SPECTRUM CONTROLS

An Allient Company

Software User's Guide Universal Industrial Gateway

Important Notes

Please read all the information in this manual before installing the product. The information in the manual applies through Gateway Version 2.02.*nnn*, where *nnn* is the build number. This manual assumes that you have a full working knowledge of the relevant equipment.

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Table of Contents

Preface

Read this introduction to become familiar with the rest of the manual. This preface covers the following topics:

- Who should use this manual
- How to use this manual
- Technical support
- Conventions used in this manual

Who Should Use This Manual

Use this manual if you are responsible for installing and running a Universal Industrial Gateway.

How to Use This Manual

This manual provides step-by-step instructions for installing and running a Universal Industrial Gateway using the embedded Gateway software.

Technical Support

For technical support, please contact your local distributor or contact Spectrum Controls, Inc. at: (425) 746-9481 from 8:00 am to 4:00 pm Pacific Time or send an email to support@spectrumcontrols.com

Conventions Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists (like this one) provide information not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.
- **Bold** type identifies headings and sub-headings.

WARNING	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. These messages help you to identify a hazard, avoid a hazard, and recognize the consequences.

ATTENTION	Actions ou situations risquant d'entraîner des blessures pouvant être mortelles, des dégâts matériels ou des pertes financières. Les messages « Attention » vous aident à identifier un danger, à éviter ce danger et en discerner les conséquences.

NOTE	Identifies information that is critical for successful application and understanding of the product.

Chapter 1
Gateway Overview

The Gateway allows you to read tag values from different kinds of programmable logic controllers/devices, and to write those values to the same controller or to different controllers.

A Gateway may access programmable logic controllers (PLCs) and related automation equipment serially, using any of the two or four serial ports, or using two different network subnets via two Ethernet ports, **PORT1** and **PORT2**, on the front of the Gateway.

You use the Gateway to configure devices and tags. This configuration specifies the connections, protocols, communication parameters, and tags on a connected PLC/device so that the Gateway can communicate without errors.

From version 2.02*nnn*, you may also specify Ethernet Client/Server operation. You must specify whether the Gateway is to act as a client or server device if a ModbusASCII, ModbusRTU, ModbusTCP or Ethernet protocol is selected or client or server.

NOTE	The information you provide when configuring a device and its tags must exactly match the actual configuration of the connected PLC or other device and the tags defined. All of this information may be retrieved using the automation software used to configure and program the PLC.

You may add as many device profiles as you wish to the Gateway. The number of serial devices you may physically connect to a Gateway is limited by the number of serial ports. The number of device profiles you may add is limited only by disk space. The number of tags you can configure also depends on available Gateway memory (disk space on the Gateway).

The protocols of the source and destination devices do not need to be the same.

The data types of the source and destination tags can also be different. However, copies between STRING and non-STRING data types are not permitted. For more information on copy limitations, see Adding Tag Maps.

The Gateway front panel contains a 128×32-bit OLED display that displays the network interface status of one or more network port groups when the network interface becomes available after booting up the Gateway. The display shows IP addresses and indicates error conditions for each network group. See Viewing OLED Interface Information.

If power fails, the Gateway reboots once power is present again. All processes restart and the database integrity is checked. If the database is missing or corrupt, a new default database is created. This allows you to login and restore a backup.

NOTE	To physically install the Gateway hardware, refer to the installation instructions provided with your Gateway when it shipped.

To review features and other important information, review the release notes.

When running the Gateway software, to access context-sensitive, embedded, online help from each of the main Gateway dialogs, select the View Help option from Gateway Help menu:

Section 1.2
Gateway Overview

Refer to the listed chapter for the following information:

- Chapter 2, Installing the Gateway
- Chapter 3, Using the Gateway Interface
- Chapter 4, Technical Reference
- Index

Chapter 2
Installing the Gateway

NOTE	To physically install the Gateway hardware, refer to the installation instructions provided with your Gateway when it shipped.
	To find out what is in this release of the product, refer to the release notes.

Section 2.1
About Information Links

Devices, tags, and tag maps have links to non-editable forms that provide information about the device, tag, and tag map configuration.

If a tag references both a device name and a tag, both device and tag forms open when the information button is clicked.

You access the forms by clicking on the following button:

Section 2.2
Viewing Help Information

To view help information:

1. From the Gateway user interface, click **View Help** on the menu bar:

2. A context-sensitive help page for the open tab appears. To access the main help page (shown below), click **Home:**
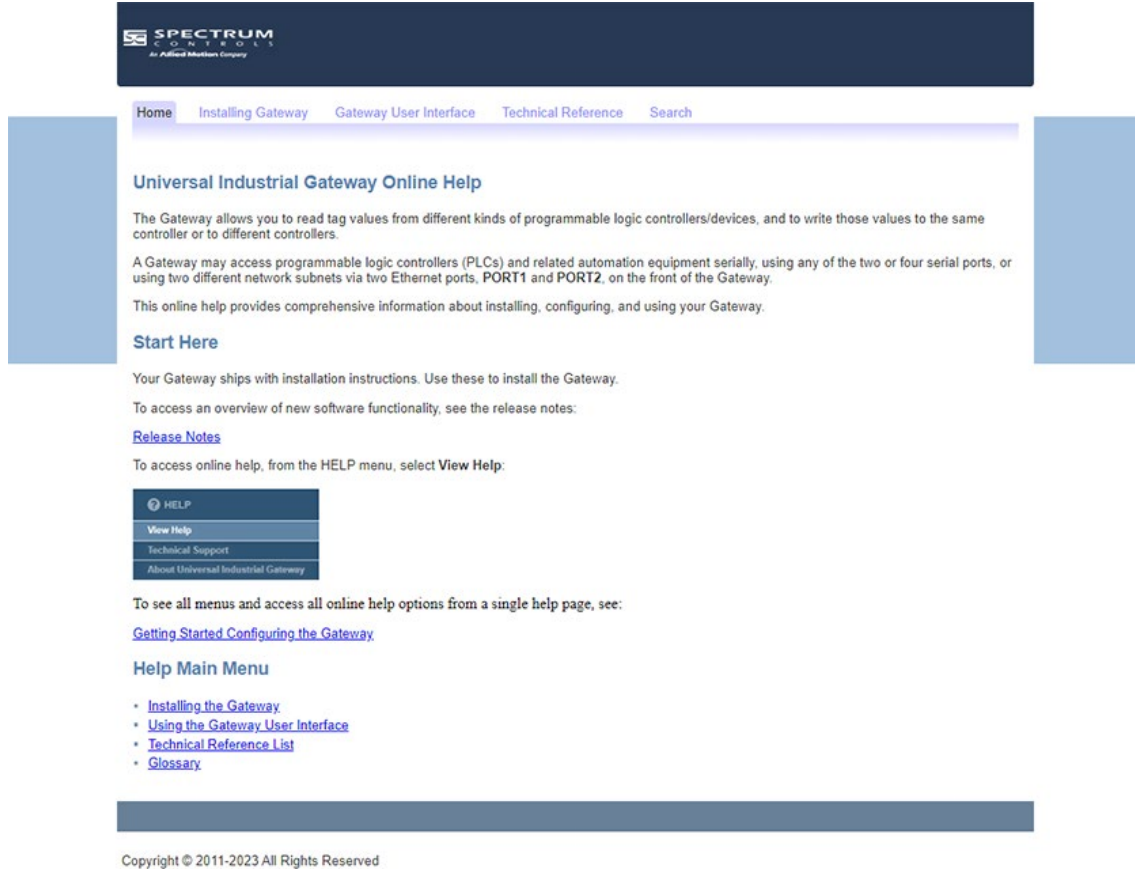
3. Either navigate to the topic of interest using the provided links, or search for a term using the search capability:

    •   For context-sensitive help, select **View Help** from the page that is currently displayed.

    •   For a software table of contents, see Using the Gateway User Interface.

Section 2.3 Providing Diagnostics Information

For troubleshooting purposes, you can compile and send Gateway diagnostics information to Technical Support.

1. To create a diagnostic file, log onto the Gateway:

    See Logging onto the Gateway User Interface.

2. To compile the diagnostics file, from the Help menu, select **Technical Support**:

3. The Create Diagnostics File dialog appears. Use this file to compile a diagnostics file to send to Technical Support:

   - **Comments**. Enter any information that helps technical services to diagnose and troubleshoot your problem.
   - **Submit**. Saves comments and creates the diagnostics file.
   - **Cancel**. Exits without saving the diagnostics information.

The software informs you that it is gathering the diagnostics information:
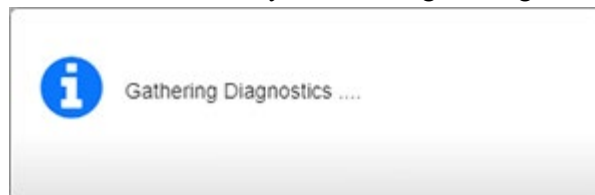
The software informs you when the download is complete:
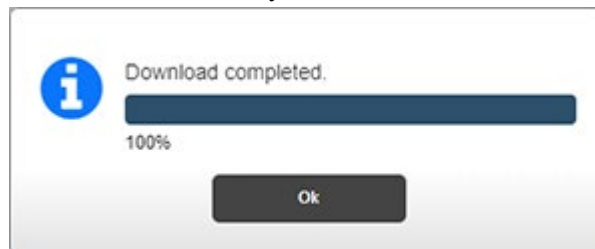
4. Click **Ok**.
5. Navigate to the directory to retrieve the saved file for sending to Technical Support. The file is normally downloaded to your Downloads directory if you have not configured your browser to request a download location. Use the live support@spectrumcontrols.com link on the dialog to email the file to Spectrum Controls.

Section 2.4
Getting Hardware and
Software Information

The Gateway provides an option that allows you to view the current firmware version, Gateway serial and model numbers, and network information. To access this information:

1. Log onto the Gateway:

   See Logging onto the Gateway User Interface.

2. To get Gateway information, from the Help menu, select **About Universal Industrial Gateway**:

3. View the information:

   About Universal Industrial Gateway. Displays the software release of the current Gateway firmware version, unique Serial Number, product-specific model number, unique MAC address(es), and Gateway IP address(es):
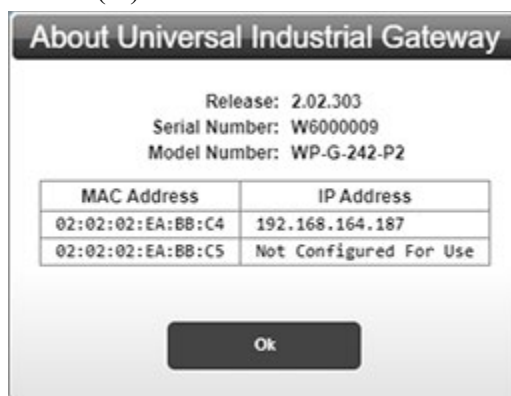
**Section 2.5
Hardware
Specifications**

General and communications hardware specification information.

General	Communications
- Processor i.MX6ULL (792 MHz). 512 Mbyte 16-bit RAM (400 MHz). 4 Gigabytes flash memory. - Real-time clock, approx. 40 to 50 days backup. Does not require a battery. - DIN Rail mounting with latch/keyhole mountings on rear of enclosure for screw mounting. - Model numbers WP-G-222-P1/WP-G-242-P1 support: - Modbus ASCII (both Client and Server versions) - Modbus RTU (both Client and Server versions) - Modbus TCP (both Client and Server versions) - EtherNet/IP [CIP over IP] (both Client and Server versions) - EtherNet/IP-PCCC - DirectNET - CCM - HostLink - Model numbers WP-G-222-P2/ WP-G-242-P2 support the above protocols and: - DF1-PCCC (Full Duplex only) - DF1-CIP (Full Duplex only) - PPI - S7comm (S7-200, S7-300, S7-1200, S7-1500 only)	- Two or four, configurable, isolated, RS-232//RS-485 serial ports. (Channels 1 and 2 share power and ground. Channels 3 and 4 share power and ground.) - Two isolated, managed Ethernet ports, 10/100 Mbyte Base-TX [PORT1, PORT2].

Temperature and dimension hardware specification information.

Temperature	Dimensions

• Operating Temperature
   - 0 °C to 55° C (32 °F to 130 °F)
• Storage/Non-Operating Temperature
   - -25 °C to 70° C (-13 °F to 158 °F)
• Humidity
   - 5% to 95% noncondensing at 60° C
	• Height × Width × Length
	   - 5.50 in. × 1.90 in. × 4.08 in.
	   - (139.70 mm. × 48.26 mm. × 101.98 mm.)
	• Weight
	   - 12.80 oz. (0.36 kg.)

Electrical information.

Electrical	

• External Power Requirements
   - 10 W peak maximum
   - 10-32 VDC - 3 W maximum steady state
• **Reboot on Power Failure**. If power fails, the Gateway reboots once power is present, restarts all processes, and checks database integrity. If the database is missing or corrupt, a new default database is created. This allows you to log-in and restore a back-up.
• Input Power Connectors
   - 4-connections, 2-position (dual row), Female
   - Nominal current: 8 A
   - Nominal voltage: 160 V
   - Torque on mounting flange fasteners: 0.2 Nm
   - Wire size: 0.2 mm – 1.5 mm (with ferrule)
   - Wire size: 0.25 mm – 0.75 mm (with ferrule with plastic sleeve)
	• Isolation
	   - Ethernet ports: 1500 VAC, 50 to 60 Hz for sixty seconds and 250 VAC working voltage.
	   - DC power and serial ports: 707 VDC for 60 seconds and 120 VAC working voltage.
	   - Must use isolated power supply (50 VDC isolation between FGND and GND on power connector), and 50 VDC working voltage. Tested at 707 VDC for one minute.

WARNING ⚠	Using an incorrectly sized wire and ferrule may damage the Universal Industrial Gateway power connector. To ensure you select the correct wire size and ferrule, use the guidelines provided in this Note.

LED Information.

LEDs/Controls	

• **PORT1, PORT2 LEDs:**
- **Green LED**: ON when receiving data at 100 Mbytes/second. Each byte of traffic turns on the LED for 200 ms (±50 ms)
Yellow LED: ON: ON when linked; blinking when traffic is transmitting on the line. Each byte of traffic turns on the LED for 200 ms (±50 ms)
- **EtherNet/IP Etherlink Status** (indicates Etherlink status, Transmit and Receive):
   ◆ ON: Link
   ◆ OFF: No link
- EtherNet/IP Etherlink Activity Status:
   ◆ Flashing: Port Activity
   ◆ OFF: No activity
• **SERIAL Ports** Communication parameters are software-configurable. See Troubleshooting Serial Ports:
- **Green LED**:
   ◆ ON: Linked
   ◆ Blinking when receiving traffic online. Each byte of data turns on the LED for 200 ms (±50 ms)
- **Yellow LED**:
   ◆ ON: Linked
   ◆ Blinking when transmitting traffic online. Each byte of data turns on the LED for 200 ms (±50 ms)
- **Status LED**:
Power:
   ◆ ON: Green; Power OK
   ◆ Blink: Green; booting
   ◆ ON: Red; Error
   ◆ Blink: Red; Reset
	• **Reset** (pinhole on front of Gateway). You may choose to:
	- Retain its current configuration. To do so, insert a paper clip into the **RESET** switch on the Gateway and press gently and briefly (less than 15 seconds). As soon as you release the button, the Gateway reboots. Status LED blinks red (0.5 seconds on/0.5 seconds off).
	- Reset to factory defaults. Insert the paper clip and press gently for more than 15 seconds. Status LED blinks red (0.5 seconds on, 0.5 seconds off).
	- If the software does not respond to a reset or reset-to-defaults request via reset switch, the display will blink the horizontal segments until the unit is power cycled. This period may be brief enough that the segments only blink once.
	• **Display** button.
	- Press to wake up the display. If you press the display button again while the display is on, the button press is ignored and the 90-second countdown continues.
	• **LED** (128×32-pixel OLED display):
	- Detailed module and function status reporting. See Viewing OLED Interface Information.
	- **Status** button. At initial power-on, Status LED is solid green under hardware control. During initial boot-up, the Status LED blinks green when under software control. Once the network interface is fully available, the LED changes to solid green.

Certifications Information.

Certifications	
UL Safety	UL 61010-2-201 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-201: Particular Requirements for Control Equipment (first edition issued February 2013) (NRAQ, NRAQ7) UL 62368-01 Information Technology Equipment Safety Standard
UL Hazardous Locations	ULH ANSI/ISA–12.12.01–Nonincendive Electrical Equipment for Use in Class I, Division 2 Hazardous (Classified) Locations T4 or better cULH CSA C22.2 No. 213-M1987–Non-incendive Electrical Equipment for use in Class I Division 2 Hazardous Locations–March 1987
ATEX	IEC 60079-0: Explosive atmospheres - Part 0: Equipment - General requirements IEC 60079-7– Explosive atmospheres - Part 7: Equipment protection by increased safety "e"
CCC Ex	GB/T3836.1-2021, GB/T3836.3-2021
UKCA	BS 61131-2, BS 61000-6-4, BS 61000-6-2, BS 60079-0, BS 60079-7
CE EMC directive	EN61131-2, EN61000-6-4, EN61000-6-2
FCC	47 CFR Part 15 Class A
UL Safety	UL 61010-2-201 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-201: Particular Requirements for Control Equipment (first edition issued February 2013) (NRAQ, NRAQ7) UL 62368-01 Information Technology Equipment Safety Standard

Section 2.6
Serial Port Pinouts

This table contains the serial port pinouts:

RJ-45 Pin	RS-232	RS-485
1	1 Not used RI (DCE)+	1
2	2 Not used CD (DCE)	2
3	3 Not used DTR (DTE)	3
4	4 COM/GND	4 GND
5	5 RXD (DCE)	5
6	6 TXD (DTE)	6 T-/R-
7	7 CTS (DCE)	7
8	8 RTS/RTR (DTE)	8 T+/R+

Section 2.7
External Terminal
Block Connector Pinouts

This table contains the external terminal block connector pinouts:

Description	Universal Gateway
Frame/Shield Ground	Pin 1
Module Ground	Pin 2
Input Power (10 to 32 VDC)	Pin 3
Module Ground	Pin 4

Section 2.8
Universal Industrial Gateway
Wire/Ferrule Sizing Guidelines

When connecting power to a Universal Industrial Gateway, use the following wire and ferrule sizing guidelines:

WARNING ⚠️	Using an incorrectly sized wire and ferrule may damage the Universal Industrial Gateway power connector. To ensure you select the correct wire size and ferrule, use the guidelines provided in this Note.

For the input power connector:

4 connections, 2-position (dual row), female.

Nominal current: 8 A

Wire size: 0.2 mm – 1.5 mm (without ferrule)

Wire size: 0.25 mm (with ferrule, with plastic sleeve)
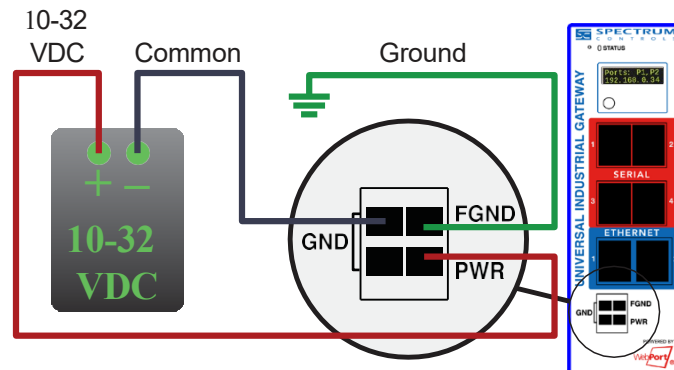
Section 2.9
Viewing
Serial LED Operation

Gateway serial LEDs work as follows.

- Green LED (top): Blinks: Receiving traffic on the line. Each byte of traffic turns on the LED for 200 ms (±50 ms).
- Yellow LED (bottom): Blinks: Transmitting traffic on the line. Each byte of traffic turns on the LED for 200 ms (±50 ms).

Section 2.10
Viewing OLED
Interface Information

The Gateway front panel contains a 128×32-bit OLED display that displays the network interface status of one or more network port groups when the network interface becomes available after booting up the Gateway. The display shows IP addresses and indicates error conditions for each network group.

When more than one network group is defined, each network port group status is displayed on a separate display page. Each page persists on the page for 2 seconds before the next page is displayed. The display cycles through all display pages continuously on a loop until the display is powered off. The display initially stays on for 5 minutes.

You cannot extend this time by pressing the Display button. Once the display is powered off, however, you may wake-up the display for a further 90 seconds by pressing the Display Button.

Power-On and Initial Boot Stage

During startup, the OLED shows the company logo until the network interface becomes available. To help ensure longevity, the OLED displays turns off 5 minutes after the network interface becomes available after power is turned on or after a reboot or restart.

Network Available State

The display shows 2 lines of 16 characters each. Information displayed includes:

- **Link down** message. Indicates that no IP address is assigned to a network port group.
- *.*.*.* message. Indicates that an IP address is assigned but is not displayed according to the security options configured for the network port group.
- *IP Address* message. indicates that the displayed IP address is assigned to the network port group. Example:
  - Ports: **P1, P2:**
  - **192.168.164.178**

Network status messages use the following additional conventions. The first network interface status page lists the ports for the network port group and the current status. Ports are prefaced with the letter P, and the port number. Network status Line 1 lists the ports. Network status Line 2 shows the status of the network port group.

Example 1:

- Display page 1:
  - **P1:** If more than one port is present, **P1** is followed by a comma (**,**) and a blank space.
  - **Link down**.
- Display page 2:
  - **P2:**
  - **192.168.164.187**

Example 2:

- Display page 1:
  - **P1, P2:**
  - ***.*.*.***

Reset Switch Pressed to Reboot Stage

This stage occurs when the Reset switch is pressed for less than 15 seconds, then released. The OLED displays the following message:

- Line 1: **"Reboot, hold to"**
- Line 2: **"Factory reset 15-second countdown time";**

Reset Switch Pressed to Restore Defaults Stage

This stage occurs when the Reset switch is pressed for more than 15 seconds, then released. The OLED displays the following message:

- The OLED display displays the message "**Factory reset**", while the system is restoring defaults and going down for reboot.
- Following shutdown and during restart, the display transitions to the Power-On and Initial Boot Stage.

Section 2.11
General Public
License Information

As part of the Universal Industrial Gateway product, the company uses software licensed under GNU General Public License, version 2.

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Section 2.12
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Section 2.13
Limited Warranty

The company warrants that its products are free from defects in material and workmanship under normal use and service, as described in company literature covering this product, for a period of 1 year. The obligations of under this warranty are limited to replacing or repairing, at its option, at its factory or facility, any product which shall, in the applicable period after shipment, be returned to the facility, transportation charges prepaid, and which after examination is determined, to the satisfaction of Spectrum Controls, Inc., to be thus defective.

This warranty shall not apply to any such equipment which shall have been repaired or altered except by Spectrum Controls, Inc. or which shall have been subject to misuse, neglect, or accident. In no case shall the liability of the company exceed the purchase price. The aforementioned provisions do not extend the original warranty period of any product which has either been repaired or replaced by the company.

Chapter 3
Using the Gateway Interface

Section 3.1
**Logging onto the**
Gateway User Interface

You log onto the Gateway User Interface to set up and manage Gateway functions. The Gateway has a single user account (admin), and a single password associated with that account. Each time you close and restart the browser, the software prompts you to log in again. The software will also log you out after thirty minutes of inactivity.

If you start the software, log in, and then clear your cache, refreshing the page returns you to the login page, and prompts you to re-enter your password. Refreshing without clearing the cache refreshes the current page.

NOTE	All fields that show a red asterisk (*) are required.

NOTE	The user interface has been tested most extensively with the Chrome bowser, but has also been tested on Edge, Firefox and Safari. In the unlikely case that you experience difficulties with one of the latter browsers or any other browser, it is recommended that you use Chrome instead. If needed, download and install on your personal computer from https://www.google.com/chrome/.

NOTE	When connecting to the Gateway for the first time, the default Ethernet address will be configured as static IP address 192.168.1.100. The gateway address is 192.168.1.1 and the DNS1 address is 8.8.8.8 (Google's DNS server address). Once you have logged in, you should change the IP address. See Configuring Network Settings for the Gateway.

To log onto the Gateway:

1. Start your **Chrome** web browser software. The browser window appears.
2. In the address bar, type **192.168.1.100**

   Q 198.168.1.100
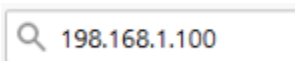
   The Gateway User Interface appears with the logon fields:

   Username: admin

   Password: [   ] *

                 Submit

   For a complete description of the user interface, see About the Gateway User Interface.
3. The first time you access the Gateway's User Interface (GUI), type in (enter) password **Spectrum**.

NOTE	• **Username**. Permanent Username is **admin**. This field is dimmed and disabled.
	• **Password**. Default password is **Spectrum** and is case-sensitive.
	Username: admin
	Password: •••••••• *
	Submit

4. Once you enter a password, the **Submit** button becomes enabled. Click **Submit**.
5. On the first login (and on the first login after a factory reset), the software provides a dialog for you to change your password. Enter a new password and confirm the password. Do NOT lose the password as you will not be able to access your system and will need to do a factory reset to regain access using the original password. You may change the password you selected at any time with the Change Password dialog. See Changing Password.
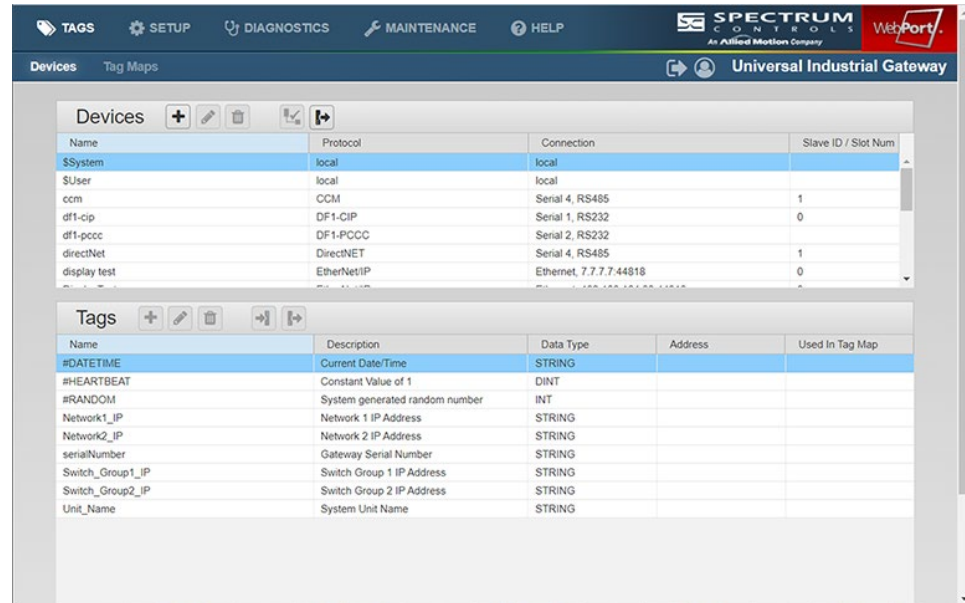
Section 3.2 About the Gateway User Interface

When you first log onto the Gateway, the following page appears. This page and associated menu options provide access to all of the tasks needed to configure devices and their tag(s). The Gateway communicates with programmable logic

controllers/devices and copies tag values between tags on the same or different controllers. The Navigation bar is available from any page except the log-in page:

The interface contains:

- **Gateway User Interface Navigation Bar**. Provides a two-row navigation bar. The upper row is a menu bar and shows the company name and logo. The lower navigation bar provides page tabs for the section specified by the menu selection. The row also displays buttons to access Trace alert, logout, and change password. When you select an option from the configuration menus, it also displays tabs that allow you to move to a specific page within the section specified by the menu selection.

- **Gateway User Interface Configuration pages**. Depending on menu selection, displays different pages that allow you to configure Gateway operation.

3.2.1 Gateway User Interface Navigation Bar

The Gateway User Interface provides a two-row navigation bar. The upper row is a menu bar and shows the company name and logo. The lower navigation bar provides page tabs for the section specified by the menu selection.

NOTE	Individual navigation menus in the upper row and the associated tabs that appear in the lower row are documented under the relevant topic. The tabs displayed on the lower row are documented in this topic.

NOTE	When a running trace completes, the following button appears in the menu bar status bar:
	This button provides a shortcut to the Diagnostics page. For further information, see Tracing Tag Map Data.

The Gateway User Interface lower navigation bar provides page tabs for the section specified by the menu selection. This bar also provides access to the logout button and the change password dialog:

- Trace alert. If you are not viewing the Diagnostics page when a running trace completes, the following button appears in the menu bar. To remove the alert from the menu bar and switch to the Diagnostics page, click the Trace Completed button:

  If you are already on the Diagnostics page when a trace completes, this button does not appear in the menu bar. If you simply navigate to the Diagnostics page without using the Trace Completed button, the button also disappears from the menu bar.

- Logging Off. To log off the Gateway, select the Log Off button:

  The firmware logs you off the Gateway.

- Changing the Password. To access the Change Password dialog, select the Change Password button:
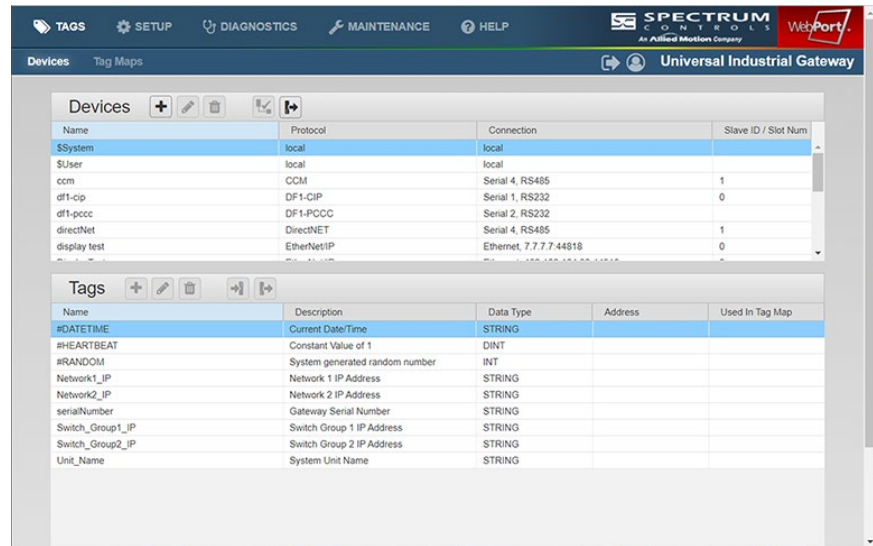
  See Changing Password.

3.2.2 Gateway User Interface

To access the user interface:

1. Log into the software.

   The Gateway user interface appears:

   The user interface is the starting point after logging in for setting up all Gateway configuration options. You may access help about all options from The View Help Option on the Help menu.

.

Section 3.3 Configuring Devices

You use the Gateway to configure devices and tags. This configuration specifies the connections, protocols, communication parameters, and tags on a connected PLC/device so that the Gateway can communicate without errors.

From version 2.02*nnn*, you may also specify Ethernet Client/Server operation. You must specify whether the Gateway is to act as a client or server device if a ModbusASCII, ModbusRTU, ModbusTCP or Ethernet protocol is selected or client or server.

NOTE	The information you provide when configuring a device and its tags must exactly match the actual configuration of the connected PLC or other device and the tags defined on that device. All of this information may be retrieved using the automation software used to configure and program the PLC.

You may add as many device profiles as you wish to the Gateway. The number of device profiles you may add is limited only by disk space. The number of serial devices you may physically connect to a Gateway is limited by the number of serial ports. The number of tags you can configure also depends on available Gateway memory (disk space on the Gateway).

When you add a device, you must also configure its associated tags so that the Gateway correctly copies tags. Each device name must be unique. Tag names on each device must be unique although tag names may be duplicated on a different device.

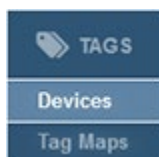The Gateway also provides a series of pre-defined $System tags. For a list of these tags, see the System Tags List.

The #HEARTBEAT is one of these tags and can be used with your PLC(s) to verify that the Gateway is indeed communicating with devices.

To use this tag, configure a corresponding tag in the PLC(s) to monitor the Heartbeat tag of the Gateway. Because the #HEARTBEAT tag is a constant value of 1, a couple of rungs of ladder logic are required to set the tag value to 0, and to monitor that the value is set back to 1 by the Gateway within a specified period of time.

The Gateway also provides user-defined ($User), single-element read and write tags of type BOOL, INT, SINT, DINT, REAL, and STRING. These are non-array tags. Tags for the $User and $System devices do not have an address, but the address must be configured for all other tags.

To add, modify, or delete devices and/or tags:

1. From the TAGS menu, select **Devices**:

The Devices page appears:

When you select a device from the Devices page, an information button appears in the **Used in Tag Map** column for any Tag that is used in a Tag Map:

2. To see how a Tag Map is configured in the tag map setup for a specific tag map, click the associated information button.

    ⓘ

3. If a tag map listed in this column is followed by an asterisk, the tag map is currently active. The Tag Map Editor dialog appears showing Source/Destination/ and On Change/Periodic settings. The dialog is not editable. To exit the dialog, click **Close**.

4. View or specify the following options:

button	Location/Function	Access
➕	Devices/Add a device:	Adding Devices
✏️	Devices/Modify a device:	Modifying Devices
🗑	Devices/Delete a device from the Gateway:	Deleting Devices
☑	Devices/Test connection:	Testing Connections
➡	Devices/Export device and tag data:	Exporting Device and Tag Data
➕	Tags/Add a tag:	Adding Tags
✏️	Tags/Modify a tag:	Modifying Tags
🗑	Tags/Delete a tag from the Gateway:	Deleting Tags
➡	Tags/Import a list of tags into the Gateway:	Importing Tags
➡	Tags/Export a list of tags from the Gateway:	Exporting Tags

3.3.1 Adding Devices

All supported protocols are listed below. The protocols that are available to you are dependent on which Gateway models you purchased. If you purchased models WP-G-222-P1 or WP-G-242-P1, the unavailable protocols are grayed out. You may purchase an upgrade to access all available protocols.

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values.

Gateway supports the following protocol families. Supported protocols are dependent on the Gateway model you purchased:

- EtherNet/IP, DF1-CIP (Full Duplex)
- EIP-PCCC, DF1-PCCC (Full Duplex)
- ModbusTCP (Client and Server), ModbusRTU (Client and Server), ModbusASCII (Client and Server)
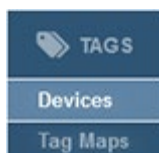- S7Comm, (S7-200, S7-300, S7-1200, S7-1500 only), PPI
- DirectNET/CCM/HostLink

Tag data types and address formats are not compatible between protocol families. If you change the protocol of a previously configured device to a protocol from a different family, all tags configured for the device will be deleted automatically and any active tag maps using those tags will be deactivated.

Examples: You may switch a device from EtherNet/IP to DF1-CIP without deleting tags. You may not switch from EtherNet/IP to PPI without deleting all the tags. During a protocol switch, the software informs you that this is the case before deleting the tags from the Gateway.

To review the supported data types in a table, see Viewing Data Types Supported by Protocols.

To add a device:

1. From the TAGS menu, select **Devices**:

The Devices page appears:

Devices			
Name	Protocol	Connection	Slave ID / Slot Num
directNet	DirectNET	Serial 4, RS485	1
display test	EtherNet/IP	Ethernet, 7.7.7.7:44818	0
DisplayTest	EtherNet/IP	Ethernet, 192.168.164.80:44818	0
eip	EtherNet/IP	Ethernet, 192.168.164.47:44818	0
eip-pccc	EtherNet/IP-PCCC	Ethernet, 192.168.164.56:44818	
Ethernet/IP-PCCC	EtherNet/IP-PCCC	Ethernet, 192.168.164.32:44818	
hostLink	HostLink	Serial 4, RS485	1

Tags				
Name	Description	Data Type	Address	Used In Tag Map
bool16d1		BOOL[16]	IBOOL2S16[0]	DisplayTest / Testing
bool16d2		BOOL[16]	IBOOL3S16[0]	DisplayTest
bool16s		BOOL[16]	BOOL2S16[0]	DisplayTest / Testing
bool1d1		BOOL	IBOOL2S32[16]	DisplayTest
bool1d2		BOOL	IBOOL2S32[17]	DisplayTest
bool1s		BOOL	BOOL2S	DisplayTest
bool32s		BOOL[32]	BOOL2S32[0]	
bool4d1		BOOL[4]	IBOOL2S32[0]	DisplayTest
bool4d2		BOOL[4]	IBOOL2S32[4]	DisplayTest
bool4d3		BOOL[4]	IBOOL2S32[8]	DisplayTest
bool4d4		BOOL[4]	IBOOL2S32[12]	
bool4s		BOOL[4]	BOOL1S8[0]	DisplayTest
bool8s		BOOL[8]	BOOL2S8[0]	DisplayTest

2. In the Devices section, click the following button

   ✚

   The Device Properties dialog appears. (Available fields change according to protocol selection):

3. View or specify the following device options:

   - **Device Name**. Enter the device name. This is a human-readable name. Rules for names:
     - All names are saved without leading or trailing spaces. Examples. " Name", "Name ", and "Name" are all saved as "Name" without leading or trailing spaces and are considered duplicates.
     - However, internal spaces are preserved. Examples. "A tag" is not a duplicate of "Atag" or "A tag".
     - Names are case-insensitive. Example. "TwoWords" and "twoWords" are duplicates.
   - **Protocol**. Select the communication protocol used by the device you are configuring. The Device Properties dialog changes according to the protocol selected. For more information and ranges see Protocol Attribute List.
   - Protocol options available are dependent on which model you purchased:
     - *DF1-CIP*. See Configuring a DF1-CIP Device on a Gateway.
     - *DF1-PCCC*. See Configuring a DF1-PCCC Device on a Gateway.
     - *ModbusRTU*. See Configuring a ModbusRTU Device on a Gateway.
     - *ModbusASCII*. See Configuring a ModbusASCII Device on a Gateway.
     - *PPI*. See Configuring a PPI Device on a Gateway.

- *DirectNET*. See Configuring a DirectNET Device on a Gateway.
- *CCM*. See Configuring a CCM Device on a Gateway.
- *HostLink*. See Configuring a HostLink Device on a Gateway.
- *EtherNet/IP*. See Configuring an EtherNet/IP Device on a Gateway.
- *Ethernet/IP-PCCC*. See Configuring an Ethernet/IP-PCCC Device on a Gateway.
- *ModbusTCP*. See Configuring a ModbusTCP Device on a Gateway.
- *S7comm*. See Configuring a S7comm Device on a Gateway.

- **Test Connection**. This option is disabled if the device is configured as a server. See Testing Connections.

4. **Submit**. Saves changes on Gateway and exits.
5. **Cancel**. Exits without saving changes on Gateway.

Configuring a DF1-CIP Device on a Gateway

NOTE	This protocol is full-duplex only.

NOTE	Array Length limits have changed in 2.02. Please refer to Array Length Limits for the updated limits for affected protocols. For example, if you switch a protocol from EtherNet/IP to DF1-CIP, there may be array tags that are too long because they contain too many elements to use in DF1-CIP. You will have to correct this issue.

The DF1-CIP protocol is only available on WP-G-222-P2/ WP-G-242-P2 Gateway models. If you purchased WP-G-222-P1/WP-G-242-P1 Gateway models, you may purchase an upgrade to make this protocol available.

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values.

To add a DF1-CIP device, see Adding Devices.

1. From the **Protocol** dropdown list, select **DF1-CIP**:

2. The Device Properties dialog changes to the default settings for this protocol. For more information about this protocol and its ranges, see Protocol Attribute List.

    View or specify the following options:

    *   Serial Port. Serial port you are using to communicate with a PLC. To configure this port, see Configuring Serial Communications Setup.

    *   Slot Number. Station number of your PLC on the network. Value to enter here is dependent on your PLC controller setup. Range **0-32**.

    *   Checksum. Select either **CRC** or **BCC** checksum methods. Please check your PLC setting to find out the checksum method your PLC uses.

    *   ACK Timeout *n milliseconds*. After the Gateway sends out a request to the target device, it waits for **ACK Timeout** value in milliseconds to pass before the Gateway considers that there is no response from the target device. Range **1-255**.

    *   NAK Retries. Send command for number of retries if there is a response from the PLC but response is a negative acknowledgement. Range **0-10**.

    *   ENQ Retries. Send command for number of retries if there is a response from PLC but the response is that the PLC is busy. Range **0-50**.

3. **Test Connection**. Tests the device connectivity to verify a connection exists between the Gateway and a PLC, (not between a computer and the Gateway). See Testing Connections.

4. **Submit**. Saves changes on Gateway and exits.
5. **Cancel**. Exits without saving changes on Gateway.

Configuring a DF1-PCCC Device on a Gateway

NOTE	This protocol is full-duplex only.

The DF1-PCCC protocol is only available on WP-G-222-P2/ WP-G-242-P2 Gateway models. If you purchased WP-G-222-P1/WP-G-242-P1 Gateway models, you may purchase an upgrade to make this protocol available.

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values.

To add a DF1-PCCC device, see Adding Devices:

1. From the **Protocol** dropdown list, select **DF1-PCCC**:

The Device Properties dialog changes to the default settings for this protocol. For more information about this protocol and its ranges see Protocol Attribute List.

2. View or specify the following options:

    - Serial Port. Serial port you are using to communicate with a PLC. To configure this port, see Configuring Serial Communications Setup.

    - Checksum. Select either **CRC** or **BCC** checksum methods. Please check your PLC setting to find out the checksum method your PLC uses.

    - ACK Timeout *n* milliseconds. After the Gateway sends out a request to the target device, it waits for **ACK Timeout** value in milliseconds to pass before the Gateway considers that there is no

response from target device. Range **1-255**.

- NAK Retries. Send command for number of retries if there is a response from the PLC but response is a negative acknowledgement. Range **0-10**.
- ENQ Retries. Send command for number of retries if there is a response from PLC but the response is that the PLC is busy. Range **0-50**.

3. **Test Connection**. Tests the device connectivity to verify a connection exists between the Gateway and a PLC, (not between a computer and the Gateway). See Testing Connections.
4. **Submit**. Saves changes on Gateway and exits.
5. **Cancel**. Exits without saving changes on Gateway.

Configuring a ModbusRTU Device on a Gateway

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values

A graphic example showing Modbus Server and Device Tag Map connections is provided here: Modbus Server and Device Tag Map Connections.

NOTE	Array Length limits have changed in 2.02. Please refer to Array Length Limits for the updated limits for affected protocols. For example, if you switch a protocol from EtherNet/IP to DF1-CIP, there may be array tags that are too long because they contain too many elements to use in DF1-CIP. You will have to correct this issue.
	Additional information about support for Modbus commands is provided in Supported Modbus Commands.
	Troubleshooting information is provided in Troubleshooting Illegal Errors for Modbus String.

NOTE	A Modbus Server device is not accessible by external tools or Client devices until it has been fully configured and is active. To be fully configured it must have at least one tag and to be active it must have at least one of its tags used in an active tag map. Once it has been fully configured and is active, tools such as Modbus Poll or other client devices will be able to establish a connection.

To add a ModbusRTU device, see Adding Devices:

1. From the **Protocol** dropdown list, select **ModbusRTU**:

Client Options	Server Options
Device Properties Device Name: modbusRTU ★ Protocol: ModbusRTU ⌄ Gateway Role: Client ⌄ Serial Port: Serial 4 ★ [Configure] Slave ID: 1 ★ Response Timeout: 1 seconds ★ Retry Count: 1 ★ End of Message Delay: 4 characters ★ Min Command Delay: 100 milliseconds ★ One-Based Addressing: ☑ Test Connection: ☒ [Submit] [Cancel]	**Device Properties** Device Name: modbusRTU ★ Protocol: ModbusRTU ⌄ Gateway Role: Server ⌄ Serial Port: Serial 4 ★ [Configure] Slave ID: 1 ★ Min Response Delay: 0 milliseconds ★ One-Based Addressing: ☑ Test Connection: ☒ [Submit] [Cancel]

2. The Device Properties dialog for the Client or Server selection, changes to the default settings for this protocol. For more information about this protocol and its ranges, see Protocol Attribute List.

- View or specify the following options. You may configure this option for client or server operation. Client and/or Server configurations options are identified below:

    - Gateway Role. Client/Server. Specifies whether the Gateway functions as a server or client.

    - Serial Port. Client/Server. Serial port you are using to communicate with a PLC or other ModbusRTU device. To configure this port, see Configuring Serial Communications Setup.

    - Slave ID. Client/Server. Modbus Node number of server device. When the Gateway is the Client, the Server ID is that of the external server device, which the Gateway will be communicating with. When the Gateway is the Server, the Server ID, through which the external Client can communicate with the server device, should generally be set to 1. Range **1-247**.

    - Response Timeout *n* seconds. Client only. Defines how long the device waits for a reply to be received after a Modbus command is sent. Range **1-5**.

    - Retry Count. Client only. Tells the device how many times to retry sending a Modbus command when no reply is received to the send command. Range **0-3**.

- <u>End of Message Delay *n* characters</u>. Client only. The Gateway starts a timer after the first byte of a response is received. When the timer detects the delay interval specified by this option, and there is also no signal on the serial communication channel, the message is considered ended. Range **1-32**.

- <u>Min Command Delay *n* milliseconds</u>. Client only. Defines the delay time between the time the client receives the end of message acknowledgement from the server to when it transmits the next command. Range **100-1000**.

- <u>Min Response Delay *n* milliseconds.</u> Server only. Specifies the number of milliseconds the Gateway waits before responding to a command received from a Client. This delay may be required to accommodate slower Client devices. Range **0-65535**.

- <u>One-Based Addressing</u>. Client/Server. Check this box to enable base 1 addressing. Uncheck it to operate with base 0 addressing. For more information, see About One-Based Addressing.

3. **Test Connection**. This option is disabled if the device is configured with the Gateway role set to server. See Testing Connections.

4. **Submit**. Saves changes on Gateway and exits.

5. **Cancel**. Exits without saving changes on Gateway.

Configuring a ModbusASCII Device on a Gateway

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values.

A graphic example showing Modbus Server and Device Tag Map connections is provided here: Modbus Server and Device Tag Map Connections

NOTE	Array Length limits have changed in 2.02. Please refer to Array Length Limits for the updated limits for affected protocols. For example, if you switch a protocol from EtherNet/IP to DF1-CIP, there may be array tags that are too long because they contain too many elements to use in DF1-CIP. You will have to correct this issue.
	Additional information about support for Modbus commands is provided in Supported Modbus Commands.
	Troubleshooting information is provided in Troubleshooting Illegal Errors for Modbus Strings.

NOTE	A Modbus Server device is not accessible on the Gateway until it has been fully configured and is active. To be fully configured it must have at least one tag and to be active it must have at least one of its tags used in an active tag map. Once it has been fully configured and is active, tools such as Modbus Poll or other Client devices, will be able to establish a connection.

To add a ModbusASCII device, see Adding Devices.

1. From the **Protocol** dropdown list, select **ModbusASCII**:

Client Options	Server Options

2. The Device Properties dialog for the Client or Server selection changes to the default settings for this protocol. For more information about this protocol and its ranges, see Protocol Attribute List.

   - View or specify the following options. . You may configure this option for client or server operation. Client and/or server configurations options are identified below:

     - Gateway Role. Client/Server. Specifies whether the Gateway functions as a server or client.

     - Serial Port. Client/Server. Serial port you are using to communicate with a PLC or other ModbusRTU device. To configure this port, see Configuring Serial Communications Setup.

     - Slave ID. Client/Server. Modbus Node number of server device. When the Gateway is the Client, the Server ID is that of the external server device, which the Gateway will be communicating with. When the Gateway is the Server, the Server ID, through which the external Client can

communicate with the server device, should generally be set to 1. Range **1-247**.

- Response Timeout *n* seconds. Client only. Defines how long the device waits for a reply to be received after a Modbus command is sent. Range **1-5**.
- Retry Count. Client only. Tells the device how many times to retry sending a Modbus command when no reply is received to the send command. Range **0-3**.
- End of Message Delay *n* characters. Client only. The Gateway starts a timer after the first byte of a response is received. When the timer detects the delay interval specified by this option, and there is also no signal on the serial communication channel, the message is considered ended. Range **1-32**.
- Min Command Delay *n* milliseconds. Client only. Defines the delay time between the time the client receives the end of message acknowledgement from the server to when it transmits the next command. Range **100-1000**.
- Min Response Delay *n* milliseconds. Server only. Specifies the number of milliseconds the Gateway waits before responding to a command received from a Client. This delay may be required to accommodate slower Client devices. Range **0-65535**.
- One-Based Addressing. Client/Server. Check this box to enable base 1 addressing. Uncheck it to operate with base 0 addressing. For more information, see About One-Based Addressing.

3. **Test Connection**. This option is disabled if the device is configured as a server. See Testing Connections.
4. **Submit**. Saves changes on Gateway and exits.
5. **Cancel**. Exits without saving changes on Gateway.

Configuring a PPI Device on a Gateway

The PPI protocol is only available on WP-G-222-P2/ WP-G-242-P2 Gateway models. If you purchased WP-G-222-P1/WP-G-242-P1 Gateway models, you may purchase an upgrade to make this protocol available.

PPI communicates via RS-485 serial communications.

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values.

To add a PPI device, see Adding Devices.

1.   From the **Protocol** dropdown list, select **PPI**:
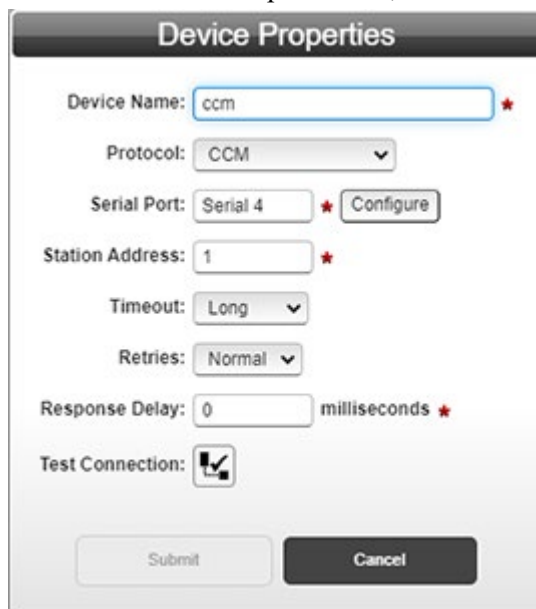

2.   The Device Properties dialog changes to the default settings for this
     protocol. For more information about this protocol and its ranges, see
     Protocol Attribute List.

   •   View or specify the following options:

       -   Serial Port. Serial port you are using to communicate with
           a PPI device. To configure this port, see Configuring
           Serial Communications Setup.

       -   Node Address. Address for the protocol is set to 2 by
           default. Range **0-16**.

3.   **Test Connection**. Tests the device connectivity to verify a connection
     exists between the Gateway and a PLC, (not between a computer and the
     Gateway). See Testing Connections.

4.   **Submit**. Saves changes on Gateway and exits.

5.   **Cancel**. Exits without saving changes on Gateway.

Configuring a DirectNET Device on a Gateway

There are specific requirements for interactions between protocol fields when
you modify a device. Additional information about these interactions is provided
in How Device Modifications Affect Protocol Field Values.

To add a DirectNET device, see Adding Devices.

    1.   From the **Protocol** dropdown list, select **DirectNET**:

    2.   The Device Properties dialog changes to the default settings for this protocol. For more information about this protocol and its ranges, see Protocol Attribute List.

- View or specify the following options:
    - Serial Port. Serial port you are using to communicate with a PLC. To configure this port, see Configuring Serial Communications Setup.
    - Station Address. Enter an integer. Range **1-90**.
    - Timeout. Select **Short**, **Medium**, or **Long**.
    - Retries. Select **Normal** or **Short**.
    - Response Delay *n* milliseconds. Specify response delay. Range **0-500**.

    3.   **Test Connection**. Tests the device connectivity to verify a connection exists between the Gateway and a PLC, (not between a computer and the Gateway). See Testing Connections.

    4.   **Submit**. Saves changes on Gateway and exits.

    5.   **Cancel**. Exits without saving changes on Gateway.

Configuring a CCM Device on a Gateway

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values.

To add a CCM device, see Adding Devices.

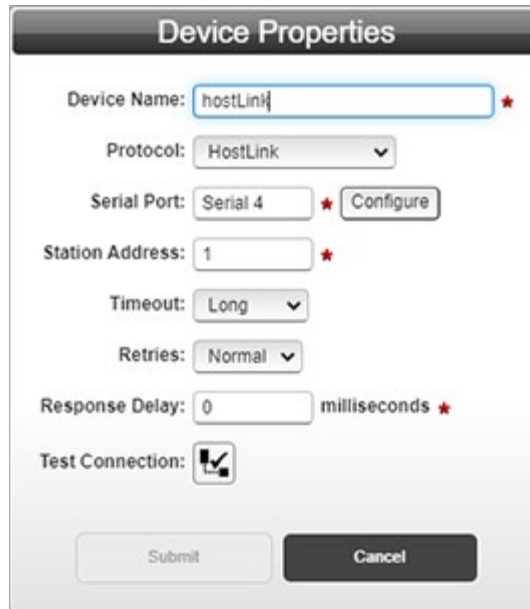1. From the **Protocol** dropdown list, select **CCM**:

2. The Device Properties dialog changes to the default settings for this protocol. For more information about this protocol and its ranges, see Protocol Attribute List.

    - View or specify the following options:

        - Serial Port. Serial port you are using to communicate with a PLC. To configure this port, see Configuring Serial Communications Setup.

        - Station Address. Enter an integer. Range **1-90**.

        - Timeout. Select **Short**, **Medium**, or **Long**.

        - Retries. Select **Normal** or **Short**.

        - Response Delay *n* milliseconds. Specify response delay. Range **0-500**.

3. **Test Connection**. Tests the device connectivity to verify a connection exists between the Gateway and a PLC, (not between a computer and the Gateway). See Testing Connections.

4. **Submit**. Saves changes on Gateway and exits.

5. **Cancel**. Exits without saving changes on Gateway.

Configuring a HostLink Device on a Gateway

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values.

To add a HostLink device, see Adding Devices:

1. From the **Protocol** dropdown list, select **HostLink**:

2. The Device Properties dialog changes to the default settings for this protocol. For more information about this protocol and its ranges, see Protocol Attribute List.

    - View or specify the following options:

        - Serial Port. Serial port you are using to communicate with a PLC. To configure this port, see Configuring Serial Communications Setup.

        - Station Address. Enter an integer. Range **1-90**.

        - Timeout. Select **Short**, **Medium**, or **Long**.

        - Retries. Select **Normal** or **Short**.

        - Response Delay *n* milliseconds. Specify response delay. Range **0-500**.

3. **Test Connection**. Tests the device connectivity to verify a connection exists between the Gateway and a PLC, (not between a computer and the Gateway). See Testing Connections.

4. **Submit**. Saves changes on Gateway and exits.

5. **Cancel**. Exits without saving changes on Gateway.

Configuring an EtherNet/IP Device on a Gateway

NOTE	EtherNet/IP CIP does not support a Bool data type. For information on how to pass Bools (Bits), see About Bools and EtherNet/IP CIP.

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values

To add an EtherNet/IP device, see Adding Devices:

1. From the **Protocol** dropdown list, select **EtherNet/IP**: The Device Properties dialog changes to the default settings for this protocol:

    For more information about this protocol and its ranges, see Protocol Attribute List.

Client Options	Server Options
Device Properties Device Name: [　　　　　] ★ Protocol: EtherNet/IP ⌄ Gateway Role: Client ⌄ TCP Port: 44818 ★ Address: [　　　　　] ★ Slot Number: 0 ★ Test Connection: ☑ Submit　　Cancel	**Device Properties** Device Name: [　　　　　] ★ Protocol: EtherNet/IP ⌄ Gateway Role: Server ⌄ TCP Port: 44818 ★ Address: Unconfigured ⌄ Slot Number: 0 ★ Test Connection: ☑ Submit　　Cancel

2. EtherNet/IP options are:

    - Gateway Role. Client/Server. Specifies whether the Gateway functions as a client or server.

        - If the device functions as a Server, the IP address and TCP Port information is followed by Network identification information.

        - If the device is bound to a Network configured with a DHCP address, or the **Address** field was set to **Unconfigured**, then the Network identification is identified as **Unconfigured**.

    - TCP Port. Client/Server. For EtherNet/IP, the default port setting is **44818**. If needed by your system, you can change this port number.

    - Address. Client/Server. Specifies PLC IP address. When Server is selected, options are **Unconfigured**, followed by a list of static IP

addresses currently specified for configured networks in numeric order:

- Each address (other than **Unconfigured**) in the drop list is followed by **on Network *x*** where *x* is the network number for which the address is configured.

- If the Device Properties form is open for modification and the device was previously configured to use a static IP address on a configured network whose ports have subsequently been removed, the selection is **Unconfigured**.

- If the static IP address to which a device was bound is changed to a DHCP address (either explicitly or after a restore), then the selection is **Unconfigured**.

- If the device is bound to a Network with no ports after a restore, then the selection is **Unconfigured**.

- Slot Number. When the port selected is Ethernet, and the protocol selected is EtherNet/IP, you must specify an associated slot number. Range **0-16**.

3. **Test Connection**. This option is disabled if the device is configured with the Gateway role set to server. See Testing Connections.

4. **Submit**. Saves changes on Gateway and exits.

5. **Cancel**. Exits without saving changes on Gateway.

Configuring an EtherNet/IP-PCCC Device on a Gateway

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values.

To add an EtherNet/IP-PCCC device, see Adding Devices:

1. From the **Protocol** dropdown list, select **EtherNet/IP-PCCC**:

2. The Device Properties dialog changes to the default settings for this protocol. For more information about this protocol and its ranges, see Protocol Attribute List.

- View or specify the following options:

- TCP Port. For EtherNet/IP-PCCC, the default port setting

is **44818**. If needed by your system, you can change this port number.

- Address. Specifies PLC IP address.

3. **Test Connection**. Tests the device connectivity to verify a connection exists between the Gateway and a PLC, (not between a computer and the Gateway). See Testing Connections.

4. **Submit**. Saves changes on Gateway and exits.

5. **Cancel**. Exits without saving changes on Gateway.

Configuring a ModbusTCP Device on a Gateway

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values.

A graphic example showing Modbus Server and Device Tag Map connections is provided here: Modbus Server and Device Tag Map Connections.

NOTE	Array Length limits have changed in 2.02. Please refer to Array Length Limits for the updated limits for affected protocols. For example, if you switch a protocol from EtherNet/IP to DF1-CIP, there may be array tags that are too long because they contain too many elements to use in DF1-CIP. You will have to correct this issue. Additional information about support for Modbus commands is provided in Supported Modbus Commands. Troubleshooting information is provided in Troubleshooting Illegal Errors for Modbus Strings.

NOTE	A Modbus Server device is not accessible by external tools or Client devices until it has been fully configured and is active. To be fully configured it must have at least one tag and to be active it must have at least one of its tags used in an active tag map. Once it has been fully configured and is active, tools such as Modbus Poll or other client devices will be able to establish a connection.

To add a ModbusTCP device, see Adding Devices:

1. From the **Protocol** dropdown list, select **ModbusTCP**:

Client	Server

2. The Device Properties dialog changes to the default settings for this protocol. For more information about this protocol and its ranges, see Protocol Attribute List. You may configure this option for client or server operation. Client and/or Server configurations options are identified below.

    View or specify the following options:

    - Gateway Role. Client/Server. Specifies whether the Gateway functions as a client or server. When functioning as a Modbus server, only a single instance exists within a Gateway sub-network. There is only one instance per configured VLAN. The server instance provides the Gateway Modbus access point for the Gateway on the TCP/IP configured VLAN network.

    - TCP Port. For ModbusTCP, the default port setting is **502**. If needed by your system, you can change this port number.

    - Address. Client/Server. Specifies IP address of the ModbusTCP device. Server Address settings differ from Client Address settings as follows:

        - If the **Gateway Role** field is set to **Server**, the **Address** field is set to **Unconfigured**, which is the default setting. The **Address** dropdown additionally contains one or more static IP addresses currently specified for configured networks in numeric order. Static IP addresses are displayed in the drop down menu only if they are defined on the Networks page. Each static address in the list is followed by **on Network _x_**, where _x_ is the network number for which the address is configured. A device Address which was previously specified may appear **Unconfigured** for the following reasons:

            * If the device was configured on a network whose

ports have subsequently been removed.

  ◆ If the static IP address to which the device was bound is changed to a DHCP address (either explicitly or after a restore).

  ◆ If the device is bound to a Network with no ports after a restore.

  - If you change the address to unconfigured while that device is currently used in an active tag map, then that tag map will be deactivated.

- Slave ID. Client/Server. Modbus server ID of the device. Range **1-247**.

- One-Based Addressing. Client/Server. When selected, the first address will end in a one (1). Example: **40001**. If unselected, the first address will end in a zero (0). Example: **40000**. For more information, see About One-Based Addressing. When Server is selected, options are **Unconfigured**, followed by a list of static IP addresses currently specified for configured networks in numeric order:

  - Each address (other than **Unconfigured**) in the drop list is followed by **on Network *x*** where *x* is the network number for which the address is configured.

  - If the device properties form is open for modification and the device was previously configured to use a static IP address on a configured network whose ports have subsequently been removed, the selection is **Unconfigured**.

  - If the static IP address to which a device was bound is changed to a DHCP address (either explicitly or after a restore), then the selection is **Unconfigured**.

  - If the device is bound to a Network with no ports after a restore, then the selection is **Unconfigured**.

3. **Test Connection**. This option is disabled if the device is configured as a server. See Testing Connections.

4. **Submit**. Saves changes on Gateway and exits.

5. **Cancel**. Exits without saving changes on Gateway.

Configuring an S7comm Device on a Gateway

The S7comm protocol is only available on WP-G-222-P2/ WP-G-242-P2 Gateway models. If you purchased WP-G-222-P1/WP-G-242-P1 Gateway models, you may purchase an upgrade to make this protocol available.

There are specific requirements for interactions between protocol fields when you modify a device. Additional information about these interactions is provided in How Device Modifications Affect Protocol Field Values.

To add an S7comm device, see Adding Devices:

1. From the **Protocol** dropdown list, select **S7comm**:

2. The Device Properties dialog changes to the default settings for this protocol. For more information about this protocol and its ranges, see Protocol Attribute List.

    View or specify the following options:

    - TCP Port. For S7Comm, the default port setting is **102**. If needed by your system, you can change this port number.

    - Address. Specifies PLC IP address.

    - PLC Type. Lists PLCs supported by this protocol. PLC options are **S7200**, **S7300**, **S71200**, and **S71500**.

    - Keep Alive *n* seconds. Specifies how long the Gateway keeps the connection alive during intervals when there is no activity between the PLC and the Gateway. Default value is 30 seconds. Keep in mind that you should use the same interval here as you use on the PLC's Ethernet communication setting. Range **1-99**.

    - TSAP. (Transport Services Access Point). It uniquely identifies specific instantiation of the transport service. It is possible to configure a S7-200 PLC to have multiple TSAPs to facilitate simultaneous communication between the PLC and multiple applications. Values must be hexadecimal. Options are **4D.57**, **10.00**, and **11.00**.

3. **Test Connection**. Tests the device connectivity to verify a connection exists between the Gateway and a PLC, (not between a computer and the Gateway). See Testing Connections.

4. **Submit**. Saves changes on Gateway and exits.

5. **Cancel**. Exits without saving changes on Gateway.

3.3.2 Modifying Devices

To modify device information:

1. Access the Devices page:

   See Configuring Devices.

   The Devices page appears:

2. Select a listing and double-click the row or click the following button on the Devices toolbar:

3. The Device Properties dialog appears. Change information in the listed fields:

   See Adding Devices.

4. When finished making changes, click either of the following to exit:

   - **Submit**. Saves changes on the Gateway and exits.
   - **Cancel**. Exits without saving changes on Gateway.

3.3.3 Deleting Devices

You may delete devices that have been added to the Gateway. If you attempt to delete a device that has tags that are part of a tag map, the software informs you that this is the case before deleting the device. The message differs according to the tag map status.

To delete a device:

1. Access the Devices page:

   See Configuring Devices.

The Devices page appears:

| Devices						
Name		Protocol	Connection			Slave ID / Slot Num
directNet		DirectNET	Serial 4, RS485			1
display test		EtherNet/IP	Ethernet, 7.7.7.7:44818			0
DisplayTest		EtherNet/IP	Ethernet, 192.168.164.80:44818			0
eip		EtherNet/IP	Ethernet, 192.168.164.47:44818			0
eip-pccc		EtherNet/IP-PCCC	Ethernet, 192.168.164.56:44818			
Ethernet/IP-PCCC		EtherNet/IP-PCCC	Ethernet, 192.168.164.32:44818			
hostLink		HostLink	Serial 4, RS485			1

Tags						
Name	Description		Data Type	Address		Used In Tag Map
bool16d1			BOOL[16]	IBOOL2S16[0]		DisplayTest / Testing
bool16d2			BOOL[16]	IBOOL3S16[0]		DisplayTest
bool16s			BOOL[16]	BOOL2S16[0]		DisplayTest / Testing
bool1d1			BOOL	IBOOL2S32[16]		DisplayTest
bool1d2			BOOL	IBOOL2S32[17]		DisplayTest
bool1s			BOOL	BOOL2S		DisplayTest
bool32s			BOOL[32]	BOOL2S32[0]		
bool4d1			BOOL[4]	IBOOL2S32[0]		DisplayTest
bool4d2			BOOL[4]	IBOOL2S32[4]		DisplayTest
bool4d3			BOOL[4]	IBOOL2S32[8]		DisplayTest
bool4d4			BOOL[4]	IBOOL2S32[12]		
bool4s			BOOL[4]	BOOL1S8[0]		DisplayTest
bool8s			BOOL[8]	BOOL2S8[0]		DisplayTest

2. Select a device from the list.

3. Click the Delete button on the Devices tool bar:

A confirmation dialog appears (example message):

Deleting this device will leave a missing trigger tag and/or incomplete tag pairs in the tag map listed below.

You will not be able to activate this tag map until you replace the deleted tags and/or remove incomplete tag pairs.

TestDeleteMessageMap

Continuing will deactivate the following tag map:

TestDeleteMessageMap

Are you sure you want to delete this device?

| Yes | No |

4. Confirm the deletion:

NOTE

Deleting a device also removes any associated tags that are associated with the device. Any tag maps that use those tags will be disabled. If a map with a (now) deleted tag was active, it will be deactivated.

- **Yes**. Deletes the selected device from the Gateway and exits.
- **No**. Exits without deleting the selected device from the Gateway.

3.3.4 Testing Connections

You may test the device connectivity to verify a connection exists between the Gateway and a PLC or other device, (not between a computer and the Gateway). You cannot test a $System or $User device. This option is not available if the device is configured with the Gateway Role set to Server. The test also validates, when possible, that the protocol is selected correctly. For Ethernet protocols, the test uses a ping. For other protocols, see the following notes.

NOTE	Testing a device connection is NOT available for a device configured with the Gateway Role set to Server.

NOTE	If a serial device has tags in an active tag map, testing the connection option is disabled.

NOTE	When testing an S7Comm PLC, the testing utility cannot distinguish between different S7Comm PLC types. Example: If you connect an S7-1500 device and configure it as an S7-200 device. the connection test will be successful even though the configuration may be incorrect.

NOTE	The Modbus RTU option now tests 9600, 19200, and 38400 when testing the device connection.

NOTE	Due to the large variety of devices, the Test Device Connection is not definitive. If a Test Connection fails and it is believed that the Device Properties are correct, proceed with adding a tag, creating a Tag Map, and verifying that a tag can be read from or written to. Rebooting the Gateway may also help.

To test connections:

1. Access the Devices page:

    See Configuring Devices.

    The Devices page appears:

2. In the Devices section, click the following button:

    The Gateway software attempts to communicate with the device. The dialog that appears shows the protocol of the device tested, and whether or not you can access the device from the Gateway.

    If successful, the following Test Results dialog appears:
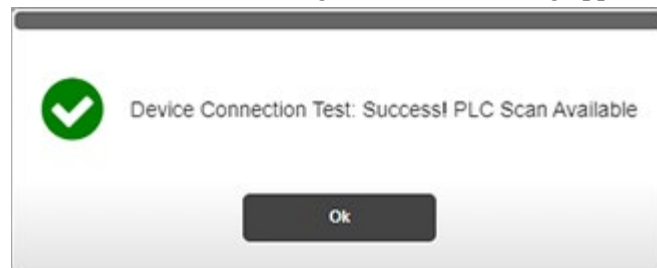
    If unsuccessful, the following dialog appears. The dialog contains an error message that lets you know the type of problem encountered (see below). However, test results are not definitive:
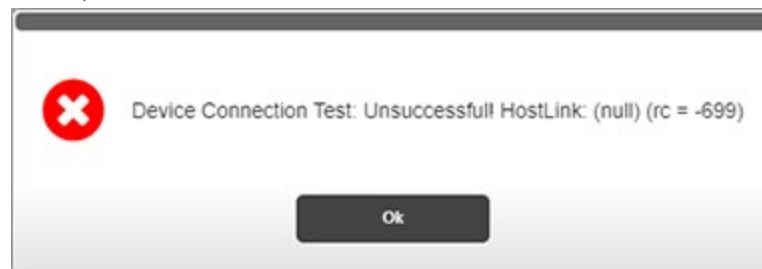
Messages you see after the test completes are self-explanatory. If your connection was unsuccessful, the dialog describes the detected issue, and, if possible, suggests a fix for the detected issue. The message also returns a numeric code. For a list of all associated messages, refer to Gateway Messages

3.3.5 Exporting Device and Tag Data

You may export a device and tag data set as a compressed, downloadable .csv file. The rows and fields in the file record the parameters configured for a single device, including all tags that are associated with the device. Each row holds information for a single tag. Fields that are not applicable contain a pair of empty quotation marks. If the Gateway loses its connection during a data export and download, the Gateway sends an error message to the user interface.

NOTE	The column **One-Based Addressing** is empty ('') for all protocols except for ModbusRTU, ModbusASCII, and ModbusTCP.
	The column shows 'true' or 'false', depending on whether or not this option is selected during configuration

'Name'	'Protocol'	'Connection'	'TCP Port'	'Address'	'Network'	'Slot Number'	'One-Based Addressing'
'modbusRTU'	'ModbusRTU'	'Serial 4'	''	''	''	'1'	'true'
'Tag Name'	'Tag Address'	'Description'	'Data Type'	'Byte Swa	'Word Swap'		
'bool'	'a-bool'	''	'BOOL'	'0'	'0'		
'ushort'	'a-ushort'	''	'USHORT'	'0'	'0'		
'short'	'a-short'	'16-bit signed int'	'SHORT'	'0'	'0'		
'udint'	'a-udint'	'unsigned double'	'UDINT'	'0'	'0'		
'dint'	'a-dint'	''	'DINT'	'0'	'0'		
'real'	'a-real'	''	'REAL'	'0'	'0'		
'str'	'a-str'	''	'STRING'	'0'	'0'		
'udintArr'	'a-udintArr'	''	'UDINT[32]'	'0'	'0'		
'boolArr'	'a-boolArr'	'boolean flags'	'BOOL[16]'	'0'	'0'		
'dintArr'	'a-dintArr'	''	'DINT[2]'	'0'	'0'		
'realArr'	'a-realArr'	'array of 10 floats'	'REAL[10]'	'0'	'0'		
'shortArr'	'a-shortArr'	''	'SHORT[1]'	'0'	'0'		
'ushortArr'	'a-ushortArr'	''	'USHORT[4]'	'0'	'0'		

Row one of the exported .csv file contains:

'Name','Protocol,'Connection','TCP Port','Address', 'Network','Slot Number','One-Based Addressing'

'DisplayTest','EthernetIP','Ethernet','44818','192.168.164.80','0','0',''

Example Excel File Output:

	'Name'	'Protocol'	'Connection'	'TCP Port'	'Address'	'Network'	'Slot Number'	'One-Based Addressing'
1	'Name'	'Protocol'	'Connection'	'TCP Port'	'Address'	'Network'	'Slot Number'	'One-Based Addressing'
2	'DisplayTest'	'EthernetIP'	'Ethernet'	'44818'	'192.168.164.80'	'0'	'0'	''
3								
4	'Tag Name'	'Tag Address'	'Description'	'Data Type'	'Byte Swap'	'Word Swap'		
5	'bool4s'	'BOOL1S8[0]'	''	'BOOL[4]'	'0'	'0'		
6	'bool8s'	'BOOL2S8[0]'	''	'BOOL[8]'	'0'	'0'		
7	'bool16s'	'BOOL2S16[0]'	''	'BOOL[16]'	'0'	'0'		
8	'bool1s'	'BOOL2S'	''	'BOOL'	'0'	'0'		
9	'bool32s'	'BOOL2S32[0]'	''	'BOOL[32]'	'0'	'0'		
10	'sint1d'	'ISINT2S'	''	'SINT'	'0'	'0'		
11	'sint2d'	'ISINT2S4[0]'	''	'SINT[2]'	'0'	'0'		
12	'sint4s'	'SINT2S4[0]'	''	'SINT[4]'	'0'	'0'		
13	'sint8s'	'INT2SA[8]'	''	'SINT[8]'	'0'	'0'		
14	'int1d'	'IINT2S'	''	'INT'	'0'	'0'		
15	'int2s'	'INT2SA[0]'	''	'INT[2]'	'0'	'0'		
16	'int4d'	'IINT2SA[2]'	''	'INT[4]'	'0'	'0'		
17	'int10d'	'IINT2SA[0]'	''	'INT[10]'	'0'	'0'		
18	'dint1d1'	'IDINT2S'	''	'DINT'	'0'	'0'		
19	'dint2d1'	'IDINT2SA[0]'	''	'DINT[2]'	'0'	'0'		

Subsequent rows contain tag information written as follows:

**'TagName','Tag
Address','Description',"TagAddress",'DataType','ByteSwap',
'WordSwap'**

'bool4s','BOOL1S8[0]','','BOOL[4]','0','0'

NOTE	If the device protocol is EtherNet/IP or one of the Modbus protocols, the Client/Server designation is appended to the protocol name in the Protocol column, separated by a space. Example. 'ModbusTCP Server'

To export a device and tag data set:

1. Access the Devices page: See Configuring Devices.

    The Devices page appears:

2. In the Devices section, click the following button:

    The User Interface informs you that it is building and downloading the export file:
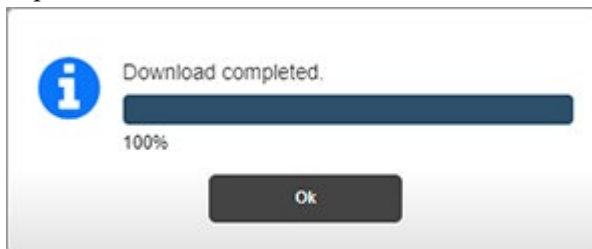
3. Click **Ok**.
4. Depending on the browser, browser settings, and computer operating system, you may be prompted to choose your download location, or the exported file is downloaded to the Downloads directory.

3.3.6 Adding Tags

Tags are data elements on a Data I/O device, such as a programmable logic controller. Legacy controllers and Modbus-based controllers have numeric addressing requirements. Other controllers may have logical name tags. Most interaction with these devices uses tags. A complete tag specification consists of a device name and a tag name.

Tag names have a maximum length of 63 Unicode characters. Leading and trailing spaces are not counted. Restricted characters that may not be used in tag names are: Ampersand, Angle brackets, Back-quote, Backslash, Caret, Curly braces, Double-quote, Percent sign, Semi-colon, and Single-quote. Neither device names nor tag names starting with a dollar sign may be configured. Syntax is enforced by the software. Problems are generally due to an incorrectly configured device or an incorrect tag address. Example of tag:

PumpController2.Level3

If a tag is going to be used in a tag map, you must configure the tag in the user interface as a tag on a specific, previously configured device. The address must match the variable (tag) address defined on the physical device. Tag attributes define the parameters that the Gateway needs to be able to provide the tag transfer service. The number of tag profiles you can configure is limited only by the amount of disk space.

If the Gateway is set up to function as a Client device, the associated tags defined for that device belong to the unique server to which it is connected.

If you try to change the configuration of a tag that is used in a tag map, the software warns you when you try to submit the change.

Tags that are used in a tag map are identified in the tag list. Hovering over an **X** in the **Used in Tag Map** column will open a tool tip with the name(s) of the tag map(s) that use the tag. If a tag map is active, its name will be preceded by an asterisk. Tags have Information button links to non-editable forms that provide information about the tag configuration.

You may also add $User tags. These tags have no address. There are no preconfigured tags in the factory default configuration. You may define single

element (non-array), read/write tags of type BOOL, INT, SINT, DINT, REAL, or STRING.

$System device tags also have no address.

Tag names must be unique. "ABC" and "abc" are considered duplicate names.

NOTE	EtherNet/IP CIP does not support a Bool data type. For information on how to pass Bools (Bits), see About Bools and EtherNet/IP CIP.

NOTE	If you experience difficulty communicating with your PLC after adding tags, as a first step, ensure you added the tag correctly. Otherwise, the Gateway will not be able to read the tag on the PLC. See Configuring Tag Data Types.

To add a tag:

1. From the TAGS menu, select **Devices**:

The Devices page appears:

2. Click the following Tags button:

The Tag Properties dialog appears. (Default dialog shows no tag information):

4. From the Tag Properties dialog, view or specify the following options (some options may not be present for a specific protocol):

    • **Tag Name**. Enter name of tag. You cannot use duplicate tag names on the same device, but you may use the same tag name on two or more different devices. The descriptive name may differ from the tag address. Example: **TAG001**. If you change the name of an existing tag that is used in a tag map, the new name will be reflected in the tag map.

    • **Description**. Enter tag description. Example: **Input_PLC01**

    • **Data Type**. Select data type for tag.

    • **Address**. Enter address of tag you are adding. The tag address is a unique string representing the tag identifier as found on the PLC or other device. The Address must exactly match the address of the tag defined on the device, and each tag must have an address. (Tags for $User device do not have an address.)

NOTE	Memory Types I, Q, and M are supported for S7comm. Memory Type DB (Global DB memory) is not supported at this time.

NOTE	If you specify an offset that results in an operation that exceeds the controller-defined length of the array, either the element transfer is truncated, or other undefined behavior occurs, depending on the type of device and protocol in use.

When a tag address is configured to represent an array, the address format includes an array offset. The format varies depending on the protocol. For instance, the address for a tag on a PCCC device might be N7:15 where 15 is the offset. The copy then starts from N7, element 15. For an EtherNet/IP protocol, the address might be specified as MyTag[12], meaning the copy starts from MyTag element 12.

- **Byte Swap**. Interchanges the two bytes of every word when they are read from the source PLC and before they are written to a destination PLC. Only enabled when the Data Type selected is at least 16 bits. Example: Source word = **0×12345678**. Destination word = **0×34127856**.

- **Word Swap**. Interchanges the two words of every double word when they are read from the source PLC and before they are written to a destination PLC. Only enabled when the Data Type selected is at least 32 bits. Example: Source double word = **0×12345678**. Destination double word = **0×56781234**.

NOTE	You may use byte swap and word swap options at the same time. Example: Source = **0×12345678.** Destination = **0×78563412**.

NOTE	The upper limit for the maximum number of array elements varies based on protocol and data type. Each protocol has a limit on how large the request packet can be. Therefore, for a given protocol, 100 INTs might be the most that can be read in a single operation. For more information, see Array Length Limits.

NOTE	A STRING (array of characters) is also byte/word swappable.

- **Is Array**. Identifies the tag description as an array. Using tag arrays provides you with maximum performance for the copy operation. Minimum array size is 1, the maximum depends on data type and protocol. Each element must be the same, and the software assumes that the elements are contiguous in controller memory. The address format for a tag array includes an array offset. The format is protocol-dependent. For instance, the address for a tag on a PCCC device might be N7:15 where 15 is the offset. The copy would start from N7, file item 15. For an Ethernet/IP protocol, the address might be specified as MyTag [12], meaning the copy starts from MyTag array item 12.
  - *Length*. When **Is Array** is selected, length specifies the number of elements to be read or written.

Example: A tag configured on the Gateway may refer to a device tag of INT[1000], of which four elements are of interest, starting at offset 68. In this example, the tag address field would be entered on the Gateway as INT[67]. Array elements use zero-based addressing, and the length field would be specified as 4.

- **Submit**. Saves changes on Gateway and exits.
- **Cancel**. Exits without saving changes on Gateway.

3.3.7 Modifying Tags

To modify tag information:

1. Access the Devices page:

    See Configuring Devices.

    The Devices page appears:

2. Select an entry in the Tags table and click the following button:

3. The Tag Properties dialog appears. Change information in the listed fields:

    See Adding Tags.

4. When finished making changes, click either of the following to exit:

    - **Submit**. Saves changes on the Gateway and exits.
    - **Cancel**. Exits without saving changes on Gateway.

3.3.8 Deleting Tags

You may delete user-configured, single tags in the Tags list by clicking on the tag and selecting the Delete button. You may also delete multiple tags with a single click. To delete multiple tags in sequential order, hold down the **SHIFT** key and click the first and last tags in the sequence. If you wish to delete non-contiguous tags from a list, hold down the **CTRL** key and click the tags you wish

to delete.

You may delete any tags that are not used in a tag map without any problem.

If you try to delete tags that are part of one or more inactive tag maps the software warns you this is the case. You will not be able to activate a tag map with one or more missing tags.

If you try to delete tags that are listed in any active tag map, any associated tag maps are deactivated upon deletion of the tags. The software warns you this is the case before deleting the tag(s) and changing the tag map's status to inactive. The deleted tags are blank in the affected tag map(s). You cannot activate the tag map until the deleted tags have been replaced or the incomplete tag pair has been removed.

If you try to delete a device that has tags that are used in an active tag map, the software provides a similar warning.

To delete a tag:

1. Access the Devices page:

    See Configuring Devices.

    The Devices page appears:

2. Select a device and one or more of the device tags from the list.
3. Click the Delete button:

A confirmation dialog appears:
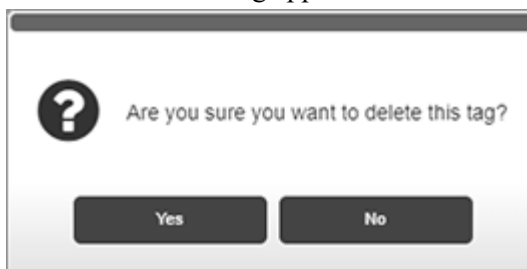
5. Confirm the deletion:

- **Yes**. Deletes the selected tag from the Gateway and exits.
- **Cancel**. Exits without deleting the selected tag from the Gateway.

If you try to delete a tag that is in use in a tag map, the software warns you this is the case.

Once the tags are deleted, any associated tag maps are deactivated.
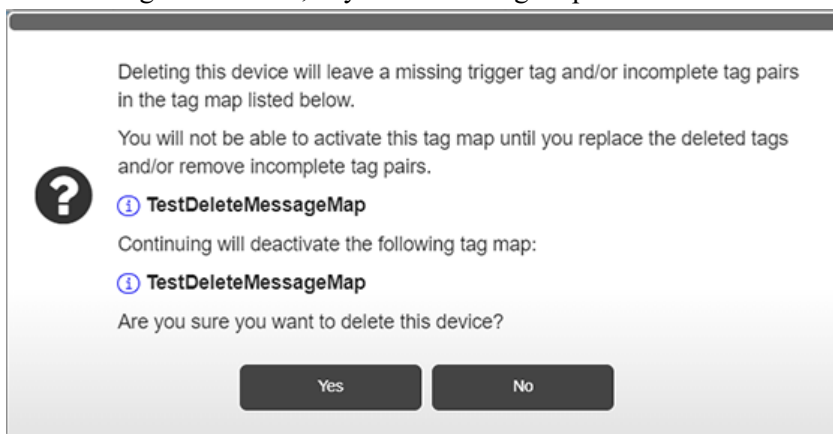
3.3.9 Importing Tags

NOTE	The best method for adding a large number of tags to a Gateway is to export them from your PLC and edit the file to match the import format shown below.

To import tags, quotation marks are only necessary if the name contains spaces or commas. The commas between fields are not optional. Example:

"Tag Name","Description","Tag Address","Data Type","Byte Swap","Word Swap"

"RealArray","Testing","RealArraAddr","real[2]","0","1".

In the following example, the description slot is empty but has quotation marks and comma:

"CurrentDateTime","","CurrentMonthAddress","STRING","0","0".

When a tag array is present, the Datatype column adds the array size after the type using square brackets. Example: **STRING[4]** has 4 elements in an array of type STRING.

Gateway enforces the following import rules:

- If **Tag Address** is missing but **Tag Name** and **DataType** are present, then **TagName** is used as both name and address.

- If **Tag Address** is missing, the expected comma must still be present, consistent with commonly understood Excel .csv formatting rules.

- If the **Tag Name** is missing, then no Tag entry will be imported for that line.

- If **Data Type** is missing, then no Tag entry will be imported for that line.

- If the **Description** has a comma, that field must be enclosed in quotation marks.

- If a line fails to conform to the expected .csv formatting then no tag entry will be imported for that line.

- To specify an array, a bracketed length must be appended to the **Data Type**. Example: **INT[10]** This indicates that the tag is an array of 10 elements of type INT.

- If the file has duplicate tag names in it, the entire file will be rejected.

- Each tag in the import file must have a unique name. If the file has duplicate tag names in it, the entire file is rejected.

- If the file has tags with names that are duplicates of tag names already configured for the device, the duplicate lines are not imported.

-

NOTE	**Byte Swap** and **Word Swap** are represented as "**0**" (unchecked) or "**1**" (checked). If the file selected for import was saved from a Gateway 1.0 device, the **Byte Swap** and **Word Swap** fields will be missing, and the firmware will add these fields (set to "**0**") to allow importing to a Gateway 2.*n.nnn* device. Importing a tag file saved from a 2.*n.nnn* Gateway cannot be imported to a Gateway 1.0 device.

NOTE	When a tag file is exported from the Gateway, each tag is on a separate line.

NOTE	Array tags have a minimum length of 1 and a maximum length that depends on protocol and data type. If tags are entered individually through the Tag Properties form, these array lengths are enforced by the user interface.

To import a tag file:

1.   From the TAGS menu, select **Devices**:

The Devices page appears:

2.   From the Devices list, select the device for which you wish to import tags.

From the dialog, click the following button:

A file selection dialog appears. If necessary, navigate to the directory in which your tag files are located. This directory can be on a personal computer drive or a network server.

3.   Select the file and click **Open**. The tag file is imported, and the tags appear in your Tags dialog.

3.3.10 Exporting Tags

You can export a list of tags associated with a single device from the Gateway into an uncompressed, downloadable .csv file. The first row, the Tag Header, holds the information for a single tag. All fields are enclosed in double quotes and separated by commas. If no description exists, the field is represented by a pair of empty quotation marks. Format example:

"TagName","Description","TagAddress","DataType","ByteSwap","WordSwap"

Example exported tag row:

"CurrentMonth","","CurrentMonthAddress","STRING","0","0".

When a tag array is present, the **Datatype** column adds the array size after the type using square brackets. Example: **STRING[4]** has 4 elements in an array of type STRING.

To export tags:

1. From the TAGS menu, select **Devices**:

The Devices page appears:

2. From the Devices list, select the device from which you wish to export tags.

3. From the dialog, click the following button:

The User Interface informs you that it is downloading the export file:
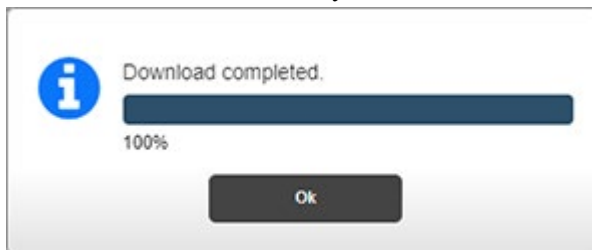
Depending on the browser, browser settings, and computer operating system, you may be prompted to choose your download location, or the exported file is downloaded to the Downloads directory.

Section 3.4
Configuring
Tag Maps

From Version 2.01, the Gateway supports tag copy for Client/Server relationships. Client/Server relationships function as follows:

A tag map represents a collection of tag pairs (each of which consists of a source and a destination tag) together with a specification of when the copies are to occur. It is recommended that you group the tag pairs based on the frequency of the copy operation. Copies can occur on a periodic basis or when the value of a specified "trigger" tag changes.

The following conditions apply:

- If a trigger tag belongs to a device where the Gateway Role is set to Client or to an EtherNet/IP device where Gateway Role is set to Server and the tag is an Assembly Object tag (the address will be 100, 101, or 102, with or without an offset in square brackets), it will be polled at a user-specified interval.

- If the trigger tag belongs to an EtherNet/IP Device with the Gateway Role set to Server and the tag is a 4C/4D tag, or the tag belongs to a Modbus device with the Gateway Role set to Server, an event is raised to notify the Gateway that the tag's value has changed and no polling is necessary (the Polling Rate field will not be present).

Any configured tag may be specified as a source tag, but only user-configured tags may be specified as destination tags. You cannot use a $System tag as a destination tag as the system will not accept the designation.

The maximum number of tag pairs that may be defined in a single map is 100. The minimum is one. The maximum number of tag maps that can be defined is 50. The actual number of tags that can be copied on schedule will depend on a variety of factors, such as tag type, the protocols of the source and destination devices, the speed of the slowest device, connection speed and network capacity, tag types, CPU availability, and specified frequency of copy operations.

The rate specified, whether On Change or Periodic, is directly related to the processing performance (CPU Load) of the Gateway. For example, a Tag Map with a period of 10 milliseconds will use more processing performance than a Tag Map with a period of 200 milliseconds. As Tag Maps are added, the CPU Load increases and processing performance decreases. The CPU Load can be viewed on the Diagnostics page.

You create sets of source and destination tag pairs and set a rate of copy or specify copy initiation based on a change in the value of a trigger tag. The software processes the sets by reading from the PLC source tag and writing to the PLC destination tag, at the rate desired. The tags may be on PLCs connected to the Gateway via either a serial or an Ethernet connection. The Gateway manages the communication requirements of both the source and destination PLCs.

The Tag Map table provides an Update Condition for each map that shows whether the map updates when the value of a trigger tag changes or updates at a specified time interval.

NOTE	The messaging you see in the Update Condition column changes according to whether the trigger tag is still configured or has been deleted:
	• As long as the tag is still configured, the Update Condition reads **"Poll deviceName.tagName for changes every *x* ms"**.
	• If an event notifies the Gateway of the change to the tag value,, the Update Condition reads **"Update when value of *deviceName.tagName* changes".** If the trigger tag has been deleted, *deviceName.tagName* is replaced by "*deleted*" and the name of the tag is shown with a red font to alert you to the deleted tag.

NOTE	The devices from which the tag values are being read, or to which they are being written, do not have to be running the same protocol as the devices the tag values are being read from, or written to. Exercise caution when copying between different tag types. There is minimal validation of tag types. When the source and destination tag types differ, data loss or a change of value may occur. For example, if a REAL is written to a DINT, the value changes, as the REAL uses IEEE format, which is transmitted bit-by-bit, rather than converted to the nearest integer value. If the value of the destination is too large to fit into the destination, the value will change as well, as only part of the source will be copied to the destination. Similarly, when a tag pair includes a signed and unsigned type, the value may change. Be sure to check that the values being written across a set are accurate.
	The one restriction is that tags of type STRING can only be copied to or from other tags of type STRING. For information about bit copying, see About Bit Copying Operations.

NOTE	When you attempt to submit a tag map with tags with invalid array lengths, invalid tags turn red. These will need to be fixed before you can submit the map.
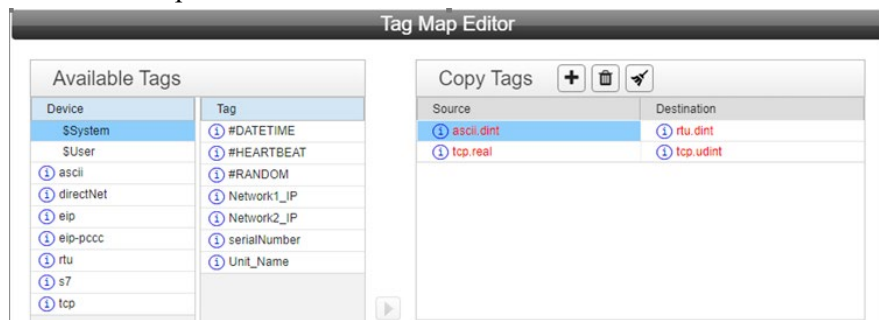
To add, modify, or delete tag maps:

1. From the TAGS menu, select **Tag Maps**:

The Tag Maps page appears:

Tag Maps	Update Condition	Status
Name	Update Condition	Status
AllDevices	Update every 1 Minutes	Invalid
cip	Update every 1 Seconds	Inactive
df1-pccc	Update every 1 Seconds	Inactive
DisplayTest	Update every 1 Seconds	Inactive
longNameTest	Poll (i) Ethernet/IP-PCCC.pollingTag901234567890123456789012345678901 for changes every 100 ms.	Inactive
modbus	Update every 500 Milliseconds	Inactive
modbusTCP	Update every 3 Seconds	Invalid
pccc	Update every 2 Seconds	Inactive
ppi	Update every 1 Seconds	Invalid
s7	Update every 750 Milliseconds	Inactive
sys2user	Update daily at 7:44:00 AM	Invalid
Testing	Poll (i) df1-cip.bool for changes every 100 ms.	Inactive
TestMessageDelete1	Update every 1 Milliseconds	Inactive
TriggerTagMap	Poll (i) ppi.str1 for changes every 100 ms.	Inactive

DisplayTest

Source	Destination
(i) DisplayTest.bool16s	(i) DisplayTest.bool4d1
(i) DisplayTest.bool1s	(i) DisplayTest.bool16d1
(i) DisplayTest.bool1s	(i) DisplayTest.sint2d
(i) DisplayTest.bool1s	(i) DisplayTest.sint1d
(i) DisplayTest.bool1s	(i) DisplayTest.dint1d1
(i) DisplayTest.bool1s	(i) DisplayTest.dint2d1
(i) DisplayTest.bool1s	(i) DisplayTest.int1d
(i) DisplayTest.bool1s	(i) DisplayTest.int10d
(i) DisplayTest.bool4s	(i) DisplayTest.dint1d2
(i) DisplayTest.bool4s	(i) DisplayTest.dint2d2
(i) DisplayTest.bool4s	(i) DisplayTest.bool1d1
(i) DisplayTest.bool4s	(i) DisplayTest.bool4d2
(i) DisplayTest.bool4s	(i) DisplayTest.bool16d2
(i) DisplayTest.bool8s	(i) DisplayTest.bool1d2
(i) DisplayTest.dint4s	(i) DisplayTest.bool4d3
(i) DisplayTest.int4s	(i) DisplayTest.dint2d3
(i) DisplayTest.real2s	(i) DisplayTest.int4d
(i) DisplayTest.sint4s	(i) DisplayTest.real2d

2. In the Available Tag Maps work area, view or specify the following options:

button	Function	Access
➕	Add a tag map:	Adding Tag Maps
✏️	Modify a tag map:	Modifying Tag Maps
🗑️	Delete a tag map:	Deleting Tag Maps
▶	Activate a tag map:	Activating Tag Maps
🏷️	View live tag data:	Viewing Live Tag Maps
➡️	Export tag maps:	Exporting Tag Maps

3.4.1 Adding Tag Maps

This topic explains how to create tag maps for copying tags between devices. A maximum of 50 tag maps may be configured. A Tag Map represents a collection of tag pairs. A tag pair consists of a source tag and a destination tag. Any configured tag may be specified as a source tag, but only user-configured tags may be specified as destination tags.

All tag pairs in a specific tag map are copied on the same periodic schedule or when the value of a single trigger tag changes, depending on the type of copy scheduling configured. If you select an array as a trigger tag, the software uses

the 0th element of the array as the trigger tag.

A tag map is valid when:

- It contains no deleted tags (that is, no tags specified as an empty string).
- None of the tags used in the map belong to ModbusTCP server devices which have their **Address** field set to **Unconfigured**.
- No tag pairs contain an empty tag for either source or destination.
- No tag pairs have a STRING type for one of the tags in the pair and a non-STRING type for the other tag in the pair.

Tags maps that are invalid are labeled as such and cannot be activated.

Tag maps update as follows for when a trigger tag value update is selected:

- If the **Gateway Role** for the device to which the trigger tag belongs is **Client** or the protocol of the device is EtherNet/IP and the tag is an assembly object tag (the address is 100, 101, or 102, with or without an offset in square brackets), the column lists:

  - **Poll deviceName.tagName for changes every *x* ms**.

- If the **Gateway Role** for the device to which the trigger tag belongs is **Server** and the protocol of the device is a Modbus protocol, or the protocol of the device is EtherNet/IP and the tag is a 4C/4D tag:

  - **Update when the value of *deviceName.tagName* changes**.

- If the trigger tag has been deleted, the text in the column changes to red and lists:

  - b**pdate when the value of *tag_deleted* changes**.

Tag maps update with either a time or date and time column listing when update on a periodic basis is selected:

- For more information about tags, see Adding Tags.
- For more overall information about tag maps, see Configuring Tag Maps.
- To better understand how tag copying works, see About Bit Copying Operations.

To create a tag map:

1. From the TAGS menu, select **Tag Maps**:

    The following page appears:

2. Click the following Tag Maps tool bar button:

    The Tag Map Editor appears. The Tag Map Editor has three panels. The **Available Tags** list contains a list of all devices on the Gateway and associated tags. The **Copy Tags** list enables you to configure tag pairs which specify the source and destination for a tag copy.

The lower right panel allows you to configure the map name and specify when copies are to be performed:
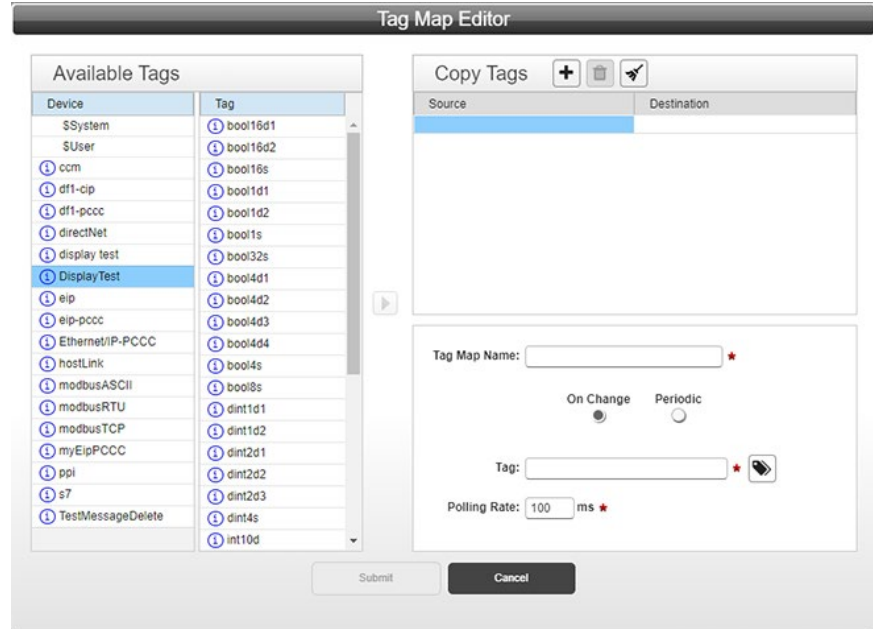
3. From the Available Tags list, select the following:

- **Device/Tag**. To select a device from which you wish to copy tags, click the device. A selected device is highlighted. Tags available for copying from the selected device appear in the associated **Tag** list. To determine tag address, if it exists, and data type, hover over the tag or click the information link to see the complete configuration of the tag. To move a tag to the **Copy Tags** list, select a tag, select a source or destination cell in the list, and click the now active **Select** button:

  The tag moves to the selected location in the **Copy Tags** list. You can also copy a tag from the Available Tags table to the selected tag in the Copy Tags table by double-clicking it.

- **Copy Tags**. The tags selected to copy from one device location to another are listed in the **Source** and **Destination** columns in the Copy Tags table. The following buttons can be used to add and delete tag pairs in the table, and to edit the list of tag pairs. To select an individual tag in a column, click the tag entry. Selected tags are highlighted. To edit the list:

- **Add** button. To add a tag pair to the Copy Tags table in the Tag Map Editor dialog, click the following button:

- **Delete** button. To delete a tag pair (with or without tags in the row), in the Tag Map Editor dialog from the Copy Tags table, click the following button:

- **Cleanup** button. To remove all tag pairs with a missing tag, (either the source or destination column has a tag missing), click the following button:

  ![cleanup button]

- Once you have your tag pairs set up you will also need to enter the following data to complete tag map setup. There is no particular order in which the fields need to be filled; you can enter the name, etc. before adding any tag pairs:

  - **Name**. Enter the tag map name (must be unique).

  - Specify when to copy the tags:

    - *On Change*. Copy tags from source to destination when the specified tag changes value.

    - *Tag*. Specify the tag that triggers the copy by clicking the Tag button and selecting a tag from the list that appears. All devices and tags are listed in alphabetical order:

    - *Polling Rate n milliseconds*. Specify how often to read a tag in a controller to check for a tag value change since the last time the value was read. Default value is 100 ms. Range **10-1000**. Polling Rate applies only if:

      - The trigger tag belongs to a device

where the **Gateway Role** field is not available on the Device Properties form (that is, the **Gateway Role** is always **Client**).

▪ The trigger tag belongs to a device where the Gateway Role field is available on the Device Properties form and the field is set to **Client**).

▪ The trigger tag belongs to an EtherNet/IP device with the **Gateway Role** set to **Server** and the tag is an assembly object tag (its address is 100, 101 or 102, with or without an offset in brackets).

▪ If the trigger tag belongs to a Modbus device with the **Gateway Role** field set to **Server** or to an EIP Server device with the **Gateway Role** field set to **Server** and the tag is 4C/4D an event is raised when the trigger tag is written, thus there is no need for a polling rate to be specified.

◆ *Periodic*. Copy tags from source to destination periodically as specified.

◆ *Every n time units*. Specify to copy the tags at a specified time period of milliseconds, seconds, minutes, hours, or days. If you choose **Days**, the copy will happen every day **At** the time of day specified.

Example: If you define a period of 1 second, and the operation takes 100 milliseconds, then the next operation begins in 900 milliseconds. If you define a period of 1 second, and the copy takes 1020 milliseconds, the software executes the next copy in the least time possible, which is immediately after finishing the first copy. Your tag copy will then run continuously.

NOTE	If the Copy Tags table references a tag or tags that are no longer defined, the missing tags appear blank. If you have tag pairs where only the source and/or destination tag is blank, clicking the **Cleanup** button deletes that (half) pair.

- **Activate** button. Tag maps are inactive when first created. To activate the tag map, return to the Tag Maps page, select the desired tag map in the Tag Maps table, and click the following button on the tool bar:

NOTE	If you try to activate a tag map that references a deleted tag, the software warns you there is a tag that no longer exists. You cannot activate the tag map until the deleted tag issue is addressed.

- **Submit**. Saves entered data on Gateway and exits.
- **Cancel**. Exits without saving changes on Gateway.

3.4.2 Modifying Tag Maps

You may modify a tag map. The tag map Status must be Invalid or Inactive before you can modify it. When you reactivate the tag map, ALL currently active tag maps in your list are restarted.

To modify a tag map:

1. From the TAGS menu, select **Tag Maps**:

The following dialog appears:

2. Click the following button on the tool bar:

3. Make your modifications to the tag maps:

   See Adding Tag Maps.

4. Confirm the modification(s):

   - **Submit**. Saves the changes to the tag map and exits.
   - **Cancel**. Exits without saving changes to the tag pairs.

3.4.3 Deleting Tag Maps

You may delete a tag map.

To delete a tag map:

1. From the TAGS menu, select **Tag Maps**:

   The following page appears:

2. Select a tag map to be deleted. Only inactive maps can be deleted.

3. Click the Delete button:

   A confirmation dialog appears:
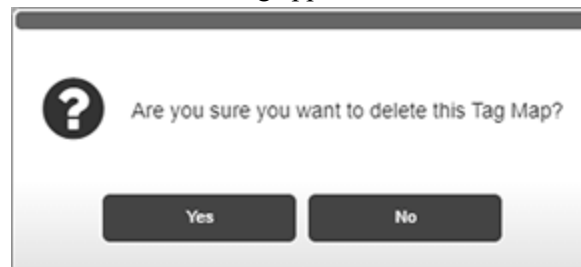
4. Confirm the deletion:

- **Yes**. Deletes the selected tag map and exits.
- **No**. Exits without deleting the selected tag map.

3.4.4 Exporting Tag Maps

You may export a tag map as a compressed, downloadable .csv file with rows and fields that record the parameters of a single tap map as follows:

NOTE	Polling rate is not applicable to if the trigger tag belongs to devices with the Gateway Role set to Server in all cases, so the Polling Rate will have empty double quotes.

Row one of the exported .csv is tag map properties. All fields are enclosed in single quotation marks. If the tag map uses periodic scheduling, then the first row header contains:

- If the tag map is **'Periodic'**:

  - The first row header contains 'TagMap Name','Update Type','Periodic Interval','Units','Use Time Of Day','Time Of Day'

  - The second row contains the entries for the tag map: 'Map Name','Periodic','Periodic Interval','Units','Use Time of Day','Time of Day'

  - If the unit used for the scheduling period is less than one day, the last two fields are empty.

A1		✕ ✓ fx	'TagMap Name'			
	A	B	C	D	E	F
1	'TagMap Name'	'Update Type'	'Periodic Interval'	'Units'	'Use Time Of Day'	'Time Of Day'
2	'DisplayTest'	'periodic'	'1'	'Seconds'	"	"
3						
4	'Source TagName'	'Tag Address'	'Data Type'	'Destination TagName'	'Tag Address'	'Data Type'
5	'DisplayTest.bool16s[16]'	'BOOL2S16[0]'	'BOOL'	'DisplayTest.bool4d1[4]'	'IBOOL2S32[0]'	'BOOL'
6	'DisplayTest.bool1s'	'BOOL2S'	'BOOL'	'DisplayTest.bool16d1[16]'	'IBOOL2S16[0]'	'BOOL'
7	'DisplayTest.bool1s'	'BOOL2S'	'BOOL'	'DisplayTest.sint2d[2]'	'ISINT2S4[0]'	'SINT'

- If the Tag Map is **'OnChange'**:

  - The first row header contains 'TagMap Name','Update Type','Trigger Tag','Polling Rate','Units'

  - The second row contains the entries for the tag map:

  - 'Map Name','OnChange','TriggerTag','PollingRate','ms'

  - If the trigger tag is not polled, the **Polling Rate** field is a double quoted empty set because it does not apply.

- Subsequent source and destination tag rows for both selections are formatted as follows:

  - The first row header contains 'Source TagName','Tag Address','Data Type','Destination TagName','Tag Address','Data Type'

  - Second and subsequent rows contain the source and destination tags in the following format: 'srcDeviceName.TagName','TagAddress','Data Type','destDevicename.TagName','TagAddress','Data Type'

To export a tag map:

1. From the TAGS menu, select **Tag Maps**:

The following page appears:

3. Select a tag map to export, and click the following button:

4. The User Interface informs you that it is downloading the export file.
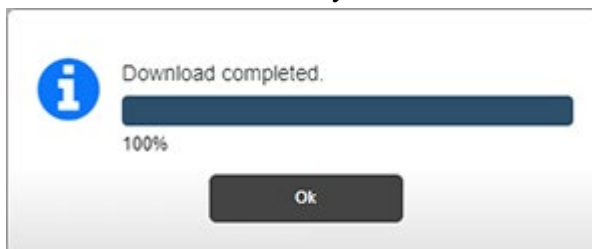
Depending on the browser, browser settings, and computer operating system, you may be prompted to choose your download location, or the exported file is downloaded to the Downloads directory.

3.4.5 Activating Tag Maps

This topic explains how to activate a tag map. Only valid tag maps can be activated. The firmware does not allow the following invalid configurations:

- Any tag pair with an empty tag for either source or destination.
- Any tag pair with a STRING type for one of the tags in the pair and a non-STRING type for the other tag in the pair.

A tag map is considered valid when:

- No tags used in the map have been deleted (no tags are specified as an empty string).
- No tags used in the map belong to Ethernet server devices which have their **Address** field set to **Unconfigured**).
- No tags used in the map have an invalid array length (this can happen if the protocol of a device is changed to a different protocol in the same family that has shorter maximum array lengths or when a backup taken from a previous release is restored onto a newer release and the maximum array lengths are shorter in the newer release).

To activate a tag map:

NOTE	
	Tag maps are inactive when first created. When you activate the tag map, ALL currently active tag maps in your list are restarted.

1. From the TAGS menu, select **Tag Maps**

The following page appears:

Tag Maps			
Name	Update Condition	Status
AllDevices	Update every 1 Minutes	Invalid
cip	Update every 1 Seconds	Inactive
df1-pccc	Update every 1 Seconds	Inactive
DisplayTest	Update every 1 Seconds	Inactive
longNameTest	Poll ⓘ Ethernet/IP.PCCC.pollingTag901234567890123456789012345678901234567890123456789012345678901 for changes every 100 ms.	Inactive
modbus	Update every 500 Milliseconds	Inactive
modbusTCP	Update every 3 Seconds	Invalid
pccc	Update every 2 Seconds	Inactive
ppi	Update every 1 Seconds	Invalid
s7	Update every 750 Milliseconds	Inactive
sys2user	Update daily at 7:44:00 AM	Invalid
Testing	Poll ⓘ df1-cip.bool for changes every 100 ms.	Inactive
TestMessageDelete1	Update every 1 Milliseconds	Inactive
TriggerTagMap	Poll ⓘ ppi.str1 for changes every 100 ms.	Inactive

DisplayTest	
Source	Destination
ⓘ DisplayTest.bool16s	ⓘ DisplayTest.bool4d1
ⓘ DisplayTest.bool1s	ⓘ DisplayTest.bool16d1
ⓘ DisplayTest.bool1s	ⓘ DisplayTest.sint2d
ⓘ DisplayTest.bool1s	ⓘ DisplayTest.sint1d
ⓘ DisplayTest.bool1s	ⓘ DisplayTest.dint1d1
ⓘ DisplayTest.bool1s	ⓘ DisplayTest.dint2d1
ⓘ DisplayTest.bool1s	ⓘ DisplayTest.int1d
ⓘ DisplayTest.bool1s	ⓘ DisplayTest.int10d
ⓘ DisplayTest.bool4s	ⓘ DisplayTest.dint1d2
ⓘ DisplayTest.bool4s	ⓘ DisplayTest.dint2d2
ⓘ DisplayTest.bool4s	ⓘ DisplayTest.bool1d1
ⓘ DisplayTest.bool4s	ⓘ DisplayTest.bool4d2
ⓘ DisplayTest.bool4s	ⓘ DisplayTest.bool16d2
ⓘ DisplayTest.bool8s	ⓘ DisplayTest.bool1d2
ⓘ DisplayTest.dint4s	ⓘ DisplayTest.bool4d3
ⓘ DisplayTest.int4s	ⓘ DisplayTest.dint2d3
ⓘ DisplayTest.real2s	ⓘ DisplayTest.int4d
ⓘ DisplayTest.sint4s	ⓘ DisplayTest.real2d

2. To activate the tag map, click the following button:

The button changes to the following button:

3. To deactivate the tag map, click the button.

NOTE ⓘ	If you try to activate a tag map that references a deleted tag, the software warns you that tag(s) no longer exist. You cannot activate the tag map until the deleted tag issue is addressed. You also cannot activate a tag map that references a tag on an Ethernet server device with an unconfigured address.

3.4.6 Viewing Live Tag Maps

Use this option to view live tag data values on source and destination tags in a tag map.

For source tags, the tag value is displayed after being read from the source device and after any word or byte swapping has been performed. For destination tags, the tag value is displayed after any byte or word swapping has been performed. The data is shown in the type format (for example, INT, REAL, STRING). The tag values showing in the source and destination lists are refreshed once per second. You may also choose to view the data in Hexadecimal format. Tags that have not been read or written use the following characters: --- (three dashes) to show no values at present. Very long tag names are truncated with an ellipsis to show that the tag name is shortened.

NOTE	When configured for ModbusTCP, the Siemens S7-1200 and S7-1500 PLCs store tag values with the least significant word first, whereas the Gateway requires tag values to have the most significant word first. Other Modbus devices may also store values with the least significant word first. To ensure that the Gateway operates on the correct values, the **Word Swap** check box must be checked on all tags configured in the Gateway for these devices. Because the Gateway swaps source tags before displaying their values in the Live Tag Viewer, source tag values will appear correctly. Destination tags are displayed after the Gateway performs the swap (in preparation to write it to the device with the required least significant word first). Thus, these tags will appear in word-swapped order under the Destination column of the Live Tag Viewer. For example, a DINT tag with hex value 0×12345678 (decimal value 305419896) will be displayed as 0×56781234 if the "Display as Hex" checkbox is checked or as the decimal value 1450709556 if the checkbox is unchecked. Note that these tags *are* copied correctly; this is strictly a presentation issue for the destination tags in the Live Tag Viewer. For more information, see S7-1200 and S7-1500 Modbus Tag Values Appear in Word-swapped Order in Live Tag Viewer.

NOTE	Tag maps are inactive when first created. When you activate the tag map, ALL currently active tag maps in your list are restarted.

NOTE	If a string contains a semicolon (;), the Live Viewer listing will truncate the string at the semicolon. To correct this issue, remove any semicolons. If you cannot remove semicolons, you may confirm the string copies are functioning correctly through your automation software or by running a trace and examining the packets that are reading and/or writing the strings.

If source and destination tags do not reference the same amount of memory space, then the number of array entries is limited to only the smallest.

Example 1:

- dev. BOOL[8] => dev. BOOL[3] (OR dev. BOOL[3] => dev. BOOL[8]) are displayed as:

Source	Destination
dev. BOOL[0]	dev. BOOL[0]
dev. BOOL[1]	dev. BOOL[1]
dev. BOOL[2]	dev. BOOL[2]

If the data types do not match, the display of tag array entries and their values include blank rows to keep corresponding source and destination values aligned.

EXAMPLE 2:

- dev. INT[8] => dev. REAL[2] are displayed as:

Source	Destination
dev. INT[0]	dev. REAL[0]
dev. INT[1]	----
dev. INT[2]	dev. REAL[1]
dev. INT[3]	----

If tags cannot be read or written because the device and/or tag configuration is incorrect or the device is offline, disconnected, powered down, or in a faulted state, the Live Tags view shows **{ERR}**:

If the source tag cannot be read, both source and destination values show as {ERR}.

If the destination tag cannot be written, only the destination value will be shown as {ERR}. The format of the value display is dependent on the state of the hex display check box, and the data type of the value. The following table lists formats for each condition:

	Hex display unchecked	**Hex display checked**
Integer types	**decimal**	**hex**
Real	decimal	IEEE 754 hex
String	ASCII	ASCII
Boolean	decimal/binary	hex

To view the values:

1. From the TAGS menu, select **Tag Maps**:

The following page appears:

2.   Select a tag map that is active, and click the following button:

The Live Tag Maps dialog appears.

The data being copied between Source and Destination PLCs is constantly displayed. The values are sampled at one-second intervals.

3.   To view array values, click on the arrow associated with the array. The values appear on an indented, drop-down list in the column:

To hide the values, click the arrow again.

4.   **Show values in hex**. To view the values in hexadecimal format, select this option:

  •   Decimal Integer types are listed in Hex format.

  •   Decimal Real types are listed in IEEE 745 hex format.

- ASCII String types are listed in ASCII format.
- Decimal/Binary Boolean types are listed in Hex format.

- **Trigger Tag Value**. Shows the current trigger tag value when the tag map is set to **On Change**. Shows the value when the tag can be read (or displays {ERR} if the tag cannot be read):
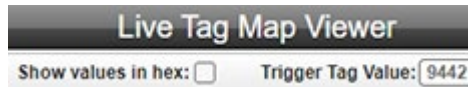
- If no value has been read, or the tag is not yet initialized, shows three dashes (---). If the tag value is too long to fit into the column, the tag value is truncated. (An ellipsis is used to indicate the truncated value.) Hover over the field to show the full tag name and its value. If a tag is not active because source and destination tags are the same, you will see '-*-' in the display. If the trigger tag is a numeric type, the value appears in decimal format when the **Show values in Hex** checkbox is unchecked; in hexadecimal value when the checkbox is checked:

5. To close, click the **Close** button (**X**) on the top right of the popup.

**Section 3.5
Setting Up
a Gateway**

When setting up a Gateway, you need to enter data for the following Gateway settings:

- Provide a user-friendly name and description for the Gateway device.
- Set up the network for the Gateway.
- Select time settings.
- Set up black and white lists for the Gateway.

To set up the Gateway:

1. From the SETUP menu, select the following setup options:

2. View the following options:

- Identifying the Gateway
- Configuring Network Settings for the Gateway
- Configuring Time Setup for the Gateway
- Configuring Security Setup for the Gateway:

**Section 3.6
Identifying the
Gateway**
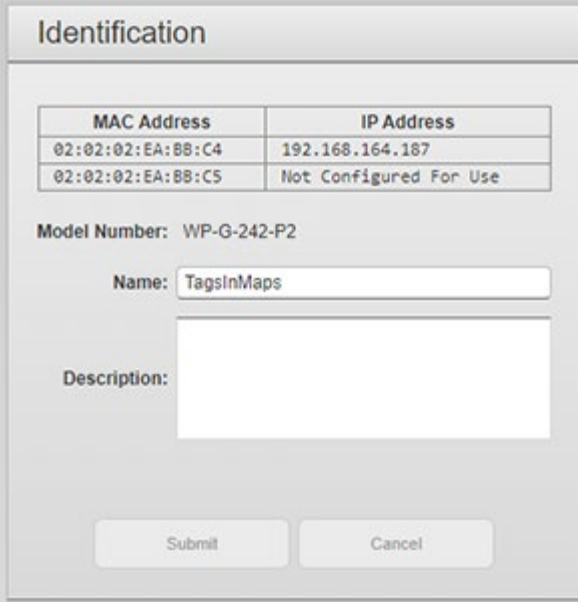
This information uniquely identifies the Gateway. The information includes all of the module's MAC addresses, the IP addresses, the Model number, a name, and a description.

To access the option:

1. From the SETUP menu, select **Identification**:

The Gateway Identification dialog appears:

2. View or specify the following settings:

   - **MAC Addresses**. Not editable. MAC addresses are a 12-digit hexadecimal string that can also be obtained from the Gateway label. If no network is configured for a MAC address, the field lists **Not Configured For Use**.

   - **Model Number**. Not editable. Lists the model number of your Gateway. This is also the catalog number.

   - **IP Addresses**. Not editable. The IP address assigned to the corresponding network.

   - **Name**. Text name that uniquely identifies your Gateway. Leading and trailing spaces are allowed, but not counted as part of the character count. 63 characters maximum. The name may not start with a dollar sign ($), may not use percent, caret, semi-colon, back slash, double quote, single quote, back quote, angle brackets, braces, ampersand, comma, and period. Example: **TagsInMaps**. The name is displayed as the tab name in the browser page. If no name is entered, the IP address of the Gateway and a brand-specific logo are displayed on the browser tab.

   - **Description**. Text description for location and comment information.

3. When finished making changes to the Gateway Identification, click either of the following to exit:

   - **Submit**. Saves changes.

   - **Cancel**. Reverts any modified fields to their original values.

Section 3.7
Configuring Network
Settings for the
Gateway

Gateways provide access to programmable logic controllers and other types of industrial automation equipment on two different network subnets via Ethernet ports, **PORT1** and **PORT2**, and either two or four serial ports (model-dependent), which enable serial communication with external devices.

There is no direct communication between PLCs or HMIs connected to one configured network and PLCs or HMIs connected to a different network as the Gateway does NOT function as a router.

To configure a Gateway, connect an Ethernet cable between **PORT1** port on the Gateway front panel and a PC or Ethernet switch with access to the subnet configured for the port on the Networks page and accessible from your PC. Before you can communicate with the Gateway, a power supply also needs to be wired into the PWR terminal strip on the Gateway front panel and plugged into an outlet in a controller cabinet or other power source. Once power is applied to the Gateway, the Gateway starts up and shows the default **192.168.1.100** IP address on the OLED display.

The Gateway Ethernet ports communicate at 10/100 Mbytes per second over the Ethernet connection. Each Network is assigned a unique MAC address. The MAC address assigned for **Network 1** is the "base" MAC address and is listed on the product label. MAC addresses are also listed on the Networks page, the Identification page, and the About Universal Industrial Gateway popup.

When you receive your Gateway, the device has the following, default configuration:

- The UIG starts up with a single Network that includes all physical ethernet ports.
    - Network 1 is configured for Static IP and has both ports assigned to it.
    - Network 2 is unconfigured with no ports assigned to it.
- The Network assumes the properties as defined in the above Static Network Configuration with a pre-configuration default static address of **192.168.1.100**.
- The default subnet mask is **255.255.255.0**.
- The default gateway address is **192.168.1.1**.
- In this configuration, DNS2 has a default address of **8.8.8.8**.

During setup, you can configure the Ethernet connection as a DHCP client or with a static IP address. At startup, the two Ethernet ports share the same default IP address. However, the Ethernet ports can be configured with different IP addresses.

You may also combine available Ethernet ports into a unique group targeting a subnet. You may define multiple, partitioned, network groups and associate each group with a unique subnet.

Static and DHCP network configurations must follow specific guidelines. Setting up Ethernet groups and subnets must also follow specific guidelines for port access, default network routing, and network configurations for multiple port

groupings.

See Network Configuration Guidelines.

NOTE	When configuring multiple subnets, the IP addresses of the subnets defined by the combination of IP address, subnet mask and possibly gateway address cannot overlap, or behavior may be unexpected. For example, configuring **Network 1** with static IP address **192.168.1.108** and subnet mask **255.255.255.0** and **Network 2** with static IP address **192.168.1.150** and subnet mask **255.255.255.0** will result in overlapping addresses.

NOTE	Keep the following in mind: • The gateway and DNS addresses are only necessary if using an external NTP server; otherwise, only address and subnet mask are needed.

NOTE	If you add both ports to Network 2 and select DHCP, submit the change and connect to the user interface at the DHCP address that is acquired, then put one of the ports in Network 1 and configure a static IP address for that network, you will lose the DHCP connection. If your PC cannot connect to the user interface on the static IP address you configured for Network 1, you will need to do a factory reset using the hardware switch

To configure network settings:

1. From the SETUP menu, select **Networks**:

The Networks page appears:

2. View or specify the following options:

- **Port *number***. Select a port for setup. Each Network may be configured either with a static or dynamic address configuration (DHCP) for the network connection:

  - *Static IP*. Default option. Static means that an IP address is entered manually and does not change until you change it.

- **IP**. Select a valid Static IP address for the Network. Enter the Gateway IP Address. The default address that the Gateway ships with is **192.168.1.100**. During installation, you will likely change this address to an IP address that works in your network.

- **Subnet Mask**. Enter subnet mask address. This value is typically **255.255.255.0**. Select a valid address from the dropdown list of addresses.

- **Gateway**. Default when shipped is **192.168.1.1**. If needed, enter gateway address suitable for your network.

- **DNS1**. Default when shipped is **8.8.8.8**. Enter the primary DNS value.

- **DNS2**. Lists a secondary DNS value. The default is not populated. For the Gateway, this value may be set to a different value. If the primary connection fails, the secondary is available.

NOTE	If an external NTP time server is configured, the Gateway must have access to the Internet and a gateway, and at least one DNS server must be configured. This does NOT apply if the Gateway is on the same subnet as the server. If the server is specified with an IP address (rather than a name), no DNS addresses are necessary.

- *DHCP Client*. If you have a DHCP Server installed and configured on the network, select this option to allow the Gateway to get a **PORT1** or a **PORT2** IP address from

the designated DHCP server for a designated lease period when the Gateway starts up. If a Gateway is unable to acquire a DHCP address, the Network column shows **No Link**.

- **Default Gateway**. Specifies the gateway address that is to be used as the default gateway address in the IP route table. If no gateway address is entered as part of the network configuration(s), this will be blank. If a gateway address is entered for any network configuration, the field will be populated by default with the gateway address for the network with the lowest number that has a gateway address configured. If more than one network has been configured with a gateway address, you may select the gateway address you wish to have the system use as the default.

NOTE	You cannot use a DHCP address for a Modbus TCP Server device. The configured addresses will also serve as the addresses for Ethernet devices with the Gateway Role set to Server. If you intend to use a network as the address of such a device, the address must be Static IP.

.

- **Submit**. Saves data on Gateway and exits. If you enter a Gateway address that is not on the same subnet as the IP address and subnet mask, you will see the following error message:

The IP address for the following Network must be private:

Network 2

Private IP address ranges:

Class A: 10.0.0.0 to 10.255.255.255

Class B: 172.16.0.0 to 172.31.255.255

Class C: 192.168.0.0 to 192.168.255.255

Ok
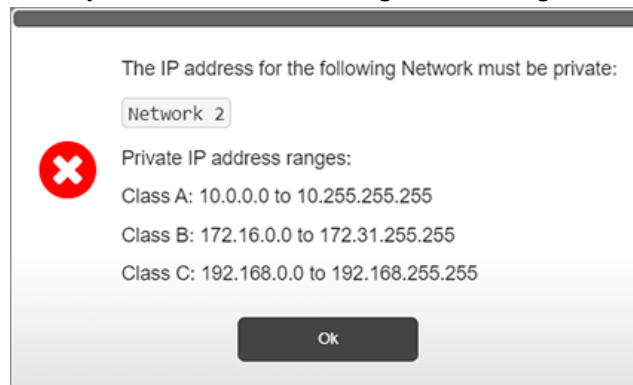
- **Cancel**. Exits without saving data from Gateway.

Section 3.8
Configuring Serial
Communications Setup

A Gateway provides RS-232/RS-485 serial communications via two or four serial ports (**Serial 1** and **Serial 2**, **Serial 3**, and **Serial 4**). Serial Ports 1 and 2 are provided on WP-G-222-P1/P2 models. Serial Ports 3 and 4 are provided only on WP-G-242-P1/P2 models. You may connect the Gateway via these ports to external programmable logic controllers (PLCs) or other devices. You can configure each available serial port for either an RS-232 or RS-485 connection. These ports provide RJ45 connectors.

Each serial port can only be configured for a single device. When setting up a RS-485 multi-drop configuration, a serial port can only function as a single

Modbus server endpoint, or as a client to a single remote server. This means each serial port can only have a one-to-one relationship to a device. A serial port also does not allow multiple server devices to use the same port resource at the same time. However, each serial port is able to function as a distinct member of a multi-drop network.

NOTE	If the protocol is changed for a previously configured serial port, the serial port reverts to an unconfigured state (no port selected). The field remains bordered in red until you reconfigure the port.

To configure serial ports for the Gateway:

1. From the Devices page, select the device for which you wish to configure a serial port:

2. Select the **Configure** button.

The Serial Port Setup dialog appears:

3. View or specify the following Communications Settings options for the selected serial port (**3**):

- **Port**. Selected. You can change this port if other serial ports are still available.

- **Baud Rate**. Specifies the speed at which the serial port sends data. Rates are **1200** through **115200**. Select the desired rate from the dropdown menu for the port.

- **Data Bits**. Specifies word length. Lengths are **7** or **8** bits. If you can specify the value (the dropdown is not grayed out), select the desired length from the dropdown menu.

- **Stop Bits**. Specifies number of stop bits to use. Numbers are **1** or **2**. Select the desired number from the dropdown menu.

- **Parity**. Specifies parity to use. Options are **none**, **odd**, or **even**. Select the desired option from the dropdown menu.

- **Handshake**. Defines whether or not to use handshaking, and the handshaking type. Options are **none**, **RTS/CTS**, **X-ON/X-OFF**. Select the desired option from the dropdown menu.

- **Connection Type**. Lists whether you are using the Gateway's **RS-232** or **RS-485** serial communication. Connection type is protocol-specific. Invalid selections for a protocol are disabled. Example: You cannot select **RS-232** for PPI or **RS-485** for DF1-CIP. If the device is on a shared port, **RS-485** is the default selection and is disabled so you cannot select **RS-232**.

- **Submit**. Saves the entered connection data on Gateway.

- **Cancel**. Exits without saving data from Gateway.

**Section 3.9
Configuring Time
Setup for the Gateway**

The Gateway tracks date and time, and uses the data to timestamp Gateway operations, such as log entries. You specify that Gateway time and date is either set manually (default selection) or via NTP, using either a local or remote Network Time Protocol (NTP) server. If you are connecting to a remote server over the Internet, you must configure a gateway address and at least one DNS address or you must configure the Gateway to use DHCP.

If the Gateway is unable to connect to, or receive data from, the specified server, the Gateway reverts to the manual option.

To configure Gateway time and date settings:

1. From the SETUP menu, select **Time**:

The Time page appears. (Default page shows current Gateway date and time information):

2. View or specify the following options:

    - **Universal Industrial Gateway Date/Time**. Shows current time and date on the Gateway as configured using either **Manual** or **NTP**.

- **Manual**. You specify the date using a calendar and time using hours, minutes, and **AM** or **PM**. (Normally this is the current time for the Gateway's physical location.):

  - *New Date*. Shows field containing current date on Gateway. The field is not directly editable. To make changes, select the date from the calendar. The calendar closes only after you select a date:

  - *New Time*. Shows three fields containing current time on Gateway as read from the PC. The meridiem field is not directly editable. The hours and minute fields are directly editable. To adjust the time, enter the new time in the fields provided and use the up and down arrows to select **AM** or **PM**:

- **NTP**. Allows Gateway to synchronize its time using a Network Time Protocol (NTP) server. Settings are grayed out until the checkbox is selected. Options for NTP server settings are **Spectrum NTP 1**, **Spectrum NTP 2**, **Spectrum NTP 3**, **Spectrum NTP 4**, **Asia**, **Europe**, **North America**, **Oceania**, or **South America**, or your own server. The field is editable:

  - *Apply DST*. Applies a Daylight Savings Time adjustment to the Gateway only for the **NTP** option.

  - *Update Rate n time*. Defines how often the Gateway updates its date and time using the NTP server. Specify an integer for a count, and select from **Hours**, **Days**, **Weeks**, or **Months** for a unit in the time field. At each specified time interval, the Gateway attempts to get the time:

    - If it cannot get the time from the server, a

message is sent to the user interface informing you that this is the case, and the time reverts to the manual option.

   ✦ If you turn off NTP updating, the Gateway stops trying to update the time using this method.

   ✦ If you turn NTP updating back on, the Gateway returns to trying to update the time at the specified update rate.

- *NTP Server Address*. Lists Internet locations of servers that provide network time synchronization. The address is also directly editable. You can supply the IP address of any NTP server either external or internal. Select a server location that describes the continent on which the Gateway is located. Example: **north-america.pool.ntp.org**

- *GMT Offset*. Lists time zone information. Select the time zone in which the Gateway is located. Example: **GMT-08.00 Pacific Time (US & Canada)**

- **Submit**. Saves new selections on Gateway.

- **Cancel**. Reverts any changes on the page. If you try to exit the page without saving your changes, the software asks you to confirm the exit without saving changes.

Section 3.10
Configuring Security
Setup for the Gateway

The Gateway provides security features that allow you to control network access to the Gateway.

NOTE	Please keep the following in mind:
	• The MAC address that you enter in the security settings is a 12-digit hexadecimal string that can be obtained from blacklist registries on the Internet or from your security or network administrator. If you have internal computers you wish to exclude, run a command shell and type **ipconfig/all** (Windows) or **ifconfig** (Mac). The MAC address for the computer on which the command is executed.
	• When you enter MAC address(es) in the whitelist, only the personal computer(s) or device(s) in the list will be able to access the Gateway. No other devices can access it. If you have checked the **Allow Ping** checkbox, only the device(s) with MAC address(es) in the Whitelist will be allowed to ping the Gateway.
	• If you blacklist a MAC address, all traffic from that address is blocked, regardless of how safe that traffic may be. Even if you select **Allow Ping**, blacklisted MAC addresses are prevented from pinging the Gateway.

To configure security for the Gateway:

1. From the SETUP menu, select **Security**:

The Security page appears:

2. View or specify the following Security Setup options for each Gateway:

- *Security Options*. Select one of the security options from the dropdown menu. Only one of these options is implemented:

    ◆ Blacklist. Enter a known, untrusted MAC address. Blacklisting an address allows the Gateway to reject any attempt to connect to the Gateway from this address. When selected, the Blacklist dialog appears.

    ◆ Whitelist. Enter a known, trusted MAC address that allows the Gateway to validate legitimate connections to it. When selected, the Whitelist dialog appears. A wrong MAC address entered here requires a reset to factory defaults from the Gateway front panel to re-establish the connection, so use with caution and double check your own MAC address before you enter it:
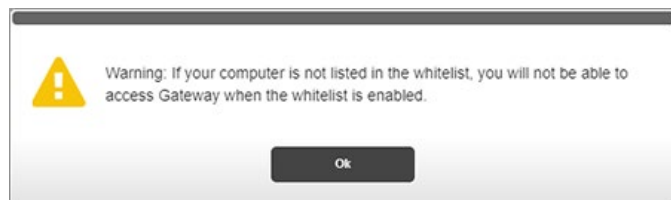
- **Enable** checkbox. Turns on the acceptance or rejection of the address(es) listed in the table, depending on whether **Whitelist** or **Blacklist** option is selected.

- **Allow Ping**. Defines whether or not the Gateway can be pinged across a network. By default, pinging is permitted.
- **Front Panel Display**. Shows you the IP address, port numbers, and the **Show IP** option. You can turn off the **Show IP** option so that the IP address for the Gateway is not visible in the OLED display on the front of the Gateway. See Viewing OLED Interface Information.
- **Submit**. Saves data on Gateway and returns to the page.
- **Cancel**. Returns to the page without saving data from Gateway.

3. View or specify the following options:

button	Function	Access
➕	Add a MAC Address:	Adding MAC Addresses
✏️	Modify a MAC Address:	Modifying MAC Addresses
🗑️	Delete a MAC Address from the Gateway:	Deleting MAC Addresses

3.10.1 Adding MAC Addresses

NOTE	Please keep the following in mind:
	• The MAC address that you enter in the security settings is a 12-digit hexadecimal string that can be obtained from blacklist registries on the Internet or from your security or network administrator. If you have internal computers you wish to exclude, run a command shell and type **ipconfig/all** (Windows) or **ifconfig** (Mac). The MAC address for the computer on which the command is executed.
	• When you enter MAC address(es) in the whitelist, only the personal computer(s) or device(s) in the list will be able to access the Gateway. No other devices can access it. If you have checked the **Allow Ping** checkbox, only the device(s) with MAC address(es) in the Whitelist will be allowed to ping the Gateway.
	• If you blacklist a MAC address, all traffic from that address is blocked, regardless of how safe that traffic may be. Even if you select **Allow Ping**, blacklisted MAC addresses are prevented from pinging the Gateway.

Enter the MAC addresses you wish to whitelist or blacklist. To add a MAC address:

1. From the SETUP menu, select **Security**:

The Security page appears:
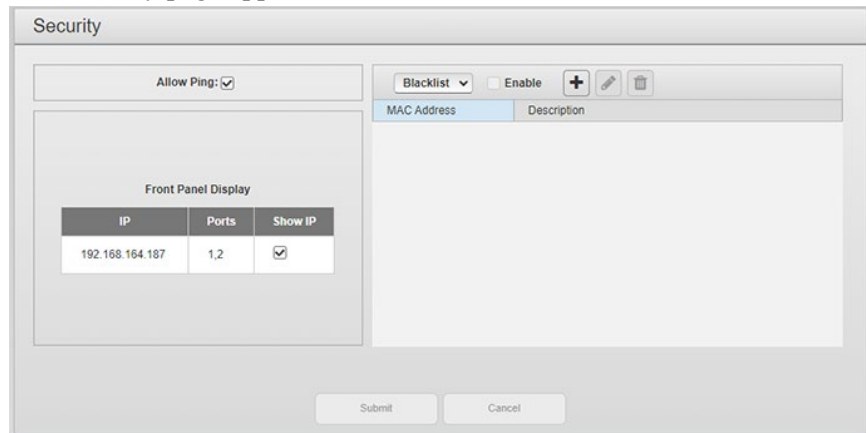
2. Select the **Blacklist** or **Whitelist** option.
3. Click the following button:

The MAC Address Properties dialog appears:
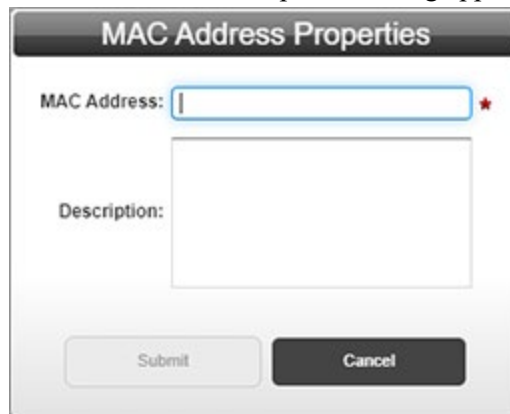
4. View or specify the following options:

   - **MAC Address**. Enter MAC address. Example: **88:88:88:88:88:88**
   - **Description**. Enter description. Example: **Spam server site.**

- **Submit**. Saves the new MAC address in the list:
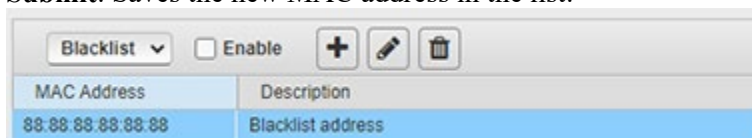
- **Cancel**. Exits without saving changes in the list.
- **Enable**. You must select this option to turn on the selected blacklist or whitelist capability.

3.10.2 Modifying MAC Addresses

To modify MAC address information:

1. From the SETUP menu, select **Security**:

The Security page appears:
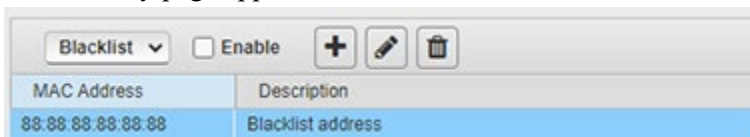
2. If changing between whitelisting or blacklisting, select the desired blacklist or whitelist option in the Security Setup page.

3. Select a MAC address from the list and click the following button:

4. The MAC Address Properties dialog appears. Change information in the listed fields:

   See Adding Mac Addresses.

5. When finished making changes, click either of the following to exit:

   - **Submit**. Saves changes on the Gateway and exits.
   - **Cancel**. Exits without saving changes on Gateway.

3.10.3 Deleting MAC Addresses

To delete a MAC Address:

1. From the SETUP menu, select **Security**:

The Security Setup page appears:
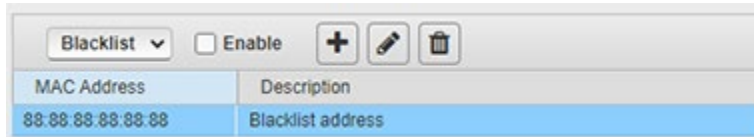
2. Select a MAC address from the list.
3. Click the Delete button:

A confirmation dialog appears:
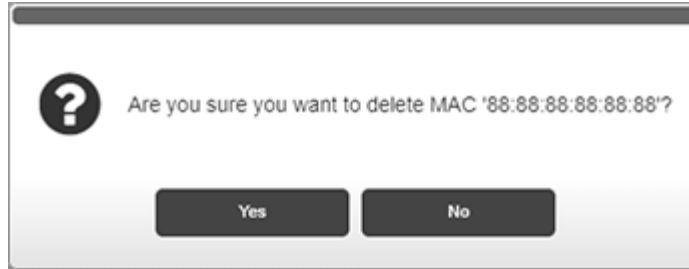
4. Confirm the deletion:
   - **Yes**. Deletes the selected MAC address from the Gateway and returns to the page.
   - **No**. Returns to the page without deleting the selected MAC address from the Gateway.

**Section 3.11
Accessing
Diagnostics
Information**

When troubleshooting a Gateway, or accessing current information about the Gateway itself, you may access and use the following options:

- Use the provided option to view available memory, disk use, and central processing unit (CPU) load.
- Capture tag map data for debugging purposes.
- View system logs that contain a record of the events that occur as the Gateway runs.

To access diagnostic information:

1. From the DIAGNOSTICS menu, select the following options:

2. View the following options:
    - Viewing Resource Information
    - Tracing Tag Map Data
        - Adding Tag Map Data Traces
        - Modifying Tag Map Data Traces
        - Deleting Tag Map Data Traces
        - Downloading Tag Map Data Traces
        - Viewing Downloaded Tag Map Trace Data
    - Viewing System Logs Information:
        - Viewing Error Log Data
        - Viewing Engineering Log Data
        - Viewing the Reboot Log

**Section 3.12
Viewing
Gateway Resource
Information**

Use the provided option to view available memory, disk use, and central processing unit (CPU) load:

1. From the DIAGNOSTICS menu, select **Resources**:

The following page appears:
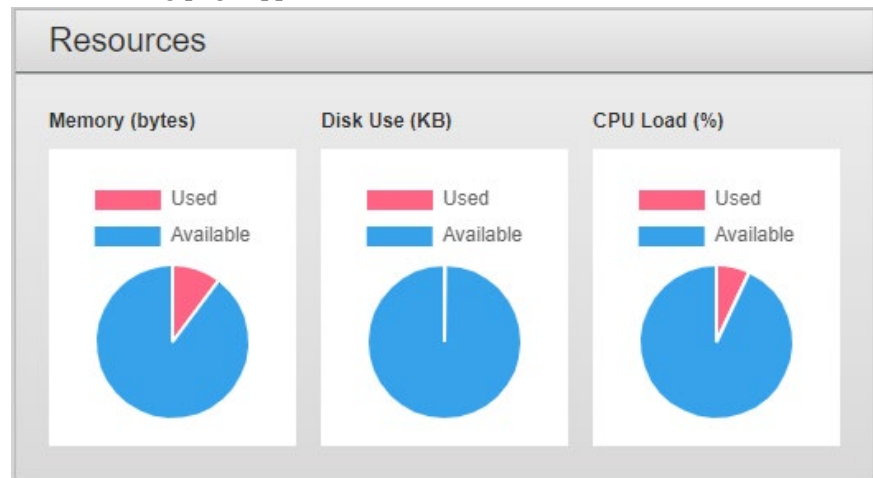
2. View the following information:

- **Memory (bytes)**. To view available and used memory in bytes, mouse over the blue or red portion of the chart:
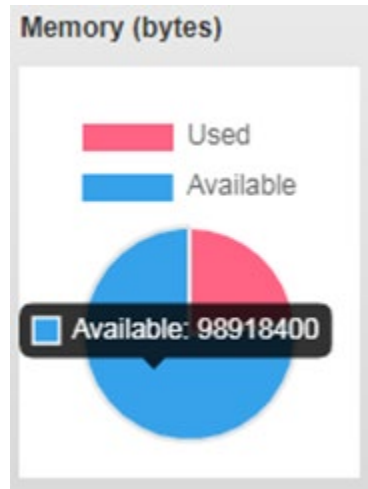
- **Disk Use (KB)**. To view available and used flash in kilobytes, mouse over the blue or red portion of the chart.

- **CPU Load %**. To view available and used CPU load in percentages, mouse over the blue or red portion of the chart. The CPU Load pie chart may show a percentage greater than 100%. This occurs because the percentage shows not just actual usage, but the amount of backed-up work waiting on the CPU.

Section 3.13
Tracing Tag Map
Data

You may capture tag map data for debugging purposes. You define which inbound and outbound devices to monitor from devices configured on the Gateway, and how long you wish to monitor the tag map data traffic. Ethernet data is captured as a .pcap file, viewable by the external WireShark program. Serial data is captured as an ASCII file, viewable in a text editor. This option is

provided for engineering and support personnel familiar with serial data transmission:

- Tag map data trace files are easier to analyze when only one tag map is active when a trace is taken.
- If you specify the same device for both inbound and outbound tracing, a single trace is launched and saved.
- If you specify different inbound and outbound devices, two traces are launched and saved.
- **Timespan** displays the date and time, in 24-hour format, on which a trace was last completed. Dates persist across reboots, firmware updates, and protocol upgrades.
- Trace status information is provided as follows:
    - IDLE. Trace has not been run since last reboot.
    - IN PROGRESS. Trace is currently running.
    - COMPLETE. Trace has completed.
    - ABORTED. Trace was stopped before the entire timespan elapsed.

To add a tag map data trace:

1. From the DIAGNOSTICS menu, select **Tag Map Tracer**:

The following page appears:

2. In the Tag Map Tracer work area, view or specify the following options:

button	Function	Access
	Add a tag map data trace:	Adding Tag Map Data Traces
	Modify a tag map data trace:	Modifying Tag Map Data Traces
	Delete a tag map data trace:	Deleting Tag Map Data Traces
	Download a tag map data trace:	Downloading Tag Map Data Traces
	View a downloaded tag map data trace:	Viewing Downloaded Tag Map Trace Data

- **Submit**. Saves changes on Gateway and exits.

- **Cancel**. Exits without saving changes on Gateway.

3.13.1 Adding Tag Map Data Traces

To help with troubleshooting, the software allows you to capture network traffic to, and from, your Gateway and user-specified, connected devices. You specify an inbound and an outbound device by name. The inbound and outbound device can be the same. You also specify how long to trace the network traffic, up to a maximum of 3 minutes. For more information about how data tracing works, see About Tag Map Data Traces.

To add a tag map data trace:

1. From the DIAGNOSTICS menu, select **Tag Map Tracer**:

   The following page appears:

2. Click the following button (all buttons are disabled if no device(s) have been configured):

   The Trace Properties dialog appears:

3. From the Trace Properties dialog, view or specify the following options:

   - **Name**. Enter name of trace. Example: **NewTrace**

   - **Inbound Device**. Specify inbound data source (PLC to Gateway). Click to select device name.

   - **Outbound Device**. Specify outbound data source (Gateway to PLC). Click to select device name.

   - **Timespan** *n* **minutes**. Enter length of time trace is to run, in minutes. Example: **1**. Range **1-3**.

   - **Submit**. Saves changes on Gateway and exits.

- **Cancel**. Exits without saving changes on Gateway.

4. When you submit your selections, the new trace setup appears in the Trace Manager:

- To start a selected trace, click the following button:

The button changes.

- To stop the data trace in process, click the changed button:

- To download trace data, see Downloading Tag Map Data Traces.

3.13.2 Modifying Tag Map Data Traces

To modify a tag map data trace:

1. From the DIAGNOSTICS menu, select **Tag Map Tracer**:

The following page appears:

2. Select a data trace from the list.
3. Click the following button:

The Trace Properties dialog appears. Change information in the listed fields:

See Adding Tag Map Data Traces.

4. When finished making changes, click either of the following to exit:

- **Submit**. Saves changes on the Gateway and exits.
- **Cancel**. Exits without saving changes on Gateway.

3.13.3 Deleting Tag Map Data Traces

To delete a tag map data trace:

1. From the DIAGNOSTICS menu, select **Tag Map Tracer**:

The following page appears:

3. Select a data trace from the list.
4. Click the following button:

A confirmation dialog appears:
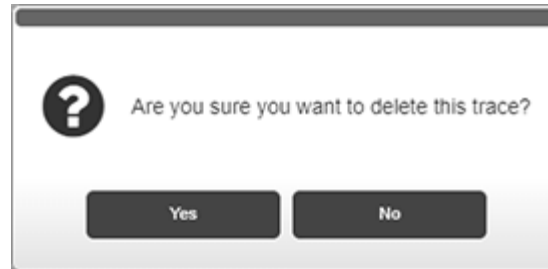
5. Confirm the deletion:
   - **Yes**. Deletes the selected data trace from the Gateway.
   - **Cancel**. Does not delete the selected data trace from the Gateway.

3.13.4 Downloading Tag Map Traces Data

You can download a tag map data trace to your personal computer or other storage location. Download is enabled only when the selected trace in the table has a **COMPLETE** status.

To download a tag map data trace:

1. From the DIAGNOSTICS menu, select **Tag Map Tracer**:

The following page appears:

2. Select a tag map data trace that has a **COMPLETE** status from the list.
3. To download the trace data to a storage device, click the following button:

The software informs you when the download is complete:
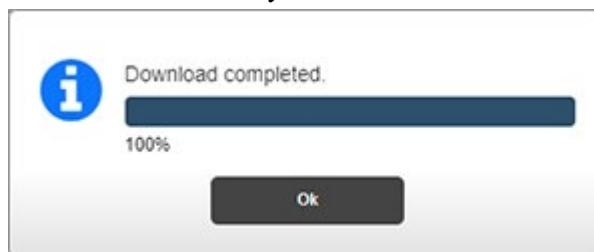
4.   Click **Ok**.

Depending on the browser, browser settings, and computer operation system, you may be prompted to choose your download location, or the exported file is downloaded to the Downloads directory.

3.13.5 Viewing Downloaded Tag Map Trace Data

To view data captured by a trace, you must first record a trace, then download the data to your personal computer for viewing with Wireshark, or text editing software. (See Downloading Tag Map Data Traces). Ethernet (.pcap) files can be viewed using Wireshark or similar third-party software. Serial files can be viewed with any text editor. This option is provided for engineering and support personnel familiar with serial data transmission.

Section 3.14 Viewing System Logs Information

The system logs contain a record of the events that occur as the Gateway runs. The logged information includes user interface connections, device connections, time updates, periodic system health reports, process level errors, and reboots. Error information that is generated at the protocol level is logged with the maximum information available to help diagnose issues.

If you reset the Gateway to factory defaults, all logs except the reboot log are deleted.

To view System Log information:

1.   From the DIAGNOSTICS menu, select **Logs**:

2.   View the following options:

- **Viewing Error Log Data**. Lists errors that have occurred on the Gateway.

- **Viewing Engineering Log Data**. Lists engineering events such as changes to Gateway processes that have occurred.

- **Viewing Reboot Log Information**. Lists data on Gateway reboots, including date and time and reason for reboot.

**Section 3.15
Viewing
Error Log Data**

Shows current Gateway error details. These are a subset of engineering log listings.

If the log contains more than one page of data, you can navigate through the pages using the provided buttons. These allow individual page, next or previous, and end or beginning of file selection. You can also enter a number in the **Page** field to go directly to a page in the log file.

When the log reaches 10 Mbytes in size, the log size is reduced to half the current size using first in, first out to reduce the size.

You may export up to 1000 lines of the log to a downloadable .csv file.

To view error logs:

1. From the DIAGNOSTICS menu, select **Logs**:

The Errors Log page appears:

2. View the following options.

    - **Date**. Lists time and date stamp associated with the error as

MM/DD/YYYY HH/MM/SS where *MM* is month, *DD* is day, *YYYY* is year, *HH* is hours, *MM* is minutes, and *SS* is seconds.

- **Module**. Lists firmware module associated with message.
- **Description**. Lists error description.

3. To refresh the snapshot of report information you are viewing, click the following button:

4. To export and download the error data to a storage device, click the following button:

The software informs you when the download is complete:
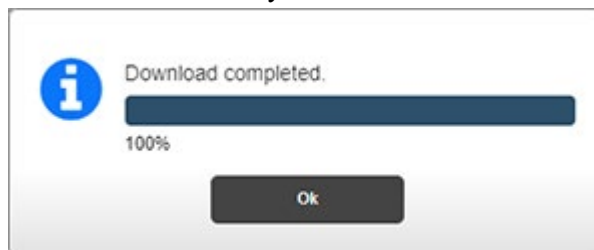
5. Click **Ok**.

Depending on the browser, browser settings, and computer operation system, you may be prompted to choose your download location, or the exported file is downloaded to the Downloads directory.

Section 3.16
Viewing Engineering
Log Data

Shows current Gateway engineering log details. This log is an overall look at Gateway operations including details about Gateway processes.

You can navigate through the pages using the provided buttons. These allow individual page, next or previous, and end or beginning of file selection. You can also enter a number in the **Page** field to go directly to a page in the log file.

When the log reaches 10 Mbytes in size, the log size is reduced to half the current size using first in, first out to reduce the size.

You may export up to 1000 lines of the log to a downloadable .csv file.

To view the Engineering log:

1. From the DIAGNOSTICS menu, select **Logs**:

The Errors Log appears:

3. From the drop down list, select **Engineering**:
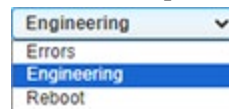
The following updated list appears:

View the following options:

- **Date**. Lists time and date stamp associated with the error as
  MM/DD/YYYY HH/MM/SS where *MM* is month, *DD* is day,
  YYYY is year, *HH* is hours, *MM* is minutes, and *SS* is seconds.

- **Module**. Lists firmware module associated with message.

- **Description**. Lists engineering message with description.

4. To refresh the information you are viewing, click the following button:

5. To export and download the engineering entry data to a storage device, click the following button:

The software informs you when the download is complete:
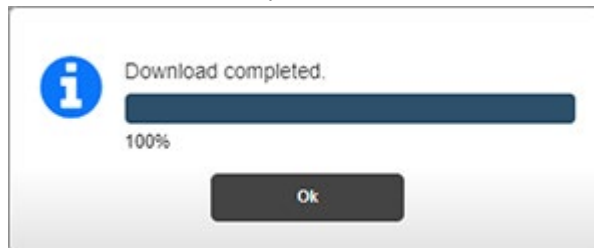
6. Click **Ok**.

    Depending on the browser, browser settings, and computer operation system, you may be prompted to choose your download location, or the exported file is downloaded to the Downloads directory.

Section 3.17 Viewing the Reboot Log

Lists messages logged during a reboot of the Gateway with the exception of a reboot caused by a loss of power. Power can be lost through a power outage, or by disconnecting the power cable from the GW (or the power supply), or by a wiring fault. When the Gateway experiences a power failure, it restarts once it has power again. During the restart, database integrity is also checked.

You can navigate through these pages using the provided buttons. These allow individual page, next or previous, and end or beginning of page selection. You can also enter a number in the **Page** field to go directly to a page in the log file.

When the log reaches 10 Mbytes in size, the log size is reduced to half the current size using first in, first out to reduce the size.

When a Gateway is reset to factory default settings, the Reboot log is retained.

You may export up to 1000 lines of the reboot log to a downloadable .csv file.

To view the Reboot log:

1. From the DIAGNOSTICS menu, select **Logs**:

The Errors Log appears:

2. From the dropdown menu, select **Reboot**:
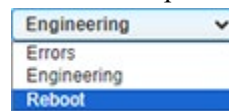
A list of messages triggered during each Gateway reboot appears:

3. View the following options.

    - **Date**. Lists time and date stamp associated with the error as *MM/DD/YYYY HH/MM/SS* where *MM* is month, *DD* is day, *YYYY* is year, *HH* is hours, *MM* is minutes, and *SS* is seconds.

    - **Module**. Identifies the RBOOT module.

    - **Description**. Lists reboot entry description.

The *refresh* button is disabled for the Reboot log as entries only get added to the log during a reboot:

4.   To export and download the reboot data to a storage device, click the following button:

The software informs you when the download is complete:
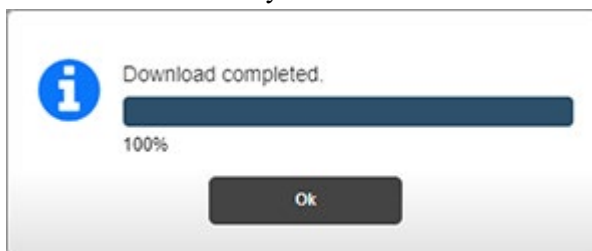
5.   Click **Ok**.

Depending on the browser, browser settings, and computer operation system, you may be prompted to choose your download location, or the exported file is downloaded to the Downloads directory.

Section 3.18 Performing Maintenance Tasks

You can reboot, backup Gateway data, update firmware, reset the Gateway to factory default settings, restore data, and upgrade protocols.

1.   To access maintenance options, mouse over the MAINTENANCE menu and select the option:

- Rebooting the Gateway
- Resetting the Gateway to Default Configuration
- Backing Up Gateway Data
- Restoring Gateway Data
- Updating Firmware
- Upgrading Protocols

3.18.1 Rebooting the Gateway

Restarts the Gateway. Rebooting is one of the steps to take if your Gateway does

not function correctly for any reason. Often, refreshing the browser will fix issues with the UI. If this does not fix the issue, rebooting is the next step to take. The reboot usually starts your Gateway with all services restored and running properly.

To reboot the Gateway:

1. From the **Maintenance** menu, select **Reboot**:

    The following dialog appears:
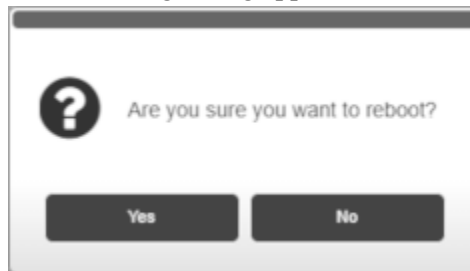
2. Confirm the reboot:

    - **Yes**. Reboots the Gateway and exits the Gateway user login.
    - **No**. Exits without rebooting the Gateway.

    The software reboots the Gateway:

    Once the Gateway has fully rebooted, the firmware lets you know when the connection is re-established.

3. Click **Ok**.

3.18.2 Resetting the Gateway to Default Configuration

Resetting a Gateway to its factory default configuration using the software removes all user-entered data that is on the Gateway. It does not affect the Protocol level of the device. If a device has been upgraded, a reset does not downgrade the level.

The Gateway reset to default returns the Gateway to its factory configuration settings as follows:

- The default device network configuration, including address set to Static IP address of **192.168.1.100**.

- Time is configured as **Manual**, **DST** unchecked, NTP update rate set to **1 Day**, NTP server address set to **Spectrum NTP 1**, GMT Offset set to **GMT-07:00 Mountain Time (US & Canada)**.

- Security is set to no MAC addresses entered, **Blacklist** selected, **Enabled** deselected; **Ping Allowed**.

- Login password is set to default value (**Spectrum**). User name (**admin**) is not editable.
- All devices, tag maps, and configured traces are removed, with the exception of $User device, and the $System device and its tags. Any tags added to the $User device are removed.
- User-configured Identification information is cleared.
- Tag Maps are removed.
- All trace files and logs are cleared, except for the Reboot log.

If the reset to default fails, try resetting the Gateway to factory defaults once more. If the reset still fails, the Gateway will be in an error condition. If this happens, call Technical Services for further help.

To reset the Gateway to factory default settings using software:

1. From the Maintenance menu, select Reset to Factory Defaults:

The following dialog appears
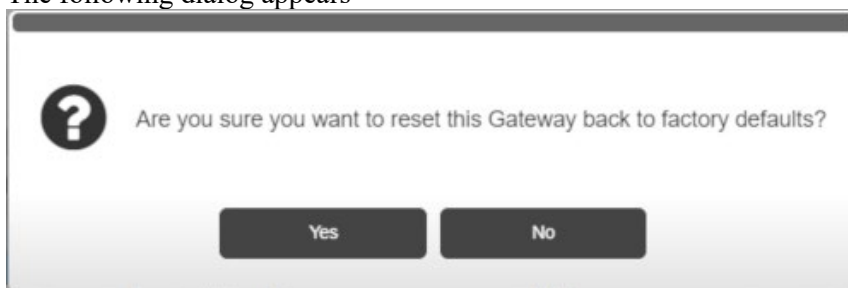
2. Confirm the reset:
   - **Yes**. Restores the factory default settings and exits.
   - **No**. Exits without restoring the factory default settings.
3. The software informs you when the reset is done and reboots the Gateway.

NOTE	You may also choose to reset the Gateway using the **Reset** switch on the Gateway front panel. Resetting the Gateway using the **Reset** switch provides two options. You can:
	• Retain its current configuration. To do so, insert a paper clip into the Reset switch on the Gateway and press gently and briefly, for 0-15 seconds. While pressing the button during the first 15 seconds, the display reads **Release for Reboot** alternating with **For Defaults Hold *xx*** sec. The *xx* is a countdown starting from 15. From 15 seconds on, the display read **For Defaults Hold *xx*** sec. Once the Gateway starts to reboot, it restarts all processes, and checks database integrity. If the database is missing or corrupt, a new default database is created. This allows you to log-in and restore a back-up.
	• Reset to factory defaults. Insert the paper clip and press gently for more than 15 seconds. From 15 seconds on, the display read **For Defaults Hold *xx*** sec. Once the Gateway starts to reboot, it restarts all processes, and checks database integrity. If the database is missing or corrupt, a new default database is created. This allows you to log-in and restore a back-up.
	• If the software does not respond to a reset or reset-to-defaults request via reset switch, you must cycle power by disconnecting and reconnecting the power cable.

NOTE	The Gateway may also become unresponsive if you double click the switch. You will need to cycle power.

3.18.3 Backing Up Gateway Data

We recommend that you regularly make a copy of all the data on your Gateway on a separate device, such as a personal computer or other storage device.

NOTE	If you are restoring a backup file from a Gateway running version 2.01 or older that includes a Modbus device with array tags that are longer than the length limits on the device to which you are restoring, you will have an invalid configuration and an invalid tag that needs to be corrected.

To back up your data:

1. From the **Maintenance** menu, select **Backup**:
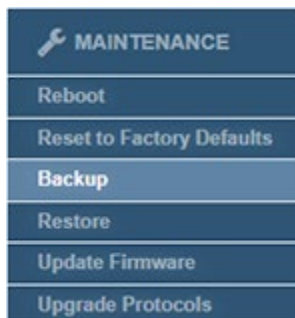
The following dialog appears:
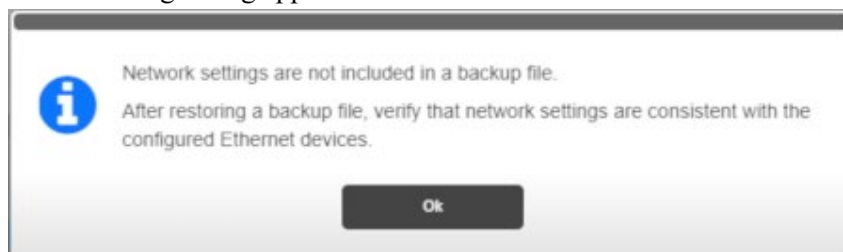
NOTE	When you back up your Gateway, if you have configured Ethernet Server devices, you may want to make a note of the current network configuration to keep with the backup file. If the network configuration of the Gateway to which you later restore the backup differs from the network configuration of the Gateway from which you saved the backup, your Ethernet Server devices may have unconfigured addresses after restoring.
	Similarly, if you restore the backup on a Gateway with a different network configuration, the IP addresses for other Ethernet devices may also be incompatible with the network configuration after the restore completes.

2. Click **Ok** to continue. The User Interface informs you when the backup and download are completed:
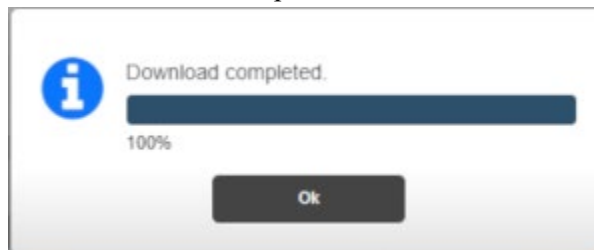
3. Click **Ok**.

   Depending on the browser, browser settings, and computer operating system, you may be prompted to choose your download location, or the exported file is downloaded to the Downloads directory.

3.18.4 Restoring Gateway Data

Restores a previous data backup on the Gateway. In order to restore to a Gateway, you must have a previous data backup file. See Backing Up Universal Gateway Data:

- During a Gateway restore operation, there is no change to the network configuration, the administrator password, or protocol level.

- You cannot restore the Gateway data using a backup saved from a non-Gateway-related device or from a P2 to a P1 Gateway.

- Restoring a P1 backup to a P2 device does not affect the P2 protocol level.

- Restoration from a backup containing Ethernet Server devices that have an IP address that is not currently available on the target Gateway results in the device address being set to **Unconfigured**. Any tag maps associated with the updated device are deactivated and cannot be reactivated until the device address is set to a valid network address.

- Restoration from a backup containing Ethernet Server devices that have an IP address, but that IP address exists on a different Network than the backup Network will change the Network ID for that device to the new Network ID for the target Gateway.

- Restoration from a P2 backup to a P1 device is blocked.

- If the backup contains one or more Ethernet Server devices where the IP address configured for a Ethernet server device in the backup exists in the network configuration for the Gateway that restored the backup, but the Network ID for that address in the backup differs from the Network ID for the address in the current network configuration, the Address field for the Ethernet server device will reflect the new Network ID.

- Model number, network configuration, including MAC addresses, the password, and serial number all remain the same as they were before the restore.

To restore a data backup:

1. From the **Maintenance** menu, select **Restore**:
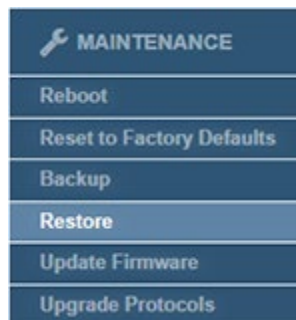
2. A file selection dialog appears. If necessary, navigate to the directory in which your backup files are located.

This directory can be on a personal computer drive or a network server:
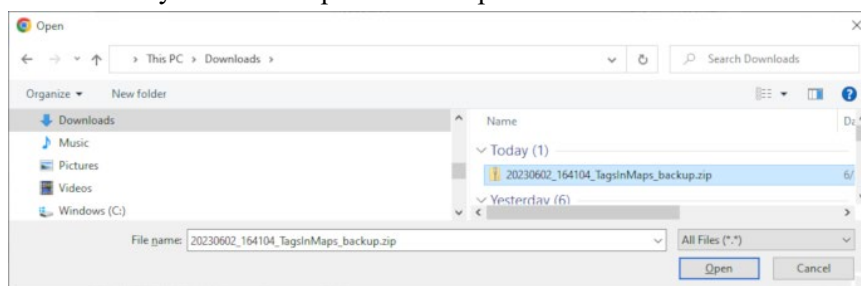
3. Select the correct file.

NOTE	If you are restoring a backup file from a Gateway running version 2.01 or older that includes a Modbus device with array tags that are longer than the length limits on the device to which you are restoring, you will have an invalid configuration and an invalid tag that needs to be corrected.

NOTE	Before you proceed with restoring your Gateway, the software informs you that restoration does not restore the network configuration that existed when you saved the backup you are about to use. If your backup includes Ethernet server devices, IP addresses that were configured on your Gateway when the backup was saved, but that are not configured on the Gateway to which you are restoring the backup, those addresses will be unconfigured after the restoration completes. All active tag maps using tags from devices with an unconfigured address are also deactivated. You will need to reconfigure the affected devices and possibly may have to reconfigure your network to ensure your tag maps function properly after restoration.
	To continue, click **Yes**:
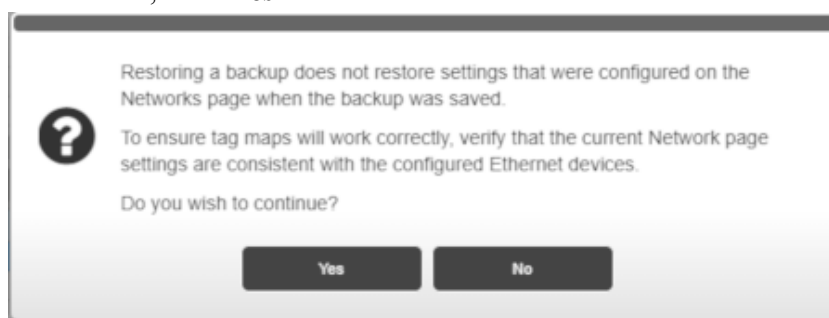
4. The software informs you that it is restoring the backup on the Gateway.

5. Once the Gateway has been restored and has rebooted, the firmware lets you know when the connection is complete:
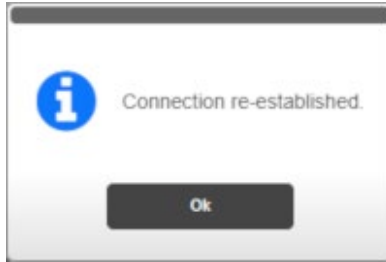
6. Click **Ok**.

The Gateway returns you to the same page you were on when you rebooted.

3.18.5 Updating Firmware

Replaces firmware on the selected Gateway. The firmware is the software that runs your Gateway. The update functions as follows:

- Replacing firmware does not change, replace, or delete your data or settings on the Gateway.
- You cannot install any 2.0*n.nnn* version of the software on a Version 1 Gateway.
- If the Gateway loses power during an update, the Gateway reboots normally to the previous firmware version when power is restored.
- You cannot install an earlier version of the firmware than the version currently present on the Gateway.
- You cannot install firmware for a different product or company (for example, the InView) on the Gateway.

NOTE	Before updating your Gateway, back up your existing database files. This provides a safety feature so that your data remains intact and can be restored if you encounter problems with the update. To back up your files, see Backing Up Gateway Data.

To update firmware:

1. From the Maintenance menu, select **Update Firmware**:
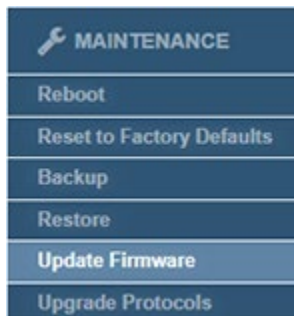
A file selection dialog appears.
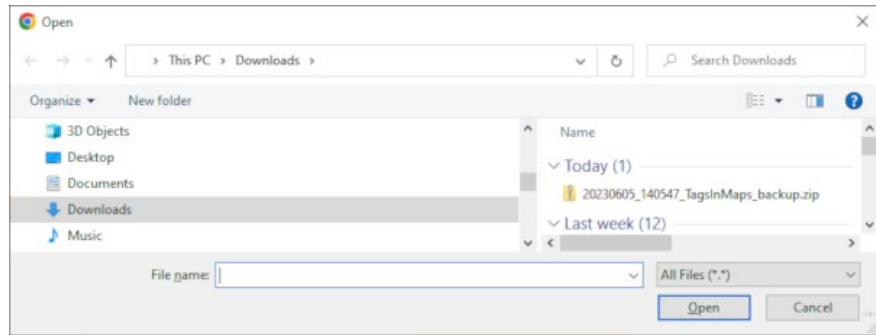
2. Navigate to the directory in which your firmware file is located. This directory can be on a personal computer drive or a network server. Select the correct file. Example: ***name_n.nnn.***tar.gz where *n.nnn* is the version. The software lets you know the upgrade has started and loads the selected firmware onto the Gateway:

The software also informs you about progress as it is installing the update:
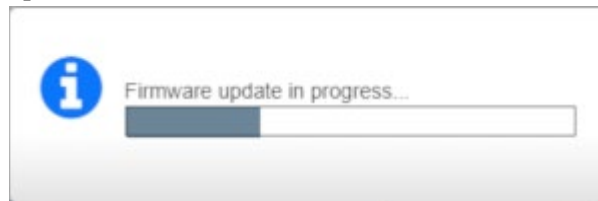
The software informs you when the update is completed and reboots the Gateway.

3. Once the Gateway has fully rebooted, you must log back in. The firmware informs you that the firmware update was completed:
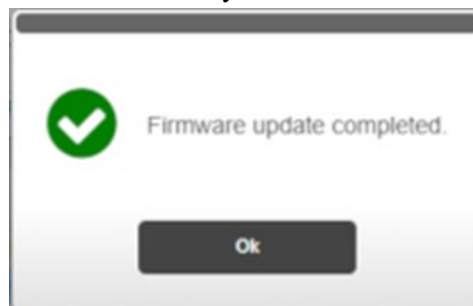
4. Click **Ok**. The software then returns you to the same page you were on when you rebooted.

3.18.6 Upgrading Protocols

Allows you to access additional protocols purchased with an upgrade. Models WP-G-222-P1/WP-G-242-P1 support Modbus ASCII, Modbus RTU, Modbus

TCP, Ethernet/IP, and EtherNet/IP-PCCC protocols. You may purchase an upgrade key to access DF1-PCCC, DF1-CIP, PPI Serial, and S7comm protocols.

NOTE	Before upgrading your Gateway using a key to allow you to access additional protocols, be sure to back up your existing database files. This provides a safety feature so that your data remains intact and can be restored if you encounter problems with the protocol upgrade. To back up your files, see Backing Up Your Gateway Data. If at any point you need to do a factory reset of your Gateway, your upgrade is retained.

To upgrade protocols:

1. From the Maintenance menu, select **Upgrade Protocols**:
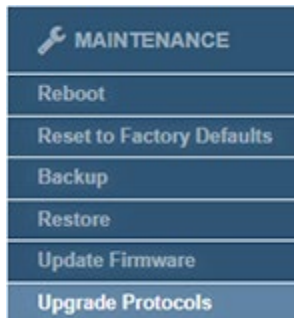
The following dialog appears:

2. You should already have provided your distributor with email and contact information, the MAC Address for your Gateway, and purchased the upgrade. To complete the upgrade, copy the 52-digit upgrade key you received into the **Upgrade Key** field.

3. Click **Submit**. The software informs you that the upgrade has started, and asks you to wait, informs you when the file is uploading, and when the upgrade is completed, then reboots the Gateway.

Section 3.19 Changing Password

To guard against unauthorized access to settings and log information, access is restricted by password. The Gateway allows you to change the password for the user interface. Passwords must use a minimum of 8 characters; a maximum of 63.

To change the password for accessing the module:

1. Click the following button:

The Change Password dialog appears:

2. View or specify the following options:

- **Current Password**. Enter the password you used to log onto the user interface.
- **New Password**. Enter the new password.
- **Confirm**. Re-enter the new password for confirmation.
- **Submit**. Saves the new password on the module.
- **Cancel**. Retains the current password without changing it.

3. **Submit**. Applies the new password.
4. **Cancel**. Cancels the change to the new password.

Chapter 4
Technical Reference

The technical reference contains reference material that provides greater detail about some of the Gateway functions than you find in the general body of the documentation.

Section 4.1
About Bit
Copying Operations

The software allows for copies between bit (BOOL) and other numeric types. Example: You may copy 16 BOOLs to an INT or vice versa. The copy from source to destination is treated as a byte copy operation; that is, both source and destination buffers are interpreted as contiguous arrays of untyped bytes. No type conversion is performed. The destination is initially set to all zeros. The following rules also apply:

- If source and destination are the same size, the entire source array of bytes is copied to the destination.

- If the source is smaller than the destination, all bytes of the source are copied to the destination with the remainder of the destination being set to zero. Bytes will be transferred to the low order portion of the destination.

- If the destination is smaller than the source, the low order portion of the bytes from the source is copied to the destination.

The following table contains examples of allowed copies from a source data tag of one data type to a destination of a different type. Strings are excepted. A string can only be copied when both source and destination tags are of the type STRING:

Source	Destination
INT[1]	BOOL[16]
BOOL[16]	INT[1]
SINT[4]	DINT[1]
DINT[1]	SINT[4]
REAL[1]	SINT[4]
SINT[4]	REAL[1]
INT[2]	DINT[1]
DINT[1]	INT[2]
REAL[1]	INT[2]
INT[2]	REAL[1]
DINT[1]	BOOL[32]
BOOL[32]	DINT[1]

Because no type conversion is performed, the value of the destination tag after a copy may not be what you expect. The following table assumes the same endianness for source and destination with no byte or word swapping:

- Single tag-single tag copies:

Source Type	Source Value(s)	Destination Type	Destination Value	Notes
Single tag to single tag copies				
Source and destination are the same size				
INT	-1 (0xFFFF)	USHORT	65535 (0xFFFF)	Source and destination are the same
USHORT	65535 (0xFFFF)	INT	-1 (0xFFFF)	Source and destination are the same
REAL	3.14159 (0x40490fd0)	DINT	1078530000 (0x40490fd0)	Source and destination are the same
DINT	1078530000 (0x40490fd0)	REAL	3.14159 (0x40490fd0)	Source and destination are the same
Source is smaller than destination (source is copied to the low order portion of the destination)				
SINT	13 (0x0D)	INT	13 (0x000D)	High-order portion of destination is unaffected (may not be zero)
SHORT	14440 (0x3868)	REAL	2.0235E-41 (0x00003868)	High-order portion of destination is unaffected (may not be zero)
Source is larger than destination (the low order portion of the source is copied to the destination)				
INT	46 (0x2E)	BOOL	0 (0x0)	Last (lowest order) binary digit of source is 0
REAL	2.71828 (0x402df84d)	SINT	77 (0x4D)	Low order byte is copied

- Array-to-array copies. The Gateway supports tag arrays as both source and destination tags in tag maps. Using arrays allows for faster tag copying:

Source Type	Source Value(s)	Destination Type	Destination Value	Notes
Array to array copies				
Source and destination elements are the same size				
INT[3]	-2, 15, 38 (0xFFFE, 0x000F, 0x26)	USHORT[2]	65534, 15 (0xFFFE, 0x000F)	Last element of source is not copied to destination
USHORT[2]	65534, 15 (0xFFFE, 0x000F)	INT[3]	-2, 15 (0xFFFE, 0x000F)	Last element of destination is unaffected
REAL[2]	101.125, 48.875 (0x42ca4000, 0x42438000)	DINT[3]	1120550912, 1111719936 (0x42ca4000, 0x42438000)	Last element of destination is unaffected
DINT[3]	1120550912, 1111719936 (0x42ca4000, 0x42438000)	REAL[2]	101.125, 48.875 (0x42ca4000, 0x42438000)	Last element of source is not copied to destination
Source elements are smaller than destination elements (multiple source elements are copied to each destination element)				
BOOL[8]	0, 1, 1, 1, 1, 0, 0, 1 (0x9E)	SINT[2]	158 (0x9e)	Last element of destination is unaffected
SINT[4]	123, 60, 77, -124 (0x7B, 0x3C, 0x4D, 0x84)	UDINT[2]	2067549572 (0x7b3c4d84)	Last element of destination is unaffected
Source elements are larger than destination elements (each source element occupies multiple destination elements)				
DINT[2]	3558942464, 3575719680 (0xD4212700, 0xD5212700)	INT[3]	9984, 54305, 9984 (0x2700, 0xd421, 0x2700)	Only low order bits of the second source element are copied to the destination
REAL[2]	15.0, 25.25 (0x41700000, 0x41ca0000)	BOOL[8]	0, 0, 0, 0, 0, 0, 0, 0, (0x00)	Only low order bits of the first source element are copied to the destination

- Single tag-to-array copies and array-to-single tag copies follow the same rules as array-to-array copies. The single tag is interpreted as an array of one element.
- String-to-string copies. Gateway only supports string array copies for EtherNet/IP and DF1-CIP protocols. String arrays are two-dimensional structures. A sequence of single characters forms a string, and a sequence of strings is arranged as a list. A sample string array from automation software for an EtherNet/IP device is provided below:

− strarray1		{...}	{...}	STRING[20]
+ strarray1[0]		'000'	{...}	STRING
+ strarray1[1]		'111'	{...}	STRING
+ strarray1[2]		'222'	{...}	STRING
+ strarray1[3]		'333'	{...}	STRING

Section 4.2 About Bools and EtherNet/IP CIP

NOTE	EtherNet/IP CIP does not support a Bool data type. For information on how to pass Bools (Bits), please see **Bools and EtherNet/IP CIP** below.

When creating tags that will be used for an EtherNet/IP server, it is important to remember two things with regards to messaging from an EtherNet/IP client (the Allen Bradley PLC) to a EtherNet/IP server (the Gateway).

First, the source and destination tags in the PLC's message instruction must be of the same type (you cannot message from an INT to a DINT for example).

Second, Bools are not a supported data type so if you need to pass a bit or bits, it must be packaged into a complete word (a SINT for example) and extracted after it has reached the PLC. Because of this, when creating a Bool tag in the Gateway, you are actually creating a SINT data file. When the Gateway is operating as a client and uses a Bool data type tag, it deals with the packing and unpacking of the bit (or bits) on both ends so there is nothing that needs to be done outside of that process.

However, when the Gateway is operating as a EtherNet/IP server, it does not unpack the bit(s) because the PLC can't read or write them, so the data type remains as a SINT. This means that when writing or reading bits to and from a Gateway EtherNet/IP server, the message instruction (CIP Data Table Read/Write) should be configured to use SINTs.

It is important to note that when bridging protocols within the Gateway, you can mix data types with the exception of STRINGS. For example, if you have a Modbus RTU device and you need to monitor the status of a coil, you can take the coil data (a Bool) and move it into a SINT, INT or DINT keeping in mind that it will be represented by bit 0 in the word it is moved to. The Gateway will also allow you to move an array of Bools into a single word. For example, if you have 5 Modbus Coils that need to be monitored, you can create a Bool array that is 5 elements long and move the array into a single SINT. Bits 0 through 4 will represent the 5 Bools in the order they are in the array. If you create an array that is longer than 8 Bools, but less than 17, the Gateway will create an INT instead of a SINT and likewise, if the array is longer than 16 Bools but less than 33, the

Gateway will create a DINT. This is important to remember because the data type that is created is what will need to be used in a message instruction from the PLC.

Section 4.3
About Copy Triggers

There is no user control over order of copy operations. However, all tags on a source device are read before any are written to the destination device.

NOTE	If you use an array tag as a trigger tag, be aware that the copy will only be triggered when the element at index 0 changes. Changes to other elements will not initiate a copy operation.

There are three types of triggers for the tag copy operation:

A Periodic Schedule. A copy action is executed periodically, with the period ranging from 1 millisecond to 1 day with the following restrictions:

- If the copy operation takes less than the period, the next copy operation begins as soon as the period expires, starting from the initiation of the previous copy operation. For example, if a period of 1 second is specified and the Tag Map cycle takes 100 ms, then the next cycle starts 900 ms after the completion of the copy operation.

- If the copy operation takes longer than the period, the copy operation completes as soon as possible and the next copy operation begins immediately. In this case, the tag map copy operation runs continuously.

The Time of Day Schedule. A copy action is executed at a specific time each day.

On Change. A copy action is executed when a specific tag changes value. **On Change** does not include a polling rate when the specified tag is an Ethernet Server tag. If a trigger tag belongs to an Ethernet Server device, the change in value is detected immediately without needing to poll. In all other cases, a change to the trigger tag is determined by polling the tag. Polling restrictions are:

- Polling applies to all client devices and to EIP Servers if the tag is an assembly object tag.

- The Gateway supports polling rates from **10 ms** to **1000 ms**.

- If an array is designated as a polling tag, the first element of the array is used as the trigger tag.

- If the **On Change** tag belongs to an EtherNet/IP device and is a 4C/4D tag or it belongs to a Modbus Server device, a direct event is used to trigger change notifications and polling is not required.

Section 4.4
About DirectNET
Addressing

Consult the user reference manual titled "DirectNET Reference Manual" from Automation Direct (Manual Number: DA-DNET-M). In addition, manual(s) for the specific programmable controllers (PLCs) that are involved should be consulted to obtain the V memory address cross references for the starting offsets and memory ranges for the particular data types being accessed.

The Gateway handles the details of the DirectNET communications described in the "DirectNET Host Communications Programs" portion(s) of the manual. In a few situations, such as when access to required memory types via V memory is not supported or V memory access isn't supported at all, understanding the format and encoding of the DirectNET/CCM/HostLink request header will prove beneficial. Variable memory/system data in these situations may still be accessed using the supported "DirectNet Reference Address" style of gateway tag addressing.

Gateway tag address notation for DirectNET/CCM/TI HostLink may be denoted in either of two supported formats. There is the most commonly used V memory addressing format with octal address values (V0 - V177777). This address notation supports access to most of the data types of DirectLOGIC products. Cross reference information is available in the previously mentioned documents.

For other situations and PLCs, there is the "DirectNet Reference Address" style, consisting of, in order, one or two HEX ASCII values for the DirectNET "Data Type"/GE "CCM Memory Type", a colon and finally the hexadecimal DirectNET Reference Address. Consult the DA-DNET-M manual appendix "Data Types and Memory Map" for the pertinent DirectLOGIC device for more details on what values to use for the "Data Type" and "DirectNET Reference Address".

Diagnostic Status Words are available for diagnosing errors that occur during data transfers. These are not accessible via V memory. They must be accessed by using the "DirectNet Reference Address" style of tag address. Consult available documentation for the given PLC as some may only support reads/writes of the entire collection of diagnostic words at a time or may ignore the beginning address/offset.

The DirectNET Reference Address for these Diagnostic Status Words is 39:0000, where 39 is the hexadecimal value for the ASCII code that represents the number 9 (HEX ASCII) and the offset zero in hexadecimal being the start of that data type's memory range.

Section 4.5
About Gateway
File Exports

The following table explains how Gateway names and identifies files that are exported. You can change the default names when saving the downloaded files.

File Type	Default File Name
Device Export File	Format: A time stamp of the form *yyyymmdd_hhmmss_* (the hour is given in 24-hour time). The unit name followed by an underscore if one is configured on the Identification page or just an underscore if there is no unit name. The constant string "Device_ The device name (for $System or $User, the dollar sign is replaced by a dash; spaces in the names are replaced by an underscore), followed by the extension ".zip".
Tag Export File	Format: The constant string "TAGS_". The device name, followed by the extension ".csv".
Tag Map Export File	Format: A time stamp of the form *yyyymmdd_hhmmss_* (the hour is given in 24-hour time). The tag map name followed by an underscore. The constant string "TagMaps.zip".
Logs Export File	Format: The unit name followed by an underscore if one is configured on the Identification page or "Gateway_" if there is no unit name. The log type (either "ERROR_", "ENG_", or "REBOOT_". A time stamp of the form *yyyymmdd_hhmmss_* (the hour is given in 24-hour time, followed by the extension ".zip".
Backup File	Format: A time stamp of the form *yyyymmdd_hhmmss_* (the hour is given in 24-hour time). The unit name followed by an underscore if one is configured on the Identification page or just an underscore if there is no unit name. The constant string "backup.zip".
Trace Download File	Format: A time stamp of the form *yyyymmdd_hhmmss_* (the hour is given in 24-hour time). The trace name followed by an underscore. The constant string "trace.zip".
Diagnostics File	Format: A time stamp of the form *yyyymmdd_hhmmss-* (the hour is given in 24-hour time). The unit's 12-digit base MAC address (without separators) followed by a dash. The constant string "snapshot.zip".

Section 4.6
About 1-Based
Addressing

One aspect of Modbus that generates a fair amount of confusion is the "Modbus Base X Addressing". There are two Base addresses, 1 and 0. Modbus addressing has two components to it, the physical memory location, which is where the data is actually kept in the device's memory, and the nomenclature (or logical) which represents the user interface. Because PLC memory is binary, its location for both Base 1 and Base 0 addressing always starts with a physical address of 0. However, with Base 1 addressing, the first memory location is represented with a "1". For example, the Holding Register 40001 represents the physical memory location "0" or the "first" register. With Base 0 addressing, register 40001 represents the second physical memory location which is location 1 (because the first location is 0). Refer to the following table:

Values are:

Base 1 addressing logical	40001	40002	40003	40004	40005
Base 0 addressing logical	40000	40001	40002	40003	40004
Physical location	0/First	1/Second	2/Third	3/Fourth	4/Fifth

Because different manufacturers will use different Base addresses, it is possible to find a scenario where one device is using Base 0 addressing while another is using Base 1. In situations like this, the Gateway allows you to set the type of addressing it will use when communicating with the device it is connecting to, Base 1 or Base 0. This allows you to set the correct address for the tag without having to use an offset.

Section 4.7
About Read/Write
Tag Errors

Read/Write tag errors are treated as follows:

- If an error occurs while reading from a device, both the source tag value and the destination tag value are displayed in the Live Tag Map Viewer as "{ERR}".
- If an error occurs while writing to a device, the Destination tag value is displayed in the Live Tag Map Viewer as "{ERR}"
- Whenever a tag cannot be read or written, an entry is also made to the error log.
- If copying for a tag map is triggered by a change in the value of a trigger tag and that tag cannot be read, no attempt is made to read either source or destination tags. If the trigger tag does not change value very often, it may be some time before the source and destination tags are processed. In either case, the software provides this information to the software user interface, which displays a triple dash for source and destination values instead of "{ERR}." This differentiates between not yet having attempted to read or write a tag and encountering an error when a read or

write is attempted. The current trigger tag value is provided to the software user interface using the same three values.

Section 4.8
About Tag Map
Data Traces

You may run tag map data traces for both Ethernet and serial devices. If you define an INPUT and OUTPUT trace for a single device, then only one trace will run. If you configure a trace with different inbound and outbound devices, the software records two separate trace logs for inbound and outbound traffic.

You may navigate away from the Diagnostics dialog while a trace is running. If you navigate away from the dialog, the Gateway software provides a menu bar user notification when data capture is complete. No notification is provided on the Diagnostics page.

The user interface provides status messages as follows:

- IDLE. Trace has not been run since last reboot. After a reboot, the status for all trace definitions is reset to IDLE.
- IN PROGRESS. Trace is currently running.
- COMPLETE. Trace has completed.
- ABORTED. Trace was stopped before the entire timespan elapsed.

If you reset to factory defaults, all trace logs are deleted.

The software automatically removes trace logs that are more than 10 days old.

Section 4.9
About Testing
Connections

The following information is provided to help you configure and troubleshoot protocol communication between external serial devices and the Gateway.

The tables contain information about each serial protocol and an ordered list of the settings that are attempted when you select the **Test Device Connection** button. This testing does NOT perform exhaustive parameter tests. Only the settings listed are attempted. Lines containing a list of settings for a given parameter are applied in the given order, from left to right. The final parameter of the entire parameter list for the given protocol is the one that will be incremented most often during the operation. In general, the baud rate remains consistent while checksum, where applicable, and word-size parameters (parity and stop bits) are changed more often. Once all combinations listed for the given serial protocol have been exhausted, the **Test Connection** option reports the result.

NOTE	Because of particular protocol implementations, a device connection test may fail, even though the device is configured correctly. If the device is online and running, you first reboot the device. If this doesn't help, you can configure a tag map and run it to verify that the device is configured correctly. If the tags values are not being copied correctly, you can check the error log to determine what errors might be occurring. You can also configure and record a trace to find clues to the solution of the problem.
	Rarely, the connection test may fail for a properly configured device even though the test has passed previously with the same configuration. In this case, be sure the device is online and running and then reboot the Gateway. This will generally allow the test to pass again.

4.9.1 Protocol Settings

DF1-CIP
User setting first and then...
Baud Rate: 19200, 38400, 9600
Parity: None, Even, Odd
Checksum: BCC, CRC
Stop Bits: 1
DF1-PCCC
User setting first and then...
Baud Rate: 19200, 38400, 9600
Parity: None, Even, Odd
Checksum: BCC, CRC
Stop Bits: 1
ModbusRTU
User setting first and then...
Baud Rate: 9600, 19200, 38400
Parity: None, Even, Odd
Stop Bits: 1
Word size: 8, 7
ModbusASCII
User setting first and then...
Baud Rate: 9600, 19200, 38400
Parity: None, Even, Odd
Stop Bits: 1

Word size: 8, 7
DirectNet/CCM/HostLink
User setting only
PPI
User setting first and then...
Baud Rate: 9600, 19200, 38400
Parity: None, Even, Odd
Stop Bits: 1

Section 4.10
Configuring Tag Data Types

When configuring tags (or 'named data') on the Gateway to associate them with the tags defined on connected devices, you must make sure that the:

- Data type in Gateway's tag properties form for the tag is the same as the data type of the corresponding tag on the PLC or other device.
- The address of the tag in the PLC or other device and the address in the tag properties form for the tag must match.

The following rules apply to tag definition:

- Tag names cannot begin with $. This character is reserved for system definitions that you may not change. If you try to create a tag with a $ in front of it, the name is not accepted.
- The tag name cannot match an existing tag configured for the same device. If you try to enter a tag name that already exists for the current device, the software will inform you that a tag with that name already exists.

Section 4.11
Array Length Limits

The Gateway supports user-defined array lengths. The minimum length is one; the maximum depends on the packet size for the protocol. In practice, this means the maximum is dictated by the combination of data type and protocol. Each array element must be the same data type, and the elements must be contiguous in controller memory. The firmware will enforce valid ranges by not allowing invalid ranges to be submitted, and by displaying the allowable Array Length for the data type. The length attribute specifies the number of elements to be read or written when a tag is configured as an array. For instance, a tag configured on the Gateway may refer to a device tag at address INT[1000], of which four elements are of interest, starting at offset 68th element. In this example, the tag address field would be entered on the Gateway as INT[67] (array elements use zero-based addressing) and the length field would be specified as 4.

Specifying an offset that would result in an operation that surpasses the controller defined length of the array results in truncation of the element transfer or an undefined behavior depending on the type of device/protocol in use.

The following table provides array length limit ranges for protocols supported on the Gateway:

Data Type	EIP-PCCC, DF1-PCCC	Ethernet/IP	DF1-CIP	Modbus	S7Comm, PPI	DirectNET, CCM, HostLink
SINT	N/A	1-480	1-216	N/A	1-100	N/A
INT/(U)SHORT	1-120	1-240	1-108	1-126	1-100	1-500
DINT/UDINT	1-60	1-120	1-54	1-63	1-100	1-500
REAL	1-60	1-120	1-54	1-63	1-100	1-500
BOOL	1-500	1-3840	1-1728	1-2016	1-100	N/A
STRING	N/A	1-45	1-4	N/A	N/A	N/A

Section 4.12
Endianness of Types

Devices may represent byte ordering of types which may not have a compatible representation on a target device. The Gateway supports optional tag level markup to provide for an endianness transformation as shown in the table below. Byte and word swapping are performed for source tags as soon as they are read, and for destination tags just before they are written to the device. In addition to native types such as WORDs and DWORDs, STRINGS (array of characters) are also byte/word swappable.

Declaring that a tag value should be BYTE and/or WORD-swapped allows you to control swapping at the tag level, instead of at the device level, for all protocols.

You may combine BYTE_SWAP and WORD_SWAP to form one of four options:

Bit Field	Action
NO_TRANSFORM	Straight copy
BYTE_SWAP	Swap 2 bytes within each word
WORD_SWAP	Swap 2 words within each double word
BYTE_SWAP and WORD_SWAP combined	Combine swapping 2 bytes within each word with swapping 2 words within each double word, that is, apply both transform operations.

BYTE_SWAP is defined as interchanging the two bytes of every word.

Source	Destination
0×12345678	0×34127856

WORD_SWAP is defined as interchanging the two, 16-bit words out of every double word.

Source	Destination
0×12345678	0×56781234

BYTE_SWAP and WORD_SWAP may be used at the same time.

Source	Destination
0×12345678	0×78563412

Values of type **STRING** (array of characters) are also byte and word swappable.

Section 4.13
Gateway Messages

The following list contains messages you may encounter when setting up and using your Gateway. Messages are listed in the Error logs. User messages may be logged in the User log or appear only on a Gateway software dialog.

Message	Possible Cause/Fix
Address is missing offset. Format is: *tagAddress[offset].*	Tags configured as part of an Array must have the Offset to define the first tag in the array. If "Is Array" is checked the Offset must be configured. Add the Offset to the Tag address or uncheck the "Is Array" box if the Tag is not part of an Array.
After changing the protocol of this device, the array length of the following tag(s) will be invalid for the new protocol: *tag_list* You will need to change the array length of [this tag] [these tags] before using [it] [them] in tag maps. Continuing will deactivate the following tag map(s): *tag_map_list* Do you wish to continue?	If you have an EIP device with array tags with too many elements to be supported by CIP, and you change the protocol from EIP to CIP, those array tags will be invalid for the new protocol. If any of the tag maps are active, you will see a follow-on message letting you know those tag maps will be deactivated (become invalid).
A later update is already installed on this Gateway. Update will not occur.	You selected an update file with a version earlier than the version currently installed. You can only install later firmware versions than the current version on the Gateway.
An error occurred during download process.	The error occurred during a backup or export operation because: - Power was interrupted during the download. - The network connection to the Gateway was broken during the download. - The unit has a failure that requires repair. - Confirm the power source is adequate and stable. - Confirm the network connection is stable. Whenever possible connect directly to the Gateway rather than across a network. - Contact Customer Support (if all other items are ruled out).

Message	Possible Cause/Fix
An error occurred during upload process.	The error occurred during an import or restore operation because: • Power was interrupted during an import or restore operation. • The network connection to the Gateway was broken during the upload. • The unit has a failure that requires repair. • Confirm the power source is adequate and stable. • Confirm the network connection is stable. Whenever possible connect directly to the Gateway rather than across a network. • Contact Customer Support (if all other items are ruled out).
Are you sure you want to delete MAC *'xx:xx:xx:xx:xx:xx'*?	If you select 'Yes', the table row is deleted. If the deletion leaves the table empty, the Blacklist/Whitelist controls revert to their default status.
Are you sure you want to delete this *item name*?	To delete the selected item, confirm the deletion. Items include devices, tags, tag maps, and traces.
Are you sure you want to reboot?	The Gateway will be rebooted if you choose to continue.
Are you sure you want to reset this Gateway's configuration back to defaults?	When you reset the Gateway to its default configuration, all data you have added is deleted, and the Gateway is restored to its factory configuration.
Are you sure you want to delete [this tag | these tags]? Deleting this [this tag | these tags] will invalidate one or more tag pairs in the following tag map(s). You will not be able to activate this (these) tag map(s) until the invalid pairs are removed or reconfigured. *tag_map_list* Continuing will deactivate the following tag map(s): *active_tag_map_list*	This series of messages appears when you select a tag for deletion. If the tag is part of a tag pair in a tag map, the firmware informs you that this is the case and lets you know which tags map(s) are involved and that they will be deactivated upon deletion of the tag.
Are you sure you wish to remove the last address in Whitelist mode? This will result in a reset to Blacklist mode.	You can choose to add another MAC address row, or to return to default Blacklist mode. In either case, the 'Enable' check box will be unchecked, so neither blacklisting nor whitelisting will be in effect.
Blank spaces are not allowed.	Remove blank spaces from password.
Both the source and destination tags are missing for *x* tag pair(s).	If you have a tag pair missing both a source and destination tag you see this message with the missing tags identified.

Message	Possible Cause/Fix
Cannot perform device connection test. The following active tag maps use tags on the device: *active_tag_map_list* These tag maps must be deactivated before the connection test can be run.	When testing a device that is connected with a serial connection and the device has tag(s) in an active tag map, you see this message. Deactivate the tag maps and re-run your test.
Changing the address of Network *x* will change the IP address for the following device(s) to *new_ip_of_network_x*: *device_list* Do you wish to continue?	This message is applicable only to one or more Networks bound to Ethernet server device(s) to a different static IP.
Changing the protocol on this device will result in the deletion of its tag(s). Do you wish to continue? Deleting this tag will leave missing trigger tag and/or incomplete tag pairs in the tag map listed below. You will not be able to activate this tag map until you replace the deleted tag and/or remove incomplete tag pairs. *tag_map_list* Continuing will deactivate the following tag map(s): *active_tag_map_list*.	Before continuing, be sure that deleting all tags on your PLC is what you wish to do. If you continue, you will also see a follow-on message that any active tag maps will be deactivated.
Changing this data type will invalidate one or more tag pairs in the following tag [map|maps]: *[tag-map-list]* Tag values cannot be copied between string and non-string tags. To change the data type of this tag, you will first need to delete any tag pairs that include it.	You see this message if the data type of a tag of type STRING that is currently used in a tag map as a source or destination is changed to a non-string type, or if the data type of a tag of a non-string type that is currently used in a tag map as a source or destination is changed to STRING (whether the tag maps are active or not)

Message	Possible Cause/Fix
Configuring Network *x* to use a DHCP address will set the IP address for the following device(s) to Unconfigured: *device_list*	This message is applicable only to a Network *x* where the Address field for Ethernet server device(s) is set to the IP address configured for the Network before the change. If you are changing the Network from a Static IP address to DHCP, the IP address for the devices in the list will be set to **Unconfigured**. 'Network *x* is the Network ID of the Network being changed. The *device_list* includes all Ethernet server device(s) configured to use that Network.' If the affected devices have tags used in tag maps, the initial message is followed by the following message 'The following tag map(s) use(s) tags from [this |these] device(s). This (these) tag map(s) will be invalidated. *tag_map_list*' Do you wish to continue?
Connection Lost.	• Power to the Gateway was interrupted. • The network connection was interrupted. • A process crashed. • Confirm a stable power source is connected to the Gateway. • Confirm the network connection between the Gateway and PC. If possible, connect directly to the Gateway (rather than going through a network). • Change the address used to access the Gateway in the web browser's address bar. • Confirm the PC's subnet mask matches the current subnet mask of the Gateway.
Connection re-established.	The user interface tries to re-establish the connection, with a series of informative messages letting you know what is happening. This message lets you know that the graphical user interface was able to re-connect to the Gateway. No further action required.
Continuing will deactivate the following tag maps: *active_tag_map_list* Do you wish to continue?	If a device has tags in one or more active tag maps and you modify the device by changing the protocol to another protocol in the same family or by changing any other property other than the device name, the tag maps will be deactivated if you continue.
Continuing will deactivate the following tag maps: *tag_map_list* Do you wish to continue?	If a device has tags in one or more active tag maps and you modify the device by changing the protocol to another protocol in the same family or by changing any other property other than the device name, the tag maps will be deactivated if you continue.

Message	Possible Cause/Fix
Could not create Trace package.	A Data Trace that is older than 10 days was selected to start, or the file was deleted or corrupt. You see this message most often when there is no trace file. That can happen because it is older than 10 days and has been removed, In that case, the solution is to re-run the trace. It can also happen because there is no traffic to be recorded, so there is no file created during the trace. This will happen if the device(s) selected as inbound and outbound devices have no tags in an active tag map. If the devices have tags in an inactive tag map, the solution is to activate at least one tag map that copies one or more tags on the device(s) selected as incoming or outgoing.
Current password is incorrect.	The entered password is compared to the current password (case-sensitive). You see this message if they do not match. Re-enter the correct password.
Deleting this device will invalidate one or more tag pairs in the following tag map(s). You will not be able to activate this (these) tag map(s) until the invalid pairs are removed or reconfigured. *tag_map-list* Continuing will deactivate the following tag maps: *active_tag_map_list* Are you sure you want to delete this device?	You see this message if the device has one or more tags currently being used in at least one tag map.
Deleting this tag will leave a missing trigger tag and/or incomplete tag pairs in the tag map listed below. You will not be able to activate this tag map until you replace the deleted tag and/or remove incomplete tag pairs. *tag_map*. Are you sure you want to delete this tag?	To fix the issue, replace the tag you are deleting or remove the second tag of the tag pair.
Destination *tagName* is missing a source.	You will need to fix incomplete tag pairs.
device name already exists.	You are trying to enter a name for a device that already exists on the Gateway. Use a different name. NOTE: Case is insignificant. 'mydevice' is the same as 'MyDevice'.
Duplicate tag names are not allowed. The following tag names already exist: *tag_list* These tags will be stripped from the import list. Do you wish to continue?	Remove the duplicates or allow them to be stripped from the file. If you select 'Yes', and all tags are stripped from the file, you see a status message 'Nothing to Import'. If only some of the tags are removed, you see a status message 'Tags were successfully imported'. NOTE: Case is insignificant. 'mytag' is the same as 'MyTag'.

Message	Possible Cause/Fix
Duplicate tag names are not allowed. The following tag names are duplicated within the import file: *tag_list* To fix this problem, open the file in a text editor and delete the duplicate tags.	Case is insignificant. 'mytag' is the same as 'MyTag'. Remove the duplicate tags from the import file and try again.
Each IP address octet must be between 0 and 255.	Check your IP address and enter the correct value. Valid characters are 0-9 and period (.)
Error: 'Backup is from a Standalone device'. Gateway will reboot.	The selected file is not a valid Gateway back-up file. Select a valid Gateway back-up file. If the restore cannot be completed, the operation is aborted, and you may continue with the current session without needing to reboot.
Error: 'Backup is from an InView device'. Gateway will reboot.	The selected file is not a valid Gateway back-up file. Select a valid Gateway back-up file. If the restore cannot be completed, the operation is aborted, and you may continue with the current session without needing to reboot.
Error: 'Cannot restore a -P2 backup to a -P1 Gateway'. Click 'Ok' to continue.	The incorrect backup file was used to restore a Gateway's configuration. P2 Gateway back-up configuration cannot be restored onto a P1 Gateway. Use a backup file that corresponds to the protocol level of Gateway you are attempting to restore.
Error: 'Downgrade not supported' during upgrade. Gateway is still running.	An older firmware version than what is currently in the Gateway was used as a firmware update. Confirm the current version of firmware and use a firmware version that is newer (higher in number) to do the firmware update.
Error: 'File is not a valid Gateway backup.' Click 'Ok' to continue.	You tried to use an invalid file type to restore the Gateway. Confirm that the backup file needed to restore the configuration of the Gateway is of the correct type and for the version of Gateway being restored.
Error: 'Invalid or corrupt archive detected'. Operation canceled.	The selected file is not a valid Gateway back-up file. Select a valid Gateway back-up file. If the restore cannot be completed, the operation is aborted, and you may continue with the current session without needing to reboot.
File "filename" is not a Gateway update file.	The incorrect product type firmware file was selected to upgrade the Gateway's firmware. Locate and use a firmware update file for a Gateway.
Gateway cannot act as a server for multiple devices at the same IP address and TCP Port number.	You see this message when the Gateway role is Server, and the gateway is already acting as the server for another device with the same IP Address and TCP port number. You can change either the port number or the IP address or both.

Message	Possible Cause/Fix
Gateway cannot act as a server for multiple devices on the same port.	You see this message if server is selected, and Gateway is already acting as a server for another device on the same port. You will have to remove the server setting for the previous device if you wish to have the Gateway act as a server for the newly selected device.
Gateway is already at the requested protocol level	You cannot upgrade a Gateway that already has all the protocols available.
Gateway is now rebooting	If you have just changed the Gateway's IP address and submitted the change you will need to log back in.
Insufficient disk space to perform the update.	The disk does not have enough disk space left to install the update. Create a backup, reset to defaults, update, then restore the backup.
Invalid characters: *invalid_character_list.*	Do not use these characters as part of a text entry. Invalid characters are listed in the message.
Invalid IP.	An invalid IP Address format was entered. Address must have four octets, with each IP address octet between 0 and 255, 0-9 and period, 1-3 digits, and 0-255 value.
Invalid MAC address.	An invalid MAC Address format was entered. Address must have six octets entered as two-digit hexadecimal values, separated by either dashes or colons. You cannot mix dashes and colons in a single address. Octet must be exactly two digits, preserve leading zeroes, and be 0-9, a-f, A-F. Values must be entered as 00 to FF. Locate the correct MAC Address of the device you are adding to the black or white list, and enter it using the correct format.
Invalid upgrade key.	The upgrade key entered is not valid. Confirm the key entered is what was sent for the upgrade. If it matches, contact technical support.
MAC_address already exists.	You cannot enter a duplicate address.
Maximum length of *limit* characters has been exceeded.	You have entered/pasted too many characters in the field. Reduce the number of characters to at or below the maximum (0-63 characters for text inputs, 0-200 for a text area).
Must be between 1 and *upper_bound.*	Allowed periodic range values must be between 1 and the listed upper range for the period. Valid ranges are: 1-1000 milliseconds, 1-60 seconds or minutes, 1-24 hours, 1 day or 1-3.
Must be between *lower_bound* and *upper_bound.*	Enter a value within the specified range.
Name already exists.	Either delete the existing tag, device, tag map, and trace or change the name.

Message	Possible Cause/Fix
name cannot begin with $.	The $ is reserved. Only Gateway system device names start with this symbol. ($ is a reserved symbol used as a prefix for Gateway System variables).
Networks cannot share the same subnet. The following Networks are in the same subnet: *network_list*	Multiple IP addresses are on the same subnet. This is not a valid configuration. If there are two or more networks configured with the same or overlapping subnets, further messages with the invalid addresses are listed.
Network settings are not included in a backup file. After restoring a backup file, verify that network settings are consistent with the configured Ethernet devices. If you are restoring a backup from a previous release, the length of Modbus array tags may be invalid after restoring. If so, you will need to correct the length of such tags before you can activate tag maps that use them.	The backup file has no network settings. Check your network settings before proceeding. You also need to ensure that if you back up the file onto a different Gateway that the network settings are configured correctly for that Gateway. If a backup from a previous release is restored to a 2.02 GW, the array lengths for Modbus tags may be too long for the max lengths for 2.02. Specifically, any data type but BOOL could have an array length up to 500 elements, but the current max lengths are less than 500.
New password cannot be *default_password.*	Enter a different password. Do not lose track of the password. The only way to recover from a lost password is to do a factory reset.
New password cannot be the same as the old.	You cannot use the default password as the new password.
No tags are selected for copying.	A tag map must have at least one source/destination tag pair. You will need to add a tag pair before you can save the tag map.
Nothing to import.	The Tag file that was selected for import does not contain any data or contains data for tags that are already configured. Edit the Tag file with the correct format and usable data.
Only one user at a time may be connected to Gateway. Another user is currently logged in and will be logged off after 30 minutes of inactivity.	You will have to wait until the user logs off or contact the user to log out so you can log on. If another user has logged onto a Gateway, and you try to log on, you see this message.
Password and Confirmation do not match.	Ensure the entries in both fields match exactly.
Password must be at least eight characters.	You entered a password with fewer than eight characters. Use a minimum of eight characters for the password.
Poll *deviceName.tagName* for changes every *x* ms.	This text applies to a Client device to which the defined trigger tag belongs.
Polling rate must be between 10 and 1000.	You entered a polling rate outside the limit. Change the rate to within the stated limits.
Protocol upgrade complete. Gateway is now rebooting.	If the key and requested upgrade level are valid, the upgrade is completed and the Gateway reboots.

Message	Possible Cause/Fix
Reconnecting...	The user interface tries to re-establish the connection, with a series of informative messages letting you know what is happening.
Removing Network *x* will set the IP address for the following device(s) to Unconfigured: *device_list*	This message appears if you remove all ports from one or more Networks bound to Ethernet Server device(s). If the affected devices have tags used in tag maps, the following message appears in the confirmation message: 'The following tag map(s) use(s) tags from [this |these] device(s). This (these) tag map(s) will be invalidated. *tag_map_list'* 'Do you wish to continue?'
Reset completed. IP address has been changed to 192.168.1.100. Gateway is now rebooting. Please connect to the Gateway at the new address in a few minutes.	Log back in when the reboot is complete.
Restoring a backup does not restore settings that were configured on the Networks page when the backup was saved. To ensure tag maps will work correctly, verify that the current Network page settings are consistent with the configured Ethernet devices. Do you wish to continue?	During restoration, there is no change to network configuration or administrator login or password keys. You should still check your network settings to make sure that they are the same as they were when the backup was saved. Otherwise, you may need to update addresses for the Ethernet devices that are configured after restoring.
Session has expired due to inactivity.	If you log in, but do not interact with the user interface for 30 minutes, the system logs you out. Log back in.
Source *device name tag name* is missing a destination.	You will need to repair or remove incomplete tag pairs.
Source *tagName* is missing a destination.	You will need to repair or remove incomplete tag pairs.
*Tag map(s) is/are currently active and will be deactivated. Do you wish to continue?	You see this message if you are modifying a device, the Address field is set to Unconfigured, and the device already has tags used in tag maps. The message will include a list of the affected tag maps. If any of these tag maps is active, its name will be followed by an asterisk and the tag map will be deactivated.
Tag name cannot begin with a '$'.	The "$" is reserved for system and user tags.
Tag names cannot start with a dollar sign or contain commas or periods. The following tags have invalid names: *tag_list* These tags will be stripped from the import list. Do you wish to continue?	You see this message because you tried to enter a tag name that begins with the symbol. Either fix the tag name or accept that the incorrect tags will be removed from the file.

Message	Possible Cause/Fix
Tags were successfully imported.	No further action needed.
The allowable Array Length for *dataType* is 1-*upperLimit.*	Array length range is determined by protocol and datatype. You see this message if you enter an invalid length. To determine allowable array lengths for protocol data types, see Array Length Limits Enter a valid length.
The array length for the following tags is invalid: *tag_list* These tags will be stripped from the import list. Do you wish to continue?	Fix the array lengths before continuing.
The change to port *x* will affect other devices sharing this port. This includes the following device(s): *device_list* Do you wish to continue?	You are attempting to change a shared serial port with one or more additional devices. If tags on any of the devices using the port are used in one or more active tag maps, the firmware will restart the affected tag maps.
The following device(s) have an unconfigured IP address: *device_list* This has invalidated the following tag map(s): *tag_map_list* You will not be able to activate this (these) tag map(s) until you reconfigure the affected device(s). You should verify the connection of all devices to ensure that tag maps will work correctly.	If any Ethernet server devices in the backup were bound to a Network that is not configured on the target Gateway or were bound to a Network that is using DHCP on the target Gateway, the address for these devices will become unconfigured.
The following lines are missing a tag name: *line_number_list* These tags will be stripped from the import list. Do you wish to continue?	You will need to either to fix the missing name or accept the stripped line.
The following lines contain invalid characters: *row_num1*: *invalid_chars_list* *row_num2*: *invalid_chars_list* *...* *row_numn*: *invalid_chars_list* They will not be imported. Do you wish to continue?	Either fix the rows by removing invalid characters or accept that rows with invalid characters will not be imported.

Message	Possible Cause/Fix
The following lines do not have six columns defined: *row_num1*: *tag_name_or_blank* *row_num2*: *tag_name_or_blank* *...* *row_numn*: *tag_name_or_blank* These tags will be stripped from the import list. Do you wish to continue?	You will have to modify your import file to match the required number of columns or accept that the affected tags will not be imported. If all tags in the file have only four columns, the file will be interpreted as having been exported from a 1.0 Gateway. A message will ask you to confirm whether you wish to convert this file to a compatible file for your device. To convert, select 'Yes'. To cancel the conversion, click 'No'. Two columns with a value of zero (0) are added to the file.
The following ModbusTCP device(s) have an unconfigured IP address: *device_list* This has invalidated the following tag map(s): *tag_map_list* You will not be able to activate this (these) tag map(s) until you reconfigure the affected device(s). You should verify the connection of all devices to ensure that tag maps will work correctly.	If any ModbusTCP server devices in the backup were bound to a Network that is not configured on the target Gateway or were bound to a Network that is using DHCP on the target Gateway, the address for these devices will become unconfigured. You will need to reconfigure the device address(es) and possibly the Network configuration.
The following tag pair(s) [is] [are] incomplete: *tag_pair_list* The incomplete tag pair(s) will be removed. Do you wish to continue?	A tag pair is complete only when both source and destination tags are specified (non-blank). The rest of the message you see is based on whether a source tag, destination tag, or both tags in a tag pair missing. Complete the pairs or delete the entries.
The following tags have a data type that is not supported by the protocol of the current device: *tag_list* These tags will be stripped from the import list. Do you wish to continue?	You will have to modify your import file to remove these tags, add a valid data type to the file, or accept that the tags with a missing datatype will be stripped from the file.
The following tags have a missing data type: *tag_list* These tags will be stripped from the import list. Do you wish to continue?	You will have to modify your import file to remove these tags, add a valid data type to the file, or accept that the tags with a missing datatype will be stripped from the file.
The following tags have a name or address longer than 63 characters or a description longer than 200 characters: *tag_list* These tags will be stripped from the import list. Do you wish to continue?	Reduce the name or address to below the specified limit.

Message	Possible Cause/Fix
The following tag(s) have an invalid array length that must be corrected. *tag_list*	Correct the array lengths.
The Gateway is already at the requested protocol level.	You are trying to upgrade a Gateway that already has the upgraded protocols.
The gateway address for Network *x* is not on the same subnet defined by the IP address and subnet mask.	This is an invalid Gateway address. Enter a gateway address that is on the same subnet defined by the Gateway IP address and subnet mask.
The gateway address is not on the same subnet as defined by the IP address and subnet mask. Do you wish to save this configuration?	The gateway address must be on the same subnet.
The IP addresses configured for Network *x* and Network *x* cannot be in the same subnet.	You may not submit a network address on the same network as the already configured network address.
The IP address for the following Network(s) must be private: *network_list* Private IP address ranges: Class A: 10.0.0.0 to 10.255.255.255 Class B: 172.16.0.0 to 172.31.255.255 Class C: 192.168.0.0 to 192.168.255.255	You entered a public IP address for the static IP address. Addresses must be private.
The MAC address is incorrect.	You are entering a MAC address that is not valid.
There are incomplete tag pairs: *missing_tag_message_list*	Complete the tag pairs before submitting the map. Each pair must have a source and destination tag. The error message lists all the missing pairs, in order of appearance in the table.
There was an error contacting the NTP time server.	Either select a different server option, enter the IP address or name of an NTP server, or click 'Submit' to see if you can now contact the server.
The selected .csv file appears to be formatted for an earlier version. Importing will uncheck all Word Swap and Byte Swap check boxes. Do you wish to continue?	If you choose to proceed, two columns with the value '0' (indicating 'no swap' will be added each tag in the file before importing.
The selected Tag Map cannot be activated. It references a tag that does not exist.	Check your tag map and fix the missing tag issue before trying to activate the tag map. If the device associated with the tag has been deleted and the device is configured as in Inbound or Outbound device for any traces, associated trace(s) are also deleted.

Message	Possible Cause/Fix
The selected Tag Map cannot be activated. It references a tag that does not exist. The tag map references one or more tags belonging to (a) device(s) with an unconfigured IP address. *device_list*	The selected tag map is invalid because it uses one or more tags that belong to an Ethernet server device for which the Address field is set to Unconfigured, either in a tag pair or as a trigger tag. The affected devices are listed in the device list.
The selected Tag Map cannot be activated. The tag map references one or more tags that have an invalid array length.	The selected tag map is invalid because it uses one or more tags with an invalid array length.
The selected Tag Map cannot be activated. The tag map references one or more tags that have been deleted. *device_list*	The selected tag map is invalid because it contains deleted tags and uses one or more tags that belong to an Ethernet server device for which the Address field is set to Unconfigured, either in a tag pair or as a trigger tag. The affected devices are listed in the device list.
The selected update is not valid for this model.	You attempted to install a firmware update for a different company on your Gateway. Select the correct firmware update version for your company.
This change will affect all devices using this port: *device_list* Do you wish to continue?	You see this message if you made a change to any field that is valid for the protocol(s) of all the other device(s) sharing the port, no other field values will be affected, and you submit the change. If, however, the new field value is invalid for the protocol(s) of any of the other device(s) sharing the port, the affected field will be disabled. For example, if a ModbusRTU and a PPI device share a port, the Data Bits field must be 8. In this case, when the Serial Port Setup form is opened, the Data Bits field displays 8 and is disabled.
This change will invalidate one or more pairs in the following tag maps. Changing this data type would create one or more tag pairs with both a string and non-string tag. To change the data type of this tag, you must first delete any tag pairs that include it. The following tag maps use this tag: *tag_map_list*.	You see this message if the data type of a tag of type STRING that is currently used in a tag map as a source or destination is changed to a non-string type, or if the data type of a tag of a non-string type that is currently used in a tag map as a source or destination is changed to STRING (whether the tag maps are active or not).
This change will invalidate one or more pairs in the following tag maps. You will not be able to activate these tag maps until the invalid pairs are removed or reconfigured. *tag_map_list* Do you wish to continue?	You are attempting to delete a device with an active tag map. If you go ahead and delete the device, all existing tags for the device are deleted, and no longer displayed in the Tags table. In tag map(s) containing the tags, the tags are listed as blanks. Affected tag maps are also deactivated. If the device is configured as an Inbound or Outbound device, traces are also deleted.

Message	Possible Cause/Fix
This device has an unconfigured address. Tag Maps using tags belonging to this device cannot be activated until an address is selected/configured. Do you wish to continue?	You see this message if you are changing a shared serial address, the device protocol is set to ModbusTCP, the Gateway Role is set to Server, the Address field is set to Unconfigured, one or more tag maps have been configured using tags belonging to the device, and you click 'Submit'.
This device has an unconfigured address. Tag Maps using tags belonging to this device cannot be activated until an address is selected/configured. The following tag map(s) use(s) tags on the device: *tag_map_list* Tag map is currently active and will be deactivated. Do you wish to continue?	You see this message if you are modifying a device and the Address field is set to Unconfigured, and the device already has tags used in tag maps. If any of the tag maps are active, another message warns you that this is the case, and the listed tag map will be deactivated. The message also appears if the new protocol is an Ethernet Server protocol and the address is Unconfigured when the Submit button is clicked.
TSAP must be: {*hex*}{*hex*}.{*hex*}{*hex*}.	Re-enter the value using the required format.
Unable to connect to Gateway.	The connection between the web browser and the Gateway could not be established. Confirm you are entering the correct IP Address. Confirm the Gateway has finished booting up (can take two or three minutes). Confirm that you have an Ethernet path between the PC and the Gateway. Confirm you are using a compatible web browser and version. Google Chrome™ browser, Mozilla Firefox™, Safari®, and Microsoft Edge® browsers are supported by Gateway. Using Chrome is highly recommended. If needed, download and install on your personal computer from https://www.google.com/chrome/. It's also possible that the address has changed somehow. In that case, you would have to reset to defaults unless the OLED is configured to show the current IP address(es) to get a known address. If you know the MAC address of the device, performing an IP scan of the network can also provide the IP address.
Unable to reconnect to Gateway.	The connection to the Gateway was lost and the reason has not been resolved. Diagnose the reason the PC is not able to connect to the Gateway and resolve the issue: Check that the Gateway is powered up. Check the network connection between the PC and Gateway. Confirm the correct IP Address is in the web browser's address bar.

Message	Possible Cause/Fix
Value must be between *lower_bound* and *upper_bound*.	Allowed integer number input values are: 0-9: 1-2 digits, Range=1-12 Minutes: 2 digits, Range=00-59. Dropdown menu values are: AM, PM. Allowed real numbers are 0-9 plus or minus numbers or e/E, after the decimal point. Must match regular expressions: [-+]?[0-9]*\.?[0-9]+([eE][-+]?[0-9]+)?. No characters are allowed. Value must be between lower bound and upper bound of range.
Warning: If your computer is not listed in the whitelist, you will not be able to access Gateway when the whitelist is enabled.	Security selection is 'Blacklist' by default. If you select 'Whitelist', you are warned that you must have the IP address for your computer in the list so that you do not lose access to the Gateway. Add your computer's IP address to the Whitelist.

Message	Possible Cause/Fix
	This basic message appears when you are either changing a static IP address the Gateway uses for the web browser connection to a different static IP address or removing all ports from the Network configured with the IP changing the address to DHCP or the user interface is using to connect to the Gateway.
	You see additional, or different messages added to the initial message when you change the IP address the user interface is using to connect to the Gateway under different initial conditions. The message sequences also change according to the state of the network after the IP address is changed or removed. These sequences are listed below with a description of the changes that trigger more specific additional message(s).
	All messages end with 'Do you wish to continue?'
	The *ip_address_list* is a list of one or more IP addresses that have a static IP address or a previously acquired DHCP address which was configured after submission of a known IP address:
You are removing the Network *ui*. This Network is being used for the web browser connection.	If one or more other Networks still exist after submitting that have a static IP address or a previously acquired DHCP address, the message in the confirmation alert is followed by the following message: 'You will need to reconnect at the new address. *ip_address_list*'
	If the only other Network(s) that still exist after submitting is/are either changing to DHCP or being added as a DHCP network, the message in the confirmation alert is followed by the following message: 'You will need to reconnect at the DHCP address acquired for (one of) the following Network(s): *network_list* If no DHCP address can be acquired for [this |any of these] Networks, you will need to reset the Gateway to factory defaults using the hardware reset button. This will change the IP address to 192.168.1.100'.
	If the user interface network is removed and the other network is set to the user interface's original address, the message in the confirmation alert is followed by the following message: 'You will need to refresh your browser to reconnect.'
You cannot configure a tag pair where the source and destination are the same. The following tag pair(s) must be corrected: *tag_pair_list*	You see this message if the tag mappings include a tag pair where both the source and destination tags are the same. You will have to configure the source and destination tags to be different.

Message	Possible Cause/Fix
You cannot copy between STRING and non-STRING data types. The following tag-pair(s) must be corrected: *tag pair list*	Change the tag copy to reflect an allowed copy type.
You entered an incorrect password.	You see this message when you make a mistake trying to log onto the Gateway. The software will only allow you to try to log on again after a brief wait.
You have *nnn* missing tag pairing(s) that reference missing tags. The tag pairings for these will be stripped from the list. Do you want to continue?	Note which tag(s) are missing and either remove or replace them with valid entries.
You have unsaved data. Are you sure you want to leave this page?	If you click 'Leave' all changes are discarded. If you click 'Stay' all fields maintain the values present before you clicked 'Leave'.
You have *xxx* tag-pairing(s) that reference missing tags. The tag-pairings for these will be stripped from the list. Do you want to continue?	You can generally save the map, but as the message says, incomplete tag pairs will be removed. You are only prevented from saving the map if all tag pairs are incomplete. You should fix the tag issues if you want to keep the tags.
You may need to configure a gateway address and DNS server address on the Network page. If the NTP time server is still unreachable, make another selection or click Submit to try again.	If the NTP server address is specified as a server name, you need to determine if you also need to configure a gateway address and DNS server for the network to function.
You may need to configure a gateway address on the Network page.	If the NTP server address is specified as an IP address, you need to determine if you also need to configure a gateway address for the network to function. If the NTP time server is still unreachable, make another selection or click Submit to try again.
You must upgrade the protocol package to use this protocol.	DF1-CIP, DF1-PCCC, PPI and S7comm are only available on your device with an upgrade package. The package can be purchased from Spectrum Controls, Inc.

Section 4.14
How Device Modifications
Affect Protocol Field Values

When you modify a device, the interactions between the protocol fields change. This topic describes those changes.

There are no changes to fields that are not being directly modified, and no tags are affected in the following circumstances:

- If you change any field on the Device Properties dialog, except for fields on the Serial Port Setup dialog and/or the **Protocol** field.

- If you change the port number, the other port parameters change to the default values.
- Change of any of the serial port parameters: stop bits, data bits, parity, baud rate or handshake.

Changing the **Protocol** field or **Gateway Role** field results in multiple changes because the fields on the Device Properties dialog change to match the newly selected protocol.

- Serial-to-Ethernet/Ethernet-to-Serial Changes. When you modify a device and change the value of the **Protocol** field from a serial protocol to an Ethernet protocol or vice versa, all fields on the Device Properties dialog change. If you change the protocol from Ethernet to Serial, all properties on both forms are set to their default values.

- Serial-to-Serial Changes. When a device is modified and you change the value of the **Protocol** field from one serial protocol to another, the fields in the Device Properties dialog that correspond to the new protocol are set to their default values. There is one exception. If you change the protocol field from ModbusASCII to ModbusRTU, the field values on the Devices form do not change automatically. However, the serial port field will no longer be valid.

- Ethernet-to-Ethernet Changes. When a device is modified and you change the value of the **Protocol** field from one Ethernet protocol to another, the **IP address** field does not change automatically. Other fields are set to their default values.

Section 4.15
Modbus Server
and Device Tag
Map Connections

The following Gateway schematic shows the relationship between a Gateway Modbus Server used to access a series of DF1 devices:
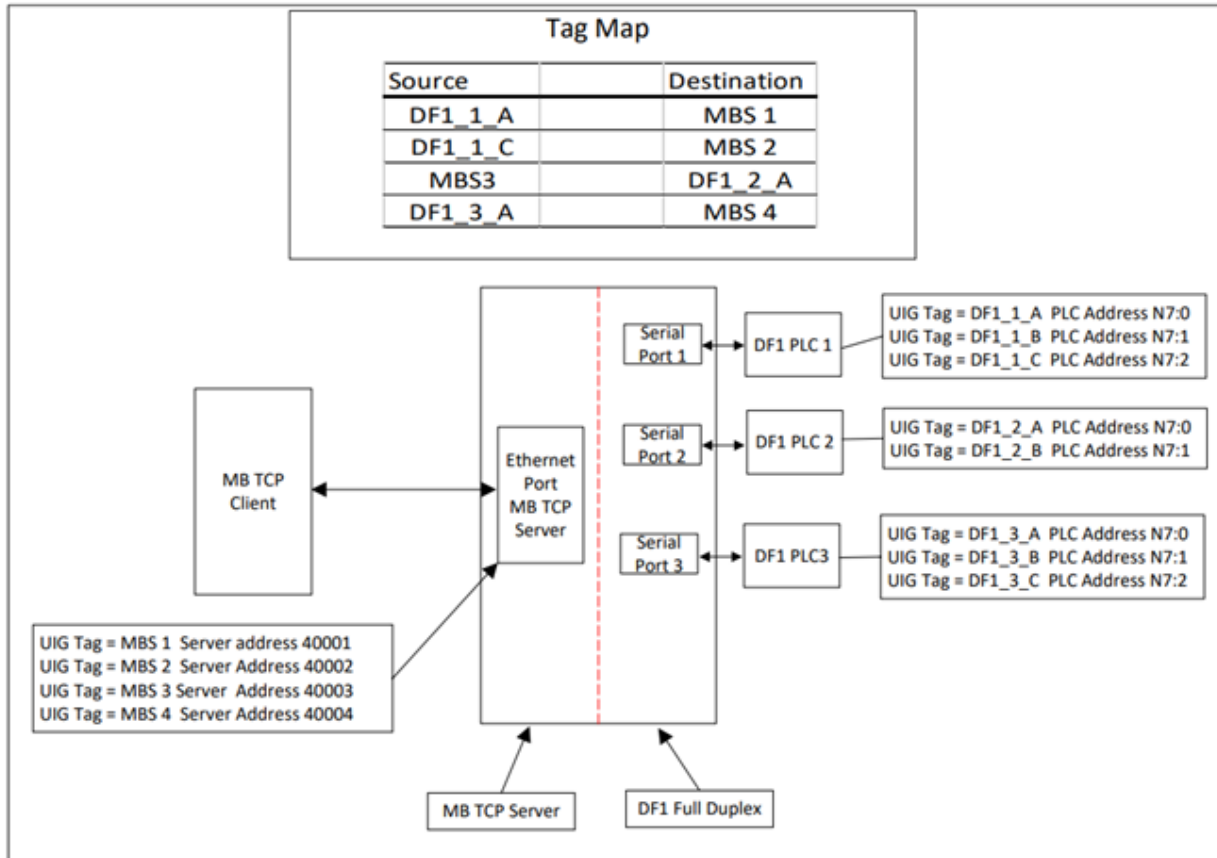
Section 4.16
Network
Configuration
Guidelines

The Gateway is able to combine available ports into groupings that address different, isolated subnets. This port collection, which may contain one or more ports, is called a network group.

The following general rules for port access apply:

- The user interface can access the device from any of the available hardware ports within any network grouping, provided the IP address associated with the group is not publicly routable because user interface access is restricted to the following private segments:

   - 10.0.0.0 to 10.255.255.255, which is a 10.0.0.0 network with a 255.0.0.0 mask.

- 172.16.0.0 to 172.31.255.255, which is a 172.16.0.0 network with a 255.240.0.0 mask.

- 192.168.0.0 to 192.168.255.255, which is a 192.168.0.0 network with a 255.255.0.0 mask.

- Only one MAC address may be shared among all ports of a network grouping.

- An IP address must be specific to a network grouping and may not be shared with any other network grouping.

- The Gateway can connect a network group as a DHCP client or via a static IP address.

- When more than one network grouping exists, (with multiple network interfaces), the default interface is determined automatically. See General Rules for Network Routing.

4.16.1 Default Network Configurationc

The Gateway ships with the following default configuration:

- All ports belong to a single network grouping that includes all physical Ethernet ports.

- The network grouping assumes the properties as defined in the Static Network Configuration described below with a pre-configuration default static address of 192.168.1.100 for the group.

- The default subnet mask is 255.255.255.0.

- In this configuration, there is an assigned network gateway address of 192.168.1.1.

- In this configuration, there is an assigned DNS address of 8.8.8.8.

Static and DHCP network configurations must also follow the specific guidelines outlined below.

4.16.2 Static Network Configuration

- One static IPV4 address/mask must be shared among all ports of a network grouping.

- The subnet mask, gateway address and the DNS address(es) must be shared among all ports of a network grouping.

- The configuration of IP address, mask, and DNS address must persist across reboots.

4.16.3 DHCP Network Configuration

- The same DHCP-assigned IP address/subnet mask must be shared among all ports of a network grouping.

- Default network gateway and primary DNS addresses must be provided by DHCP unless overwritten during the user interface configuration phase.

- If the DHCP server fails to provision a DHCP IP address then the Gateway DHCP client must not assume a fallback IP address.

Section 4.17
Protocol Attribute List

Lists the relevant communication parameters for each individual protocol by attribute. These attributes are not defined by the port connection configuration.

Protocols supported are:

Serial DF1-CIP	
Slot Number	(0-32)
Checksum	CRC or BCC
ACK Timeout	(1-255) x 20 ms
NAK Retries	(0-10)
ENQ Retries	(0-50)
Serial DF1-PCCC	
Checksum	CRC or BCC
ACK Timeout	(1-255) x 20 ms
NAK Retries	(0-10)
ENQ Retries	(0-50)
Serial Modbus RTU (Client and Server)	
Slave ID (client and server)	Integer (1-247)
Response Timeout (client only)	(1-5) seconds
Min Response Delay (server only)	(0-65535) milliseconds
Retry Count (client only)	Integer (0-3)
End of Message Delay (client only)	(1-32) characters
Min Command Delay (client only	(100-1000) milliseconds
Min Response Delay (server only)	0-65535 milliseconds
One-Based Addressing (client and server)	Range not applicable
Serial Modbus ASCII (Client and Server)	
Slave ID (client and server)	Integer (1-247)
Response Timeout (client only)	(1-5) seconds
Retry Count (client only)	Integer (0-3)
End of Message Delay (client only)	(1-32) characters
Min Command Delay (client only)	(100-1000) milliseconds
Min Response Delay (server only)	0-65535 milliseconds

One-Based Addressing (client and server)	Range not applicable
EtherNet/IP	
TCP Port	Integer (1-65535)
IP Address	IP-V4
Slot Number	(0-16)
EtherNet/IP-PCCC	
TCP Port	Integer (1-65535)
IP Address	IP-V4
ModbusTCP (Client and Server)	
Slave ID (client and server)	Integer (1- 247)
TCP Port (client and server)	Integer (1-65535)
IP Address (client and server)	Client: IP-V4/ Server: Unconfigured)
S7Comm	
PLC Type	S7200, S7300, S71200, S71500
Keep Alive	Integer (1-99) seconds
TCP Port	Integer (1-65535)
IP Address	IP-V4
TSAP	Applies to S7200 only. (Preconfigured options are "4D.57", "10.00", "11.00", but you may specify other values
PPI	
Node Address	Integer (0-16), Default: 2
DirectNET/CCM/HostLink	
Station Address	Integer (1-90)
Timeout	Short, Medium, or Long
Retries	Normal or Short
Response Delay	(0-500) milliseconds

Section 4.18
S7-1200 and S7-1500
Modbus Tag Values
Appear in Word-swapped
Order in Live Tag Viewer

For all protocols except Modbus, the architectural ordering of words for values stored on the device is specified by the protocol. Some values require more than one word of storage space (Examples: DINTs or REALs). Depending on the protocol, these values may be stored with the most significant word in the lower of the word addresses OR with the least significant word in the lower of the word addresses.

For example, if a protocol specifies that the least significant word is stored before the most significant word, a numeric value of 0×12345678 would be stored as follows:

- Lower address: 0×5678
- Higher address: 0×1234

However, the Modbus protocol specification does not require a particular word ordering for values that require more than one word of storage space. As a result, some devices store the most significant word first and others store the least significant word first.

The Gateway expects tag values to have the most significant word first. If the device stores the least significant word first, the Gateway will receive the value in word-swapped order (with respect to the actual numeric value). In this case, the Live Tag Viewer will display the values in word-swapped order. So for a numeric value of 0×12345678, the Live Tag Viewer would display 0×56781234. To correct this, you must check the Word Swap check box for all tags configured for the device. This will ensure that the Gateway will do the word-swapping when it receives a source value, thus converting the value to the format the Gateway requires. It will also ensure that the Gateway will do the necessary word-swapping before it sends a destination value to be written to the device tag in the order the device requires.

For such devices, the Live Tag Viewer will display the correct numeric value of the source tags because it does the word swapping before displaying and processing the tag. However, the Gateway does the word-swaps for destination tags, so the least significant word is first and displays it in the Live Tag Viewer after this swap. This means that the Live Tag Viewer will display the destination values in word-swapped order.

NOTE	Note that these tags are copied correctly; this is strictly a presentation issue for the destination tags in the Live Tag Viewer.

For example, consider a tag copy from a Siemens S7-1200 running ModbusTCP to a Siemens S7-1500 running ModbusTCP. Both of these PLCs store the least significant word first, so they are not in the format the Gateway needs. In this case, if you correctly checked the Word Swap check box for both tags, and a source tag with a numeric value of 0x12345678 is read from the S7-1200, the Gateway will swap the words as soon as it receives the value from the protocol

library and the Live Tag Viewer will display the source tag's value correctly as 0x12345678. It then does the word-swap before sending it to be written to the destination device. This means it will display the destination's tag value as 0x56781234 (storage order rather than correct numeric value) in the Live Tag viewer; however, the tag is correctly copied to the S7-1500.
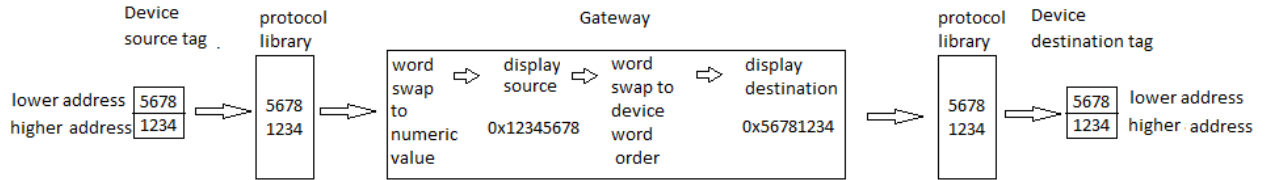
Section 4.19 Setting Up EtherNet/IP Server Function Between a Gateway 4- and Allen Bradley Logix PLCs

The Universal Industrial Gateway offers two types of connection when communicating with Allen Bradley Logix PLCs:

- Communicating as an Ethernet client. Tag maps set up using the user interface initiate and control communications between the Gateway and the PLC. The Client role handles all aspects of the communication session. This means that you only need to create the tag maps on the Gateway and provide the needed data tags in the PLC. No other PLC programming is required. For further information, see Configuring Tag Maps.

- Communicating as an EtherNet/IP Server. This method also uses tag maps, but it also uses message instructions in the PLC. The PLC acts as a client to communicate with the Gateway, which is acting as a server. This method does require PLC programming. However, it provides better PLC control over messaging. Information about this method is provided here.

The example provided here shows how to configure a CompactLogix 5069-L306ERM PLC. However, the basic configuration applies to all Logix-based PLCs.

Before you can make the connection:

- You must have RSLinx software installed and running on your personal computer.

- You must have Studio 5000 installed and running on your personal computer. This software is used to configure the controller.

- Your PLC must be able to access the Gateway.

- Your Gateway must be installed with power and network connections up and running.

- You must be able to access your Gateway via a web browser.

- Have the *Company Name* EDS file downloaded from the company's website.

To set up EtherNet/IP server function between a Gateway and a Logix PLC, add the Gateway to the Logix PLC's I/O Configuration tree as follows:

1. Before you can add the Gateway to Configuration tree first install the EDS file. From the personal computer's Start menu, select Rockwell Software:EDS Hardware Installation Tool:
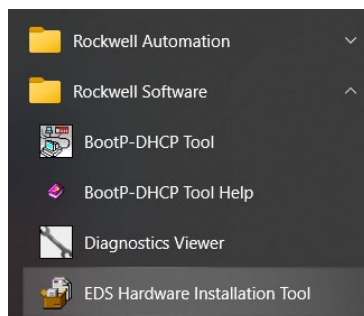
The following dialog appears:
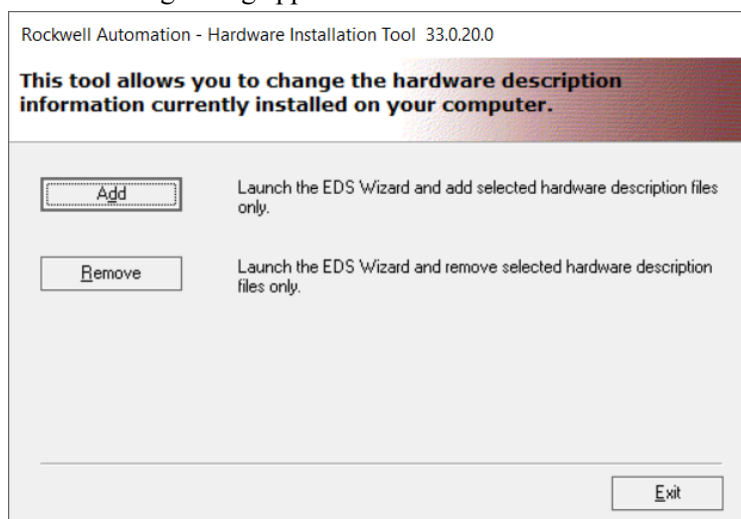
2. Select **Add**. The following dialog appears:
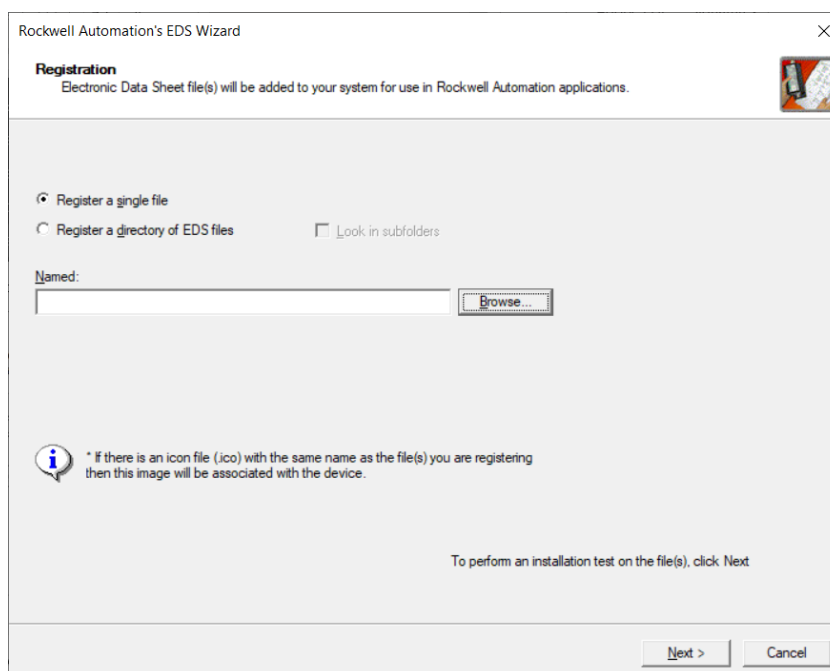
3. Browse to the location of the EDS files:
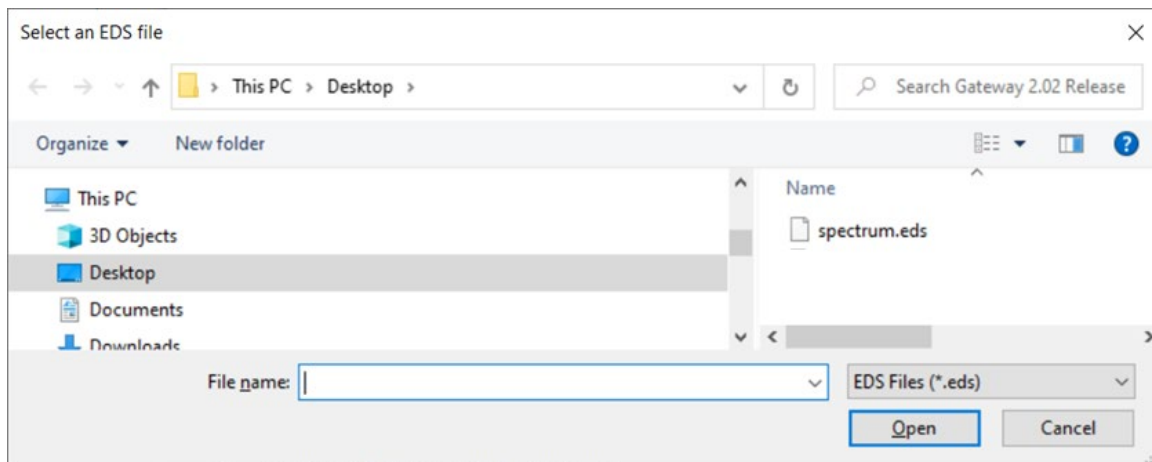
4. Select the *Company Name*.eds file and click **Open**. The following dialog appears with the selected EDS file in the **Named** field:
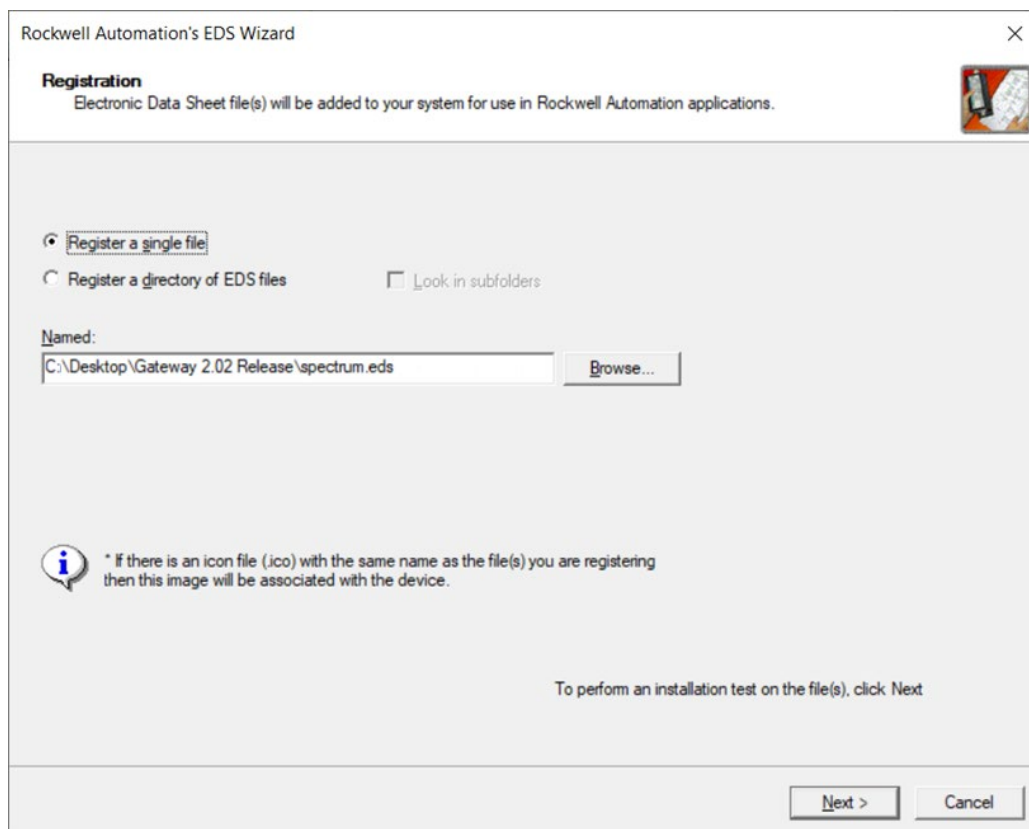
5. Click **Next**. The following dialog appears. This confirms the file is present. However, it does not validate the file itself.
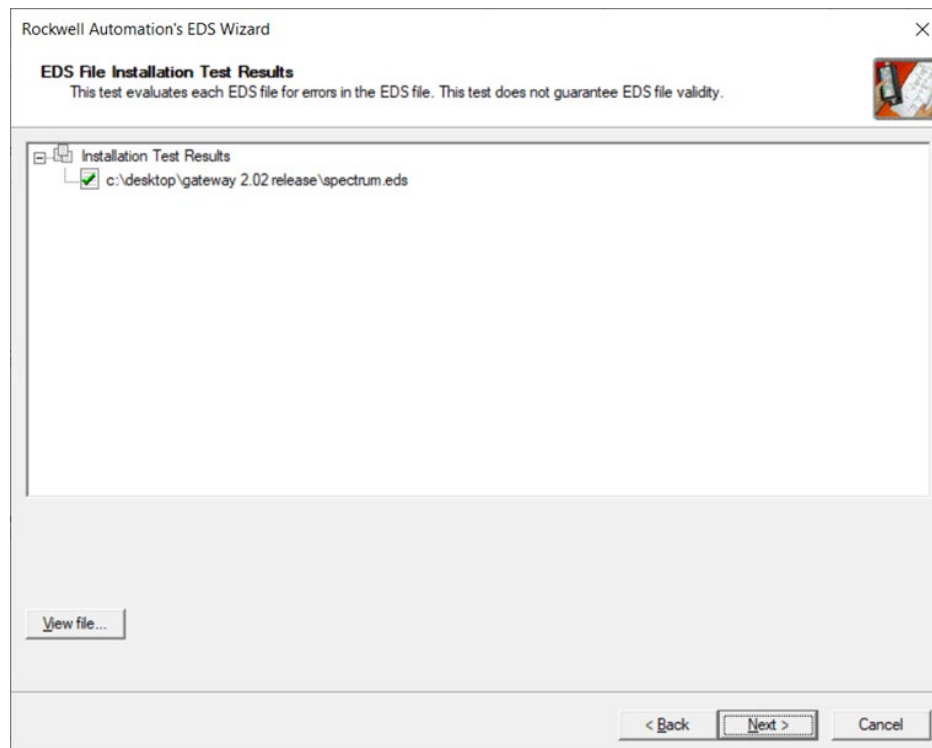
6. Click Next:

The installer displays the icon that will be associated with the Gateway when the installation is complete. You can use the provided icon or choose your own.
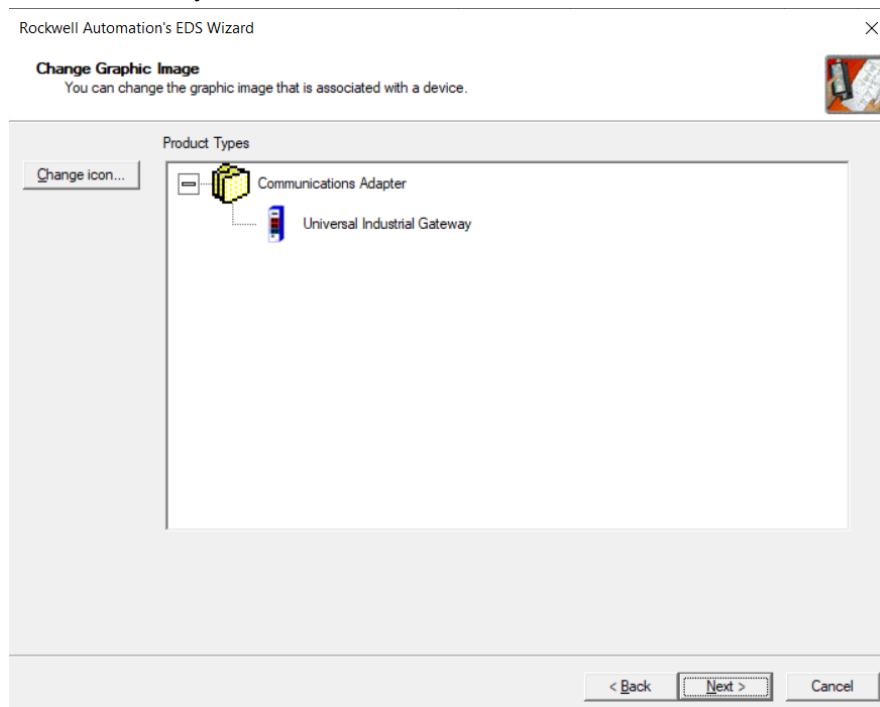
7. Click **Next**. Review the Final Task Summary dialog to ensure that you understand what you are going to install:
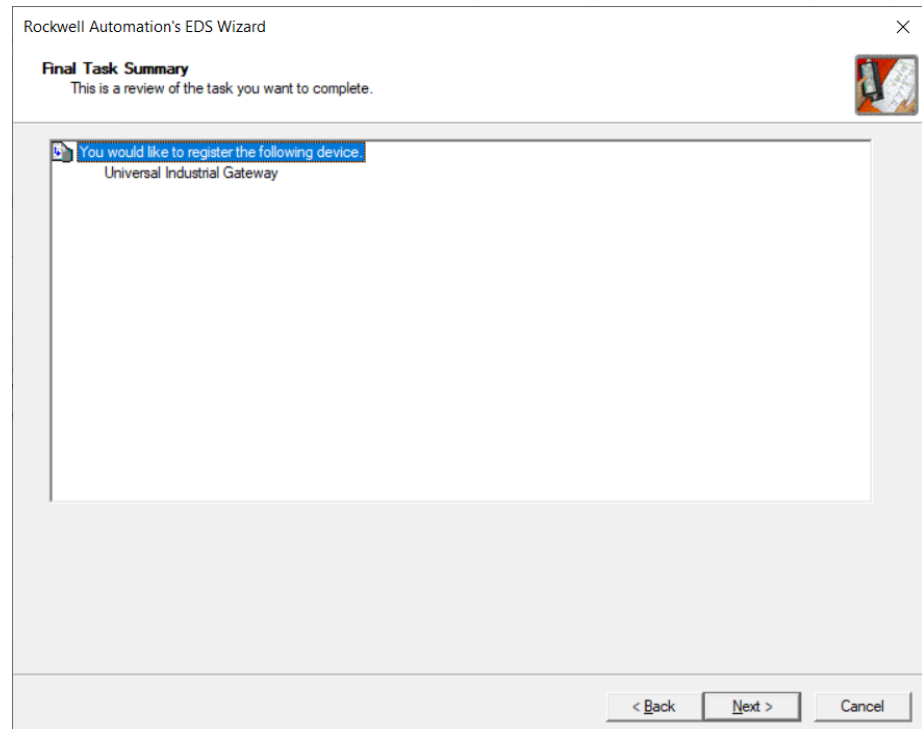
8. The following dialog informs you that you have successfully completed EDS installation:
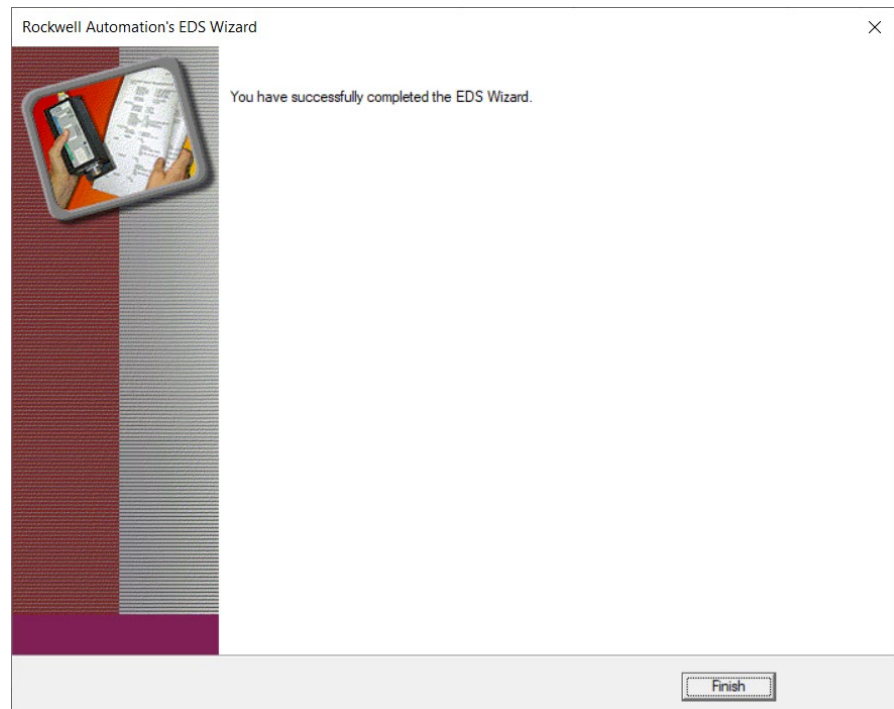
9. Click **Finish**. The following dialog appears:
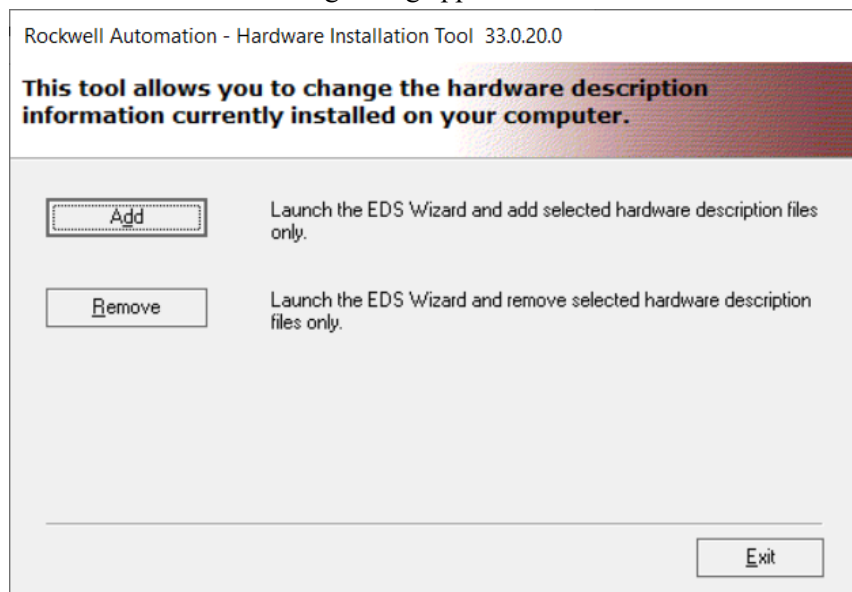
10. Click **Exit**.

4.19.1 Adding a Gateway to a PLC I/O Configuration Tree

1. To add a Gateway to the PLC's I/O Configuration tree, start Studio 5000.
2. Navigate to the Ethernet port to which the Gateway will be connected and right click on the port.
    The following popup menu appears:
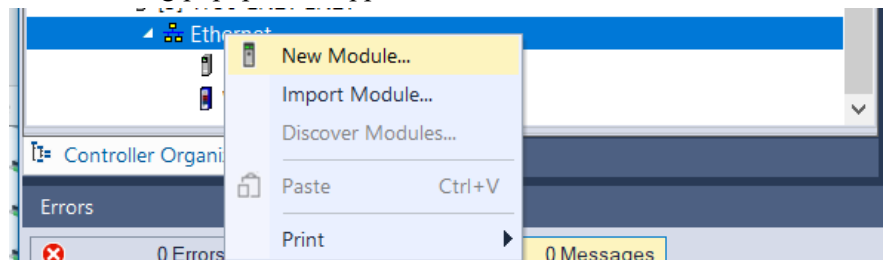
3. Select New Module.

The Select Module Type dialog appears:

Select Module Type

Catalog | Module Discovery | Favorites

Enter Search Text for Module Type...   Clear Filters   Hide Filters ⌃

☑ Module Type Category Filters
☑ 20 - Comm-ER
☑ Analog
☑ CIP Motion Safety Track Section
☑ Communication

☑ Module Type Vendor Filters
☑ Advanced Energy Industries, Inc.
☑ Dialight
☑ Endress+Hauser
☑ FANUC CORPORATION

Catalog Number	Description	Vendor	Category
1420-V1P-ENT	Powermonitor 500	Rockwell Aut...	PowerMonitor 5000
0001_0073_010D	48MS-SN1PF1-M2	Rockwell Aut...	Rockwell Automation Misc...
0001_0073_010E	48MS-SN1PF2-M2	Rockwell Aut...	Rockwell Automation Misc...
0005_007B_0030	SP600	Rockwell Aut...	DPI to EtherNet/IP
0005_007B_0038	SP600 ER 400V	Rockwell Aut...	DPI to EtherNet/IP
0005_007B_0039	SP600 ER 200V	Rockwell Aut...	DPI to EtherNet/IP
0005_007B_003A	SP600 ER 600V	Rockwell Aut...	DPI to EtherNet/IP
0005_007B_0060	Liquiflo 2.0	Rockwell Aut...	DPI to EtherNet/IP
0005_007F_0027	MD60	Rockwell Aut...	MDI to EtherNet/IP
0005_007F_0028	MD65	Rockwell Aut...	MDI to EtherNet/IP
100-1167-001	SynapSense Industrial Gateway	Panduit Corp...	Communication
1305-ACDrive-EN1	AC Drive via 1203-EN1	Rockwell Aut...	Drive

770 of 770 Module Types Found   Add to Favorites

☐ Close on Create   Create   Close   Help

4. On the upper right side of the dialog, deselect all vendors and reselect Spectrum Controls in the vendor list.

6.   The Universal Industrial Gateway Catalog entry appears:

7.   Click on the Universal Industrial Gateway to select:

8. Click **Create**.

The New Module dialog opens to the General tab:

9. View or specify the following General tab options:

- **Type.** Type and description of module. Not editable.

- **Vendor**. Vendor of module. Not editable.

- **Parent**. Name of parent module. Not editable.

- **Name**. Enter the name for module.

- **Description**. Enter user description of module.

- **Module Definition Settings**. (Settings include revision, electronic keying, and connection information). No change needed.

- **Ethernet Address**: Ethernet settings for Gateway:
  - Private Network. Not used for this purpose.
  - IP address. Enter IP address of the Gateway.
  - HostName. Not used for this purpose.

10. Click the Connection tab:

11. View or specify the following Connection tab options. These options define controller-to-module behavior:

- **Requested Packet Interval (RPI) (ms)**. No change needed. Range **10.00 – 1000.0 ms**.
- **Connection over EtherNet/IP**. No change needed. Type is **Unicast**.
- **Input Trigger**. If supported, select an input trigger. No change needed. Type is **Cyclic**.
- **Inhibit Module**. Choose whether to inhibit module. Leave unselected.
- **Major Fault on Controller If Connection Fails While in Run Mode**. Choose whether a loss of connection to this module causes a major fault in the controller. Leave unselected.
- If you make changes, click **OK**.

12. Select the Module Info tab:

13. View the Gateway properties. This data comes directly from the module. The data is not retrievable if the communication format is set to **Listen-Only**. You can use this option to:

- Determine module identity.
- View module's current operational status.
- View whether an owner controller is currently connected to the module.
- Retrieve the latest information from the module.
- Reset a module to its power-up state.
- View the protection mode of the module.

14. Select the Port Configuration tab:

15. View the Port Configuration settings. You use this option to view and configure port properties. No change is needed to the module settings.

- When online with the Gateway, you can refresh the

communication settings to obtain the latest port configuration setting information from the module.

4.19.2 Adding Message Instructions

NOTE	Any UIG EtherNet/IP Server tag used in a message instruction must be part of an active tag map.

After adding the Gateway to the I/O Configuration tree, add the message instructions.

The Gateway supports CIP Symbolic messaging and so the PLC can use CIP Data Table Read messages and CIP Data Table Write messages to exchange data with the Gateway.

The following ladder logic example shows two message instructions. The first message triggers the second message when it receives a done or error bit.

Both instructions are identical except that one is using a CIP Data Table Read command and the other is using a CIP Data Table Write command.
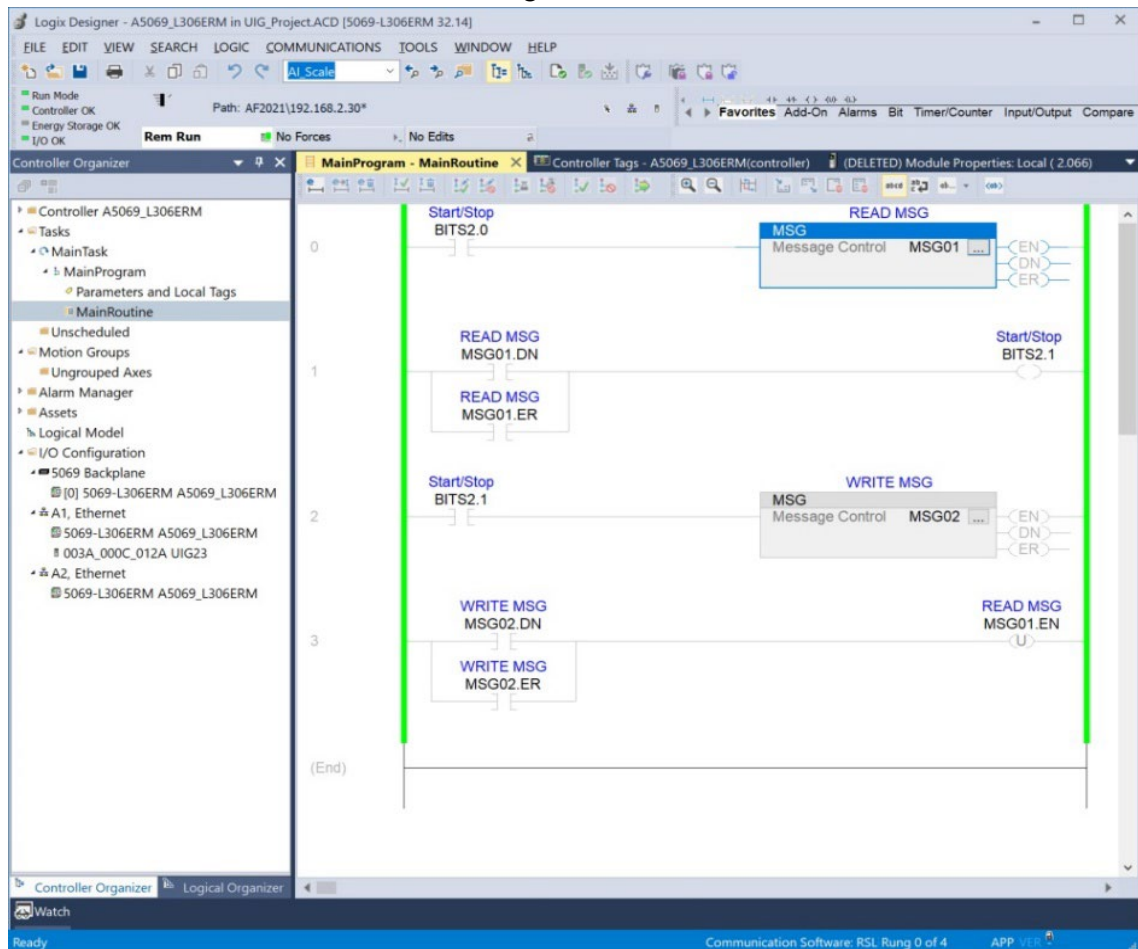
The first message instruction is the read instruction which means the "Source

Element" is the address of a tag in the Gateway's EtherNet/IP Server tag list. The "Destination Element" is the tag within the Logix PLC to which you are moving the data.

The second message instruction is a write instruction which means the "Destination Element" is the address of a tag in the UIG's EtherNet/IP Server tag list. The "Source Element" is the tag within the Logix PLC from which you are taking the data.

Section 4.20
Supported
Modbus
Commands

The Gateway supports the following Modbus Commands. Additional functionality returns the appropriate Modbus-specific code.

See also About One-Based Addressing.

When the Gateway functions as a Modbus server, it supports the following Modbus commands:

- Read Coils (01)
- Read Discrete Inputs (02)
- Read Holding Registers (03)
- Read Input Registers (04)
- Write Single Coil (05)
- Write Single Register (06)
- Write Multiple Coils(15)
- Write Multiple Holding Registers(16)

Gateways supports the following commands in Server mode:

- Mask Write Register (22)
- Read/Write Multiple registers (23)

ModbusTCP (Client and Server) supports the commands listed above and:

- Also supports VLAN environments.
- Sets maximum server number to five to support five clients respectively. The Gateway must have 272 Kbytes of RAM per server available.
- Does not specify the maximum client number.

ModbusRTU (Client and Server) supports the commands listed above and:

- Sets maximum server number to four to answer four clients respectively. The Gateway must have 272 Kbytes of RAM per server available. (The Gateway has only four serial ports.)
- Sets maximum Client number to four to enquire for data from four servers respectively. (The Gateway has only four serial ports).

ModbusASCII (Client and Server) supports the commands listed above and:

- Sets maximum server size to four to answer four clients respectively (272 Kbytes of RAM per server needed. (The Gateway has only four serial ports.)
- Sets maximum Client number to four to enquire for data from four servers respectively. (The Gateway has only four serial ports.)

Section 4.21
System Tags List

System tags are read-only tags that provide information about lower-level communications on the Gateway. Other tags are refreshed on a one-minute, heartbeat interval. You may not add or delete system tags. Tags beginning with a # sign are generated on request.

Some UIG 1.0 $System tags have been removed in UIG 2.*n.nnn*. In some cases, tag names and/or data types for tags that exist in both versions have changed in 2.0. These changes are accommodated when a 1.0 backup file that uses $System tags is restored on a 2.0 device. A $System tag is considered to be in use if it is a source tag in any tag map in the backup file. The actions in following table are taken when restoring a 1.0 backup with in-use $System tags that have been changed or removed.

Tag	Description	Data Type
#DATETIME	Current date and time	STRING
#HEARTBEAT	Constant Value of 1	DINT
#RANDOM	System-generated random number	INT
Network1_IP	Network 1 IP address	STRING
Network2_IP	Network 2 IP address	STRING
serialNumber	Gateway Serial Number	STRING
Unit_Name	System Unit Name	STRING

Restoring a backup taken from a 1.0 Gateway has the following rules for dealing with $System tags that were present on a Gateway 1.0 but are no longer used by a Gateway 2.0.

- If a $System tag that has been removed is not in use in the backup file, the tag will be removed from the $System device with no notification to you.

- If a $System tag that has been renamed is not in use, the tag will be renamed with no notification to you.

- If the $System.#RANDOM tag is not in use, the type of the 2.*n.nnn* $System.#RANDOM tag will be changed to INT with no notification to the user.

Tag Used in Backup	Tag Changes	Tag Map State	Notification Message
WebPort Name	Rename as Unit_Name	No Change	Restore completed. Gateway is now rebooting. A sequence of messages for automatically reconnecting to the Gateways appears.
ETH1_IP	Rename as Network_Group1_IP	No Change	Restore completed. Gateway is now rebooting.

Tag Used in Backup	Tag Changes	Tag Map State	Notification Message
#RANDOM	Change data type to INT. Rename instances of tag in tag pair(s) to $System.#RANDOM(invalid) Invalidate tag pair(s) using $System.#RANDOM (this prevents the tag map(s) from being activated until you remove or repair any affected tag pair).	Deactivate. Disable	Restore completed. The data type for the tag $System.#RANDOM has been changed from STRING to INT. Tag pairs using this tag are now invalid. The following tag maps use this tag and have been disabled: *tag_map_list* Gateway is now rebooting. A sequence of messages for automatically reconnecting to the Gateways appears.
Other Removed $System Tags	Before the restore is started, the back end must notify the user interface that a 1.0 backup is being restored.	Deactivate. Disable	The following tags no longer exist: *tag_list* Tag pairs using a non-existent tag will be invalid after the restore and will prevent the tag map from being activated until the tag pairs are removed or repaired. Do you wish to continue? Yes No The auto-reconnection popup sequence appears. Restore completed. Gateway is now rebooting. A sequence of messages for automatically reconnecting to the Gateways appears.

Once the restore operation completes and you have logged back in, you will see the following message sequence that explains changes that occurred as a result of the restore:

The following device(s) have an unconfigured IP address:
device_list
This has invalidated the following tag map(s):
tag_map_list
You will not be able to activate this (these) tag map(s) until you reconfigure the affected device(s).
You should verify the connection of all devices to ensure that tag maps will work correctly.

The restoration includes the following changes:

- *device_list*. This list includes all service device(s) configured to use a Network that is no longer configured.

- If there are multiple devices in the above list, the names are separated by commas (,).
- *tag_map_list*. This list includes all tag maps using tags belonging to devices in the *device_list*.
- If there are multiple devices in the *tag_map_list*, the names are separated by commas (,).
- The Address input displays Unconfigured when the Device Properties dialog is opened for any device in the above list.
- If the backup contains one or more Ethernet server devices where the IP address for an Ethernet server device exists in the network configuration for the Gateway on which the backup was restored, but the Network ID for that address in the backup differs from the Network ID for the address in the current network configuration, the Address field for the Ethernet server device reflects the new Network ID
- The model number network configuration, including MAC addresses, the password, and the serial number remain the same.

Section 4.22
Troubleshooting
Gateway Startup

If you encounter difficulties when starting up your Gateway, check the following:

- Check the wiring and test the output from the power supply. The output should be 24 volts.
- If the Gateway does not show a P1 address in the OLED display on the front of the Gateway, connect the P1 cable to the network and reboot again. If the problem persists, contact technical support.
- When a power failure occurs, the Gateway reboots once power is available again. All processes restart, and the software checks the database integrity. If the database is missing or corrupt, a new default database is created. This allows you to log-in and restore a back-up.

For more information on this topic, see Resetting the Gateway to Default Configuration.

Section 4.23
Troubleshooting illegal
data address errors for
Modbus strings

If you get an illegal data address error when attempting to read or write a tag on a Modbus device that you have configured on the Gateway with the data type set to STRING, this typically means that the space allocated for the string on the Modbus device is not large enough.

The Gateway always attempts to read a fixed length of 200 characters. If the string buffer allocated on the Modbus device is less than that, you will get an illegal data address error.

If you cannot conveniently allocate 200 bytes on the Modbus device, as a workaround, you can configure string tags to be arrays of INT on the Gateway. For example, if you know that strings will always be shorter than 20 characters,

you can configure the tag on the Gateway to be an array of 10 INTs. The values will be copied correctly, but they will show up as integers in the Live Tag Map Viewer, rather than as characters. If you check the Show as Hex check box, you can view these values as hexadecimal character codes. As an alternative way to check, you can configure a STRING tag on the $User device and add a tag pair to your tag map that copies from your Modbus tag to the $User tag (or vice versa) to verify that the value is copied correctly.

Section 4.24
Troubleshooting Gateway Ethernet ports

The Gateway User Interface (running on a personal computer) uses TCP port 443 to communicate to the Gateway. If traffic is blocked on this port, the Gateway User Interface will not open up on your personal computer.

Section 4.25
Troubleshooting Gateway Power Supplies

The Gateway uses a power supply for powering the Gateway.

Use the following information to help you troubleshoot Gateway power up problems:

1. If you use a power supply that fails to supply steady power, on startup, the Universal Industrial Gateway may behave erratically. You may see intermittent Gateway reboots, flickering LEDs, or the LEDs may not illuminate at all.
2. If you have improperly wired the connector, the Gateway either will not power up, or if you significantly exceed the input limit, you will observe a puff of smoke.

Section 4.26
Troubleshooting Serial Ports

When setting up serial ports, if you are configuring the port as RS-232, the software actively prevents you from adding more than one device to a particular port. RS-485 configuration allows multiple devices to share a port. The messages you see are dependent on the error condition.

Related technical descriptions can be found at:

- Technical Reference Definitions
- Gateway Messages

Section 4.27
Viewing Data Types Supported by Protocols

Individual protocols support a set of data types. When you select a protocol, the data types are restricted to those supported by the selected protocol. This table lists each protocol and shows you the supported data types for that protocol:

Protocol	DF1-CIP	DF1-PCC	Modbus RTU	Modbus ASCII	EtherNet/IP	EtherNet/IP-PCCC	Modbus TCP	S7Comm	PPI	DirectNET/CCM/HostLink
SINT	Yes				Yes			Yes	Yes	
INT	Yes	Yes			Yes	Yes		Yes	Yes	
DINT	Yes	Yes			Yes	Yes		Yes	Yes	
REAL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BOOL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
STRING	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SIGNED 16-BIT (SHORT)			Yes	Yes			Yes			Yes
UNSIGNED 16-BIT (USHORT)			Yes	Yes			Yes			Yes
SIGNED 32-BIT (DINT)			Yes	Yes			Yes			Yes
UNSIGNED 32-BIT (UDINT)			Yes	Yes			Yes			Yes

Section 4.28
Viewing Supported
Data Types

This table lists each tag data type supported by the Gateway. Not all types are available for every device because each protocol supports a subset of these data types:

Data Type	Description
BOOL	1 bit (1 byte as a unit of storage)
SINT	1-byte integer
INT	2-byte integer
SHORT (SIGNED 16 BIT)	2-byte integer
USHORT (UNSIGNED 16 BIT)	2-byte unsigned integer
DINT (SIGNED 32 BIT)	4-byte integer
UDINT (UNSIGNED 32-BIT)	4-byte unsigned integer
REAL	4-byte IEEE float
STRING	ARRAY of bytes

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