tap 12 comm error	
269 (10D)	GuardLink-CH[0] Tap 13 comm error	
270 (10E)	GuardLink-CH[0] Tap 14 comm error	
271 (10F)	GuardLink-CH[0] Tap 15 comm error	
272 (110)	GuardLink-CH[0] Tap 16 comm error	
273 (111)	GuardLink-CH[0] Tap 17 comm error	
274 (112)	GuardLink-CH[0] Tap 18 comm error	
275 (113)	GuardLink-CH[0] Tap 19 comm error	
276 (114)	GuardLink-CH[0] Tap 20 comm error	
277 (115)	GuardLink-CH[0] Tap 21 comm error	
278 (116)	GuardLink-CH[0] Tap 22 comm error	
279 (117)	GuardLink-CH[0] Tap 23 comm error	
280 (118)	GuardLink-CH[0] Tap 24 comm error	
281 (119)	GuardLink-CH[0] Tap 25 comm error	
282 (11A)	GuardLink-CH[0] Tap 26 comm error	
283 (11B)	GuardLink-CH[0] Tap 27 comm error	
284 (11C)	GuardLink-CH[0] Tap 28 comm error	
285 (11D)	GuardLink-CH[0] Tap 29 comm error	
286 (11E)	GuardLink-CH[0] Tap 30 comm error	
287 (11F)	GuardLink-CH[0] Tap 31 comm error	

Table 4 - DG Relay Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
288 (120)	GuardLink-CH[0] Tap 32 comm error	No or corrupted GuardLink channel communications from the specified Tap. Check the tap and the wiring that is located before the tap.
289 (121)	GuardLink-CH[1] Tap 1 comm error	
290 (122)	GuardLink-CH[1] Tap 2 comm error	
291 (123)	GuardLink-CH[1] Tap 3 comm error	
292 (124)	GuardLink-CH[1] Tap 4 comm error	
293 (125)	GuardLink-CH[1] Tap 5 comm error	
294 (126)	GuardLink-CH[1] Tap 6 comm error	
295 (127)	GuardLink-CH[1] Tap 7 comm error	
296 (128)	GuardLink-CH[1] Tap 8 comm error	
297 (129)	GuardLink-CH[1] Tap 9 comm error	
298 (12A)	GuardLink-CH[1] Tap 10 comm error	
299 (12B)	GuardLink-CH[1] Tap 11 comm error	
300 (12C)	GuardLink-CH[1] Tap 12 comm error	
301 (12D)	GuardLink-CH[1] Tap 13 comm error	
302 (12E)	GuardLink-CH[1] Tap 14 comm error	
303 (12F)	GuardLink-CH[1] Tap 15 comm error	
304 (130)	GuardLink-CH[1] Tap 16 comm error	
305 (131)	GuardLink-CH[1] Tap 17 comm error	
306 (132)	GuardLink-CH[1] Tap 18 comm error	
307 (133)	GuardLink-CH[1] Tap 19 comm error	
308 (134)	GuardLink-CH[1] Tap 20 comm error	
309 (135)	GuardLink-CH[1] Tap 21 comm error	
310 (136)	GuardLink-CH[1] Tap 22 comm error	
311 (137)	GuardLink-CH[1] Tap 23 comm error	
312 (138)	GuardLink-CH[1] Tap 24 comm error	
313 (139)	GuardLink-CH[1] Tap 25 comm error	
314 (13A)	GuardLink-CH[1] Tap 26 comm error	
315 (13B)	GuardLink-CH[1] Tap 27 comm error	
316 (13C)	GuardLink-CH[1] Tap 28 comm error	
317 (13D)	GuardLink-CH[1] Tap 29 comm error	
318 (13E)	GuardLink-CH[1] Tap 30 comm error	
319 (13F)	GuardLink-CH[1] Tap 31 comm error	
320 (140)	GuardLink-CH[1] Tap 32 comm error	
512 (200)	DG not configured.	Configure the DG relay as stated in publication 440R-UM015.
513 (201)	DG needs firmware update.	Follow the general instructions for faults.

Table 4 - DG Relay Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
528 (210)	Rotary switch mismatch (0)	Wrong rotary switch position detected during startup. Turn the rotary switch back to the specified position.
529 (211)	Rotary switch mismatch (1)	
530 (212)	Rotary switch mismatch (2)	
531 (213)	Rotary switch mismatch (3)	
532 (214)	Rotary switch mismatch (4)	
533 (215)	Rotary switch mismatch (5)	
534 (216)	Rotary switch mismatch (6)	
535 (217)	Rotary switch mismatch (7)	
536 (218)	Rotary switch mismatch (8)	
537 (219)	Rotary switch mismatch (9)	
538 (21A)	Rotary switch mismatch (10)	
539 (21B)	Rotary switch mismatch (11)	
540 (21C)	Rotary switch mismatch (12)	
541 (21D)	Rotary switch mismatch (13)	
542 (21E)	Rotary switch mismatch (14)	
543 (21F)	Rotary switch mismatch (15)	

GuardLink Tap Tags

Table 5 - GuardLink Taps (Tag name prefix: ENETRname:I.Relayx_GSR_DG.GuardLinkx.)

Name	Data Type	Definition
Active	BOOL	Active Status - Indicates whether the GuardLink circuit is used on IN1. 0 = IN1 is used for standard OSSD or EMSS inputs. When the Active value is zero, all remaining GuardLink tags are zero. 1 = IN1 is used as a GuardLink input.
Trip	BOOL	Tripped Status - Indicates whether the GuardLink circuit is operational or in a tripped state. 0 = Operational 1 = Tripped
DiagnosticActive	BOOL	Diagnostic Active - Indicates whether the GuardLink circuit is in a diagnostic state. 0 = All GuardLink taps are not in a faulted (diagnostic) state. 1 = One or more GuardLink taps are in a faulted (diagnostic) state. The tap indicators are flashing red.
Fault	BOOL	Fault - Indicates whether the GuardLink circuit is in a fault state. 0 = No fault 1 = Fault
DiagnosticCode	SINT	Diagnostic Code - See Table 6 on page 47 for more information.
FaultCode	SINT	Fault Code - Indicates the fault code when the GuardLink circuit is faulted. See Table 7 on page 48.

Table 5 - GuardLink Taps (Tag name prefix: ENETRname:I.Relayx_GSR_DG.GuardLinkx.)

<table>
<tr><th>Name</th><th>Data Type</th><th>Definition</th></tr>
<tr><td>DeviceTrip</td><td>DINT</td><td>Device Trip - When all nodes are operational, DeviceTrip is the same as DeviceCount. When nodes are tripped, DeviceTrip shows a value that reflects all nodes that remain operational. Bit values of zero indicate the nodes that are tripped.
With four operational nodes, the decimal value is 15.
• If nodes 1 and 3 are tripped, the decimal value is 10.
• If only node 2 is tripped, the decimal value is 13.
<table>
<tr><th>Status</th><th>Decimal</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td>All Operational</td><td>15</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>Nodes 1 and 3 tripped</td><td>10</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>Node 2 tripped</td><td>13</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
</table></td></tr>
<tr><td>DeviceDiagnostic</td><td>DINT</td><td>Device Diagnostic - Indicates the nodes whose diagnostics are active.
0 = No nodes are in diagnostics.
DINT = one or more taps with active diagnostics</td></tr>
<tr><td>DeviceFault</td><td>DINT</td><td>Device Fault - Indicates the nodes that are faulted.
0 = No nodes are faulted.
For example, with four nodes, a 6 means that node 1 and node 4 are faulted.</td></tr>
<tr><td>DeviceCount</td><td>DINT</td><td>Device Count - Provides the number of nodes in the GuardLink1 circuit. For example, a 15 means the GuardLink system has four nodes.</td></tr>
</table>

GuardLink Tap Diagnostic Codes

Table 6 - Tap Diagnostic Codes

Diagnostic Code Decimal (Hex)	Description	Recommended Action
00 (00)	No diagnostic	No action needed
01 (01)	Safety signal timeout	Check status of downstream (furthest away from the DG relay) device.
02 (02)	Safety signal invalid	Cycle the device between safe and active state. Measure the voltage of the safety signals; verify that they are at the switch concurrently.
03 (03)	Reset input is held ON	Check the reset signal duration. Reset must be 250…3000 s.
04 (04)	Power low warning	Evaluate supply voltage. Supply voltage must be 20.4…26.4V at all taps under all electrical load conditions.
64 (40)	Device startup functional test	Functionally test the monitored device. Cycle the device between safe and active state.
65 (41)	Device fault functional test	

GuardLink Tap Fault Codes

Table 7 - GuardLink Tap Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
00 (00)	No fault.	No action necessary.
01 (01)	Short circuit is detected on Channel A of the monitored field device	Check wiring. Functionally test the monitored device. Cycle the device between safe and active state.
02 (02)	Short circuit is detected on Channel B of the monitored field device	
05 (05)	Power error	Evaluate supply voltage. Supply voltage must be 20.4. . . 26.4V at all taps under all electrical load conditions.
06 (06)	Internal memory fault	Follow the general instructions for faults. See General Instructions for Faults on page 39.
07 (07)	Failure to detect monitored field device type	
08 (08)	Internal memory (ROM) fault	
09 (09)	Runtime memory (RAM) fault.	
10 (0A)	Internal memory(CPU) fault	
11 (0B)	Internal test fault	
12 (0C)	Voltage fault	Evaluate supply voltage. Supply voltage must be 20.4. . .26.4V at all taps under all electrical load conditions.
13 (0D)	Channel A and Channel B (OSSD) cross fault	Check for a short circuit condition between ChA and ChB of the monitored device.
14 (0E)	Internal memory fault	Follow the general instructions for faults. See General Instructions for Faults on page 39.
15 (0F)	No response on GuardLink	Check GuardLink wiring - brown wire is connected to 24V, blue wire is connected to ground, white wire is connected to S12, and black wire is connected to S22.

DI and DIS Tags

Due to similar functionality, the DI and DIS safety relays have the same tags. The DI safety relay has voltage-free electromechanical outputs, and the DIS safety relay has solid-state outputs.

Table 8 - DI and DIS Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_DI. or ENETRname:I.Relayx_GSR_DIS.)

Name	Data Type	Definition
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.
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.
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.
ResetRequired	BOOL	Reset Required Indication - Turns ON (1) when all monitored input conditions are ON and the safety relay Output is OFF (0).
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
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.

Table 8 - DI and DIS Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_DI. or ENETRname:I.Relayx_GSR_DIS.)

Name	Data Type	Definition
RecoverableFault	BOOL	Recoverable Fault Status – Toggles ON (1) for one scan when the DI/DIS safety relay has detected an unexpected operation. • S12 OpenWire • S22 OpenWire • S32 OpenWire • S42 OpenWire • Cross Loop Fault • Invalid Switch Setting • Reset Held ON Toggles back to OFF (0), when the unexpected operation status goes to ON (1) 0 = No fault 1 = Fault
NonRecoverableFault	BOOL	Nonrecoverable Fault Status – Toggles ON (1) for one scan when the DI/DIS safety relay has detected an unexpected internal operation or failed a pulse check. Toggles back to OFF (0), when the nonrecoverable fault tags are assigned a value. See NonRecoverableFault_A and NonRecoverableFault_B fault tags for values. 0 = No fault 1 = Fault
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.
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.
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.
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.
L12	BOOL	L12 Status – Indicates whether terminal L12 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
S34	BOOL	S34 Status – Indicates whether terminal S34 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
NonRecoverableFault_A	SINT	Nonrecoverable Fault Processor A – Indicates that Safety Processor A has recorded a nonrecoverable fault. See Table 9 on page 50 for a list of nonrecoverable fault codes.
NonRecoverableFault_B	SINT	Nonrecoverable Fault Processor B – Indicates that Safety Processor B has recorded a nonrecoverable fault. See Table 9 on page 50 for a list of nonrecoverable fault codes.
S12OpenWire	BOOL	S12 Open Wire - Indicates S12 open (0) and closed (1) while S22 remained closed (1).
S22OpenWire	BOOL	S22 Open Wire - Indicates S22 open (0) and closed (1) while S12 remained closed (1).
S32OpenWire	BOOL	S32 Open Wire - Indicates S32 open (0) and closed (1) while S42 remained closed (1).
S42OpenWire	BOOL	S42 Open Wire - Indicates S42 open (0) and closed (1) while S32 remained closed (1).
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
InvalidSwitchSetting	BOOL	Invalid Switch Settings – Indicates the switch settings changed after power-up of the safety relay. 0 = No fault 1 = Fault
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

DI and DIS Fault Codes

Table 9 - DI and DIS Relay Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
06 (06)	Safety mat wiring detected on one of the input pairs while the safety relay is configured for 'OR' logic	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.
07 (07)	Mismatch between current switch settings and setting stored in EEPROM during power-up	Change the switch settings to the correct values or reconfigure the relay.
09 (09)	SPI compare fault	Follow the general instructions for faults.
11 (0B)	ROM test failure	
12 (0C)	Terminal S12 hardware input fault	At the specified terminal, check the wiring for short circuits to 24V, 0V, or other channels. Validate the electrical installation and appropriate measures to reduce noise and suppress surges are taken.
13 (0D)	Terminal S22 hardware input fault	
14 (0E)	Terminal S32 hardware input fault	
15 (0F)	Terminal S42 hardware input fault	
16 (10)	Terminal S34 hardware input fault	
17 (11)	Pulse test fault on main transistor	
18 (12)	Pulse test fault of transistor for safety output channel 1 (DIS terminal 14, 34)	
19 (13)	Pulse test fault of transistor for safety output channel 2 (DIS terminal 24, 44)	
20 (14)…30 (1E)	Internal plausibility test fault	Follow the general instructions for faults. See General Instructions for Faults on page 39.
31 (1F)	Different Single Wire Safety input signal is detected at Processor A than Processor B	
32 (20), 33 (21)	Internal program fault	
34 (22), 35 (23)	Rotary switch read error	
36 (24)	Cross fault at processor pins for safety outputs	
37 (25)	Under voltage detected	Measure and adjust the voltage at terminal A1 to 20.4…26.4V under all electrical load conditions.
38 (26)	Fault detected in the other Processor	Follow the general instructions for faults. See General Instructions for Faults on page 39.

EM Tags

Table 10 lists the tags used by the EM expansion module.

Table 10 - EM Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_EM.)

Name	Data Type	Definition
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.
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.
Recoverable_Fault	BOOL	Recoverable Fault Status – Toggles ON (1) for one scan when the EM has detected an unexpected operation. Toggles back to OFF (0), when the unexpected operation status goes to ON (1). 0 = No fault 1 = Fault
NonRecoverable_Fault	BOOL	Nonrecoverable Fault Status – Toggles ON (1) for one scan when the safety relay has detected unexpected internal operation or failed a pulse check. Toggles back to OFF (0), when the nonrecoverable fault tags are assigned a value. See NonRecoverableFault_A and NonRecoverableFault_B for details. 0 = No fault 1 = Fault
NonRecoverableFault_A	SINT	Nonrecoverable Fault Processor A – Indicates that Safety Processor A has recorded a nonrecoverable fault. See Table 12 on page 53 for a list of nonrecoverable fault codes.
NonRecoverableFault_B	SINT	Nonrecoverable Fault Processor B – Indicates that Safety Processor B has recorded a nonrecoverable fault. SeeTable 12 on page 53 for a list of nonrecoverable fault codes.

EMD Tags

Table 11 lists the tags that are used by the EMD module with delayed outputs.

Table 11 - EMD Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_EMD.)

Name	Data Type	Definition
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.
B1State	BOOL	B1 Status – Only when the Safety Output is ON, this tag indicates whether input B1 is ON (connected to 24V DC or to B2) or OFF. When the SafetyOutput tag is 0, B1 State is 0. 0 = The input is OFF. 1 = The input is ON.
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.
Recoverable_Fault	BOOL	Recoverable Fault Status – Toggles ON (1) for one scan when the EMD has detected an unexpected operation. 0 = No fault 1 = Fault
NonRecoverable_Fault	BOOL	Nonrecoverable Fault Status – Toggles ON (1) for one scan when the EMD has detected unexpected internal operation or failed a pulse check. See NonRecoverableFault_A and NonRecoverableFault_B for details. 0 = No fault 1 = Fault
NonRecoverableFault_A	SINT	Nonrecoverable Fault Processor A – Indicates that Safety Processor A has recorded a nonrecoverable fault. See Table 12 on page 53 for a list of nonrecoverable fault codes.
NonRecoverableFault_B	SINT	Nonrecoverable Fault Processor B – Indicates that Safety Processor B has recorded a nonrecoverable fault. See Table 12 on page 53 for a list of nonrecoverable fault codes.
Input_Retrigger	BOOL	Input Retrigger – Indicates whether a retrigger event occurred when the EMD is configured for non-retriggerable OFF-delay. If the SWS input at terminal L12 turns ON during the timing period, this tag is set to 1 and the PWR/Fault indicator is green with flashing red 4X. Turn the SWS input OFF during the timing cycle to clear the fault condition. 0 = No fault 1 = Retrigger event occurred.
InvalidSwitchSetting	BOOL	Invalid Switch Setting – Indicates that either the Range or Time (or both) switch settings have been changed after configuration. The Recoverable Fault tag changes from 0 to 1 for one scan and then the InvalidSwitchSetting value changes from 0 to 1 and remain at 1 until the switches are returned to their original configured values. The PWR/Fault indicator is green with flashing red 2X when this tag has a value of 1. 0 = No changes 1 = One or both switches have changed
B1_B2_Setting_Change	BOOL	While the Safety Output tag is On, this tag indicates whether the connection between terminals B1 and B2 has changed from its original configuration. Example: The EMD is configured for OFF-delay with B1/B2 connected (retriggerable). If the B1/B2 connection opens while the safety output is ON, the following events happen: 1. The Recoverable Fault tag changes from 0 to 1. 2. The B1 State tag changes from 1 to 0. 3. The B1_B2_Setting_Change tag changes from 0 to 1. 4. The Recoverable Fault tag changes back from 1 to 0. 5. The PWR/Fault indicator is green with flashing red 3X. If the B1/B2 connection is remade while the safety output is ON, the same steps happen with the values reversed, and the PWR/Fault indicator changes to solid green. When the SafetyOutput tag is 0, the B1_B2_Setting_Change tag has a value of 0. 0 = Connection has not changed. 1 = Connection changed.

EM and EMD Fault Codes

Table 12 - EM and EMD Relay Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
00 (00)	No fault	No action necessary.
01 (01)	RAM test	Follow the general instructions for faults. See General Instructions for Faults on page 39.
02 (02)	Stack over-/under-flow	
03 (03)	Configuration mismatch between Processors A and B	
04 (04)	Internal timing	
05 (05)	EEPROM read/write failure	
06 (06)	B1 configuration	Check the wiring to terminal B1.
07 (07)	Mismatch between current switch settings (switch 1: Range) and setting stored during power-up.	Change the switch settings to the correct values.
08 (08)	Mismatch between current switch settings (switch 2: Time) and setting stored during power-up.	
09 (09)	SPI compare fault	Follow the general instructions for faults. See General Instructions for Faults on page 39.
11 (0B)	ROM test failure	
17 (11)	Pulse test fault on main transistor	
18 (12)	Pulse test fault of transistor for safety output channel 1	
19 (13)	Pulse test fault of transistor for safety output channel 2	
20 (14)…24 (18)	Internal plausibility test fault	
25 (19)	Relay contact K1	
26 (1A)	Relay contact K2	
27 (1B)	Relay contact K3	
28 (1C)	Relay contact K4	
29 (1D), 30 (1E)	Internal plausibility test.	
31 (1F)	Different Single Wire Safety input signal is detected at Processor A than Processor B	
32 (20), 33 (21)	Internal program	
34 (22), 35 (23)	Rotary switch read error	
36 (24)	Cross fault at processor pins for safety outputs.	
37 (25)	Under voltage detected	Measure and adjust the voltage at terminal A1 to 20.4…26.4V under all electrical load conditions.
38 (26)	Fault detected in the other Processor	Follow the general instructions for faults. See General Instructions for Faults on page 39.
42 (30)	Capacitor short detected	

GLP Tags

Table 13 lists the tags that are used by the GLP safety relay.

Table 13 - GLP Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_GLP.)

Name	Data Type	Definition
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.
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.
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.
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.
RecoverableFault	BOOL	Recoverable Fault Status – Toggles ON (1) for one scan when the GLP safety relay has detected unexpected operation for the following: • Gate Open Fault • Invalid Switch Setting • Lock Request Gate Open Fault • Overspeed SL2 • Overspeed SL1 • Lock Request Held ON • Unlock Request Held ON Toggles back to OFF (0), when the unexpected operation status goes to ON (1). 0 = No fault 1 = Fault
NonRecoverableFault	BOOL	Nonrecoverable Fault Status – Toggles ON (1) for one scan when the safety relay has detected unexpected internal operation or failed a pulse check. Toggles back to OFF (0), when the nonrecoverable fault tags are assigned a value. See NonRecoverableFault_A and NonRecoverableFault_B tags for details. 0 = No fault 1 = Fault
OSSD_51	BOOL	51 Status – Indicates whether terminal 51 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
L61	BOOL	L61 Status – Indicates whether terminal L61 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
Y32	BOOL	Y32 Status – Indicates whether terminal Y32 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
S11	BOOL	S11 Status – Indicates whether terminal S11 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
S21	BOOL	S21 Status – Indicates whether terminal S21 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
L11	BOOL	L11 Status – Indicates whether terminal L11 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
NonRecoverableFault_A	SINT	Nonrecoverable Fault Processor A – Indicates that Safety Processor A has recorded a nonrecoverable fault. See Table 14 on page 56 for a list of nonrecoverable fault codes.
NonRecoverableFault_B	SINT	Nonrecoverable Fault Processor B – Indicates that Safety Processor B has recorded a nonrecoverable fault. See Table 14 on page 56 for a list of nonrecoverable fault codes.

Table 13 - GLP Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_GLP.)

Name	Data Type	Definition
GateOpenFault	BOOL	Gate Open Fault - Indicates the Gate inputs, S12, S22, unexpectedly opened. 0 = No Fault 1 = Fault
InvalidSwitchSetting	BOOL	Invalid Switch Setting Fault – The rotatory switch configuration does not match the configuration that is stored in the safety relay.
LockRequestGateOpenFault	BOOL	Lock Request/Reset Gate Open Fault - Indicates that the gate was open during a lock or reset request. 0 = No fault 1 = Fault
Overspeed_SL2	BOOL	Overspeed SL2 Fault - Indicates that the monitored speed exceeded the configured maximum speed limit settings for SL2 with the safety gate locked. PWR/Fault indicator is green with red flashing 4X. Reduce the speed to below SL2 and press the reset button to clear the fault. 0 = No fault 1 = Fault
Overspeed_SL1	BOOL	Overspeed SL1 Fault - Indicates that the monitored speed exceeded the configured maximum speed limit settings for SL1 when the gate is unlocked with Logic setting = 3 or 4. Reduce speed below the SL1 setting and press reset to clear the fault. 0 = No fault 1 = Fault
LockRequestHeldOn	BOOL	Lock Request Held On Fault – Indicates the lock request signal ON (1) for longer than the maximum time of 3000 ms. The fault is cleared when the signal is removed. 0 = No fault 1 = Fault
UnLockRequestHeldOn	BOOL	Unlock Request Held On Fault – Indicates the unlock request signal ON (1) for longer than the maximum time of 3000 ms. The fault is cleared when the signal is removed. 0 = No fault 1= Fault

GLP Fault Codes

Table 14 - GLP Relay Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
00 (00)	No fault	No action needed.
02 (02)	Reserved	Follow the general instructions for faults. See General Instructions for Faults on page 39.
03 (03)	Jitter fault	Check the movement of the sensor targets. Movement must not cause one sensor to turn ON and OFF while the other sensor does not change state.
04 (04)	Proximity Sensor 1 (P12) stuck at High fault.	Check the alignment and functionality of the specified proximity sensor. Check the wiring at the specified terminal for short circuits to 24V.
05 (05)	Proximity Sensor 2 (P22) stuck at High fault.	
06 (06)	Proximity Sensors cross fault.	Check connection for short circuit from P12 and P22.
07 (07)	Self-test of terminal 51 failed.	Check connection of 51 or L61 against shorts to 24V or 0V and cross loop shorts from 51 to L61.
08 (08)	Self-test of terminal L61 failed.	
09 (09)	Proximity Input Fault: Both Proximity inputs are Low simultaneously.	Check the alignment and functionality of the Proximity Sensors.
10 (0A)	Proximity Input Fault: Both Proximity inputs stuck at HIGH simultaneously.	
11 (0B)	SPI compare fault	Follow the general instructions for faults. See General Instructions for Faults on page 39.
12 (0C)	Self-test of Single Wire Safety output at L11.	Check connection of L11 for short circuits to 24V or 0V.
13 (0D)	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 L61 and 51 connection has changed after configuration.	Change the current configuration back to the stored configuration.
14 (0E)	Mismatch between current switch settings and setting stored during powerup.	Change the switch settings to the correct values.
15 (0F)	EEPROM read/write Fault	Follow the general instructions for faults. See General Instructions for Faults on page 39.
16 (11)	Compare State Fault	
18 (13)	L52 Fault	
21 (16)	Cross Tran Fault	
23 (18)	Gate Open Fault: Indicates the Gate inputs, S12, S22, unexpectedly opened.	
24 (19)	Over Speed 1	
30 (1E)	Terminal S12 hardware input fault	
31 (1F)	Terminal S22 hardware input fault	
32 (20)	Pulse test fault on main transistor	Check wiring for shorts to 24V or other channels.
33 (21)	Over voltage detected	Measure and adjust the voltage at terminal A1 to 20.4…26.4V under all electrical load conditions. Processor A shows FF. Processor B shows 21.
34 (22)	S54 Auto-start fault	
35 (23)	Prox sensor cross fault	Check for a short circuit from P12 to P22 while safety outputs are ON.
40 (28)…57 (39)	ROM Fault	Follow the general instructions for faults. See General Instructions for Faults on page 39.
250 (FA)	Proximity speed exceeds SL1 when safety gate is unlocked with logic setting = 1	Reduce the speed to below the SL1 setting. Cycle power. Processor A shows 00. Processor B shows FA. PWR/Fault indicator is flashing red 7X.

GLT Tags

Table 15 lists the controller tags for the guard locking with time delay safety relay.

Table 15 - GLT Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_GLT.)

Name	Data Type	Definition
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.
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.
LockRequest_S44	BOOL	Lock Request – Indicates whether the lock request input at terminal S44 is ON (24V) or OFF (0V). 0 = The Lock Request input is OFF. 1 = The Lock Request input is ON.
UnlockRequest_S54	BOOL	Unlock Request – Indicates whether the lock request input at terminal S54 is ON (24V) or OFF (0V). 0 = The Unlock Request input is OFF. 1 = The Unlock Request input is ON.
Recoverable_Fault	BOOL	Recoverable Fault Status – Toggles ON (1) for one scan when the GLT safety relay has detected unexpected operation of the following: • Gate Open Fault • Cross Loop Fault • Lock Request Gate Open • S12 Open Wire • S22 Open Wire • Logic, Range, or Time switch settings changed Toggles back to OFF (0), when the unexpected operation status goes to ON (1). 0 = No fault 1 = Fault
NonRecoverable_Fault	BOOL	Nonrecoverable Fault Status – Toggles ON (1) for one scan when the GLT safety relay has detected an unexpected internal operation or failed a pulse check. Toggles back to OFF (0), when the nonrecoverable fault tags are assigned a value. See NonRecoverableFault_A and NonRecoverableFault_B tags for details. 0 = No fault 1 = Fault
OSSD_51	BOOL	51 Status – Indicates whether terminal 51 is ON or OFF. 0 = The terminal is OFF. The 51/L61 indicator is ON. 1 = The terminal is ON. The 51/L61 indicator is OFF.
L61_Door_Cntrl	BOOL	L61 Door Control Status –Indicates whether terminal L61 is ON or OFF. 0 = The terminal is OFF. The 51/L61 indicator is ON. 1 = The terminal is ON. The 51/L61 indicator is OFF.
Y32	BOOL	Y32 Status – Indicates whether terminal Y32 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
OSSD_14	BOOL	S11 Status – Indicates whether terminal S11 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
OSSD_24	BOOL	S21 Status – Indicates whether terminal S21 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
L61_OSSD	BOOL	Not used.
L11	BOOL	L11 Status – Indicates whether terminal L11 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
NonRecoverableFault_A	SINT	Nonrecoverable Fault Processor A – Indicates that Safety Processor A has recorded a nonrecoverable fault. See Table 16 on page 58 for a list of nonrecoverable fault codes.
NonRecoverableFault_B	SINT	Nonrecoverable Fault Processor B – Indicates that Safety Processor B has recorded a nonrecoverable fault. See Table 16 on page 58 for a list of nonrecoverable fault codes.

Table 15 - GLT Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_GLT.)

Name	Data Type	Definition
CrossLoopFault	BOOL	Cross Loop Fault – Indicates that a short circuit is present from terminal S11 to terminal S21, or short circuit from S11 to 24V or from S21 to 24V. • Case 1: The input circuit is open (gate is open) The PWR/Fault indicator is solid green. Close the gate and press the reset button to clear the fault. • Case 2: The input circuit is closed (gate is locked) The PWR/Fault indicator is green with red flashing 5X. Remove the fault and cycle power to the GLP to clear the fault. • Case 3: The input circuit is open (E-stop pushed). The PWR/Fault indicator is solid green. Remove the fault and release the E-stop to clear the fault. • Case 4. The input circuit is closed (E-stop released) The PWR/Fault indicator is solid green. Remove the fault and cycle the E-stop to clear the fault. 0 = No fault 1 = Fault
S12OpenWire	BOOL	S12 Open Wire Fault – Indicates that the circuit to terminal S12 opened when it was expected to be closed. The PWR/Fault indicator is green with red flashing 5X. Check the wiring at S12 and its source. Open and close the gate to clear the fault. If the Logic setting is 5…8, then a short circuit from S12 to 0V also sets this bit to 1. The PWR/Fault indicator is solid green. Remove the short circuit and cycle the E-stop button to clear the fault. 0 = No fault 1 = Fault
S22OpenWire	BOOL	S22 Open Wire Fault – Indicates that the circuit to terminal S22 opened when it was expected to be closed. The PWR/Fault indicator is green with red flashing 5X. Check the wiring at S22 and its source. Open and close the gate to clear the fault. If the Logic setting is 5…8, then and a short circuit from S22 to 0V sets this bit. Remove the short circuit and cycle the E-stop to clear the fault. 0 = No fault 1 = Fault
LockRequest_GateOpen	BOOL	Lock Request/Reset Gate Open Fault - Indicates that the gate was open during a lock or reset request. The PWR/Fault indicator is green with red flashing 3X. Close the gate and press the unlock button to clear the fault. 0 = No fault 1 = Fault
Gate_Retrigger_Fault	BOOL	Gate Retrigger Fault – With the GLP configured for non-retriggerable delay, the E-stop was released before the time delay expired. The PWR/Fault indicator is green with red flashing 4X. After the timing cycle expires, cycle the E-stop button to clear the fault. 0 = No fault 1 = Fault
GateOpen_Fault	BOOL	Gate Open Fault - Indicates the gate inputs, S12 and S22, unexpectedly opened, or a cross loop fault occurred when the gate was locked. The PWR/Fault indicator is green with red flashing 5X. Close the gate and press the reset button to clear the fault. 0 = No Fault 1 = Fault

GLT Fault Codes

Table 16 - GLT Relay Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
00 (00)	No Fault	No action needed.
05 (05)	S11 Pulse Test	Follow the general instructions for faults. See General Instructions for Faults on page 39.
06 (06)	S21 Pulse Test	
07 (07)	OSSD1	Check for short circuits at terminal 14 to 24V and 0V. Processor A shows 07. Processor B shows 07 (24V short). Processor A shows 07. Processor B shows 02 (0V short).

Table 16 - GLT Relay Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
08 (08)	OSSD2	Check for short circuits at terminal 24 to 24V and 0V. Processor A shows FF. Processor B shows 08 (24V short). Processor A shows 82. Processor B shows 08 (0V short).
09 (09)	Low Side	Check for short circuits at terminal 51 and L61 to 24V and 0V. Processor A shows 09. Processor B shows 0A.
10 (0A)	High Side	
11 (0B)	SPI	Follow the general instructions for faults. See General Instructions for Faults on page 39.
12 (0C)	L11	Check for short circuits at terminal L11 to 24V and 0V. Processor A shows FF. Processor B shows 0C.
13 (0D)	Locking configuration different from EEPROM	The connections at terminals 51 and L61 differ from the configuration that is stored in the EEPROM. Return to the previous connections or reconfigure the GLP. Processor A shows FF. Processor B shows 0C.
14 (0E)	Switch setting different from EEPROM	Logic, Range, or Time switch setting was incorrect on power-up. Processor A shows FF. Processor B shows 0E (24V short). Set switch back to appropriate setting or reconfigure the GLP.
15 (0F)	EEPROM	Follow the general instructions for faults. See General Instructions for Faults on page 39.
17 (21)	Compare State	
19 (13)	L52	
20 (14)	Switch 3	
21 (15)	CASE 000	
22 (16)	Cross Tran	
23 (17)	B2 Value Different from EPROM	In Logic Setting 5…8: Upon power-up, the connection to B2 is not as originally configured. Either reconnect 24V or remove 24V from B2 and cycle power to the GLP.
24 (18)	IN1 is open while guard switch is locked	Follow the general instructions for faults. See General Instructions for Faults on page 39.
25 (19)	Switch overflow	
29 (1D)	B2	
30 (1E)	S12	
31 (1F)	S22	
32 (20)	Main Output Transistor	
33 (21)	Overvoltage detected	Measure and adjust the voltage at terminal A1 to 20.4…26.4V under all electrical load conditions. Processor A shows FF. Processor B shows 21.
40 (28)	ROM	Follow the general instructions for faults. See General Instructions for Faults on page 39.
50 (32)	CASE	
51 (33)	RAM	
52 (34)	Flow control	
53 (35)	Unused interrupt	
54 (36)	Stack	
55 (37)	Wrong revision number (Processor B only)	
56 (38)	Array overflow	
57 (39)	ADC	
58 (40)	Input not equal to other processor	

SI Tags

Table 17 lists the controller tags for the single input safety relay.

Table 17 - SI Relay Tags (Tag name prefix: ENETRname:I.Relayx_GSR_SI)

Name	Data Type	Definition
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.
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).
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
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.
RecoverableFault	BOOL	Recoverable Fault Status – Toggles ON (1) for one scan when the SI safety relay has detected an unexpected operation for the following: • S12 OpenWire • S22 OpenWire • Cross Loop Fault • Invalid Switch Setting • Reset Held ON Toggles back to OFF (0), when the unexpected operation status goes to ON (1). 0 = No fault 1 = Fault
NonRecoverableFault	BOOL	Nonrecoverable Fault Status – Toggles ON (1) for one scan when the safety relay has detected unexpected internal operation or failed a pulse check. Toggles back to OFF (0), when the nonrecoverable fault tags are assigned a value. See NonRecoverableFault_A and NonRecoverableFault_B tags for details. 0 = No fault 1 = Fault
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.
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.
S34	BOOL	S34 Status – Indicates whether terminal S34 is ON or OFF. 0 = The terminal is OFF. 1 = The terminal is ON.
NonRecoverableFault_A	SINT	Nonrecoverable Fault Processor A – Indicates that Safety Processor A has recorded a nonrecoverable fault. See Table 18 for a list of nonrecoverable fault codes.
NonRecoverableFault_B	SINT	Nonrecoverable Fault Processor B – Indicates that Safety Processor B has recorded a nonrecoverable fault. See Table 18 for a list of nonrecoverable fault codes.
S12OpenWire	BOOL	S12 Open Wire - Indicates S12 open (0) and closed (1) while S22 remained closed (1).
S22OpenWire	BOOL	S22 Open Wire - Indicates S22 open (0) and closed (1) while S12 remained closed (1).
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
InvalidSwitchSetting	BOOL	Invalid Switch Settings – Indicates the switch settings changed after power-up of the safety relay. 0 = No fault 1 = Fault
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

SI Fault Codes

Table 18 - SI Relay Nonrecoverable Fault Codes

Fault Code Decimal (Hex)	Description	Recommended Action
00 (00)	No fault	No action needed.
01 (01)	Reserved	Follow the general instructions for faults. See General Instructions for Faults on page 39.
02 (02)	Stack over or underflow Fault	
03 (03)	Different configuration at Processor A + B	
04 (04)	Timing Fault	
05 (05)	EEPROM Read or Write Fault	
06 (06)	Reserved	
07 (07)	Mismatch between current Reset setting and setting stored in EEPROM during power-up	Change the switch settings to the correct values or reconfigure the relay.
08 (08)	Current Safety Mats configuration unequal the stored value	Follow the general instructions for faults. See General Instructions for Faults on page 39.
09 (09)	SPI Compare Fault	
10 (0A)	Reserved	
11 (0B)	ROM Test Fault	
12 (0C)	Terminal S12 hardware input fault	
13 (0D)	Terminal S22 hardware input fault	
14 (0E)	Reserved	
15 (0F)	Reserved	
16 (10)	Terminal S34 hardware input fault	
17 (11)	Pulse Test Fault of main transistor	
18 (12)	Pulse Test Fault of transistor for safety output channel 1	
19 (13)	Pulse Test Fault of transistor for safety output channel 2	
20 (14)	Plausibility Test Fault of relay channel 1 feedback contact	
21 (15)	Plausibility Test Fault of relay channel 2 feedback contact	
22 (16)	Plausibility Test Fault of main transistor	
23 (17)	Plausibility Test Fault of transistor for safety output channel 1	
24 (18)	Plausibility Test Fault of transistor for safety output channel 2	
25 (19)	Reserved	
26 (1A)	Reserved	
27 (1B)	Reserved	
28 (1C)	Reserved	
29 (1D)	Plausibility Fault of Single Wire Safety Output (should be ON, but is OFF)	
30 (1E)	Plausibility Fault of Single Wire Safety Output (should be OFF, but is ON)	
31 (1F)	Different Single Wire Safety Input Signal at Processor A + B	
32 (20)	Switch / Case Fault	
33 (21)	Logical program flow control fault	
34 (22)	ADC Fault (reading Potentiometer values)	
35 (23)	Fault by reading the Potentiometer values	
36 (24)	Cross Fault at processor pins for safety outputs	
37 (25)	Fault of voltage reduction of the relay voltage	
38 (26)	The other Processor has a Fault only	
39 (27)…255 (FF)	Reserved	

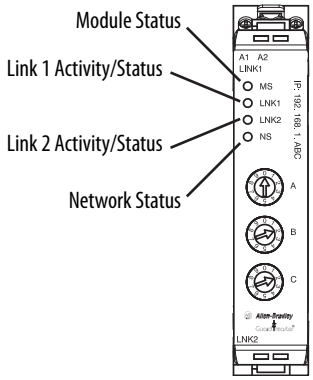
Notes:

Diagnostic Status Indicators

Indicator Location

Figure 48 shows the four diagnostic status indicators on the front face of the ENETR interface.

Figure 48 - Diagnostic Status Indicators



Indicator Description

Table 19 on page 64 describes each of the indicators and recommended actions for each status.

Table 19 - Diagnostic Status Indicator Descriptions

Indicator	Status	Description and Recommended Actions
Module status	OFF	No power is applied to device. AOP: ConnectionFaulted = 0 Check the voltage at terminals A1/A2.
	Solid green	Device operating normally. AOP: ConnectionFaulted = 0 No action necessary.
	Flashing green	Device needs commissioning due to missing, incomplete, or incorrect configuration. Update module configuration (See Upload Method on page 33). Check for missing IP address. Check if automation controller is in program mode. Cycle power.
	Flashing red/green	Module self-test on power-up. No action necessary.
	Flashing red	Recoverable fault. Complete firmware update. Verify address switches. Check for monitored safety relay fault - PWR/Fault indicator may be red or Device Fault bit may be 1. Power was cycled to one of the monitored safety relays. Cycle power.
	Solid red	Unrecoverable fault; may require device replacement. Cycle power.
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. Check RJ45 connections at top or bottom of ENETR interface.
	Solid green	One of the following conditions exists: • A 100 Mbps (full or half-duplex) link exists. • The ring network is operating normally. No action necessary.
	Flashing green	Transmit or receive activity present on indicated port @ 100 Mbps. AOP: EthernetLinkxSts = 1 if ConnectionFaulted = 0 AOP: EthernetLinkxSts = 0 if ConnectionFaulted = 1. No action necessary.
	Solid yellow	One of the following conditions exists: • A 10 Mbps (full or half-duplex) link exists. • The ring network is operating normally. • AOP: EthernetLinkxSts = 1 if ConnectionFaulted = 0. • AOP: EthernetLinkxSts = 0 if ConnectionFaulted = 1. No action necessary.
	Flashing yellow	Transmit or receive activity present on indicated port @ 10 Mbps. AOP: EthernetLinkxSts = 1 if ConnectionFaulted = 0. AOP: EthernetLinkxSts = 0 if ConnectionFaulted = 1. No action necessary.

Studio 5000 Example Logix Code

GuardLink Commands

This chapter shows sample code for GuardLink commands.

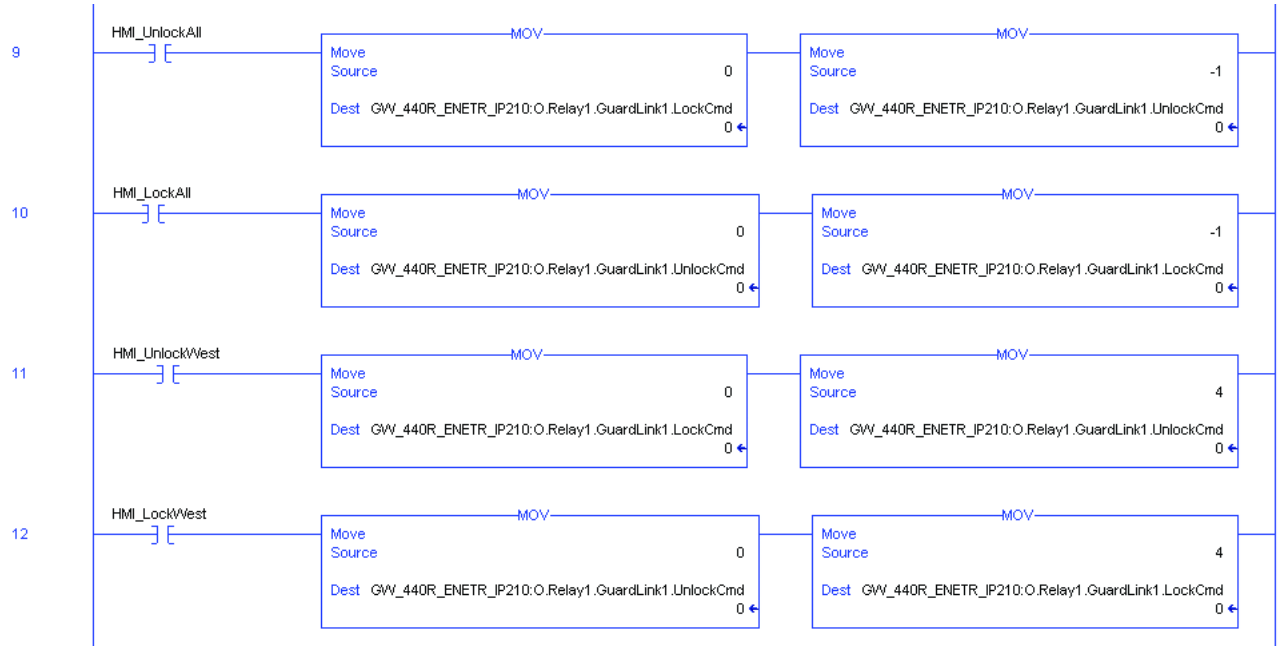
Lock and Unlock

Figure 49 shows sample code to lock and unlock guard locking switches. Rung 9 uses an HMI input to unlock all switches in the GuardLink circuit. First, we move a zero into the LockCmd to clear out any previous lock commands. Then, we move a -1 into the UnlockCmd. The -1 is converted to a 1 for each tap.

Rung 10 uses an HMI input to lock all switches in the GuardLink circuit. First, we move a zero into the UnlockCmd to clear out any previous unlock commands. Then, we move a -1 into the LockCmd. The -1 is converted to a 1 for each tap.

Rungs 11 and 12 provide an example of unlocking and locking a specific switch. In this case, we move a 4, which is the third tap, instead of a -1.

Figure 49 - Unlock and Lock Commands

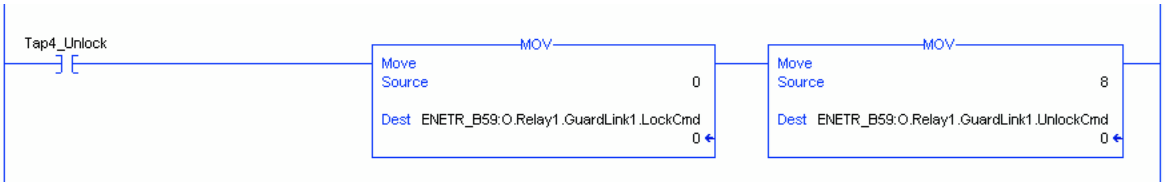


Lock and Unlock a Nonlocking Device

When an unlock command is sent to a tap connected to a non-locking device (like an E-stop), the GuardLink safety signal turns OFF. When a lock command is sent to a tap connected to a non-locking device, the tap turns ON. The following events occur when an unlock command is issued to an individual tap that is not connected to a locking switch.

Figure 50, an unlock command is sent to tap 4 on Relay 1, GuardLink1. Tap 4 is an E-stop.

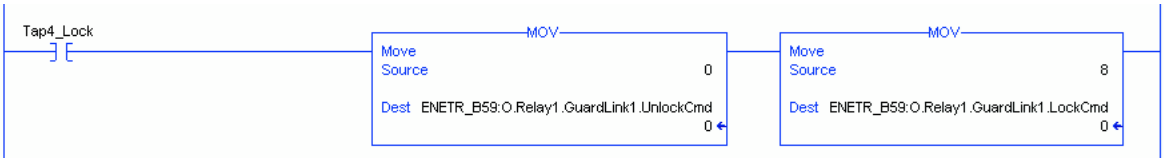
Figure 50 - Unlock Tap 4



1. The GuardLink safety signal turns OFF.
   - The Link indicator on all taps changes to solid red.
   - The Device indicator on all taps changes to blinking green. Tap 4 blinks green because the E-stop has not been pressed.
   - The DG IN1 indicator changes to solid red.
   - The DG output turns OFF.
2. The following occurs in the Studio 5000 AOP:
   - The GuardLink1.DeviceTrip.4 bit remains HI because the E-stop is not pressed.
   - The GuardLink1.Trip bit remains LO, because no devices are tripped.
   - The Relay1_GSR_DG.PtS12 is LO, because the GuardLink Safety signal is OFF.
   - The Relay1_GSR_DG.SafetyInput01 is LO.

The unlock command for tap 4 must be cleared (set to 0), and a lock command must be sent to tap 4 to restore the GuardLink safety signal (Figure 51).

Figure 51 - Lock Tap 4



Fault Reset Command to All GuardLink Taps

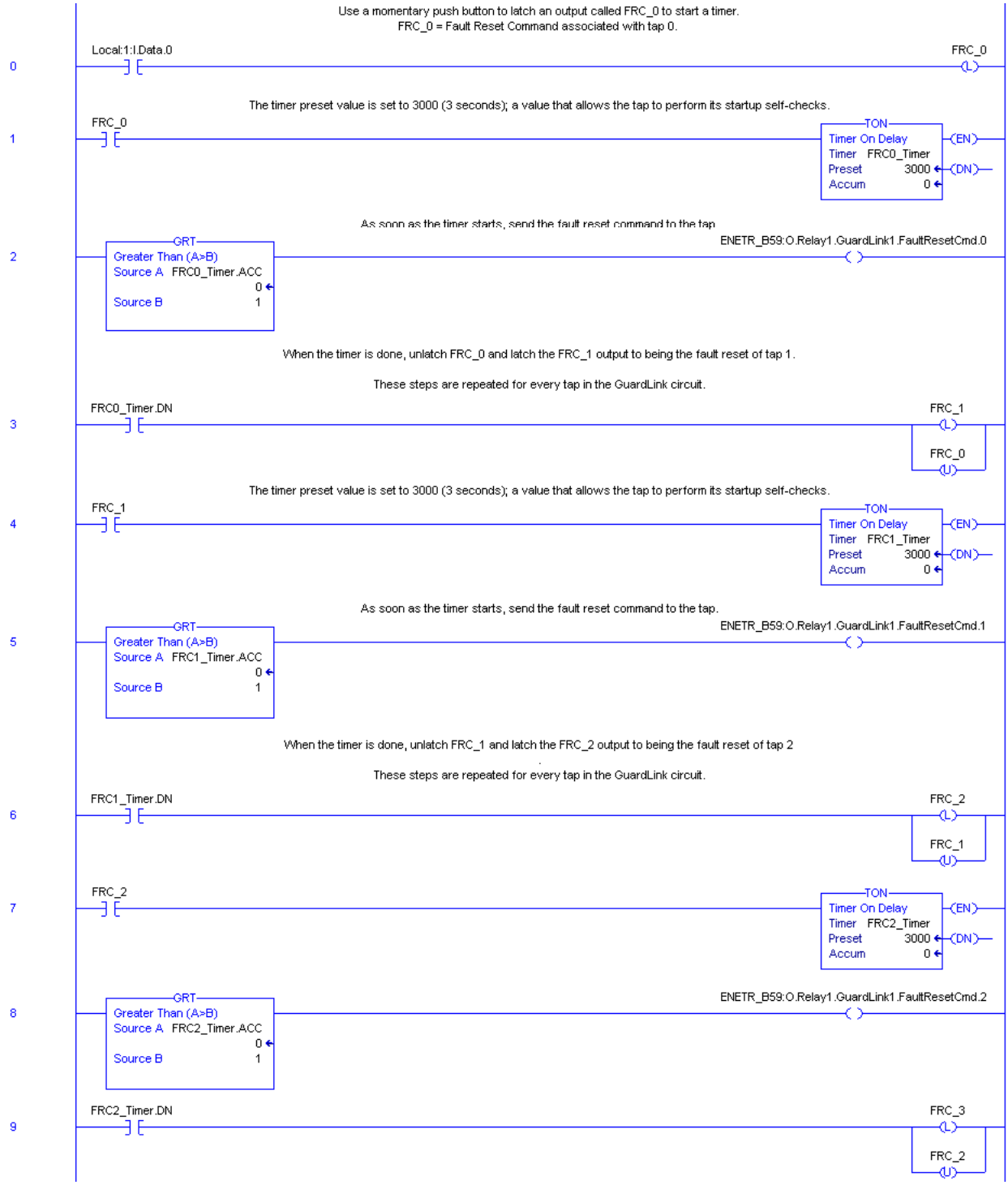
The fault reset command is used to power cycle a tap. In GuardLink 1.0, the DG relay does not know if a device connected to a tap is in a faulted state; the DG relay only knows that the tap is OFF. If the tap remains OFF, this state can indicate a device fault. A fault reset command can be sent to the tap to power cycle the tap and the device that is connected to the tap. This action can clear the fault in the device.

The fault reset command cannot be sent to all taps with a rung of code like the lock all and unlock all commands. By using timers, logic can be written to execute the fault reset command to all taps.

Figure 52 on page 68 shows example logic for Studio 5000. A reset command is sent to a tap. After 3 seconds, the reset command is sent to the next tap. The process is repeated until all taps are reset.

In this example, a momentary push button is used to initiate the subroutine. The FRC_0 output is latched; this output is for the first tap (Tap 0). The output starts a timer. The timer value is set to 3000 ms; enough time for the tap to execute its startup self-test. After timer is done, the FRC_0 output is unlatched, and the FRC_1 output is latched. The steps are repeated for each tap.

Figure 52 - Jump to Fault Reset Subroutine



Guard Locking with Fault Reset Command

Figure 53 on page 70 shows an example of how the lock, unlock, and fault reset commands can be used. In this example, a guard locking interlock switch (like the TLS-ZR or 440G-LZ) is connected to tap 4. Momentary, normally open push buttons initiate the lock and unlock commands. The logic initiates the fault reset command automatically.

The safety outputs of the guard locking switch can be OFF for various reasons:

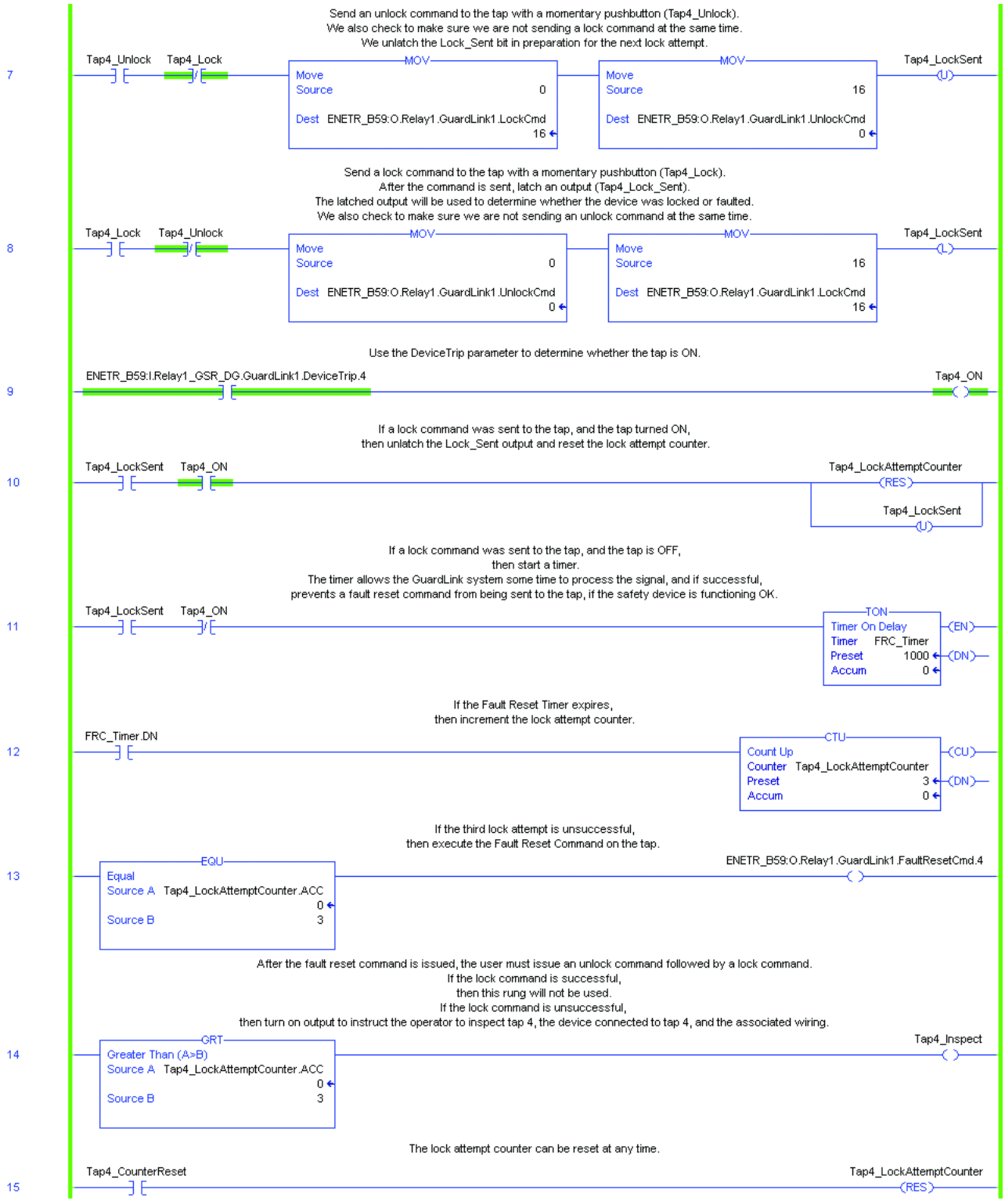
- The switch is unlocked.
- The gate is not closed.
- The switch has faulted.

If the gate is not closed and a lock command is issued to the tap, the tap and switch do not fault. If the gate is then closed, the tap does not automatically lock the gate. The operator must issue an unlock command, followed by a lock command.

The GuardLink taps only know that the safety outputs of the switch are OFF. The example logic allows an operator to attempt to lock the switch twice. If on the third attempt, the switch does not lock, the logic automatically sends a fault reset command to the tap. The fault reset command cycles power to the switch, in an attempt to clear a faulted state. If on the fourth unsuccessful attempt to lock the switch, an inspect flag is set. This flag can be used to inform the operator to inspect the tap, the switch, and its cabling.

You can change the number of attempts and the delay that is allowed before determining the lock command does not work. The delay must be set for at least 200 ms.

Figure 53 - Logix



Explicit Communication

Explicit communication is used when status information is requested from the ENETR interface or control signals are sent to the ENETR interface only when needed.

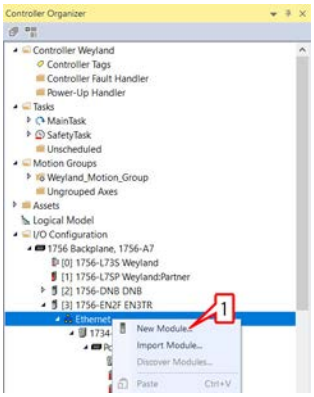
This communication method is also used by non-Rockwell Automation controllers.

The examples in this chapter show how to use the explicit communications when the AOP is not loaded into the Project. In this example, a generic Ethernet device is added to the project and the Get Message block is used.

Setup

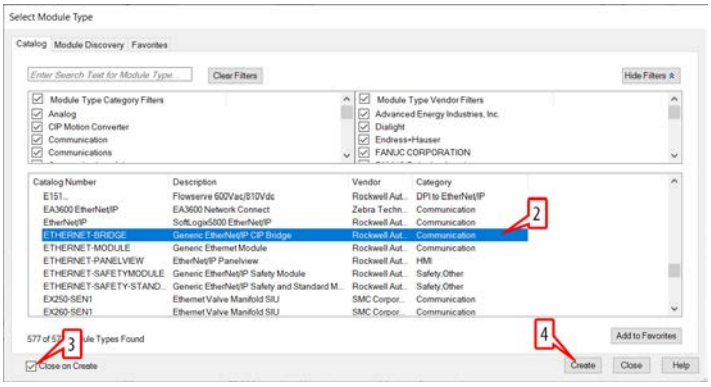
1. Figure 54 shows the start of the process of adding a new module. In the controller organizer, right-click the Ethernet connection and select New Module.

Figure 54 - New Module



2. In Figure 55, scroll down to find the ETHERNET-BRIDGE.
3. Check Close on Create.
4. Click Create.

Figure 55 - Select Ethernet-Bridge



5. In Figure 56, enter a name.
6. Enter a description (optional).
7. Enter an IP address.
8. Click OK.

Figure 56 - New Module Name and IP Address

9. Create three message type controller tags; one for the configuration, a second for the input and a third for the output.
10. Create three SINT data type. These data types must be arrays with the values as shown.

Figure 57 - Create Controller Tags

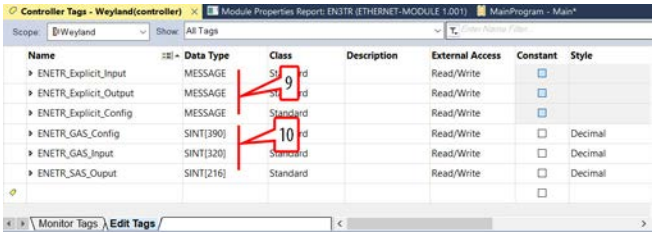
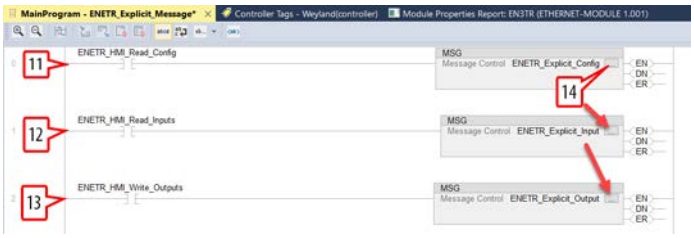


Figure 58 on page 73 shows an example logic program. Add three rungs with the message block tags. When the program is running, toggle the HMI control to execute the message function.

11. Add a rung to read the configuration of the ENETR interface.
12. Add a rung to read the input values of the ENETR interface.
13. Add a rung to write control signals to the ENETR interface.
14. To configure each of the message blocks, click the ellipsis.

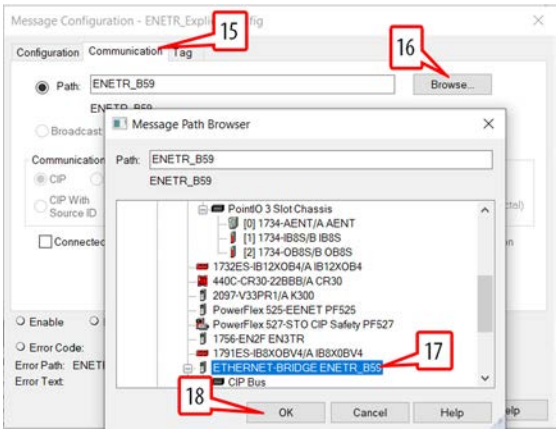
Figure 58 - Example Logic Program



15. In Figure 59, click the Communication tab.
16. Click Browse.
17. Scroll down to find the Ethernet-Bridge.
18. Click OK.

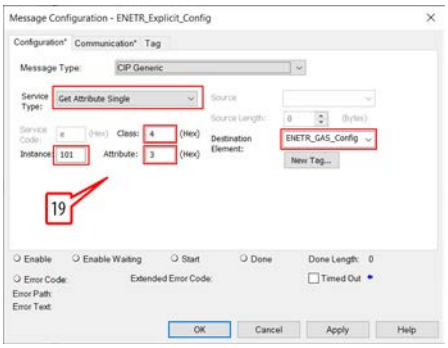
IMPORTANT Repeat these steps for each of the message controls.

Figure 59 - Communication Tab



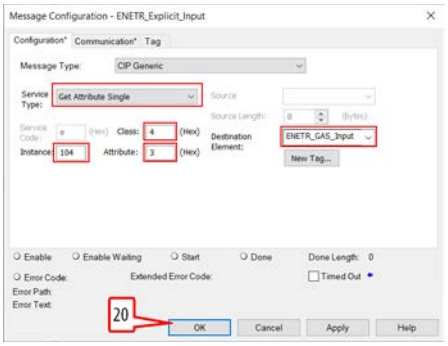
19. Populate the five fields as shown in Figure 60 to read the ENETR interface configuration and click OK.

Figure 60 - Config Message Configuration



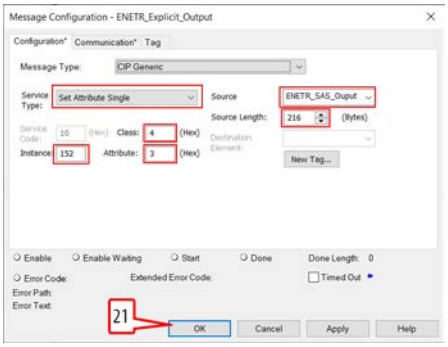
20. Populate the five fields as shown in Figure 61 to read the ENETR interface input values and click OK.

Figure 61 - Input Message Configuration



21. Populate the six fields as shown in Figure 62 to write the ENETR interface output values and click OK.

Figure 62 - Output Message Configuration



Configuration Data

The Configuration data can occupy an array of up to a maximum of 390 bytes. Table 20 on page 75 describes the bytes. The Relay ID shows up in the first six(0...5) bytes. Since the ENETR interface can only monitor a maximum of six relays, each relay is identified by one byte. Byte 0 is the relay closest to the ENETR interface (called Slot 1).

Each DG relay can have a maximum of 32 GuardLink taps on each input and each DG relay as two inputs. Therefore, the Slot 1 GuardLink 1 taps are identified with bytes 6...37. Each GuardLink circuit occupies 32 bytes.

IMPORTANT See Knowledgebase article 1087826 for additional configuration information: https://rockwellautomation.custhelp.com/app/answers/detail/a_id/1087826

Table 20 - Start and End Bytes

Description	Start Byte	End Byte
Relay ID	0	5
Slot 1 GuardLink 1 ID	6	37
Slot 1 GuardLink 2 ID	38	69
Slot 2 GuardLink 1 ID	70	101
Slot 2 GuardLink 2 ID	102	133
Slot 3 GuardLink 1 ID	134	165
Slot 3 GuardLink 2 ID	166	197
Slot 4 GuardLink 1 ID	198	229
Slot 4 GuardLink 2 ID	230	261
Slot 5 GuardLink 1 ID	262	293
Slot 5 GuardLink 2 ID	294	325
Slot 6 GuardLink 1 ID	326	357
Slot 6 GuardLink 2 ID	358	389

Table 21 shows the IDs in hexadecimal and decimal format for each of the relays and taps.

Table 21 - Config IDs

Type	Name	Cat. No.	Hex	Dec
Relay	DIS	440R-D22S2	1	1
	DI	440R-D22R2	2	2
	EM	440R-EM4R2	3	3
	EMD	440R-EM4R2D	4	4
	SI	440R-S12R2	6	6
	GLP	440R-GL2S2P	8	8
	GLT	440R-GL2S2P	9	9
	DG	440R-DG2R2T	A	10
Taps	OSSD 5-pin	440S-SF5D	81	129
	OSSD 8-pin	440S-SF8D	82	130
	EMSS 5-pin	440S-MF5D	83	131
	EMSS 8-pin	440S-MF8D	84	132

Notes:

Specifications

440R-ENETR Specifications

Attribute	440R-ENETR	
Indicators	Two red/green status indicators: • Module status • Network status (Ports 1 and 2 combined)	Two 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 screw torque	0.4 N•m (4 lb•in)	
Weight, approx.	180 g (0.4 lb)	
Wiring category	– on power ports – 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	
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% noncondensing	
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	

Notes:

Regulatory Approvals

The ENETR interface is not a safety rated device and does not meet the standard requirements of machine safety devices. The ENETR interface is a monitoring device that reports the status of the safety relays. It also monitors to the machine control system so you can take appropriate actions and sends non-safety related commands.

Certifications

c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CE	• ENETR Interface Declaration of Conformity • 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

Notes:

R

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Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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