Important Notes

Please read all the information in this manual before installing the product. The information in the manual applies through Universal Industrial Gateway Version 1.00.nn, where nn is the build number. This manual assumes that you have a full working knowledge of the relevant equipment.

Notice

The product described in this manual is useful in a wide variety of applications. Therefore, you and others responsible for applying the product described herein are responsible for determining its acceptability for each application. While efforts have been made to provide accurate information within this manual, Spectrum Controls, Inc. assumes no responsibility for the accuracy, completeness, or usefulness of the information herein.

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2. The Software will perform in accordance with the printed documentation distributed with it by us, and
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No employee, agent, dealer, or distributor of ours is authorized to modify this limited warranty, nor to make any additional warranties.

No action for any breach of the above limited warranty may be commenced more than one (1) year following the expiration date of the warranty.

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Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

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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
Universal Industrial Gateway
Overview

Section 1.1
Start Here

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

A Universal Industrial Gateway may access devices serially, using any of the two to four serial ports, or via Ethernet using the ETH 1 port.

You use the Universal Industrial Gateway Graphics User Interface (GUI), accessible from the Gateway, to configure devices and tags, then create sets of source and destination tag pairings, called tag maps, and set a rate of copy, or specify a copy initiation based on a change in value of a trigger tag, between different controllers, or between tags on the same controller.

A tag map represents a collection of source and destination Tag Pairs. The software processes the copies between tag pairs by reading the tag(s) from the source controller and writing the tag(s) to the destination controller at the specified rate.

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 Universal Industrial Gateway provides a seven-segment LED display on its faceplate. The IP address of the Gateway scrolls on the display after the Gateway is fully powered up. Note that startup operations continue for a brief time after the IP address begins to display. You will not be able to start the user interface until the startup sequence is complete.

If power fails, the Universal Industrial Gateway reboots once power is present again. All processes restart and the database integrity is checked.

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>To physically install the Universal Industrial Gateway hardware, refer to the installation instructions provided with your Universal Industrial Gateway when it shipped.</td>
</tr>
</tbody>
</table>

To review features and other important information, review the release notes.
When running the Universal Industrial Gateway software, to access context-sensitive, embedded, online help from each of the main Universal Industrial Gateway dialogs, click the following button on the upper right-hand side of the Universal Industrial Gateway menu bar:

Section 1.2
Universal Industrial Gateway Overview

Refer to the listed chapter for the following information:

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

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

Section 2.1 Hardware Specifications
This table contains the Universal Industrial Gateway hardware specifications:

<table>
<thead>
<tr>
<th>General</th>
<th>Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Processor ARM (400 MHz)</td>
<td>• Two or Four, configurable, isolated, RS-232/RS-485 serial ports (Channels 1 and 2 are isolated from Channels 3 and 4)</td>
</tr>
<tr>
<td>• 128 Mbyte RAM</td>
<td>• One isolated Ethernet port, 10/100 Mbyte Base-TX [ETH1]</td>
</tr>
<tr>
<td>• 512 Mbyte Flash memory</td>
<td></td>
</tr>
<tr>
<td>• Real-time clock, approx. 40 to 50 days backup</td>
<td></td>
</tr>
<tr>
<td>• DIN Rail mounting with latch</td>
<td></td>
</tr>
<tr>
<td>• Model numbers WP-G-221-P1/ WP-G-241-P1 support:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Modbus ASCII</td>
</tr>
<tr>
<td></td>
<td>• Modbus RTU</td>
</tr>
<tr>
<td></td>
<td>• Modbus TCP</td>
</tr>
<tr>
<td></td>
<td>• EtherNet/IP</td>
</tr>
<tr>
<td></td>
<td>• EtherNet/IP-PCCC</td>
</tr>
<tr>
<td></td>
<td>• Model numbers WP-G-221-P2/ WP-G-241-P2 support the above protocols and:</td>
</tr>
<tr>
<td></td>
<td>• DF1-PCCC</td>
</tr>
<tr>
<td></td>
<td>• DF1-CIP</td>
</tr>
<tr>
<td></td>
<td>• PPI</td>
</tr>
<tr>
<td></td>
<td>• S7Comm</td>
</tr>
</tbody>
</table>
### Temperature

- **Ambient 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**
  - 0% to 80% noncondensing at 60°C

### Dimensions

- **Height × Width × Length**
  - 5.40 in. × 1.88 in. × 3.88 in.
    - (137.00 mm. × 48.00 mm. × 98.00 mm.)
- **Weight**
  - 12.80 oz. (0.36 kg.)

### Electrical

- **External Power Supply**
  - 10 W peak maximum
  - 24 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.
- **Input Power Connectors**
  - Three-pin, male screw terminal header
  - Associated three-pin, female plug

### Isolation

- Ethernet port: 1500 VAC, 50 to 60 Hz for sixty seconds
- DC power and serial ports: 707 VDC for 60 seconds
- Must use isolated power supply (50 VDC isolation between FGND and GND on power connector)
**LEDs/Controls**

- **ETH1 LED:**
  - **Green LED:** Blinking when transmitting or receiving data at 100 Mbytes/second.
  - **Yellow LED:**
    - ON: ON when linked; blinks when traffic online.

- **SERIAL Ports** Communication parameters are software-configurable. See Troubleshooting Serial Ports:
  - **Green LED**
    - ON: Linked
    - Blinking at \( n \) seconds when receive traffic online
  - **Yellow LED**
    - ON: Linked
    - Blinking at \( n \) seconds when transmit traffic online

- **Reset** (button on front of Universal Industrial Gateway). You may choose to:
  - Retain its current configuration. To do so, insert a paper clip into the Reset switch on the Universal Industrial Gateway and press gently and briefly, for 0-15 seconds. The horizontal segments of the seven-segment display will blink. As soon as you release the button, the Gateway reboots.
  - Reset to factory defaults. Insert the paper clip and press gently for more than 15 seconds. All segments of the seven-segment display are steadily lit. As soon as you release the button, the Gateway resets to defaults and reboots.
  - NOTE: The Gateway may become unresponsive if you double click the switch. You will need to cycle power. When power is applied to the connector, all segments are momentarily lit (showing power has been applied.) A series of dots will blink until network setup is complete. At that point, the IP address will be displayed, one character at a time.

- **LED (single digit, seven segment):**
  - Displays ETH1 IP address.

### Certifications

<table>
<thead>
<tr>
<th>UL Safety</th>
<th>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)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UL 60950-01 Information Technology Equipment Safety Standard</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UL Hazardous Locations</th>
<th>ULH ANSI/ISA–12.12.01–2007 Nonincendive Electrical Equipment for Use in Class I, Division 2 Hazardous (Classified) Locations T4 or better</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>eULH CSA C22.2 No. 213-M1987–Non-incendive Electrical Equipment for use in Class I Division 2 Hazardous Locations–March 1987</td>
</tr>
</tbody>
</table>
### Certifications

<table>
<thead>
<tr>
<th>Certification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCC</td>
<td>47 CFR Part 15 Class A</td>
</tr>
</tbody>
</table>

### Section 2.2 Getting Hardware and Software Information

You right click anywhere on the white or gray area of the Gateway graphics user interface to bring up a menu that allows you to view Gateway hardware equipment information, the current firmware version, and to access an option to create a diagnostics file to send to Spectrum Controls, Inc. To access this information:

1. If needed, log onto the Universal Industrial Gateway:
   - See Logging onto the Universal Industrial Gateway User Interface
2. Right click on a Universal Industrial Gateway white or gray area:
   - The following popup menu appears:
     - About Universal Industrial Gateway...
     - Create Diagnostics File..
3. View the information using the following options:
   - About Universal Industrial Gateway:
     - Displays the current Universal Industrial Gateway firmware version, unique Serial Number, product-specific model number, and unique MAC address:
Create Diagnostics File. Creates a diagnostic file to be sent to Spectrum Controls, Inc. for troubleshooting purposes:

- **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.**

A download file is simultaneously displayed at the lower left of the dialog. Click the file name:

The following dialog appears showing where the software saved the exported files (usually to the Downloads directory, or other designated folder, on your personal computer). These files are password-protected
for Spectrum Controls use only:

5. Navigate to the directory to retrieve the saved files for sending to Spectrum Controls, Inc.

Section 2.3 Viewing Serial LED Operation

Universal Industrial Gateway serial LEDs work as follows.

- Green LED (top): Flashing: Receiving traffic
- Yellow LED (bottom): Flashing: Transmitting traffic

Section 2.4 General Public License Information

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

GPL version 2.0

Spectrum Controls, Inc. also uses software licensed under GNU General Public License, version 3:

GPL version 3.0

Please refer to the websites listed above for further information about these licenses, and how they are to be used.

Section 2.5 Limited Warranty

Spectrum Controls, Inc. warrants that its products are free from defects in material and workmanship under normal use and service, as described in Spectrum Controls, Inc. literature covering this product, for a period of 1 year. The obligations of Spectrum Controls, Inc. 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 Spectrum Controls, Inc. 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 Spectrum Controls, Inc. 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 Spectrum Controls, Inc.
Chapter 3
Using the Universal Industrial Gateway Interface

You log onto the Universal Industrial Gateway User Interface to set up and manage Universal Industrial 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 30 minutes of inactivity.

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

<table>
<thead>
<tr>
<th>NOTE</th>
<th>All fields that show a red asterisk (*) are required</th>
</tr>
</thead>
</table>

| NOTE | When connecting to the Universal Industrial Gateway for the first time, the default IP address will be 192.168.1.100. Once you have logged in, you should change the IP address. See Configuring Network Settings for the Universal Industrial Gateway. |

Section 3.1 Logging onto the Universal Communications Gateway User Interface

To log onto the Universal Industrial Gateway:

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

   ![192.168.1.100](image)

   The Universal Industrial Gateway User Interface dialog appears with the logon fields:
For a complete description of the user interface see About the Universal Industrial Gateway User Interface Window.

2. The first time you access the Gateway's User Interface (GUI), type in (enter) password spectrum. The default username and password for the Universal Industrial Gateway are:

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Password field is case-sensitive.</td>
</tr>
</tbody>
</table>

- **Username.** Permanent User name is admin. Grayed out.
- **Password.** Default password is spectrum and is case sensitive.

![Password Field](Image)

3. Once you enter a password, the **Submit** button activates. Click **Submit**.

4. 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 User Information dialog. See About the Universal Industrial Gateway User Interface Window.
Section 3.2
About the Universal Industrial Gateway User Interface Window

You use the Universal Industrial Gateway User Interface Window to configure the Universal Industrial Gateway to communicate with programmable logic controllers/devices, and to copy tag values between tags on the same or different controllers:

The Universal Industrial Gateway User Interface Window contains:

- **Universal Industrial Gateway User Interface Title Bar.** Displays company name and logo.
- **Universal Industrial Gateway User Interface Menu Bar.** Accesses Trace alert, ETH1 communications connection information, and logout and embedded help options.
- **Universal Industrial Gateway User Interface Configuration Work Area.** Allows you to configure Gateway operation.

### 3.2.1 Universal Industrial Gateway User Interface Title Bar

The Universal Industrial Gateway User title bar shows the company name and logo.
3.2.2 Universal Industrial Gateway User Interface Menu Bar

<table>
<thead>
<tr>
<th>NOTE</th>
<th>When there is a trace status update, the following icon appears in the menu bar status bar:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Trace Completed" /></td>
<td>This button provides a shortcut to the Diagnostics page. For further information, see Tracing Data.</td>
</tr>
</tbody>
</table>

The Universal Industrial Gateway User Interface menu bar also provides access to Universal Industrial Gateway network status data (ETH1), the logout button, and the embedded help button:

<table>
<thead>
<tr>
<th>NOTE</th>
<th>• The ETH1 connection is always green (online), and the Connection Status line of the ETH1 panel always displays connected. This happens because the only communication is through an Ethernet connection. If the connection goes down, the user interface no longer receives the information that triggers a status update.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="ETH" /> <img src="image" alt="Logout" /> <img src="image" alt="Help" /></td>
<td>• The information is updated at intervals, so changes made on the network screen may not show up immediately.</td>
</tr>
</tbody>
</table>

• **Trace alert.** If you are not viewing the Diagnostics page when a running trace completes, the following button appears in the menu bar. If you are on a different window when a trace completes, the alert appears. To remove the alert from the menu bar, click the **Trace Completed** button:

![Trace Completed](image)

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.

• To access ETH1 communications status information, mouse over the ETH1 icon:

![ETH](image)

See Viewing ETH1 Communications Status Information.

• To access embedded help, select the Help icon:

![Help](image)

See Viewing Help Information.
3.2.3 Universal Industrial Gateway User Interface Work Area

To access the work area, log into the software.
The work area appears:

![Universal Industrial Gateway User Interface Work Area](image)

Use the work area for setting up all Universal Industrial Gateway configuration options. You may access help about all options from Using the Universal Industrial Gateway User Interface (in the online help).

Section 3.3 Configuring Devices

You use the Universal Industrial 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. The information you provide when configuring a device and its tags must exactly match the actual configuration of the connected device and its tags. 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 Universal Industrial Gateway. The number of profiles you may add is limited only by disk space. The number of devices and tags you can configure also depends on available Gateway memory (disk space on the Gateway). The number of serial devices you may physically connect to a Gateway is limited by the number of ports.

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 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 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. A detailed description with example ladder logic is provided in an application note on the Spectrum Controls Inc. website.

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

To add, modify, or delete devices (and tags):

1. Click the Devices icon:

   ![Device Icon](image)

   The Devices window appears:

2. View or specify the following options:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Function</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Add" /></td>
<td>Add a device:</td>
<td>Adding Devices</td>
</tr>
<tr>
<td><img src="image" alt="Modify" /></td>
<td>Modify a device:</td>
<td>Modifying Devices</td>
</tr>
<tr>
<td><img src="image" alt="Delete" /></td>
<td>Delete a device from the Universal Industrial Gateway:</td>
<td>Deleting Devices</td>
</tr>
<tr>
<td><img src="image" alt="Test" /></td>
<td>Test device connection:</td>
<td>Testing Device Connections</td>
</tr>
<tr>
<td><img src="image" alt="Export" /></td>
<td>Export device and tag data:</td>
<td>Exporting Device and Tag Data</td>
</tr>
<tr>
<td><img src="image" alt="Add Tag" /></td>
<td>Add a tag:</td>
<td>Adding Tags</td>
</tr>
<tr>
<td><img src="image" alt="Modify Tag" /></td>
<td>Modify a tag:</td>
<td>Modifying Tags</td>
</tr>
</tbody>
</table>

   ![Device Window](image)
### 3.3.1 Adding Devices

All supported PLCs and protocols are listed below. The protocols that are available to you are dependent on which Gateway models you purchased. If you purchased models W-G-221-P1 or WP-G-241-P1, the unavailable protocols are grayed out. You may purchase an upgrade to access all available protocols.

Gateway supports the following PLCs:
- PLC-5
- SLC 500
- ControlLogix
- CompactLogix
- MicroLogix
- Micro 800 (includes Micro850)
- Schneider M340 and Quantum 140
- Siemens S7-200/300/1200/1500

Gateway supports the following protocol families:
- EtherNet/IP, DF1-CIP
- EtherNet/IP-PCCC, DF1-PCCC
- ModbusTCP, ModbusRTU, ModbusASCII
- S7Comm, (S7-200, S7-300, S7-1200, S7-1500 only),
- PPI

Tag 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, you are required to delete all existing tags from a device.

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 on the device. During a protocol switch, the software informs you that this is the case before deleting the tags from the PLC.

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

1. Click the Devices icon:

   ![Device Icon](image)

   The Devices window appears:

   ![Devices Window](image)

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

   ![Add Device Icon](image)

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

   ![Device Properties Dialog](image)
3. View or specify the following Devices options:
   - **Device Name.** Enter the device name. This is a human-readable name.
   - **Connection.** Select the physical serial port or Ethernet connection on the Gateway that the Universal Industrial Gateway will use to communicate with the device you are adding:
     - **Serial n.** If selected, allows you to set up serial communications with the PLC through the serial ports on the Universal Industrial Gateway. Options are two or four serial ports, depending on your Gateway model.
     - **Ethernet.** ETH1 port.

4. **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.
   - If you choose **Serial**, options are:
     - **DF1-CIP.** Options are:
       - **Slot Number.** Station number of your PLC on the network. Value to enter here is dependent on your PLC controller setup.
       - **Checksum.** Please check your PLC setting to find out the checksum method PLC uses. By default, the protocol setting is **CRC**.
       - **ACK Timeout 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.
       - **NAK Retries.** Send command for number of retries if there is a response from the PLC but response is a negative acknowledgement.
       - **ENQ Retries.** Send command for number of retries if there is a response from PLC but the response is that the PLC is busy.
     - **DF1-PCCC.** Options are:
       - **Checksum.** Select either **CRC** or **BCC** checksum methods. Please check your PLC setting to find out the checksum method your PLC uses.
- **ACK Timeout** 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.

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

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

- **ModbusRTU**. Modbus is a serial communications protocol that allows a personal computer or other device to communicate with multiple PLCs.

  - **Slave ID**. Modbus Node number of slave device.
  
  - **Response Timeout**. Defines how long the device waits for a reply to be received after a Modbus command is sent.
  
  - **Retry Count**. Tells the device how many times to retry sending a Modbus command when no reply is received to the sent command.
  
  - **End of Message Delay** n characters. 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.
  
  - **Min Command Delay** n milliseconds. Defines the delay time between characters of commands sent to the Modbus device.

- **ModbusASCII**. Options are:

  - **Slave ID**. Modbus Node number of slave device.
  
  - **Response Timeout**. Defines how long the device waits for a reply to be received after a Modbus command is sent.
  
  - **Retry Count**. Tells the Modbus device how many times to retry sending a Modbus command when no reply is received to the sent command.
  
  - **End of Message Delay** n characters. 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.
  
  - **Min Command Delay** n milliseconds. Defines the delay time between characters of commands sent
to the Modbus device.

- **PPI.** Siemens S7-200 protocol. Communicates via RS-485. Make sure that RS-485 is the connection type selected for the serial port.
  - **Node Address.** Address for the protocol is set to 2 by default.

For additional information about serial port setup, see Configuring Serial Communications Setup

- If you choose **Ethernet**, options are:
  - **EtherNet/IP.** Options are:
    - **TCP Port.** For EtherNet/IP, the default port setting is 44818. If needed by your system, you can change this port number.
    - **Address.** Specifies PLC IP address.
    - **Slot Number.** When the port selected is Ethernet, and the protocol selected is EtherNet/IP, you must specify an associated slot number between 0 and 16.
  - **ModbusTCP.** Options are:
    - **Slave ID.** For Modbus TCP, the range of possible values is 1 to 255, depending on the device.
    - **TCP Port.** For ModbusTCP, the default port setting is 502. If needed by your system, you can change this port number.
    - **Address.** Specifies PLC IP address.
  - **EtherNet/IP-PCCC.** Options are:
    - **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.
  - **S7comm.** Options are:
    - **PLC Type.** Lists PLCs supported by this protocol.
    - **Keep Alive.** 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.
    - **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.
• **TCP Port.** For S7Comm, the default port setting is **102.** If needed by your system, you can change this port number.

- **Test Device Connection.** See Testing Device Connections.
- **Submit.** Saves changes on Universal Industrial Gateway and exits.
- **Cancel.** Exits without saving changes on Universal Industrial Gateway.

### 3.3.2 Modifying Devices

To modify device information:

1. Access the Devices window:
   - See Configuring Devices.
   
   The Devices window appears:

2. Select a listing and click the following icon 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 Universal Industrial Gateway and exits.
   - **Cancel.** Exits without saving changes on Universal Industrial Gateway.

### 3.3.3 Deleting Devices

Deletes a device from 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. Click the Devices icon:

   ![Devices Icon](image)

   The Devices window appears:

   ![Devices Window](image)

2. Select a device from the list.

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

   ![Delete Icon](image)

   A confirmation dialog appears (example message):

   ![Confirmation Dialog](image)

4. Confirm the deletion:

   ![Confirmation Button](image)

   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 stopped.
3.3.4 Exporting Device and Tag Data

You may export a device and tag data set as a compressed, zipped .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. Fields that are not applicable contain a pair of empty quotes.

Row one of the exported .csv file contains:

'Device Name', 'Connection', 'Protocol', 'TCP Port', 'Address', 'Slot Number'

Example Excel File Output:

Subsequent rows contain tag information written as follows:

'TagName', 'TagAddress', 'Description', 'DataType'

To export a device and tag data set:

1. Click the Devices icon:
2. In the Devices section, click the following icon:

The software compresses the export file, and provides a link on the lower right of the dialog:

Mouse over the file name to see the full name:

3. The software has saved the exported file to the downloads directory (or other, designated folder) on your personal computer. Click to open the file or the folder that contains it:
3.3.5 Testing Device Connections

You may test the device connectivity to verify a connection exists between the Universal Industrial Gateway and a PLC, (not between a computer and the Universal Industrial Gateway). The test also validates, when possible, that the protocol is selected correctly.

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 is incorrect.

To test connections:

1. Click the Devices icon:

   The Devices window appears:

   ![Device Window]

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

   The Universal Industrial 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:

   ![Test Results Dialog]
If unsuccessful, the following dialog appears. The dialog contains an error message that lets you know the type of problem encountered (see below):

![Test Results](image)

If unsuccessful, the following dialog appears. The dialog contains an error message that lets you know the type of problem encountered (see below):

3. Messages you see after you click the **Device** ping icon are self-explanatory. If your connection was unsuccessful, the dialog describes the detected issue, and suggests a fix for the detected issue. For a list of all associated messages, refer to Universal Industrial Gateway Messages.

### 3.3.6 Adding Tags

<table>
<thead>
<tr>
<th>NOTE</th>
<th>If you experience difficulty communicating with your PLC after adding tags, as a first step, ensure you have used the correct tag syntax. Using an incorrect syntax for a tag means that the Universal Industrial Gateway will not be able to read the tag on the PLC. See Configuring Tag Data Types. 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. Later controllers may have logical name tags. Most interaction with these devices uses tags. Restricted characters that may not be used in tag names are: ^{;&lt;&gt;%&quot;&amp;,. &amp;. Neither device names nor tag names starting with a dollar sign may be configured. A complete tag specification consists of a device name and a tag name. Syntax is enforced by the software. Problems are generally due to an incorrectly configured device or an incorrect tag address. Example of tag: <strong>PumpController2.Level3</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE</td>
<td>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 in use in a tag map are identified in the tag list. You may also add $User tags. You may define single-element (non-array), read/write tags of type BOOL, INT, SINT, DINT, REAL, or STRING.</td>
</tr>
</tbody>
</table>

To add a tag:

1. Click the Devices icon:
The Devices window appears:

2. Click the following Tags icon:

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

3. From the Tag Properties dialog, view or specify the following options:
   - **Tag Name.** Enter name of tag (must be unique). The descriptive name may differ from the tag address. Example: **TAG001**
   - **Description.** Enter tag description. Example: **Input_PLC01**
   - **Data Type.** Select data type for tag.
   - **Address.** Enter address of tag to be copied. The tag address is a unique string representing the tag identifier as found on the PLC.
The Address must exactly match the address of the tag defined on
the PLC, and each tag must have an address. (Tags for $User
device do not have an address.)

| 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. Example: Source word = 0x1234. Destination word = 0x3412.
- **Word Swap.** Interchanges the two words of every double word. Example: Source double word = 0x12345678. Destination double word = 0x56781234.

| NOTE | You may use both options at the same time. Example: Source = 0x12345678. Destination = 0x78563412. |

- **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 but must never exceed 500. Each element must be the same, and the software assumes that the elements are contiguous in controller memory. Example Array: BOOLDestArray[8]

| 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. |

| NOTE | String array copies are supported ONLY for EtherNet/IP and DF1/CIP string array copies. |
3.3.7 Modifying Tags

To modify tag information:

1. Access the Devices window:
   See Configuring Devices.

   The Devices window appears:

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

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 Universal Industrial Gateway and exits.
   - **Cancel**: Exits without saving changes on Universal Industrial Gateway.
3.3.8 Deleting Tags

You may delete single tags in the Tags list by clicking on the tag and selecting the Delete icon. You may also delete multiple tags with a single click. To delete multiple tags in sequential order, hold down the \texttt{SHIFT} key and click the first and last tags in the sequence. If you wish to delete individual tags from a list, hold down the \texttt{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 listed in any active tag map, the associated tag map is 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.

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.

To delete a tag:

1. Access the Devices window:
   See Configuring Devices.

   The Devices window appears:

   ![Devices Window]

   2. Select a device and one or more of the device tags from the list.

   3. Click the Delete icon:

   ![Delete Icon]

   A confirmation dialog appears:

   ![Confirmation Dialog]

   4. Confirm the deletion:

   - **Yes**. Deletes the selected tag from the Universal Industrial Gateway and exits.
3.3.9 Importing Tags

NOTE

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

Commas and quotation marks between tag data values are required. Example: "TagName", "Description", "TagAddress","DataType"
"RealArray","Testing","RealArrayAddr","real[2]".

In the following example, the description slot is empty but has quotation marks and comma:
"CurrentDateTime","","CurrentMonthAddress","STRING".

When a tag array is present, the Datatype column adds the array size after the type using square brackets. Example: STRING[10] has 10 elements in an array of type STRING.

Gateway enforces the following import rules:

- If TagAddress is missing but TagName and DataType are present, then TagName is used as both name and address.
- If TagAddress is missing, the expected comma must still be present, consistent with commonly understood Excel .csv formatting rules.
- If the TagName is missing, then no Tag entry will be imported for that line.
- If DataType 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
**DataType.** Example: **INT[10]** This indicates that the tag is an array, of 10 elements of type INT.

- 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**

When a tag file is exported from the Gateway, it automatically terminates each line with a CRLF.

**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. If tags are imported, however, these limits are not enforced and it's theoretically possible to configure tags with a negative length, a length of zero, or a length that exceeds the maximum.

If such tags are imported and used as source or destination tags in a tag maps, the behavior is undefined. The tag may generate an error which might appear in the logs, part of an array may be copied, or nothing at all may be copied. You should verify that the array lengths in imported files are valid for data type and protocol to avoid unexpected results.

**Sample Import File Format**

<table>
<thead>
<tr>
<th>TagName</th>
<th>Description</th>
<th>TagAddress</th>
<th>Datatype</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;TagName&quot;</td>
<td>&quot;Description&quot;</td>
<td>&quot;TagAddress&quot;</td>
<td>&quot;Datatype&quot;</td>
</tr>
<tr>
<td>&quot;CurrentDateTime&quot;</td>
<td>&quot;Starting Date and Time&quot;</td>
<td>&quot;CurrentMonthAddress&quot;</td>
<td>&quot;STRING&quot;</td>
</tr>
<tr>
<td>SourceData[10]</td>
<td>SourceDataAddress</td>
<td>STRING</td>
<td></td>
</tr>
<tr>
<td>RealArray[2]</td>
<td>RealArray_Address</td>
<td>REAL</td>
<td></td>
</tr>
</tbody>
</table>
To import a tag file:

1. Click the Devices icon:

The Devices window appears:

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

3. From the dialog, click the following icon:

The following dialog appears. Navigate to the directory where the file you wish to import is located:

4. 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. Each row holds the information for a single tag. All fields are enclosed in 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"
Example exported tag row:
"CurrentMonth","","CurrentMonthAddress","STRING". When a tag array is present, the Datatype column adds the array size after the type using square brackets. Example: STRING[10] has 10 elements in an array of type STRING.

1. Click the Devices icon:

The Devices window appears:

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

3. From the dialog, click the following icon:

The following dialog appears:

4. The software has saved the exported file to the downloads directory (or other designated folder) on your personal computer. Click to open the file or the folder that contains it:
Section 3.4
Configuring Tag Maps

A tag map is used to move data from a source tag to a destination tag. 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 a change in a single tag value. Any configured tag may be specified as a source tag, but only user-configured tags may be specified as destination tags.

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. It is important to note that performance depends on many variables, such as tag type, the protocols of devices, CPU availability, the desired frequency of copy, connection speed, and so on.

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 actual number of tags that can be copied on the schedule is dependent on a variety of factors, such as 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 greater the data processing needs, the fewer the devices and/or the more time required to complete the data transfer.

**NOTE**

| The devices from which the tag values are being read do not have to be running the same protocol as the devices to which the tag values are being written. Exercise caution when copying between different tag types. There is minimal validation of tag types. The types of the source and destination tags must be compatible in the sense that there is a logical conversion from one type to the other. 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. |
To add, modify, or delete tag maps:

1. Click the Tag Maps icon:

   ![Tag Maps icon]

   The Tag Maps window appears:

   ![Tag Maps window]

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

<table>
<thead>
<tr>
<th>Icon</th>
<th>Function</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Add icon]</td>
<td>Add a tag map:</td>
<td>Adding Tag Maps</td>
</tr>
<tr>
<td>![Modify icon]</td>
<td>Modify a tag map:</td>
<td>Modifying Tag Maps</td>
</tr>
<tr>
<td>![Delete icon]</td>
<td>Delete a tag map:</td>
<td>Deleting Tag Maps</td>
</tr>
<tr>
<td>![Activate icon]</td>
<td>Activate a tag map:</td>
<td>Activating Tag Maps</td>
</tr>
<tr>
<td>![View icon]</td>
<td>Viewing live tag data</td>
<td>Viewing Live Tag Data</td>
</tr>
</tbody>
</table>

3.4.1 Adding Tag Maps

This topic explains how to create tag maps for copying between PLCs. 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.

- 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.

The following diagram maps tag copying results between different data types. Use this mapping to determine whether or not you can copy data between different types of tag:

![Tag map results with different data types diagram]

**Results Key**
- Formal expression: results with casts
- Hooked by UI: results with casts
- Target might not represent the source value
- Data loss

**CHART NOTES**
1. Integers: \( x \rightarrow y \rightarrow \text{cast} \rightarrow \text{result} \)
2. Integers: \( x \rightarrow y \rightarrow \text{cast} \rightarrow \text{result} \)
3. Destination will be an undefined value
4. Destination will be a specified value

**OPERATIONAL NOTES**
- Destination tag is cleaned to 0(x) before bits are copied
- Array order is [0, 1, 2, ...]
- Bit order is LIL to UIL, SF = INT will place INT31 value bits 3 of the INT and INT[1] into bits 15-16
- There is no endian swap being done at the high level. The protocol MUST do byte or word swap if required or the user has selected to do so.

**DATA TYPE EXAMPLES**

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DESTINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>INT</td>
</tr>
<tr>
<td>REAL</td>
<td>REAL</td>
</tr>
<tr>
<td>REAL</td>
<td>INT</td>
</tr>
<tr>
<td>REAL</td>
<td>REAL</td>
</tr>
<tr>
<td>INT</td>
<td>INT</td>
</tr>
<tr>
<td>INT</td>
<td>REAL</td>
</tr>
</tbody>
</table>

To create a tag map:

1. Click the Tag Maps icon:

   ![Tag Maps icon](image)

   The following window appears:

   ![Tag Map Editor](image)

   2. Click the following Tag Maps window icon:

   ![Add button](image)

   The Tag Map Editor appears. The Tag Map Editor has two work areas. 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:

   ![Available Tags and Copy Tags](image)

   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 turns blue. Tags available for
copying from the selected device appear in the associated Tag list. 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.

- **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 work area. The following buttons can be used to add and delete rows in the tag map, and to edit the list of tags. To select an individual tag in a column, click the tag entry. Selected tags turn blue. To edit the list:
  - **Add** icon. To add a tag row to the Copy Tags work area in the Tag Map Editor dialog, click the following icon:
  - **Delete** icon. To delete a tag row (with or without tags in the row), in the Tag Map Editor dialog from the Copy Tags work area, click the following icon:
  - Once you have your source and destination tag list set up, enter the following data to complete tag map setup:
    - **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 icon and selecting a tag from the list that appears.
      - **Polling Rate.** Specify how often to look at a tag in a controller for a tag value change since the last time the value was checked. Range is 10 milliseconds to 1000 milliseconds. Default value is 100 ms.
      - **Periodic.** Copy tags from source to destination periodically as specified.
      - **Every n time period at time t.** Specify to
copy the tags at a specified time period of milliseconds, seconds (default), 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.

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the Copy Tags action references a tag or tags that are no longer defined, the software provides a Clean Up button to allow you to remove the listed Not Found tags:</td>
</tr>
</tbody>
</table>

4. **Activate** icon. Tag maps are inactive when first created. To activate the tag map, return to the Tag Maps window and click the following icon on the window:

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you try to activate a tag map that references a deleted tag in either the source or destination map, 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. You also cannot activate a System Tag Map.</td>
</tr>
</tbody>
</table>

- **Submit.** Saves entered data on Universal Industrial Gateway and exits.
- **Cancel.** Exits without saving changes on Universal Industrial Gateway.
3.4.2 Modifying Tag Maps
You may modify a tag map. The tag map has to be made INACTIVE before you can modify it. When you reactivate the tag map, ALL of the tag maps will be restarted.

To modify a tag map:
1. Click the Tag Maps icon:

   ![Tag Maps icon]

   The following dialog appears:

   ![Tag Maps dialog]

2. Click the following Tag Maps dialog icon:

   ![Tag Maps dialog icon]

3. Make your modifications to the tag maps:
   See Adding Tag Maps
4. Confirm the modification(s):
   - **Yes.** Saves the changes to the tag map and exits.
   - **No.** Exits without saving changes to the tag set.
3.4.3 Deleting Tag Maps
You may delete a tag map.
To delete a tag map:

1. Click the Tag Maps icon:

   ![Tag Maps Icon]

   The following dialog appears:

2. Select a Tag Map to be deleted. Only inactive maps can be deleted.

3. Click the Delete icon:

   A confirmation dialog appears:

   ![Confirmation Dialog]

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 .csv file as follows:
Row one of the exported .csv is Tag Map Properties. All fields are enclosed in single quotation marks. If the Tag Map is “Periodic”, then the first row contains:
   - Map Name, 'Periodic', 'Periodic Interval', 'Units', 'Use TimeOfDay', 'TimeOfDay'
   - If the Tag Map is 'OnChange', then the first row contains:
     - Map Name, 'OnChange', 'OnChange Tag', 'Polling Rate', 'ms'
   - Subsequent rows are Source and Destination tag pair mappings:
     - 'srcDeviceName.TagName', 'TagAddress', 'DataType',
To export a tag map:

1. Click the Tag Maps icon:

The following dialog appears:

2. Select a tag map to export, and click the following Tag Maps Export dialog icon:

The User Interface informs you that it is downloading the export file.

3. A download file is simultaneously displayed at the lower left of the dialog. Click the file name:
4. The software has saved the exported file to the downloads directory (or other designated folder) on your personal computer. Click to open the file or the folder that contains it:

![Image of file explorer]

3.4.5 Viewing Live Tag Maps

Use this option to view live tag data values on source and destination tags in a tag map. 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 as they change, which depends on the copying rate. 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.

If tags cannot be read or written because the device and/or tag configuration is incorrect or the device is offline, the Live Tags view shows {ERR}:

![Image of Live Tag Map Viewer]

To view the values:

1. Click the Tag Maps icon:

![Image of Tag Maps icon]

The following dialog appears:

![Image of Tag Map dialog]

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

![Image of Live Tag Maps icon]

The Live Tag Maps dialog appears. The data being copied between Source and Destination PLCs is constantly displayed.
The values are sampled at five-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:

4. To hide the values, click the arrow again.

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

- **Polling Tag Value.** Shows the current polling tag value when the tag map trigger is set to **On Change.** Shows the value when the tag can be read, and 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 ellipse is used to indicate the truncated value.) Hover over the field to show the full tag name and its value. If the polling 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 **X**.

### 3.4.6 Activating Tag Maps

This topic explains how to activate a tag map.

To activate a tag map:

1. Click the Tag Maps icon:

   ![Tag Maps Icon]

   The following window appears:

   ![Tag Map Window]

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

   ![Activate Icon]

   3. To deactivate the tag map, click the icon again.

   **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 you try to activate a tag map that references a deleted tag in either the source or destination map, the software warns you that tag(s) no longer exist. You cannot activate the tag map until the deleted tag issue is addressed.
Section 3.5
Identifying the Universal Industrial Gateway

This information uniquely identifies the Universal Industrial Gateway. The information includes the module's MAC address, the model ID, a name, and a description.

To access the option:

1. Click the Identification icon:

   ![Identification Icon]

   The Universal Industrial Gateway Identification dialog appears:

   ![Identification Dialog]

   2. View or specify the following settings:

      - **MAC Address.** Not editable. The MAC address is a 12-digit hexadecimal string that can be also be obtained from the Universal Industrial Gateway label.
      - **Model ID.** Not editable. Lists the model number of your Gateway. This is also the catalog number.
      - **Unit Name.** Text name that uniquely identifies your Gateway. No spaces are allowed. 100 characters maximum. Allowable characters are a to z, A to Z, 0 to 9, dash, underscore, and comma. Example: *SpectrumLaboratory1*. The name is displayed as the tab name in the browser window.
      - **Description.** Text description for location and comment information. Example: *Master Universal Industrial Gateway for Spectrum Testing Laboratory*.

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

   - **Submit.** Saves changes.
   - **Cancel.** Resets any modified fields on the dialog.
Section 3.6
Configuring Network Settings for the Universal Industrial Gateway

You use the Universal Industrial Gateway Network Settings options to set up the network parameters.

<table>
<thead>
<tr>
<th>NOTE</th>
<th>When assigning IP addresses across the system, (ETH1) DO NOT overlap with IP addresses used elsewhere.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>NOTE</th>
<th>Keep the following in mind: the gateway and DNS addresses are only necessary if using NTP; otherwise, only address and subnet mask are needed.</th>
</tr>
</thead>
</table>

The Universal Industrial Gateway ETH1 port is a single Ethernet port that provides an interface between a network and the Universal Industrial Gateway. You may also access the Universal Industrial Gateway User Interface over the network via its ETH1 Ethernet port. The ETH1 port communicates at 10/100 Mbytes per second over an Ethernet connection. Each Universal Industrial Gateway ETH1 port is assigned a unique Spectrum Controls MAC address. This address is listed on the label on your Universal Industrial Gateway. During setup, you can configure the ETH1 as a DHCP client or with a static IP address.

You configure a Universal Industrial Gateway using an Ethernet cable to make a connection between the ETH1 port on the Universal Industrial Gateway front panel and a PC. Before you can communicate with the Universal Industrial Gateway, a power supply 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 Universal Industrial Gateway starts up and shows the default 192.168.1.100 address that is the initial starting IP address for the device displayed on the single-character, seven-segment display. The address is shown one character at a time, separated by periods for each portion of the address.
To configure network settings:

1. Click the Network icon:

   ![Network icon]

   The Network Setup window appears:

   ![Network Setup window]

2. View or specify the following options:
   - **Connection type.** Identifies whether to use static or dynamic address configuration for the ETH1 network:
     - **Static IP.** Default option. Static means that an IP address is entered manually and does not change until you change it.
     Select a valid Static IP address in the Network. Enter the Universal Industrial Gateway IP Address. The default address 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**.
   - **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. For the Universal Industrial Gateway, this value may be set to a different value. If the primary connection fails, the secondary is available.
NOTE

If an NTP timer server is configured, The Universal Industrial Gateway must have access to the Internet and a gateway, and at least one DNS server must be configured.

- **DHCP Client.** If you have a DHCP Server installed and configured on the network, select this option to allow the Universal Industrial Gateway to get an ETH1 IP address from the designated DHCP server for a designated lease period when the Universal Industrial Gateway starts up.
  
  - **Submit.** Saves data on Universal Industrial Gateway and exits.
  - **Cancel.** Exits without saving data from Universal Industrial Gateway.

### Section 3.7 Configuring Serial Communications Setup

A Universal Industrial 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 3 and 4 are provided only on WP-G-241-P1/P2 models. You may connect the Universal Industrial 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.

To configure serial ports for the Universal Industrial Gateway:

1. Click the Serial Ports icon:

   ![Serial Ports Icon](image)

   The Serial Communications Setup dialog appears:

   ![Serial Communications Setup Dialog](image)

2. View or specify the following Communications Settings options for each serial port (1 through 4):

   - **Port.** Ports 1 through n (2 or 4), are listed by row in the setup list.
   - **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. 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.** Defines whether to use the Universal Industrial Gateway's RS-232 or RS-485 serial communication.

• **Submit.** Saves the entered connection data on Universal Industrial Gateway. The software informs you that the data settings were successfully modified. Click **OK.**

• **Cancel.** Exits without saving data from Universal Industrial Gateway.

### Section 3.8 Configuring Time Setup for the Universal Industrial Gateway

The Universal Industrial Gateway tracks date and time, and uses the data to timestamp Gateway operations, such as log entries. You specify that Universal Industrial Gateway time and date is either set manually (default selection) or via the Internet, with a remote server using the Network Time Protocol (NTP) server.

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>An operating system anomaly exists which does not allow for Date/Time settings beyond January 19, 2038 3:14:07 AM GMT.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you choose the NTP method, you specify how often the time is updated by the NTP service, but you may only use this option if you choose one of the following options:</td>
</tr>
<tr>
<td>• Use a static IP address, and have both gateway and DNS1 addresses configured.</td>
</tr>
<tr>
<td>• Configure the address as DHCP.</td>
</tr>
</tbody>
</table>

To configure Universal Industrial Gateway time and date settings:
1. Click the Time icon:
   ![Time Icon](image)

   The Time Setup window appears.
(Default dialog shows current Universal Industrial Gateway date and time information):

2. View or specify the following options:
   - **WebPort Date/Time.** Shows current time and date on the Gateway as configured using either Manual or NTP.
     
   - **Manual.** You specify the date and time to use using a calendar. Normally this is the current time for the Gateway's physical location. If the current date and time for the Gateway falls during Daylight Saving time and you set the date and time such that it falls during Standard time, one hour is automatically subtracted from the time you set:

     - **New Date/Time.** Shows field containing current date on Universal Industrial Gateway. The field is not directly editable. To make changes, select the date from the calendar.
To adjust the time, use the up and down arrows in the time field at the bottom of the calendar:

- **NTP.** Allows Universal Industrial Gateway to synchronize its time over the Internet using a Network Time Protocol (NTP) server. Settings are grayed out until the checkbox is selected. To enable NTP, navigate to the Network window and either turn on DHCP, or enter values in the Static IP Gateway and DNS1 settings. 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 Universal Industrial 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 Universal Industrial Gateway attempts to get the time:
    - If it cannot get the time from the server, it repeats the time update attempt every fifteen seconds as long as the Universal Industrial Gateway is active.
    - If you turn off NTP updating, the Universal Industrial Gateway stops trying to update the time using this method.
    - If you turn NTP updating back on, the Universal Industrial Gateway returns to trying to update the time every fifteen seconds.
- **NTP Server Address.** Lists Internet locations of servers that provide network time synchronization. Select a server location that describes the continent on which the Universal Industrial Gateway is located. Example: north-america.pool.ntp.org

- **GMT Offset.** Lists time zone information. Select the time zone in which the Universal Industrial Gateway is located. Example: GMT-07.00 Mountain Time (US & Canada)

- **Submit.** Saves new selections on Universal Industrial Gateway.
- **Cancel.** Reverts any changes on the window. If you try to exit the window without saving your changes, the software asks you to confirm the exit without saving changes.

### Section 3.9 Configuring Universal Industrial Gateway Operations

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

To access the options:

1. Click the Operations icon:

2. The Universal Industrial Gateway Operations dialog appears (with the current firmware version running on the Gateway):

3. From the dialog, select the appropriate function:
   - Rebooting the Universal Industrial Gateway
   - Updating Firmware
   - Backing Up Universal Industrial Gateway Data
   - Resetting the Universal Industrial Gateway to Default Configuration
   - Upgrading Protocols
3.9.1 Rebooting the Universal Industrial Gateway

Restarts the Universal Industrial Gateway. Rebooting is one of the first steps to take if your Universal Industrial Gateway does not function correctly for any reason. The reboot usually starts your Universal Industrial Gateway up with all services restored and running properly.

To reboot the Universal Industrial Gateway:

1. Click the Operations icon:

![Operations Icon](image)

The following dialog appears:

![Reboot Dialog](image)

2. Click **Reboot**:

![Reboot Button](image)

3. The following dialog appears:

![Confirmation Needed Dialog](image)

4. Confirm the reboot:
   - **Ok**. Reboots the Universal Industrial Gateway and exits the Gateway user login.
   - **Cancel**. Exits without rebooting the Universal Industrial Gateway.
The software reboots the Universal Industrial Gateway:

```
Gateway is now rebooting. You may refresh the browser in a few minutes.
```

5. Once the Gateway has fully rebooted, reload your web browser and log back in to your Serial Communications Gateway.

### 3.9.2 Backing Up Universal Industrial Gateway Data

Spectrum Controls, Inc. recommends that you regularly make a copy of all the data on your Universal Industrial Gateway on a separate device, such as a personal computer or other storage device. To back up your data:

| NOTE | Backing up a very large database may take some time. Please wait until the backup completes before moving onto your next task. |

| NOTE | IP addresses and Passwords are not saved as a part of the backup configuration file. |

1. Click the Operations icon:

   ![Operations Icon]

   The following dialog appears:

   ![Backup Dialog]

2. From the dialog, click **Backup**: 

   ![Backup Icon]
3. When back up and download shows 100% completed, click OK:

4. A download file is simultaneously displayed at the lower left of the Operations dialog. Click the file name:

5. The following dialog appears:

The software has saved the exported backup file to the Downloads directory (or other designated folder) on your personal computer. Use the correct version of this file if you need to restore your Gateway.

### 3.9.3 Restoring Universal Industrial Gateway Data

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

| NOTE | During a Gateway restore operation, there is no change to the network configuration or to the administrator password. You also cannot restore the Gateway from a non-Gateway, related device, or from a P2 to a P1 Gateway. |
To restore a data backup:

1. Click the Operations icon:

   ![](image1.png)

   The following dialog appears:

   ![](image2.png)

2. From the dialog, click **Restore**:

3. An Open 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:

   ![](image3.png)

4. Select the correct file.

5. Click **Open**. The software informs you that it is restoring the backup on the Universal Industrial Gateway:

   ![](image4.png)
The software informs you when the software backup restoration is complete and informs you that it is rebooting the Universal Industrial Gateway:

![Gateway Reboot Notification](image)

6. Wait a few minutes, then refresh your Gateway browser, and, if necessary, log back in.

### 3.9.4 Updating Firmware

Replaces firmware on the selected Universal Industrial Gateway. The firmware is the software that runs your Universal Industrial Gateway. Replacing firmware does not change, replace, or delete your data or settings on the Universal Industrial Gateway.

**NOTE**

You cannot reverse a firmware update once it has been installed or re-install an earlier version. Before updating your Universal Industrial 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 upgrade. To back up your files, see Backing Up Your Universal Communications Gateway Data.

To update firmware:

1. Click the Operations icon:

![Operations Icon](image)

The following window appears:

![Firmware Update Window](image)

2. Click **Upgrade Firmware**:

![Upgrade Firmware Button](image)
An updating and a firmware update file selection dialog appear:

3. 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: Gateway-\textit{n.n}.fup where \textit{n.n} is the version. The software loads the selected firmware onto the Universal Industrial Gateway:

![Uploading File](image)

4. The software also informs you about progress as it is installing the update:

![Installing upgrade](image)

The software informs you when the update is completed and reboots the Gateway.

5. After the Universal Industrial Gateway reboots, and before logging back onto your Universal Industrial Gateway, clear the Internet browser's cache. Then log back onto your Universal Industrial Gateway. Once logged in, check that the right version of the software is installed (listed on Operations window).

### 3.9.5 Upgrading Protocols

Allows you to access additional protocols purchased with an upgrade. Models WP-G-221-P1/WP-G-241-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.
To upgrade protocols:

1. Click the Operations icon:

   ![Operations Icon]

   The following dialog appears:

   ![Dialog with options]

   - Reboot
   - Reset to Default Config
   - Update Firmware
   - Upgrade Protocols
   - Backup
   - Restore

2. Click **Upgrade Protocols**: 

   ![Upgrade Protocols Button]
An upgrading selection dialog appears:

3. 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 into the Upgrade Key field.

4. Click Submit. The software informs you when the upgrade is completed and reboots the Gateway.

5. After the Universal Industrial Gateway reboots, and before logging back onto your Universal Industrial Gateway clear the Internet browser's cache. Then log back onto your Universal Industrial Gateway. Once logged in, check that the right version of the software is visible under Operations.

3.9.6 Resetting the Universal Industrial Gateway to Default Configuration

Resetting a Universal Industrial Gateway to its factory default configuration using the software removes all user-entered data that is on the Universal Industrial Gateway.

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

- The ETH1 address is set to Static IP address of 192.168.1.100.
- All serial ports are set to 19200, 8/1/None/RS-232.
- Time is configured as Manual.
- Security is set to No MAC addresses whitelisted or blacklisted; allowed; Firewall setting is Default option.
• Login password is set to default value (spectrum). User name (admin) is not editable.
• All Devices, Tag Maps, and Traces are removed, with the exception of $System device and its tags, and the $User device. Any tags added to the $User device are removed.
• User-configured Identification information is cleared.
• All trace file and logs are cleared, except for the Reboot log.

If the reset to default fails, the Universal Industrial Gateway will be in an error condition. If this happens, call Technical Services for further help.

To reset the Universal Industrial Gateway to factory default settings using software:

1. Click the Operations icon:

   ![Operations Icon]

   The following dialog appears:

   ![Version 1.00.70]

   - Reboot
   - Reset to Default Config
   - Update Firmware
   - Upgrade Protocols
   - Backup
   - Restore

2. Click Reset to Default Config:

   ![Reset to Default Config]

   The following dialog appears:

   ![Confirmation Needed]

   Are you sure you want to reset Gateway's configuration back to defaults?

   Yes
   No

3. Confirm the reset:
   • Yes. Restores the factory default settings and exits.
   • No. Exits without restoring the factory default settings.
The software informs you when the reset is done and reboots the Gateway.

| NOTE | You may also choose to reset the Universal Industrial 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 Universal Industrial Gateway and press gently and briefly, for 0-15 seconds. The horizontal segments of the seven-segment display will blink. As soon as you release the button, the Gateway reboots.  
|      |   - Reset to factory defaults. Insert the paper clip and press gently for more than 15 seconds. All segments of the seven-segment display are steadily lit. As soon as you release the button, the Gateway resets to defaults and reboots.  |

| NOTE | The Gateway may become unresponsive if you double click the switch. You will need to cycle power. When power is applied to the connector, all segments are momentarily lit (showing power has been applied.) A series of dots will blink until network setup is complete. At that point, the IP address will be displayed, one character at a time. |

Section 3.10 Configuring Security Setup for the Universal Industrial Gateway

| NOTE | It is recommended that you do **NOT** choose the **All Open** option. The software informs you that selecting **All Open** will remove **ALL** firewall protection. The Universal Industrial Gateway provides security features that allow you to control network access to the Gateway. |
Please keep the following in mind:

- You may enter at least 25 MAC addresses into both the whitelist and the blacklist.
- Setting the **Firewall** option to **All Open** disables both the whitelist and the blacklist.
- 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) and `ifconfig` (Mac). The MAC address appears.
- If you whitelist a MAC address, the same firewall settings apply as for a blacklist address.
- When you enter a MAC address into the Whitelist, ONLY the personal computer or device with that MAC address will be able to access the Universal Industrial Gateway. No other devices can access it. If you have checked the **Allow Ping** checkbox, only the MAC address from the Whitelist will be allowed to ping the Universal Industrial 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 Universal Industrial Gateway.

To configure security for the Universal Industrial Gateway:

1. Click the Security icon:

   ![Security icon](image)

   The Security Setup window appears:

   ![Security Setup window](image)
2. View or specify the following Security Setup options for each Universal Industrial Gateway:

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

- **Whitelist.** Enter a known, trusted MAC address that allows the Universal Industrial 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 Universal Industrial Gateway front panel to re-establish the connection, so use with caution and double check your own MAC address before you enter it.

- **Enable name_list.** Turns on the acceptance or rejection of the address, depending on whether Whitelist or Blacklist option is selected.

- **Allow Ping.** Defines whether or not the Universal Industrial Gateway can be pinged across a network. By default, pinging is permitted.

- **Firewall.** Determines security settings for the Universal Industrial Gateway:
  - **All Open.** Completely opens the firewall, and is completely insecure. All traffic is let through. No security is available, and this setting is recommended only for testing and troubleshooting. Black or whitelisting settings also have no effect. If you choose this option, the software warns you that this is an insecure setting. This selection also disables both the blacklist and the whitelist, even if these are configured and enabled.
  - **Default.** The default firewall lets all ports used by Universal Industrial Gateway through as well as common industry ports, but blocks all other types of traffic. Use this to support established and related connections. If the Universal Industrial Gateway originates the connection, returning data is allowed through. See Default Firewall Configuration Ports.
  - **Enhanced.** Adds advanced security settings that protect your Universal Industrial Gateway. When enhanced, provides additional settings that protect the Universal Industrial Gateway from denial-of-service attacks and malformed packet attacks. Only a few selected ports (selected by your organization) can be used for communication. For additional information, call Technical Services.

- **Submit.** Saves data on Universal Industrial Gateway and exits.

- **Cancel.** Exits without saving data from Universal Industrial Gateway.
3. View or specify the following options:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Function</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Add a blacklisting:</td>
<td>Adding Blacklistings</td>
</tr>
<tr>
<td>✍️</td>
<td>Modify a blacklisting:</td>
<td>Modifying Blacklistings</td>
</tr>
<tr>
<td>✗</td>
<td>Delete a blacklisting from the Universal Industrial Gateway:</td>
<td>Deleting Blacklistings</td>
</tr>
<tr>
<td>+</td>
<td>Add a whitelisting:</td>
<td>Adding Whitelistings</td>
</tr>
<tr>
<td>✍️</td>
<td>Modify a whitelisting:</td>
<td>Modifying Whitelistings</td>
</tr>
<tr>
<td>✗</td>
<td>Delete a whitelisting from the Universal Industrial Gateway:</td>
<td>Deleting Whitelistings</td>
</tr>
</tbody>
</table>

### 3.10.1 Adding Blacklistings

**NOTE**

Please keep the following in mind:

- You may enter at least 25 MAC addresses into both the whitelist and the blacklist.
- Setting the **Firewall** option to **All Open** disables both the whitelist and the blacklist.
- 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) and `ifconfig` (Mac). The MAC address appears.
- If you whitelist a MAC address, the same firewall settings apply as for a blacklist address.
- When you enter a MAC address into the Whitelist, ONLY the personal computer or device with that MAC address will be able to access the Universal Industrial Gateway. No other devices can access it. If you have checked the **Allow Ping** checkbox, only the MAC address from the Whitelist will be allowed to ping the Universal Industrial 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 Universal Industrial Gateway.

Enter a known, untrustworthy MAC address so that the Universal Industrial Gateway rejects any attempt to connect to the Universal Industrial Gateway from this address.
To add a blacklisting:

1. Click the Security icon:

The Security window appears:

2. If necessary, select the **Blacklist** option in the Security Setup window.

3. Click the following Blacklist dialog icon:

The MAC Address Properties dialog appears:

4. View or specify the following options:
   - **Description.** Enter description. Example: **Spam server site.**
   - **Submit.** Saves changes on Universal Industrial Gateway and shows new blacklisted MAC address:
   - **Cancel.** Exits without saving changes.
3.10.2 Modifying Blacklistings

To modify blacklisting information:

1. Access the Security Setup window:
   See Configuring Security Setup for the Universal Industrial Gateway.
   The Security Setup window appears:

   ![Blacklist Table]

   2. If necessary, select the **Blacklist** option in the Security Setup dialog.

   3. Select a MAC address from the blacklist and click the following icon:

   ![Edit Icon]

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

   5. When finished making changes, click either of the following to exit:
   - **Submit.** Saves changes on the Universal Industrial Gateway and exits.
   - **Cancel.** Exits without saving changes on Universal Industrial Gateway.

3.10.3 Deleting Blacklistings

To delete a blacklisting:

1. Click the Security icon:

   ![Security Icon]

   The Security Setup window appears:

   ![Blacklist Table]

   2. If necessary, select the **Blacklist** option in the Security Setup dialog.

   3. Select a MAC address from the list.

   4. Click the Delete icon:

   ![Delete Icon]

   A confirmation dialog appears:
5. Confirm the deletion:
   - **Yes.** Deletes the selected MAC address from the Universal Industrial Gateway and returns to the window.
   - **No.** Exits without deleting the selected MAC address from the Gateway.

### 3.10.4 Adding Whitelistings

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please keep the following in mind:</td>
</tr>
<tr>
<td>You may enter at least 25 MAC addresses into both the whitelist and the blacklist.</td>
</tr>
<tr>
<td>Setting the <strong>Firewall</strong> option to <strong>All Open</strong> disables both the whitelist and the blacklist.</td>
</tr>
<tr>
<td>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 <code>ipconfig/all</code> (Windows) and <code>ifconfig</code> (Mac). The MAC address appears.</td>
</tr>
<tr>
<td>If you whitelist a MAC address, the same firewall settings apply as for a blacklist address.</td>
</tr>
<tr>
<td>When you enter a MAC address into the Whitelist, ONLY the personal computer or device with that MAC address will be able to access the Universal Industrial Gateway. No other devices can access it. If you have checked the <strong>Allow Ping</strong> checkbox, only the MAC address from the Whitelist will be allowed to ping the Universal Industrial Gateway.</td>
</tr>
<tr>
<td>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 <strong>Allow Ping</strong>, blacklisted MAC addresses are prevented from pinging the Universal Industrial Gateway.</td>
</tr>
</tbody>
</table>

Enter a known, trustworthy MAC address so that the Universal Industrial Gateway accepts any attempt to connect to the Universal Industrial Gateway from this address.
To add a whitelisting:
1. Click the Security icon:

![Security Icon]

The Security window appears:

![Security Window]

2. If necessary, select the **Whitelist** option in the Security Setup window.
3. Click the following Whitelist dialog icon:

![Whitelist Dialog Icon]

4. The MAC Address Properties dialog appears:

![MAC Address Properties]

5. View or specify the following options:
   - **MAC Address.** Enter MAC address. Example: **88:88:88:88:88:88**
   - **Description.** Enter description. Example: MAC address for onsite server.
   - **Submit.** Saves changes on Universal Industrial Gateway and shows new whitelisted MAC address:
     ![New Whitelisted MAC Address]
   - **Cancel.** Exits without saving changes.
3.10.5 Modifying Whitelistings

To modify whitelisting information:

1. Access the Security Setup window:
   See Configuring Security Setup for the Universal Industrial Gateway.
   The Security Setup dialog window appears:

   ![Security Setup Window]

2. Select a MAC address from the whitelist and click the following icon:

   ![Edit Icon]

3. The MAC Address Properties dialog appears. Change information in the listed fields:
   See Adding Whitelistings.

4. When finished making changes, click either of the following to exit:
   - **Submit**. Saves changes on Universal Industrial Gateway and shows new whitelisted MAC address:

     ![Whitelist Window]

   - **Cancel**. Exits without saving changes on Universal Industrial Gateway.
3.10.6 Deleting Whitelists

To delete a whitelisting:

1. Click the Security icon:

   ![Security icon]

   The Security Setup window appears:

   ![Security Setup window]

2. If necessary, select the Whitelist option in the Security Setup window.
3. Select a MAC address from the list.
4. Click the Delete icon:

   ![Delete icon]

   A confirmation dialog appears:

   ![Confirmation dialog]

5. Confirm the deletion:
   - **Yes.** Deletes the selected MAC address from the Universal Industrial Gateway and exits.
   - **Cancel.** Exits without deleting the selected MAC address from the Gateway.
Section 3.11
Viewing Diagnostics, Storage, and Trace Information

Use the provided options to manage diagnostics tasks:

- Monitor Gateway's resource use.
- Trace traffic network to, and from, the Gateway to a specific, connected device.

1. Click the Diagnostics icon:

The following dialog appears:

2. View the following options:
   
   - **Resources**. Graphically shows available memory, flash memory, and central processing unit (CPU) load:
     - **Memory (bytes)**. To view available and used memory in kilobytes, 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.

- **Trace Manager.** Use to trace data for network debugging purposes. Data includes the name of the trace and a timestamp. See Tracing Data.

### Section 3.12
**Tracing Data**

You may capture network 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 data traffic.

To add a data trace:

1. Click the Diagnostics icon:

The following dialog appears:

2. In the Trace Manager work area, view or specify the following options:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Function</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Add" /></td>
<td>Add a data trace:</td>
<td>Adding Data Traces</td>
</tr>
<tr>
<td><img src="image" alt="Modify" /></td>
<td>Modify a data trace:</td>
<td>Modifying Data Traces</td>
</tr>
<tr>
<td><img src="image" alt="Delete" /></td>
<td>Delete a data trace:</td>
<td>Deleting Data Traces</td>
</tr>
<tr>
<td><img src="image" alt="Download" /></td>
<td>Download a data trace:</td>
<td>Downloading Data Traces</td>
</tr>
</tbody>
</table>

- **Submit.** Saves changes on Universal Industrial Gateway and
3.12.1 Adding Data Traces Data

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 Data Traces.

To add a data trace:

1. Click the Diagnostics icon:

The following window appears:

2. Click the following Trace Manager icon (all buttons are disabled if no device(s) have been configured):
3. From the Trace Properties dialog, view or specify the following options:
   - **Name.** Enter name of trace. Example: **NewTrace**
   - **Timespan.** Enter length of time trace is to run, in minutes. Example: 3.
   - **Inbound.** Specify inbound data source (PLC to Gateway). Click to select device name.
   - **Outbound.** Specify outbound data source (Gateway to PLC). Click to select device name.
   - **Submit.** Saves changes on Universal Industrial Gateway and exits.
   - **Cancel.** Exits without saving changes on Universal Industrial Gateway.

4. When you submit your selections, the new trace setup appears in the Trace Manager:
   - To start a selected trace, click **Start**.
   - To download trace data, see Downloading Data Traces.
3.12.2 Modifying Data Traces

To modify a data trace:

1. Click the Diagnostics icon:

   ![Diagnostics Icon]

   The following dialog appears:

   ![Modifying Data Traces Dialog]

2. Select a data trace from the list.
3. Click the following Trace Manager icon:

   ![Trace Manager Icon]

4. The Trace Properties dialog appears. Change information in the listed fields:
   - See Adding Data Traces.
5. When finished making changes, click either of the following to exit:
   - **Submit**. Saves changes on the Universal Industrial Gateway and exits.
   - **Cancel**. Exits without saving changes on Universal Industrial Gateway.
3.12.3 Deleting Data Traces

To delete a data trace:

1. Click the Diagnostics icon:

   ![Image of Diagnostics icon]

   The following dialog appears:

   ![Image of data trace management interface]

   2. Select a data trace from the list.
   3. Click the following Trace Manager icon:

      ![Image of Trace Manager icon]

   A confirmation dialog appears:

   ![Image of confirmation dialog]

   4. Confirm the deletion:
      - **Yes**: Deletes the selected data trace from the Universal Industrial Gateway.
      - **No**: Does not delete the selected data trace from the Gateway.
3.12.4 Downloading Data Traces

You can download a 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 data trace:

1. Click the Diagnostics icon:

The following dialog appears:

2. Select a data trace that has a COMPLETE status from the list.

3. Click the following icon:

   ![Download Icon]

   The software informs you that it is building the trace download.

4. Once the trace is built, save the file to your hard drive.
3.12.5 Viewing Downloaded 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.

To download the trace data for viewing:

1. Click the Diagnostics icon:

   ![Diagnostics Icon]

   The following dialog appears:

   ![Resources Dialog]

2. From Trace Manager, click the following icon:

   ![Download Icon]

3. The software builds a zipped file, and informs you when the download is complete:

   ![Download Completed]

4. The download file is simultaneously displayed at the lower left of the dialog. Click the file name:

   ![File Name]

   The software saves the exported file to the Downloads directory, or other designated folder, on your personal computer.
5. Navigate to the directory location to retrieve the saved file. You may view the file contents with Wireshark (.pcap file) or with a text editor (.xml file):

Section 3.13 Changing Password

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

To change the password for accessing the module:

1. Click the User icon:

   ![User Icon]

   The User Information window appears:

   ![User Information Window]

2. View or specify the following options:
   - **Current Password.** Enter the password you used to log onto the software.
   - **New Password.** Enter the new password.
   - **Confirm.** Re-enter the new password for confirmation.
   - **Submit.** Saves the new password on the module.
   - **Cancel.** Saves the new password on the module.

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. An engineering log rolls over when the log reaches 3 Mbyte in size. The Gateway stores up to a maximum of 3 system logs, plus the current system log. You can export logs up to one
thousand (1000) lines.

To view System Log information:

1. **Click the Logs icons on Home page:**

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 Universal Industrial Gateway error details. These are a subset of engineering log listings.

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.

To view error logs:

1. **Click the Logs icon:**

The Errors Log dialog 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 icon:

4. Filtering allows you to view entries from a starting date. To filter error
   log entries, click the following icon:

5. The Filter dialog appears. View or specify the following options:

   - **From.** Defines a starting date. Enter a new date in the field
     provided or select a date from the calendar. To make changes,
     click the field to drop down a calendar:

   - **Apply.** Applies filtering selections.
   - **Clear.** Cancels filtering selections (and/or closes dialog).

6. To export and download the error data to a storage device, click the
   following icon:
The software informs you that it is gathering the information:

![Building Export Download](image)

The software informs you when the download is complete:

![Download completed.](image)

7. Click OK.
8. A download file is simultaneously displayed at the lower left of the dialog. Click the file name:

![111-IntNoCIP_ERR....zip](image)

The following dialog appears showing where the software saved the exported files (usually to the Downloads directory, or other designated folder, on your personal computer):

![Directory Dialog](image)

9. Navigate to the directory to retrieve the saved file.

**Section 3.16**

**Viewing Engineering Log Data**

Shows current Universal Industrial Gateway engineering log details. This log is an overall look at Universal Industrial Gateway operations including detail about Universal Industrial 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.
To view the Engineering log:

1. Click the Logs icon:

The Errors Log appears:

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

3. View the following options.
   - **Date.** Lists time and date stamp associated with the engineering entry 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 icon:

5. Filtering allows you to view entries from a starting date. To filter engineering log entries, click the following icon:

6. The Filter dialog appears. View or specify the following options:

   * **From.** Defines a starting date. Enter a new date in the field provided or select a date from the calendar. To make changes, click the field to drop down a calendar:

   ![Calendar](image)

   * **Apply.** Applies filtering selections.
   * **Clear.** Cancels filtering selections (and/or closes dialog).

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

   ![Download](image)

   The software informs you that it is gathering the information:
The software informs you when the download is complete:

8. Click **OK**.
9. A download file is simultaneously displayed at the lower left of the dialog. Click the file name:

![Download file](111-IntNoCIP_ENG.zip)

10. The following dialog appears showing where the software saved the exported files (usually to the Downloads directory, or other designated folder, on your personal computer):

![File location dialog]

11. Navigate to the directory to retrieve the saved file.

---

**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 power failure. 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 file selection. You can also enter a number in the Page field to go directly to a page in the log file.
To view the Reboot log:

1. Click the Logs icon:

The Errors Log appears:

2. From the dropdown menu, select Reboot:

3. A list of messages triggered during each Gateway reboot appears:

4. View the following options.
   - **Date.** Lists time and date stamp associated with the reboot entry 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 icon is disabled for the Reboot log as entries only get added to the log during a reboot:

5. Filtering allows you to view entries from a starting date. To filter reboot log entries, click the following icon:

6. The Filter dialog appears. View or specify the following options:

   - Apply. Applies filtering selections.
   - Clear. Cancels filtering selections and shows all reboot entries.

7. From. Defines a starting date. Enter a new date in the field provided or select a date from the calendar. To make changes, click the field to drop down a calendar:

   - Apply. Applies filtering selections.
   - Clear. Cancels filtering selections and shows all reboot entries.

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

   The software informs you that it is gathering the information:
The software informs you when the download is complete:

9. Click **OK**.

10. A download file is simultaneously displayed at the lower left of the dialog. Click the file name:

The following dialog appears showing where the software saved the exported files (usually to the Downloads directory, or other designated folder, on your personal computer):

11. Navigate to the directory to retrieve the saved file.

**Section 3.18 Viewing ETH1 Communications Status Information**

Network access to the Gateway is available via an Ethernet port designated as Eth1.

**NOTE**

- The ETH1 connection is always green (online). The Connection Status line of the **ETH1** panel always displays **connected**. This happens because the only communication is through an Ethernet connection. If the connection goes down, the user interface no longer receives the information that triggers a status update.
- The information is updated at intervals so changes made on the network screen may not show up immediately.

To view the information, mouse over the following icon on the menu bar:
The following dialog appears:

- **Connection Status.** Shows the Universal Industrial Gateway is communicating via the WAN. Always shows **connected** when Gateway is running.
- **IP Address.** Lists Universal Industrial Gateway **IP Address**.
- **Subnet Mask.** Lists Universal Industrial Gateway ETH1 **Subnet Mask** address.
- **Gateway.** Lists **Gateway** address.
- **DNS1.** Enter the primary DNS value. This option is enabled only if you select **Static IP** addressing.
- **DNS2.** This field is not automatically populated.

To modify connection information, navigate to Network Setup:
See Configuring Network Settings for the Universal Industrial Gateway.
Section 3.19  
Viewing Help Information

To view help information:

1. From the Gateway configuration work area, click the following icon on the menu bar:

   ![Help icon]

   The following help window appears:

   ![Help window]

   This window only appears if you clicked the Help icon on the main GUI window. If you click the Help icon on other windows, context-sensitive help appears for the window.

2. 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 the help icon from the window that is currently displayed.
   - For a software table of contents, see Using the Universal Industrial Gateway User Interface.
Chapter 4
Technical Reference

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

Section 4.1
Universal Industrial Gateway Messages

The following list contains messages you may encounter when setting up and using your Universal Industrial Gateways. Messages are listed in the Error logs. User messages may be logged in one of the logs, or appear only on a Universal Industrial Gateway software dialog. An Error Code List is provided for messages that return an error code. See Error Code List.

The following list contains messages you may encounter when setting up and using your Universal Industrial Gateway. Messages are listed in the Error logs. User messages may be logged in the User log, or appear only on a Universal Industrial Gateway software dialog. An Error Code List is provided for messages that return an error code. See Error Code List.

<table>
<thead>
<tr>
<th>Message</th>
<th>Possible Cause</th>
<th>Fix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address is missing offset. Format is: 'tagName[offset]'</td>
<td>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.</td>
<td>Add the Offset to the Tag address or uncheck the “Is Array” box if the Tag is not part of an Array.</td>
</tr>
</tbody>
</table>
| An error occurred during download process | • 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). |
<p>| Are you sure you want to delete MAC 'xx:xx:xx:xx:xx:xx'? | If you select Yes, the table row is deleted. The deletion leaves the table empty, which means that the Blacklist/Whitelist controls revert to their default status. | |</p>
<table>
<thead>
<tr>
<th>Message</th>
<th>Possible Cause</th>
<th>Fix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you sure you want to delete this <em>item name</em>?</td>
<td>To delete the selected item, confirm the deletion.</td>
<td></td>
</tr>
<tr>
<td>Are you sure you want to reboot?</td>
<td>The Universal Industrial Gateway will be rebooted if you choose to continue.</td>
<td></td>
</tr>
<tr>
<td>Are you sure you want to reset Gateway's configuration back to defaults?</td>
<td>When you reset the Universal Industrial Gateway to its default configuration, all data you have added is deleted, and the Universal Industrial Gateway is restored to its factory configuration.</td>
<td></td>
</tr>
<tr>
<td>Are you sure you wish to remove the last address in Whitelist mode?</td>
<td>You can choose to add another MAC address row, or to return to default Blacklist mode.</td>
<td></td>
</tr>
<tr>
<td>Blank spaces are not allowed</td>
<td>Remove blank spaces.</td>
<td></td>
</tr>
<tr>
<td>Changing the configuration of a tag that is currently referenced by a tag map might have adverse effects. Do you wish to continue?</td>
<td>If you are OK with your active tag maps being deactivated, choose to continue. Otherwise cancel to take further actions before changing the tag configuration.</td>
<td></td>
</tr>
<tr>
<td>Modifying the tag will disable the active tag maps: <em>tag_map_list</em>. Do you wish to proceed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changing the protocol on this device will result in all of its tags being deleted. Do you wish to continue?</td>
<td>Before continuing, be sure that deleting all tags on your PLC is what you wish to do.</td>
<td></td>
</tr>
<tr>
<td>Message</td>
<td>Possible Cause</td>
<td>Fix</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Connection Lost!</td>
<td>• Power to the Gateway was interrupted.</td>
<td>• Confirm a stable power source is connected to the Gateway.</td>
</tr>
<tr>
<td></td>
<td>• The network connection was interrupted.</td>
<td>• Confirm the network connection between the Gateway and PC. If possible, connect directly to the Gateway (rather than going through a network).</td>
</tr>
<tr>
<td></td>
<td>• The Network IP Address was changed.</td>
<td>• Change the address used to access the Gateway in the web browser’s address bar.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Confirm the PC’s subnet mask matches the current subnet mask of the Gateway.</td>
</tr>
<tr>
<td>Connection re-established</td>
<td>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 GUI was able to re-connect to the Gateway.</td>
<td></td>
</tr>
<tr>
<td>Could not create Trace package.</td>
<td>A Data Trace that is older than 10 days was selected start.</td>
<td>Delete the previous Data Trace and recreate the needed Trace Route.</td>
</tr>
<tr>
<td>Current password is incorrect</td>
<td>Re-enter the correct password.</td>
<td></td>
</tr>
<tr>
<td>device name already exists.</td>
<td>You are trying to enter a name for a device that already exists on the Universal Industrial Gateway. Use a different name.</td>
<td></td>
</tr>
<tr>
<td>Device name cannot begin with $</td>
<td>The $ is reserved. Only Universal Industrial Gateway system device names start with this symbol. ($ is a reserved symbol used as a prefix for Universal Industrial Gateway System variables).</td>
<td></td>
</tr>
<tr>
<td>Message</td>
<td>Possible Cause</td>
<td>Fix</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>-----</td>
</tr>
</tbody>
</table>
| 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. |  |
| 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. | Self-explanatory. |  |
<p>| Each IP address octet must be between 0 and 255 | Check your IP address and enter the correct value. |  |
| 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. | Use a backup file that corresponds to the version 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 upgrade. | Confirm the current version of firmware and use a firmware version that is newer (higher in number) to do the firmware upgrade. |
| Error: ‘File is not a valid Gateway backup.’ Click ‘OK’ to continue. | An invalid file type was used 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. |</p>
<table>
<thead>
<tr>
<th>Message</th>
<th>Possible Cause</th>
<th>Fix</th>
</tr>
</thead>
</table>
| Error: 'Out of space' during upgrade. Gateway is still running.' | Not enough memory space is available to load the new firmware file. | Follow these steps:  
  - Export the Tags from all of the configured Devices.  
  - Delete the Tags.  
  - Upgrade the firmware.  
  - Import the Tags back into the appropriate devices.  
  - Go to the Tag Map configuration page and re-associate the Tags with the appropriate Tag Maps. |
<p>| File “filename.fup” is not a Gateway file.        | The incorrect product type firmware file was selected to upgrade the Gateway’s firmware. | Locate and use a firmware upgrade file for a Gateway.                                        |
| Gateway is Already at this Upgrade Level          | The firmware file selected for the upgrade matches firmware version already installed in the Gateway. | Confirm Gateway’s current firmware load and compare it to the newest available version. If a newer version is available use it to upgrade. If the current version matches what is already loaded in the Gateway no action is needed. |
| Invalid characters: <em>invalid_character_list</em>      | Do not use these characters as part of a text entry.                           |                                                                                                |
| Invalid date: <em>MM of YYYY</em> has only <em>xx</em> days     | Re-enter a data that is valid.                                                |                                                                                                |
| Invalid IP address.                               | An invalid IP Address format was entered.                                     | Enter a valid IPv4 Address.                                                                  |
| Invalid MAC Address                               | An invalid MAC Address format was entered.                                    | 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 Polling Tag                               | Replace the polling tag.                                                     |                                                                                                |
| 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 at Spectrum Controls, Inc. |
| <em>MAC_address</em> already exists.                     | You cannot enter a duplicate address.                                        |                                                                                                |</p>
<table>
<thead>
<tr>
<th>Message</th>
<th>Possible Cause</th>
<th>Fix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum length of <em>nn</em> characters has been exceeded</td>
<td>You have entered/pasted too many characters in the field. Reduce the number of characters to at or below the maximum.</td>
<td></td>
</tr>
<tr>
<td>Modifying the device will disable the active tag maps: <em>tag_map_list</em>. Do you wish to proceed?</td>
<td>Continuing with either sequence of messages results in all of the tags for the current protocol being deleted on the Gateway.</td>
<td></td>
</tr>
<tr>
<td>Changing the protocol on this device will result in all of its tags being deleted. Do you wish to continue?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>You are about to delete one or more tags that are currently being used in the following Tag Maps: <em>tag_map_list</em> Are you sure you want to delete these tags?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Must be between <em>lower_bound</em> and <em>upper_bound</em>.</td>
<td>Allowed values are: 0-9: 1-2 digits, Range=1-12 Minutes: 2 digits, Range=00-59. Dropdown menu values are: AM, PM.</td>
<td></td>
</tr>
<tr>
<td>Must be between <em>x</em> and <em>y</em>.</td>
<td>Calendar picker allowed values are: Day: 1-2 digits, Range=1-31. Month: 1-2 digits, Range=1-12 Year: 4 digits Time picker allowed values are: Hours: 1-2 digits, Range=1-12 Minutes: 2 digits, Range=00-59. Dropdown menu values are: AM, PM.</td>
<td></td>
</tr>
<tr>
<td>Name already exists.</td>
<td>Either delete the existing trace, or change the name of the new trace.</td>
<td></td>
</tr>
<tr>
<td>New password cannot be spectrum</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>New Password is same as current password</td>
<td>Change the password. Do not lose track of the password. The only way to recover from a lost password is to do a factory reset.</td>
<td></td>
</tr>
<tr>
<td>No tags are selected for copying.</td>
<td>Select tags then copy them.</td>
<td></td>
</tr>
<tr>
<td>Message</td>
<td>Possible Cause</td>
<td>Fix</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Nothing to import.</td>
<td>The Tag file that was selected for import does not contain any data.</td>
<td>Edit the Tag file with the correct format and usable data.</td>
</tr>
<tr>
<td>You will have to wait until the user logs off, or contact the user to log out so you can log on.</td>
<td>If another user has logged onto a Gateway, and you try to log on, you see this message.</td>
<td></td>
</tr>
<tr>
<td>Password and Confirmation do not match</td>
<td>Allowed characters (numbers) are 0 to 9 (and a period for IP addresses).</td>
<td></td>
</tr>
<tr>
<td>Polling rate must be between: 10 ms - 1000 ms</td>
<td>Enter a valid value.</td>
<td></td>
</tr>
<tr>
<td>Reconnecting...</td>
<td>The user interface tries to re-establish the connection, with a series of informative messages letting you know what is happening.</td>
<td></td>
</tr>
<tr>
<td>Reset completed. IP address has been changed to 192.168.1.100. Gateway is now rebooting. You may refresh the browser in a few minutes.</td>
<td>Refresh your browser and log back in.</td>
<td></td>
</tr>
<tr>
<td>Selecting ‘All Open’ will remove all firewall protection.</td>
<td>Spectrum Controls suggests you do not use this option except in circumstances when you know your Gateway will not be subject to external access of its ports.</td>
<td></td>
</tr>
<tr>
<td>Session has expired due to inactivity</td>
<td>Log back in.</td>
<td></td>
</tr>
<tr>
<td>Source device tag is missing a destination.</td>
<td>Insert a tag in the Destination field.</td>
<td></td>
</tr>
<tr>
<td>Source device name tag name is missing a source.</td>
<td>Insert a tag in the Source field.</td>
<td></td>
</tr>
<tr>
<td>Source tagName is missing a destination. Destination tagName is missing a source.</td>
<td>You will need to repair or remove incomplete tag pairs.</td>
<td></td>
</tr>
<tr>
<td>Message</td>
<td>Possible Cause</td>
<td>Fix</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>-----</td>
</tr>
<tr>
<td>Tag [Map] name already exists.</td>
<td>Use a different name for the tag or tag map to avoid duplicating a name that has already been configured in the device.</td>
<td></td>
</tr>
<tr>
<td>Tag name cannot begin with &quot;$&quot;</td>
<td>Use a different name for the tag.</td>
<td></td>
</tr>
<tr>
<td>Tag names cannot start with a dollar sign or contain commas or periods. The following tags have invalid names:</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>tag_list</td>
<td></td>
<td></td>
</tr>
<tr>
<td>These tags will be stripped from the import list. Do you wish to continue?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tags were successfully imported.</td>
<td>No further action needed.</td>
<td></td>
</tr>
<tr>
<td>The allowable Array Length range for dataType is 1-upperLimit</td>
<td>For allowed lengths, see Array Length Limits</td>
<td></td>
</tr>
<tr>
<td>The device_name device is using serialn via the protocol_name protocol. The Serial Port must be configured as RSxxx. This configuration is not supported. Do you wish to continue?</td>
<td>Configure the Serial Port to use the correct Connection Type.</td>
<td></td>
</tr>
<tr>
<td>The first three octets of IP &amp; Gateway must be identical.</td>
<td>In the first three digits from the right, ensure the first three octets are the same.</td>
<td></td>
</tr>
<tr>
<td>The following lines are missing a tag name:</td>
<td>You will need to either to fix the missing name or accept the stripped line.</td>
<td></td>
</tr>
<tr>
<td>line_number_list</td>
<td></td>
<td></td>
</tr>
<tr>
<td>These tags will be stripped from the import list. Do you wish to continue?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Message</td>
<td>Possible Cause</td>
<td>Fix</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>-----</td>
</tr>
</tbody>
</table>
| The following rows 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. | |
| The following tag maps are currently active and will be deactivated on tag deletion: tag_map_list. Are you sure you want to delete these tags? | Be aware that if you continue with the change, all tags currently associated with the device will be deleted. | |
| The following tags did not have four columns defined: tag_list. These tags will be stripped from the import list:  
  row_num1: tag_name_or_blank  
  row_num2: tag_name_or_blank  
  ...  
  row_numn: tag_name_or_blank  
  Do you wish to continue? | You will have to modify your import file to match the required number of columns or accept that the additional tag columns will be stripped. | |
<table>
<thead>
<tr>
<th>Message</th>
<th>Possible Cause</th>
<th>Fix</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following tags have a data type that is not supported by the protocol of the current device.</td>
<td>You will have to modify your import file to remove these tags or accept that the unsupported tags will be stripped from the file.</td>
<td></td>
</tr>
<tr>
<td><em>tag_list</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>These tags will be stripped from the import list. Do you wish to continue?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The following tags have a missing data type.</td>
<td>You will have to modify your import file to remove these tags or accept that the tags with a missing datatype will be stripped from the file.</td>
<td></td>
</tr>
<tr>
<td><em>tag_list</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>These tags will be stripped from the import list. Do you wish to continue?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The limit of xx characters has been reached.</td>
<td>Reword or reduce the total of numbers (characters) entered.</td>
<td></td>
</tr>
<tr>
<td>There are incomplete tag pairs: <em>missing_tag_message_list</em></td>
<td>Complete the tag pairs before submitting the map.</td>
<td></td>
</tr>
<tr>
<td>There was an error contacting the NTP time server. Make another selection or click Submit to try again.</td>
<td>Either select a different server option or click Submit to see if you can now contact the server.</td>
<td></td>
</tr>
<tr>
<td>The selected tag map cannot be activated. It references a tag that does not exist.</td>
<td>Check your tag map and fix the missing tag issue before trying to activate the tag map.</td>
<td></td>
</tr>
<tr>
<td>This mapping conflicts with an existing mapping. Do you wish to continue?</td>
<td>Change the address(es) or remove the existing Tag Map entry.</td>
<td></td>
</tr>
<tr>
<td>To use the xxx protocol on Serial Port y, the port must be configured as RSzzz. This configuration is not supported. Do you wish to continue?</td>
<td>Valid combinations are listed below:</td>
<td>Protocol Connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Protocol Connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modbus ASCII</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DF1-CIP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DF1-PCC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PPI</td>
</tr>
<tr>
<td>TSAP must be: {hex} {hex} . {hex} {hex}</td>
<td>Re-enter the value using the required format.</td>
<td></td>
</tr>
<tr>
<td>Message</td>
<td>Possible Cause</td>
<td>Fix</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>-----</td>
</tr>
</tbody>
</table>
| UI connection from *IP address socket number* | The logged information contains the IP address and socket number of the connection. | - 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/](https://www.google.com/chrome/) |
| Unable to connect to Gateway | The connection between the web browser and the Gateway could not be established. |  |
| Unable to import data. Import failed *details* | The file import process failed | - Confirm you are using the correct file and file format.  
- Confirm you have a reliable network connection to the Gateway. (A local connection is recommended.)  
- Confirm your firewall setting allow for file transfers. |
<table>
<thead>
<tr>
<th>Message</th>
<th>Possible Cause</th>
<th>Fix</th>
</tr>
</thead>
</table>
| 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. |
<p>| Universal Industrial Gateway is now rebooting. You may refresh the browser and log back in after a few minutes. | You will need to re-enter the Universal Industrial Gateway's IP address in your browser, and log back in. |                                                  |
| Warning: If your computer is not listed in the whitelist, you will not be able to access Gateway when the whitelist is enabled. | When creating a whitelist, you must enter the MAC address for the computer you use to access the Gateway. Failing to enter your own computer MAC address means that you won't be able to access the Gateway as soon as you enable the whitelist. |                                                  |
| You are about to delete a device that is currently being used in the following Tag Maps: tag_map_list. | The device has tags that are currently being used in one or more tag maps. |                                                  |</p>
<table>
<thead>
<tr>
<th>Message</th>
<th>Possible Cause</th>
<th>Fix</th>
</tr>
</thead>
<tbody>
<tr>
<td>You are about to delete one or more tags that are currently being used</td>
<td>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 \texttt{$_DeviceUnknown&lt;$.TagNotFound}</td>
<td></td>
</tr>
<tr>
<td>in the following Tag Maps: \texttt{tag_map_list}. The following Tag</td>
<td></td>
<td>Affected tag maps are also deactivated.</td>
</tr>
<tr>
<td>Maps are currently active and will be deactivated upon tag deletion:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>\texttt{active_tag_map_list}. Are you sure you want to delete these</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tags?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>You cannot copy between STRING and non-STRING data types. The following</td>
<td>Change the tag copy to reflect an allowed copy type.</td>
<td></td>
</tr>
<tr>
<td>tag-pairs must be corrected: \texttt{tag_pair_list}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>You entered an incorrect password.</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>You have \texttt{nnn} missing tag pairing(s) that reference missing</td>
<td>Note which tag(s) are missing and either remove or replace them with valid entries.</td>
<td></td>
</tr>
<tr>
<td>tags. The tag pairings for these will be stripped from the list. Do</td>
<td></td>
<td></td>
</tr>
<tr>
<td>you want to continue?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>You have \texttt{xxx} tag-pairing(s) that reference missing tags. The</td>
<td>You must fix the tag issues before you can save the tag map.</td>
<td></td>
</tr>
<tr>
<td>tag-pairings for these will be stripped from the list. Do you want to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>continue?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>You must upgrade the protocol package to use this protocol.</td>
<td>Contact Spectrum Controls Inc. to purchase the upgrade.</td>
<td></td>
</tr>
</tbody>
</table>
## Section 4.2 Concepts

The following list contains further information about concepts that you may encounter when setting up and using your Universal Industrial Gateways.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU</strong></td>
<td>Central Processing Unit. Carries out the instructions provided by a computer program. Normally these are basic logical, input/output, and arithmetical operations that form the basis of most software operations on a computer.</td>
</tr>
<tr>
<td><strong>DoS</strong></td>
<td>Denial of Service. A common attack involving overwhelming a server with invalid requests.</td>
</tr>
<tr>
<td><strong>Domain Name Server (DNS)</strong></td>
<td>This is the value that is associated with the Domain Name Server that your system interacts with on the Internet. Domain name servers convert text names that are easy to remember (google.com, spectrumcontrols.com) to IP address values. If you are going to communicate using the optional cell phone modem in data mode, you need to add a public domain name server address as the alternate DNS address when setting up your LAN. When in data mode, the cell phone modem uses the public DNS address to communicate via the Internet.</td>
</tr>
<tr>
<td><strong>Dynamic Host Configuration Protocol (DHCP)</strong></td>
<td>A type of network configuration for host devices that dynamically provides IP, gateway, and routing address for devices that are connected to that network. This means that the Universal Industrial Gateway dynamically allocates IP addresses to the devices that you connect to it. For example, when you connect a personal computer, programmable logic controller, or EtherNet/IP device to a LAN port on the Universal Industrial Gateway, the Universal Industrial Gateway senses the device is present and dynamically allocates the information that is needed to allow communications between the two devices. The Universal Industrial Gateway assigns an IP address, a subnet mask address, and a gateway address to the new device from the range of addresses stored on the Universal Industrial Gateway. The Universal Industrial Gateway also provides a lease that defines how long these addresses are valid. This allows communications between the Universal Industrial Gateway and the device. When the lease is up, if the device is still in use, the Universal Industrial Gateway allocates addresses again. If the device is no longer in use, the address becomes available to be allocated to other devices.</td>
</tr>
<tr>
<td><strong>DHCP Client</strong></td>
<td>Dynamic Host Configuration Protocol Client. When you connect a new device such as a computer, or a Universal Industrial Gateway to a network that has a DHCP Server set up, the client device gets its IP address and other configuration information such as default gateway and domain name from a group of IP addresses maintained by the DHCP server for a defined time period.</td>
</tr>
<tr>
<td><strong>Gateway Address</strong></td>
<td>A gateway address is the default address of your network or web site. This is usually the next address in line when connecting to the Internet from a local area network and is usually the address assigned to a router or a firewall. Communications traffic goes out and comes in through the gateway.</td>
</tr>
<tr>
<td><strong>GPL</strong></td>
<td>GNU Public License. A license offered by the Free Software Foundation that covers licensing and distribution of free software.</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Concept</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTP/HTTPS</td>
<td>Hypertext Transfer Protocol. Communication protocols that access the world-wide web. HTTP protocol is not secure. HTTPS is secure. The S designation means that the transfer protocol is combined with the Secure Socket Layer/Transport Security Layer (SSL/TLS) protocol to provide secure communication for transactions such as payments across the Internet.</td>
</tr>
<tr>
<td>Internet Protocol (IP) Address</td>
<td>An IP address is a unique number that every device that connects to the Internet must have. Devices include personal computers, printers, removable hard drives, routers such as the Universal Industrial Gateway, hardware firewalls, cell phones, and modems. The addresses are assigned by your system administrator or by the protocol that is running on your device. The connection method you choose defines how that address is assigned.</td>
</tr>
<tr>
<td>Local Area Network (LAN)</td>
<td>A local area network (LAN) is a network that is normally made of devices such as personal computers that are located near to each other, such as in the same office building or plant.</td>
</tr>
<tr>
<td>LED</td>
<td>Light-emitting diode. Photons emitted from a semi-conductor provide indicator signals for electronic devices and various forms of lighting. An LED can emit light photons in different colors, including red, green, and purple, and different frequencies (visible, infrared, and ultraviolet).</td>
</tr>
<tr>
<td>MAC</td>
<td>Media Access Control address. A unique set of numbers assigned to a network interface card and stored in the read-only memory. A MAC address may also be called the Ethernet hardware address or the physical address of a device.</td>
</tr>
<tr>
<td>PLC</td>
<td>Programmable logic controller. A digital computer used to automate industrial processes such as controlling electrical turbine operation, assembly lines, and manufacturing machinery. The controllers are frequently ruggedized to withstand difficult operating environments.</td>
</tr>
<tr>
<td>PHY</td>
<td>Physical layer that connects to a media access control address.</td>
</tr>
<tr>
<td>Static IP Address</td>
<td>A permanent IP address assigned to a computer by the network administrator or a domain name server.</td>
</tr>
<tr>
<td>Transmission Control Protocol, Internet Protocol (TCP/IP)</td>
<td>Transmission Control Protocol, Internet Protocol. A group of communications protocols used to communicate between computers on the Internet or other networks. Also called The Internet protocol suite. The suite sends data across the Internet in packets.</td>
</tr>
</tbody>
</table>

4.2.1 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 polling 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.
- 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 one 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. This is determined by polling the tag. Polling restrictions are:
- Polling of the trigger tag does not occur while a copy operation is in progress. If the polling tag value changes while a copy operation is underway, the change is detected, and the next copy operation begins immediately after the current operation is complete.
- The Gateway software supports polling rates from 10 ms to 1000 ms.

### 4.2.2 About Bit Copying Operations

The software allows for copies between bit (BOOL) and other numeric types. Example: You may copy 16 BOOLs to be copied 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 are 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 are 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.
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:

<table>
<thead>
<tr>
<th>Source Type</th>
<th>Source Value(s)</th>
<th>Destination Type</th>
<th>Destination Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>-1 (0xFFFF)</td>
<td>USHORT</td>
<td>00330 (0xFFFF)</td>
<td></td>
</tr>
<tr>
<td>USHORT</td>
<td>65535 (0xFFFF)</td>
<td>INT</td>
<td>1 (0xFFFF)</td>
<td></td>
</tr>
<tr>
<td>REAL</td>
<td>3.54159 (0x4039064D)</td>
<td>DINT</td>
<td>10785500000 (0x404006D)</td>
<td></td>
</tr>
<tr>
<td>DINT</td>
<td>10785500000 (0x404006D)</td>
<td>REAL</td>
<td>3.14159 (0x404006D)</td>
<td></td>
</tr>
</tbody>
</table>

Source and destination are the same size

<table>
<thead>
<tr>
<th>Source is smaller than destination (source is copied to the low order portion of the destination)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINT</td>
</tr>
<tr>
<td>SHORT</td>
</tr>
</tbody>
</table>

Source is larger than destination (the low order portion of the source is copied to the destination)

<table>
<thead>
<tr>
<th>Source Type</th>
<th>Source Value(s)</th>
<th>Destination Type</th>
<th>Destination Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>46 (0x1E)</td>
<td>BOOL</td>
<td>0 (0x00)</td>
<td>Last (lowest order) binary digit of source is 0</td>
</tr>
<tr>
<td>REAL</td>
<td>2.71828 (0x4020F84D)</td>
<td>SINT</td>
<td>77 (0x4020)</td>
<td></td>
</tr>
</tbody>
</table>

Array to array copies

<table>
<thead>
<tr>
<th>Source and destination elements are the same size</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT[2]</td>
</tr>
<tr>
<td>USHORT[2]</td>
</tr>
<tr>
<td>REAL[2]</td>
</tr>
<tr>
<td>DINT[3]</td>
</tr>
</tbody>
</table>

Source elements are smaller than destination elements (multiple source elements are copied to each destination element)

<table>
<thead>
<tr>
<th>Source and destination elements are larger than destination elements (each source element occupies multiple destination elements)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOOL[8]</td>
</tr>
<tr>
<td>SINT[4]</td>
</tr>
</tbody>
</table>

Source elements are larger than destination elements (only low order bits of the second source element are copied to the destination)

<table>
<thead>
<tr>
<th>Source and destination elements are larger than destination elements (only low order bits of the first source element are copied to the destination)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DINT[2]</td>
</tr>
<tr>
<td>REAL[2]</td>
</tr>
</tbody>
</table>
4.2.3 Array Length Limits
The following table provides array length limit ranges for protocols supported on the Gateway.

<table>
<thead>
<tr>
<th>Data Type</th>
<th>EIP-PCCC, DF1-PCCC</th>
<th>Ethernet/IP</th>
<th>DF1-CIP</th>
<th>Modbus</th>
<th>S7Comm, PPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINT</td>
<td>N/A</td>
<td>1-460</td>
<td>1-216</td>
<td>N/A</td>
<td>1-100</td>
</tr>
<tr>
<td>INT/(U)SHORT</td>
<td>1-120</td>
<td>1-230</td>
<td>1-108</td>
<td>1-500</td>
<td>1-100</td>
</tr>
<tr>
<td>DINT/UDINT</td>
<td>1-60</td>
<td>1-115</td>
<td>1-54</td>
<td>1-500</td>
<td>1-100</td>
</tr>
<tr>
<td>REAL</td>
<td>1-60</td>
<td>1-115</td>
<td>1-54</td>
<td>1-500</td>
<td>1-100</td>
</tr>
<tr>
<td>BOOL</td>
<td>1-60</td>
<td>1-115</td>
<td>1-54</td>
<td>1-500</td>
<td>1-100</td>
</tr>
<tr>
<td>STRING</td>
<td>N/A</td>
<td>1-4</td>
<td>1-4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

4.2.4 About Read/Write Tag Errors
Read/Write tag errors are treated as follows:
- If an error occurs while reading from a device, the tag value is marked as unrecorded for purposes of data presentation.
- If an error occurs while writing to a device, the tag value is marked as unrecorded. The marking of a tag as recorded is only assigned when a valid read or write has successfully been made for the specific tag.
- Tags marked unrecorded remain so until a subsequent tag transaction for this tag completes successfully.
- The unrecorded status of a tag is passed to the software user interface, which displays "{'ERR}" for such tags. 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 polled tag and that polling tag cannot be read, no attempt is made to read either source or destination tags. If the polling 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 distinguishes between not yet having attempted to read or write a tag, and encountering an error when a read or write is attempted. The current polling tag value is provided to the software user interface so it can be displayed as appropriate.

Because no type conversion is performed, the value of the destination tag after a copy may not be what you expect. The following examples assume the same endianness for source and destination with no byte or word swapping:
- Single tag-to-single tag copies:
  - If the source is the same size as the destination, the entire source value is copied to the destination. Examples (assuming same endianness).
    - INT to USHORFT: -1 (0xFFFF) <-> 65535 (0xFFFF)
    - REAL to DINT: 3.14159 (0x40490fd0) <-> 1078530000 (0x40490fd0)
  - If the source is smaller than the destination, the source is copied
to the low order portion of the destination.

- SINT to INT: 13 (0×0D) -> 13 (0×000D)
- SHORT to REAL: 14440 (0×3868) -> 2.0235E-41 (0×00003868)

- If the source is larger than the destination, the low order portion of the source is copied to the destination. Examples (assuming same endianness):
  - INT to BOOL: 46 (0×2E) -> 0
  - REAL to SINT: 2.71828 (0×402df84d) -> 77 (0×4D)

**Single tag-to-single tag copies:**

- If the array element size is the same for both source and destination, the result is an element-to-element copy, that is, source[0] is copied to destination[0], source[1] is copied to destination[1], etc. If the source and destination arrays have different lengths, the number of elements copied will be the minimum of the two lengths. Examples (assuming same endianness):
  - INT[3] to USHORT[2]: -2, 15, 38 (0×FFFE, 0×000F, 0×26) <-> 65534, 15
  - REAL[2] to DINT[3]: 101.125, 48.875 (0×42ca4000, 0×42438000) <-> 1120550912, 1111719936, 0

- If the array element size of the source is smaller than the array element size of the destination, multiple source elements will be copied to each destination element. If the total sizes (number of elements × element size) of the two arrays differ, the number of bytes copied will be the smaller of the two sizes. Examples (assuming same endianness):
  - BOOL[8] to SINT[2]: 0, 1, 1, 1, 0, 0, 1 (0×9E) <-> 158, 0
  - SINT[4] to UDINT[2]: 123, 60, 77, -124 (0×7B, 0×3C, 0×4D, 0×84) <-> 2067549572 (0×7b3c4d84), 0

- If the array element size of the source is larger than the array element size of the destination, each source element will occupy multiple destination elements. Examples (assuming same endianness)
  - DINT[2] to INT[3]: 3558942464, 3575719680 (0xD4212700, 0xD5212700) -> 54305, 9984, 54561 (0xD421, 0x2700, 0xD521)
  - REAL[2] to BOOL[8]: 15.0, 25.25 (0×41700000, 0×41ca0000) -> 0, 0, 0, 0, 0, 0, 0, 0 (0×00)

- 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.
4.2.5 About Data Traces
This topic provides further, technical reference information about adding traces to complement this topic: Adding Data Traces.

You may run Ethernet-to-Ethernet, Ethernet-to-Serial, Serial-to-Serial, and Serial-to-Ethernet traces.

You can run only one serial or TCP capture at a time. However, you can run one serial trace, and one network trace at the same time. If you define an INPUT and OUTPUT trace for a single device, then only one trace will run. If you define trace profiles between two separate PLCs, using two separate serial ports, the software runs 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 window.

You can stop a trace at any time. If you do so, the trace is marked as Aborted. If you reset to factory defaults, all trace logs are deleted.

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

4.2.6 Configuring Tag Data Types
When configuring tags (or 'named data') on the Universal Industrial Gateway to associate them with the tags defined on connected programmable logic controllers (PLCs), 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.
- The address of the tag in the PLC 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 $ is not accepted as a character.
- 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.
- If Q or I tags are used, they are defined in blocks of 8 BOOLs. Example, Q4.0 to Q4.7 is valid, but Q4.0 to Q4.15 is not (that is, Q4.8 to Q4.15 do not exist as memory locations on the PLC). (Applies only to S7-200 PLCs.)
### 4.2.7 Default Firewall Configuration Ports

The Default Firewall Configuration selection in the Security Setup window allows connections to the following ports:

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tcp dpt:22</td>
<td>SSH</td>
</tr>
<tr>
<td>tcp dpt:20</td>
<td>FTP data</td>
</tr>
<tr>
<td>tcp dpt:21</td>
<td>FTP ctrl</td>
</tr>
<tr>
<td>tcp dpt:37</td>
<td>time protocol</td>
</tr>
<tr>
<td>udp dpt:37</td>
<td>time protocol</td>
</tr>
<tr>
<td>udp dpts:989-990</td>
<td>FTPS</td>
</tr>
<tr>
<td>tcp dpts:989-990</td>
<td>FTPS</td>
</tr>
<tr>
<td>tcp dpt:465</td>
<td>URL Rendezvous Directory for SSM (Cisco protocol)</td>
</tr>
<tr>
<td>tcp dpt:25</td>
<td>SMTP</td>
</tr>
<tr>
<td>tcp dpt:115</td>
<td>SFTP</td>
</tr>
<tr>
<td>udp dpt:69</td>
<td>TFTP</td>
</tr>
<tr>
<td>udp dpt:67</td>
<td>BOOTP</td>
</tr>
<tr>
<td>udp dpt:68</td>
<td>BOOTP</td>
</tr>
<tr>
<td>udp dpt:50001</td>
<td>Certificate management</td>
</tr>
<tr>
<td>tcp dpt:84314</td>
<td>Adobe Flash</td>
</tr>
<tr>
<td>tcp dpt:65775</td>
<td>Flash communications</td>
</tr>
<tr>
<td>tcp dpt:7765</td>
<td>Flash communication</td>
</tr>
<tr>
<td>udp dpt:123</td>
<td>NTP</td>
</tr>
<tr>
<td>tcp dpt:135</td>
<td>Microsoft EPMAP (DHCP, DNS, etc.)</td>
</tr>
<tr>
<td>udp dpt:137</td>
<td>NetBIOS name server</td>
</tr>
<tr>
<td>udp dpt:138</td>
<td>NetBIOS Datagram Service. Not a directory</td>
</tr>
<tr>
<td>tcp dpt:139</td>
<td>NetBIOS Session Service</td>
</tr>
<tr>
<td>tcp dpt:445</td>
<td>Microsoft-DS (Directory Services) Active Directory, SMB</td>
</tr>
</tbody>
</table>

### 4.2.8 Protocol Attribute List

Lists the values for each individual protocol by attribute. Protocols supported are:

<table>
<thead>
<tr>
<th>Serial DF1-CIP</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot Number</td>
<td>(0-32)</td>
</tr>
<tr>
<td>Checksum</td>
<td>CRC or BCC</td>
</tr>
<tr>
<td>ACK Timeout</td>
<td>(1-255) x 20 ms</td>
</tr>
<tr>
<td>NAK Retries</td>
<td>(0-10)</td>
</tr>
<tr>
<td>ENQ Retries</td>
<td>(0-50)</td>
</tr>
<tr>
<td>Serial DF1-PCCC</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Checksum</td>
<td>CRC or BCC</td>
</tr>
<tr>
<td>ACK Timeout</td>
<td>(1-255) x 20 ms</td>
</tr>
<tr>
<td>NAK Retries</td>
<td>(0-10)</td>
</tr>
<tr>
<td>ENQ Retries</td>
<td>(0-50)</td>
</tr>
<tr>
<td>Serial Modbus RTU</td>
<td></td>
</tr>
<tr>
<td>Slave ID</td>
<td>Integer (1-247)</td>
</tr>
<tr>
<td>Response Timeout</td>
<td>(1-5) seconds</td>
</tr>
<tr>
<td>Retry Count</td>
<td>Integer (0-3)</td>
</tr>
<tr>
<td>End of Message Delay</td>
<td>(1-32) characters</td>
</tr>
<tr>
<td>Min Command Delay</td>
<td>(100-1000) milliseconds</td>
</tr>
<tr>
<td>Swap Order</td>
<td>See Endianness of Types</td>
</tr>
<tr>
<td>Serial Modbus ASCII</td>
<td></td>
</tr>
<tr>
<td>Slave ID</td>
<td>Integer (1-247)</td>
</tr>
<tr>
<td>Response Timeout</td>
<td>(1-5) seconds</td>
</tr>
<tr>
<td>Retry Count</td>
<td>Integer (0-3)</td>
</tr>
<tr>
<td>End of Message Delay</td>
<td>(1-32) characters</td>
</tr>
<tr>
<td>Min Command Delay</td>
<td>(100-1000) milliseconds</td>
</tr>
<tr>
<td>Swap Order</td>
<td>See Endianness of Types</td>
</tr>
<tr>
<td>EtherNet/IP</td>
<td></td>
</tr>
<tr>
<td>TCP Port</td>
<td>Integer (1-65535)</td>
</tr>
<tr>
<td>IP Address</td>
<td>IP-V4</td>
</tr>
<tr>
<td>Slot Number</td>
<td>(0-16)</td>
</tr>
<tr>
<td>EtherNet/IP-PCCC</td>
<td></td>
</tr>
<tr>
<td>TCP Port</td>
<td>Integer (1-65535)</td>
</tr>
<tr>
<td>IP Address</td>
<td>IP-V4</td>
</tr>
<tr>
<td>ModbusTCP</td>
<td></td>
</tr>
<tr>
<td>Slave ID</td>
<td>Integer (1-247)</td>
</tr>
<tr>
<td>TCP Port</td>
<td>Integer (1-65535)</td>
</tr>
<tr>
<td>IP Address</td>
<td>IP-V4</td>
</tr>
<tr>
<td>Swap Order</td>
<td>See Endianness of Types</td>
</tr>
</tbody>
</table>
### S7Comm

<table>
<thead>
<tr>
<th>PLC Type</th>
<th>S7200, S7300, S71200, S71500</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP Port</td>
<td>Integer (1-65535)</td>
</tr>
<tr>
<td>IP Address</td>
<td>IP-V4</td>
</tr>
<tr>
<td>TSAP</td>
<td>Applies to S7200 only. (Preconfigured options are “4D.57”, “10.00”, “11.00”, but you may specify other values)</td>
</tr>
</tbody>
</table>

#### PPI

| Node Address   | Integer (0-16), Default: 2 |

### 4.2.9 System Tags List

System tags are read-only tags that provide information about lower-level communications on the Gateway. The following table lists all system tags and provides a description of each tag's function if the name is not self-explanatory. Tags are refreshed at one-second intervals. You may not add or delete system tags.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#DATE</td>
<td>Current Date</td>
</tr>
<tr>
<td>#DATETIME</td>
<td>Current date and time</td>
</tr>
<tr>
<td>#HEARTBEAT</td>
<td>Constant Value of 1</td>
</tr>
<tr>
<td>#LOGDATE</td>
<td>Log Date and Time</td>
</tr>
<tr>
<td>#RANDOM</td>
<td>System-generated random number</td>
</tr>
<tr>
<td>#STARTTME</td>
<td>System Start Time</td>
</tr>
<tr>
<td>#TIME</td>
<td>Current Time</td>
</tr>
<tr>
<td>#UPFOR</td>
<td>System Has Been Up For</td>
</tr>
<tr>
<td>diskFree</td>
<td>Free disk storage</td>
</tr>
<tr>
<td>diskTotal</td>
<td>Total disk storage</td>
</tr>
<tr>
<td>diskUsed</td>
<td>Used disk storage</td>
</tr>
<tr>
<td>ETH1_Broadcast</td>
<td>ETH1 Broadcast Address</td>
</tr>
<tr>
<td>ETH1_IP</td>
<td>ETH1 IP Address</td>
</tr>
<tr>
<td>ETH1_MAC</td>
<td>ETH1 MAC Address</td>
</tr>
<tr>
<td>ETH1_NetMask</td>
<td>ETH1 Net Mask</td>
</tr>
<tr>
<td>ETH1_Multicast</td>
<td>ETH1 Multicast Address</td>
</tr>
<tr>
<td>memCached</td>
<td>Cached RAM memory</td>
</tr>
<tr>
<td>memFree</td>
<td>Free RAM memory</td>
</tr>
<tr>
<td>memTotal</td>
<td>Total RAM memory</td>
</tr>
</tbody>
</table>
## Tag Description

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>memUsed</td>
<td>Used RAM memory</td>
</tr>
<tr>
<td>sdFree</td>
<td>Not used</td>
</tr>
<tr>
<td>sdTotal</td>
<td>Not used</td>
</tr>
<tr>
<td>sdUsed</td>
<td>Not used</td>
</tr>
<tr>
<td>serialNumber</td>
<td>Gateway Serial Number</td>
</tr>
<tr>
<td>TCP_DNS1</td>
<td>TCP Primary DNS</td>
</tr>
<tr>
<td>TCP_Gateway</td>
<td>TCP Gateway Address</td>
</tr>
<tr>
<td>TCP_GWInterface</td>
<td>TAC Gateway INTerface</td>
</tr>
<tr>
<td>WebPort_ID</td>
<td>Unique ID for Gateway</td>
</tr>
<tr>
<td>WebPort_Name</td>
<td>Gateway Name</td>
</tr>
</tbody>
</table>

### 4.2.10 Error Code List

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Success</td>
</tr>
<tr>
<td>1</td>
<td>Operation not permitted</td>
</tr>
<tr>
<td>2</td>
<td>No such file or directory</td>
</tr>
<tr>
<td>3</td>
<td>No such process</td>
</tr>
<tr>
<td>4</td>
<td>Interrupted system call</td>
</tr>
<tr>
<td>5</td>
<td>Input/output error</td>
</tr>
<tr>
<td>6</td>
<td>No such device or address</td>
</tr>
<tr>
<td>7</td>
<td>Argument list too long</td>
</tr>
<tr>
<td>8</td>
<td>Exec format error</td>
</tr>
<tr>
<td>9</td>
<td>Bad file descriptor</td>
</tr>
<tr>
<td>10</td>
<td>No child processes</td>
</tr>
<tr>
<td>11</td>
<td>Resource temporarily unavailable</td>
</tr>
<tr>
<td>12</td>
<td>Cannot allocate memory</td>
</tr>
<tr>
<td>13</td>
<td>Permission denied</td>
</tr>
<tr>
<td>14</td>
<td>Bad address</td>
</tr>
<tr>
<td>15</td>
<td>Block device required</td>
</tr>
<tr>
<td>16</td>
<td>Device or resource busy</td>
</tr>
<tr>
<td>17</td>
<td>File exists</td>
</tr>
<tr>
<td>18</td>
<td>Invalid cross-device link</td>
</tr>
<tr>
<td>19</td>
<td>No such device</td>
</tr>
<tr>
<td>20</td>
<td>Not a directory</td>
</tr>
<tr>
<td>21</td>
<td>Is a directory</td>
</tr>
<tr>
<td>22</td>
<td>Invalid argument</td>
</tr>
<tr>
<td>Error Code</td>
<td>Message</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>23</td>
<td>Too many open files in system</td>
</tr>
<tr>
<td>24</td>
<td>Too many open files</td>
</tr>
<tr>
<td>25</td>
<td>Inappropriate ioctl for device</td>
</tr>
<tr>
<td>26</td>
<td>Text file busy</td>
</tr>
<tr>
<td>27</td>
<td>File too large</td>
</tr>
<tr>
<td>28</td>
<td>No space left on device</td>
</tr>
<tr>
<td>29</td>
<td>Illegal seek</td>
</tr>
<tr>
<td>30</td>
<td>Read-only file system</td>
</tr>
<tr>
<td>31</td>
<td>Too many links</td>
</tr>
<tr>
<td>32</td>
<td>Broken pipe</td>
</tr>
<tr>
<td>33</td>
<td>Numerical argument out of domain</td>
</tr>
<tr>
<td>34</td>
<td>Numerical result out of range</td>
</tr>
<tr>
<td>35</td>
<td>Resource deadlock avoided</td>
</tr>
<tr>
<td>36</td>
<td>File name too long</td>
</tr>
<tr>
<td>37</td>
<td>No locks available</td>
</tr>
<tr>
<td>38</td>
<td>Function not implemented</td>
</tr>
<tr>
<td>39</td>
<td>Directory not empty</td>
</tr>
<tr>
<td>40</td>
<td>Too many levels of symbolic links</td>
</tr>
<tr>
<td>41</td>
<td>Unknown error 41</td>
</tr>
<tr>
<td>42</td>
<td>No message of desired type</td>
</tr>
<tr>
<td>43</td>
<td>Identifier removed</td>
</tr>
<tr>
<td>44</td>
<td>Channel number out of range</td>
</tr>
<tr>
<td>45</td>
<td>Level 2 not synchronized</td>
</tr>
<tr>
<td>46</td>
<td>Level 3 halted</td>
</tr>
<tr>
<td>47</td>
<td>Level 3 reset</td>
</tr>
<tr>
<td>48</td>
<td>Link number out of range</td>
</tr>
<tr>
<td>49</td>
<td>Protocol driver not attached</td>
</tr>
<tr>
<td>50</td>
<td>No CSI structure available</td>
</tr>
<tr>
<td>51</td>
<td>Level 2 halted</td>
</tr>
<tr>
<td>52</td>
<td>Invalid exchange</td>
</tr>
<tr>
<td>53</td>
<td>Invalid request descriptor</td>
</tr>
<tr>
<td>54</td>
<td>Exchange full</td>
</tr>
<tr>
<td>55</td>
<td>No anode</td>
</tr>
<tr>
<td>56</td>
<td>Invalid request code</td>
</tr>
<tr>
<td>57</td>
<td>Invalid slot</td>
</tr>
<tr>
<td>Error Code</td>
<td>Message</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>58</td>
<td>Invalid slot</td>
</tr>
<tr>
<td>59</td>
<td>Bad font file format</td>
</tr>
<tr>
<td>60</td>
<td>Device not a stream</td>
</tr>
<tr>
<td>61</td>
<td>No data available</td>
</tr>
<tr>
<td>62</td>
<td>Timer expired</td>
</tr>
<tr>
<td>63</td>
<td>Out of streams resources</td>
</tr>
<tr>
<td>64</td>
<td>Machine is not on the network</td>
</tr>
<tr>
<td>65</td>
<td>Package not installed</td>
</tr>
<tr>
<td>66</td>
<td>Object is remote</td>
</tr>
<tr>
<td>67</td>
<td>Link has been severed</td>
</tr>
<tr>
<td>68</td>
<td>Advertise error</td>
</tr>
<tr>
<td>69</td>
<td>Srmount error</td>
</tr>
<tr>
<td>70</td>
<td>Communication error on send</td>
</tr>
<tr>
<td>71</td>
<td>Protocol error</td>
</tr>
<tr>
<td>72</td>
<td>Multihop attempted</td>
</tr>
<tr>
<td>73</td>
<td>RFS specific error</td>
</tr>
<tr>
<td>74</td>
<td>Bad message</td>
</tr>
<tr>
<td>75</td>
<td>Value too large for defined data type</td>
</tr>
<tr>
<td>76</td>
<td>Name not unique on network</td>
</tr>
<tr>
<td>77</td>
<td>File descriptor in bad state</td>
</tr>
<tr>
<td>78</td>
<td>Remote address changed</td>
</tr>
<tr>
<td>79</td>
<td>Cannot access a needed shared library</td>
</tr>
<tr>
<td>80</td>
<td>Accessing a corrupted shared library</td>
</tr>
<tr>
<td>81</td>
<td>.lib section in a.out corrupted</td>
</tr>
<tr>
<td>82</td>
<td>Attempting to link in too many shared libraries</td>
</tr>
<tr>
<td>83</td>
<td>Cannot exec a shared library directly</td>
</tr>
<tr>
<td>84</td>
<td>Invalid or incomplete multibyte or wide character</td>
</tr>
<tr>
<td>85</td>
<td>Interrupted system call should be restarted</td>
</tr>
<tr>
<td>86</td>
<td>Streams pipe error</td>
</tr>
<tr>
<td>87</td>
<td>Too many users</td>
</tr>
<tr>
<td>88</td>
<td>Socket operation on non-socket</td>
</tr>
<tr>
<td>89</td>
<td>Destination address required</td>
</tr>
<tr>
<td>90</td>
<td>Message too long</td>
</tr>
<tr>
<td>Error Code</td>
<td>Message</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>91</td>
<td>Protocol wrong type for socket</td>
</tr>
<tr>
<td>92</td>
<td>Protocol not available</td>
</tr>
<tr>
<td>93</td>
<td>Protocol not supported</td>
</tr>
<tr>
<td>94</td>
<td>Socket type not supported</td>
</tr>
<tr>
<td>95</td>
<td>Operation not supported</td>
</tr>
<tr>
<td>96</td>
<td>Protocol family not supported</td>
</tr>
<tr>
<td>97</td>
<td>Address family not supported by protocol</td>
</tr>
<tr>
<td>98</td>
<td>Address already in use</td>
</tr>
<tr>
<td>99</td>
<td>Cannot assign requested address</td>
</tr>
<tr>
<td>100</td>
<td>Network is down</td>
</tr>
<tr>
<td>101</td>
<td>Network is unreachable</td>
</tr>
<tr>
<td>102</td>
<td>Network dropped connection on reset</td>
</tr>
<tr>
<td>103</td>
<td>Software caused connection abort</td>
</tr>
<tr>
<td>104</td>
<td>Connection reset by peer</td>
</tr>
<tr>
<td>105</td>
<td>No buffer space available</td>
</tr>
<tr>
<td>106</td>
<td>Transport endpoint is already connected</td>
</tr>
<tr>
<td>107</td>
<td>Transport endpoint is not connected</td>
</tr>
<tr>
<td>108</td>
<td>Cannot send after transport endpoint shutdown</td>
</tr>
<tr>
<td>109</td>
<td>Too many references: cannot splice</td>
</tr>
<tr>
<td>110</td>
<td>Connection timed out</td>
</tr>
<tr>
<td>111</td>
<td>Connection refused</td>
</tr>
<tr>
<td>112</td>
<td>Host is down</td>
</tr>
<tr>
<td>113</td>
<td>No route to host</td>
</tr>
<tr>
<td>114</td>
<td>Operation already in progress</td>
</tr>
<tr>
<td>115</td>
<td>Operation now in progress</td>
</tr>
<tr>
<td>116</td>
<td>Stale NFS file handle</td>
</tr>
<tr>
<td>117</td>
<td>Structure needs cleaning</td>
</tr>
<tr>
<td>118</td>
<td>Not a XENIX named type file</td>
</tr>
<tr>
<td>119</td>
<td>No XENIX semaphores available</td>
</tr>
<tr>
<td>120</td>
<td>Is a named type file</td>
</tr>
<tr>
<td>121</td>
<td>Remote I/O error</td>
</tr>
<tr>
<td>122</td>
<td>Disk quota exceeded</td>
</tr>
<tr>
<td>123</td>
<td>No medium found</td>
</tr>
</tbody>
</table>
### Error Code Message

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>124</td>
<td>Wrong medium type</td>
</tr>
<tr>
<td>125</td>
<td>Operation canceled</td>
</tr>
<tr>
<td>126</td>
<td>Required key not available</td>
</tr>
<tr>
<td>127</td>
<td>Key has expired</td>
</tr>
<tr>
<td>128</td>
<td>Key has been revoked</td>
</tr>
<tr>
<td>129</td>
<td>Key was rejected by service</td>
</tr>
<tr>
<td>130</td>
<td>Owner died</td>
</tr>
<tr>
<td>131</td>
<td>State not recoverable</td>
</tr>
</tbody>
</table>

#### 4.2.11 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. 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 the following options:

<table>
<thead>
<tr>
<th>Bit Field</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO_TRANSFORM</td>
<td>Straight copy</td>
</tr>
<tr>
<td>BYTE_SWAP</td>
<td>Swap 2 bytes within each word</td>
</tr>
<tr>
<td>WORD_SWAP</td>
<td>Swap 2 words within each double word</td>
</tr>
<tr>
<td>BYTE_SWAP and WORD_SWAP combined</td>
<td>Combine swapping 2 bytes within each word with swapping 2 words within each double word</td>
</tr>
</tbody>
</table>

**BYTE_SWAP** is defined as interchanging the two bytes of every word.

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x12345678</td>
<td>0x34127856</td>
</tr>
</tbody>
</table>

**WORD_SWAP** is defined as interchanging the two words out of every double word.

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x12345678</td>
<td>0x56781234</td>
</tr>
</tbody>
</table>

4.2.12 Viewing Supported Data Types

This table lists each tag data type supported by the Gateway.

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOOL</td>
<td>1 bit (1 byte as a unit of storage)</td>
</tr>
<tr>
<td>SINT</td>
<td>1-byte integer</td>
</tr>
<tr>
<td>INT</td>
<td>2-byte integer</td>
</tr>
<tr>
<td>SHORT</td>
<td>2-byte integer</td>
</tr>
<tr>
<td>USHORT</td>
<td>2-byte unsigned integer</td>
</tr>
<tr>
<td>DINT</td>
<td>4-byte integer</td>
</tr>
<tr>
<td>UDINT</td>
<td>4-byte unsigned integer</td>
</tr>
<tr>
<td>REAL</td>
<td>4-byte IEEE float</td>
</tr>
<tr>
<td>STRING</td>
<td>ARRAY of bytes</td>
</tr>
</tbody>
</table>

4.2.13 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.

<table>
<thead>
<tr>
<th>Protocol</th>
<th>DF1-CIP</th>
<th>DF1-PCC</th>
<th>Modbus RTU</th>
<th>Modbus ASCII</th>
<th>EtherNet/IP</th>
<th>EtherNet/IP-PCCC</th>
<th>Modbus TCP</th>
<th>S7Comm</th>
<th>PPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINT</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DINT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REAL</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOOL</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STRING</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIGNED 16-BIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>UNSIGNED 16-BIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>SIGNED 32-BIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>UNSIGNED 32-BIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>
4.2.14 Troubleshooting Universal Industrial Gateway Power Supplies
The Universal Industrial Gateway uses a power supply for powering the Gateway.
Use the following information to help you troubleshoot Universal Industrial Gateway power-up problems:

- 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 Universal Industrial Gateway reboots, flickering LEDs, or the LEDs may not illuminate at all.
- If you have improperly wired the connector, the Universal Industrial Gateway either will not power up, or if you significantly exceed the input limit, you will observe a puff of smoke.

4.2.15 Troubleshooting Universal Industrial Gateway Startup
If you encounter difficulties when starting up your Universal Industrial Gateway, check the following:

- If the Universal Industrial Gateway LED1 (inside the enclosure) does not light up (green), no power is being applied to the Universal Industrial Gateway. Check the wiring, and test the output from the power supply. The output should be 24 volts.
- If the Universal Industrial Gateway does not show an ETH1 address in the LED display on the front of the Universal Industrial Gateway, connect the ETH1 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.

For more information on this topic, see Resetting the Universal Industrial Gateway to Default Configuration.

4.2.16 Troubleshooting Serial Ports
When setting up serial ports, the software actively prevents you from adding more than one device to a particular port. The messages you see are dependent on the error condition.

Related technical descriptions can be found at:

- Technical Reference Definitions
- Universal Industrial Gateway Messages

4.2.17 Troubleshooting Universal Industrial Gateway User Interface Communication Ports
The Universal Industrial Gateway User Interface (running on a personal computer) uses TCP port 443 to communicate to the Universal Industrial Gateway. If traffic is blocked on this port, the Universal Industrial Gateway User Interface will not open up on your personal computer. You will only see a blue screen in the browser.
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