IO-Link

IO-Link Master EIP-4

User Guide

COMTROL®

Document Number: 2000582 Rev. A

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Chapter 1. Introduction

This document provides configuration and detailed web interface information. In addition, it also discusses:

- Using the IO-Link Master web interface to view IO-Link, EtherNet/IP, and Modbus/TCP diagnostic information (Page 41).

- An introduction to PortVision DX, a configuration and management utility for Windows operating systems that includes how to use PortVision DX for basic procedures. The PortVision DX help system provides detailed information about how to customize it for your network.

- Updating images and application subassemblies (Page 51). The next subsection provides links to download the latest software and documentation for your IO-Link Master.

- Detailed information interface specifications are located in the following *IO-Link Master Reference Manuals*:
    - *IO-Link Master EtherNet/IP Reference Manual*
    - *IO-Link Master Modbus/TCP Reference Manual*

1.1. Product Overview

The IO-Link Master 4-EIP features include:

- Four channel IO-Link Master to EtherNet/IP
- EtherNet/IP access to IO-Link sensor process, event and service data
- Class 1 (Implicit) and Class 3 (Explicit) interfaces
- Write-to-Tag/File and Read-from-Tag/File
- Modbus/TCP access to IO-Link sensor processes, events, and service data
- Rugged IP67 housing with M12 connectors for harsh environments
- PortVision DX (configuration and management utility for Windows operating systems)
- Web GUI that also provides configuration and extensive diagnostics
- Wide operating temperature (0° to +70°C)
- LEDs that display device, network and port status
- Additional digital input on every port
- IO-Link V1.1 compatibility
- IO-Link COM1, COM2, and COM3 that supports 230K baud rate
- Slim-line machine-mount installation

Refer to the Comtrol web site for additional specification information.

1.2. Installation and Configuration Overview

IO-Link Master installation includes the following procedures:

1. Install the IO-Link Master hardware (Page 9).
2. If necessary, configure the IP address (Page 13).
3. Configure the IO-Link ports (Page 5).

4. Connect the IO-Link devices (Page 39).

1.3. Locating the Latest Software and Documentation

You can use the links in this table to locate the latest images, application subassemblies, utilities, and documentation. For detailed information about images or application subassemblies and updating IO-Link Master, see *7.3.2. Updating Application Subassemblies* on Page 55.

Latest Images	
Application Base	
FPGA	
U-Boot Bootloader	
System uImage (Primary/Backup)	
Latest Application Subassemblies	
Application Manager	
Configuration Manager	
Discovery Protocol	
EtherNet/IP	
Event Log	
IO-Link Driver	
Web User Interface	

Latest Configuration Utility	
PortVision DX supports the following operating systems: • Windows 8 • Windows Server 2012 • Windows 7 • Windows Server 2008 • Windows Vista • Windows Server 2003 • Windows XP	This is a configuration and management utility for Comtrol Ethernet attached devices, including IO-Link Master.

Latest Product Documentation	
IO-Link Master User Guide	
IO-Link Master EtherNet/IP Reference Manual	
IO-Link Master Modbus/TCP Reference Manual	
Web Interface Help System	PortVision DX **Software Settings** tab support.

Chapter 2. Hardware Installation

Use the following procedures to install the IO-Link Master hardware:

- *2.1. Setting the Rotary Switch*
-
-
-
-

After connecting the IO-Link Master to the network, perform the following tasks:

- Configure the network information, refer to
- Configure the port characteristics, refer to
- Connect the IO-Link devices to the IO-Link Master, refer to

2.1. Setting the Rotary Switch

You can use the rotary switches under the configuration window on the IO-Link Master to set the lower 3digits (8 bits) of the static IP address.

If the rotary switches are set to a non-default position, the upper 9 digits (24 bits) of the IP address are then taken from the static network address and DHCP maybe disabled. The switches only take effect during startup, but the current position is always shown on the **Help/SUPPORT** web page.

Optionally, you can leave the rotary switch set to the default and use the web interface or PortVision DX to set the network address.

Note: *If you set the network address using the rotary switches, the Rotary Switch setting overrides the network settings in the web interface.*

Switch Setting	Node Address
000 (Default setting)	Use the network configuration stored in the flash. The default network configuration values are: • IP address = 192.168.1.250 • Subnet mask = 255.255.255.0 • IP gateway = 0.0.0.0 After completing the hardware installation, see *Chapter 3. Initial Configuration* on Page 13 to set the network address using the web interface or PortVision DX.
001-254	This is the last three digits in the IP address. This uses the first three numbers from the configured static address, which defaults to 192.168.1.xxx.
255-887	Reserved.
888	Reset to factory defaults.
889-997	Use the network configuration values stored in the flash (reserved).
998	Use DHCP addressing.
999	Use the default IP address.

Use the following steps if you want to change the default rotary switch settings.

1. Remove the two phillips screws.

2. Gently swing open the configuration window from the left to the right, allowing it pivot on the hinge on the right side.

3. Turn each dial to the appropriate position using a small flathead screwdriver.
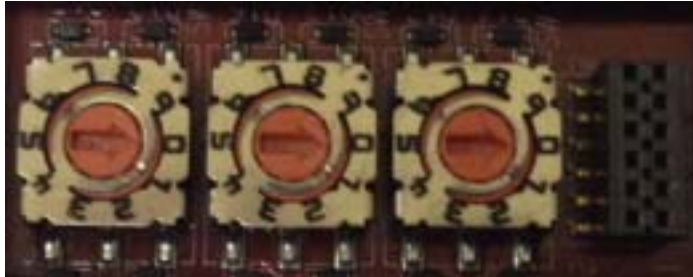
The default value is 000 as shown above.

The arrow points to the switch location. 0 is located at the 3:00 position. Turn the dial clockwise to the appropriate setting.

4. Carefully close the window making sure that is properly aligned.

5. Reinsert the two screws making sure that the window is securely sealed.

Note: *Failure to reassemble the configuration window properly may permit leakage.*

2.2. Mounting the IO-Link Master

Use the following procedure to mount the IO-Link Master. The IO-Link Master can be installed on a mounting panel or a machine.

1. Verify that the mounting surface is level (flat) to prevent mechanical stress to the IO-Link Master.

2. Attach the IO-Link Master to the surface with two 6mm screws and washers.

   a. Attach the grounding strap to chassis or earth ground.

   b. Torque down to 8Nm.

   Note: *Make sure that you connect the FE terminal at low impedance to function ground to meet EMC standards.*

2.3. Connecting to the Network

The IO-Link Master provides two Fast Ethernet (10/100BASE-TX) M12 connections (4-pin female /D-coded).

Pin	Signal
1	Tx+
2	Rx+
3	Tx-
4	Rx-
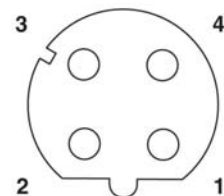
You can use this procedure to connect the IO-Link Master to the network.

1. Securely connect one end of the M12 Ethernet cable to EIP 1 or EIP 2.

2. Connect the other end to the network.

3. Optionally, you can use the other Ethernet port to daisy-chain to another Ethernet device.

4. If you did not connect both Ethernet ports, make sure that screw on a connector cap, which was shipped with the IO-Link Master to keep dust and liquids from getting in the connector.

Note: *Ethernet ports must have an approved cable or protective cover attached to the port guarantee IP67 compliance.*

2.4. Connecting the Power

IO-Link Master provides dual M12 (A-coded) power connectors.
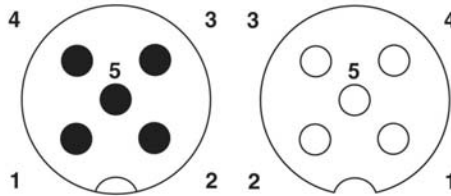
Pin	Input - Male	Output - Female
1	L+	L+
2	L2+	L2+
3	L-	L-
4	L2-	L2-
5	Not connected	Not connected

Maximum EMC protection is provided by a low impedance connection between functional earth, the grounding tabs, and protective earth. The following table contains power-related information about the power supply.

Power Supply Voltage/Current	Values
Voltage Input Range	20 to 30VDC
Current (for the IO-Link Master)	100mA
Maximum Output Current	1.9A†
† The total supply of current for all connected IO-Link devices.	

Note: *IO-Link Master requires a UL listed power supply with an output rating of 24VDC.*

You can use this procedure to connect the IO-Link Master to a power supply.

1. Securely attach the power cable between the male power connector and the power supply.

2. Either attach a power cable between the female power connector and another device to which you want to provide power or securely attach a connector cap to prevent dust or liquids from getting into the connector. Connector caps were shipped with the IO-Link Master.

3. Apply the power and verify that the following LEDs are lit indicating that you are ready to begin configuration.
   - PWR
   - MS, first the flashing green and red LEDs displays that it is in self-test mode. After the self-test, depending on whether you set the IP address with the rotary switch one of the following occurs:
     - The green LED is flashing to indicate that it is in standby mode.
     - The green LED is lit to indicate that it is operational.
   - NET, first it flashes green and red indicating that it is in self-test mode. After the self-test, depending on whether you set the IP address with the rotary switch one of the following occurs:

- - Off indicates there is no IP address
- - Steady red indicates duplicate IP address on the network
- • EIP 1/2 should be steady green indicating that the link is up if both connectors are connected.

If the LEDs indicate that you ready for configuration, go to *Chapter 3. Initial Configuration* on Page 13.

If the LEDs do not meet the above conditions, you can refer to the *2.5. IO-Link Master LEDs* table on Page 12 and if necessary, refer to *Chapter 8. Troubleshooting and Technical Support* on Page 57.

Note: *Power connectors must have an approved cable or protective cover attached to the port guarantee IP67 compliance.*

2.5. IO-Link Master LEDs

The following table provides LED descriptions.

IO-Link Master LEDs	
PWR	A lit green LED indicates that the IO-Link Master is powered.
MS (Module Status)	This LED provides the following information: • Off = No module status • Flashing green and red = Self-test • Flashing green = Standby – not configured • Steady green = Operational • Flashing red = Minor recoverable fault • Steady red = Major unrecoverable fault
NET (Network)	This LED provides the following information: • Off = No IP address • Flashing green and red = Self-test • Flashing green = An IP address is configured, but no CIP connections are established, and an Exclusive Owner connection has not timed out • Steady green = Active EtherNet/IP connection and no EtherNet/IP connection time-outs • Flashing red = One or more EtherNet/IP connection time-outs • Steady red = Duplicate IP address on network
Port 1-4	This LED provides the following information about the IO-Link port. • Off: SIO mode - signal is low or disconnected • Yellow: SIO mode - signal is high • Red: Hardware fault • Solid Green: An IO-Link device is connected and communicating • Blinking Green: Searching for IO-Link devices
Port 1-4 DI	This LED indicates digital input on Pin 2. • Off: DI signal is low or disconnected • Yellow: DI signal is high
EIP 1 EIP 2	The EIP LEDs provide this information: • Green lit LED = link • Green blinking LED = Activity

Chapter 3. Initial Configuration

If you used the rotary switch to set the IP address (*2.1. Setting the Rotary Switch* on Page 9), then you still must configure the upper 9 digits (24 bits) of the IP address using PortVision DX or the web interface. You may want to install PortVision DX to access and manage your IO-Link Masters.

This section discusses IP address configuration options using one of these methods:

- *PortVision DX* (below)
- *Web interface* (Page 19)

    Use the web page, if you want to configure the following:

    - Host name
    - DNS servers
    - Syslog Server IP/Host name
    - Syslog Port
    - SSH Server Enable

    Note: *You can use PortVision DX to configure the IP address information and then use the web interface to configure the options not configurable in PortVision DX.*

In addition, this section discusses setting up *passwords* through the web interface.

After you configure the network settings, you can configure the port characteristics, refer to *Chapter 4. IO-Link Port Configuration* on Page 25.

3.1. Using PortVision DX

This subsection contains the following topics:

- *3.1.1. PortVision DX Overview*
- *3.1.2. Installing PortVision DX* on Page 15
- *3.1.3. Programming the IP Address* on Page 17

3.1.1. PortVision DX Overview

PortVision DX automatically detects Comtrol Ethernet attached products physically attached to the local network segment so that you can configure the network address, upload firmware, access product configuration web pages, and manage the following products:

- DeviceMaster family
- IO-Link Master
- RocketLinx managed switches

In addition to identifying Comtrol Ethernet attached products, you can use PortVision DX to display any third-party switch and hardware that may be connected directly to those devices. All non-Comtrol products and unmanaged RocketLinx devices are treated as non-intelligent devices and have limited feature support. For example, you cannot configure or update firmware on a third-party switch.

After PortVision DX is installed and the network has been scanned for Comtrol devices, the devices are

displayed in the *Scan Results* folder as shown in the following graphic.
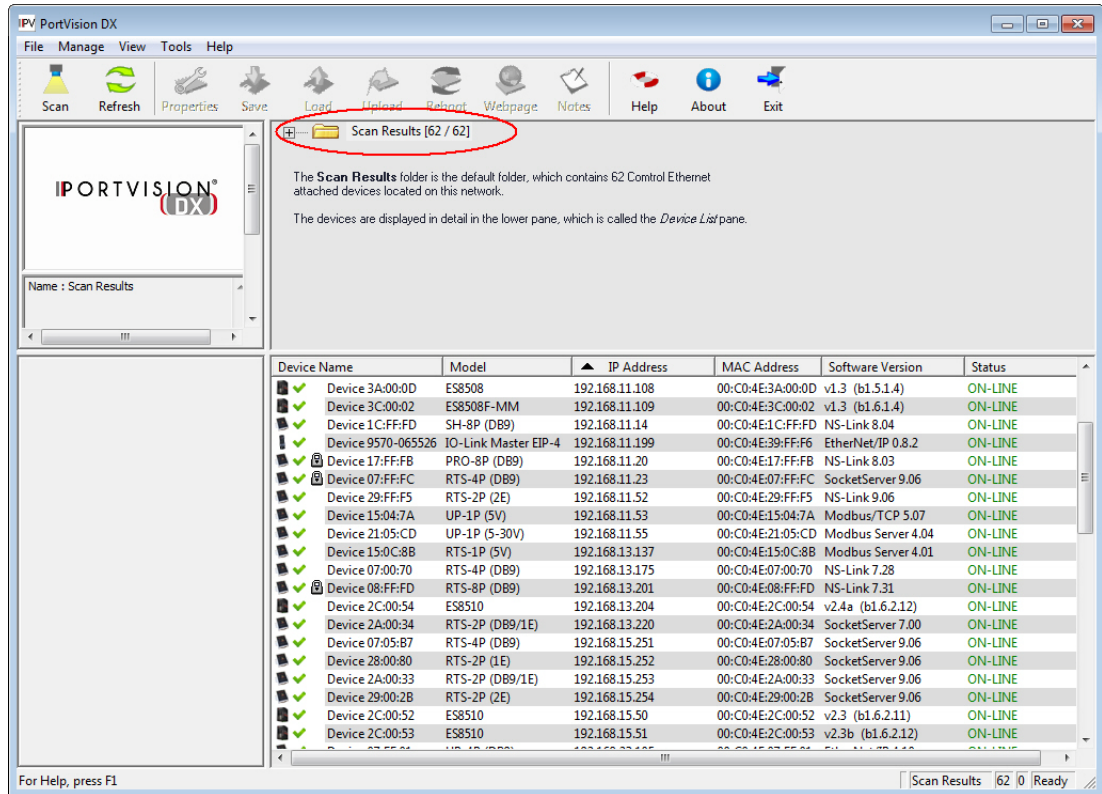
You can use the PortVision DX help system to learn how to organize your devices.
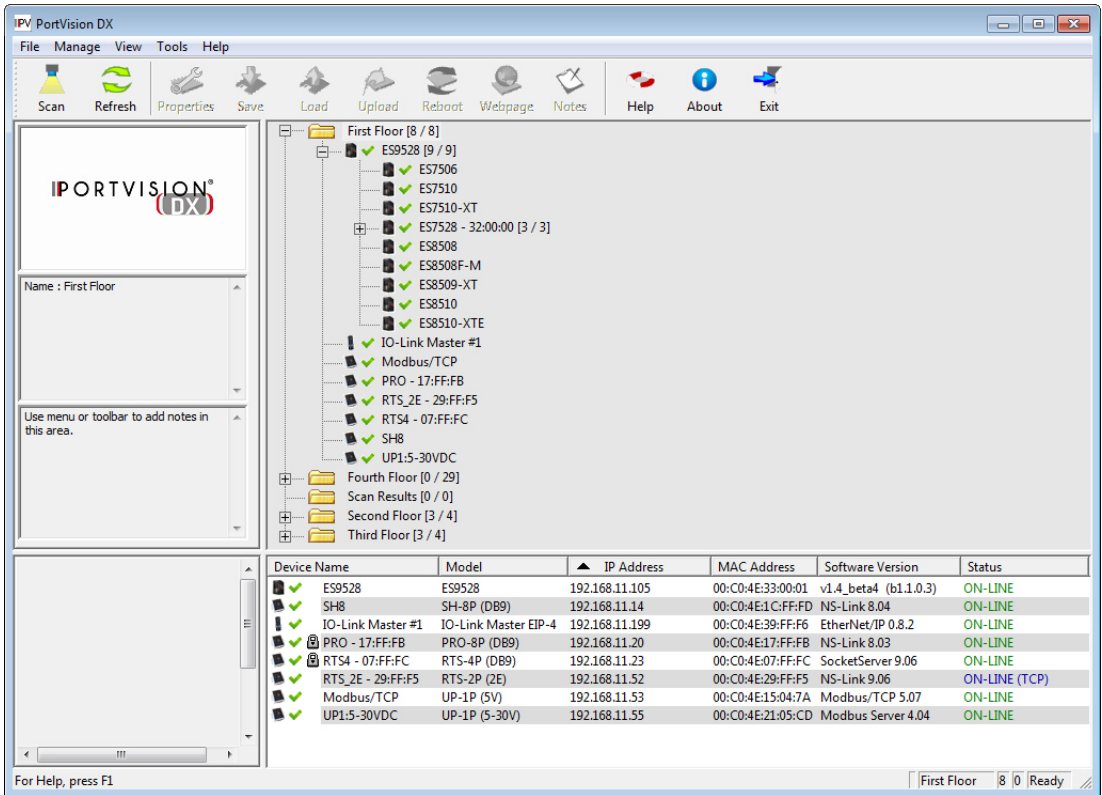
3.1.2. Installing PortVision DX

Use this procedure to install or update PortVision DX. You can install PortVision DX from the CD shipped with the IO-Link Master or download the latest version. Refer to *Locating the Latest Software and Documentation* on Page 8 to locate the latest version.

1. Execute the **PortVision_DX_*x.xx*.msi** file, where *x.xx* is the version number.

2. Click **Next** to start the installation.
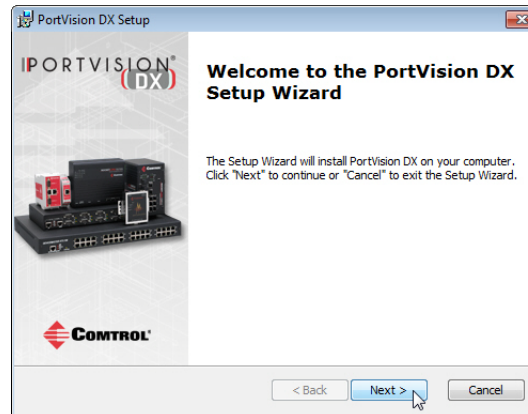
3. Click **I accept the terms in the License Agreement** and **Next**.
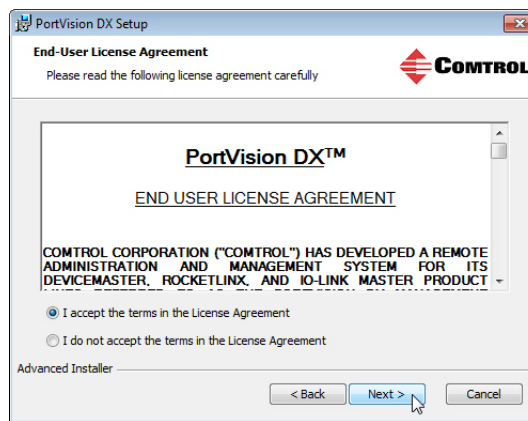
4. Click **Next** to install in the default location or browse to another location and then click **Next**.
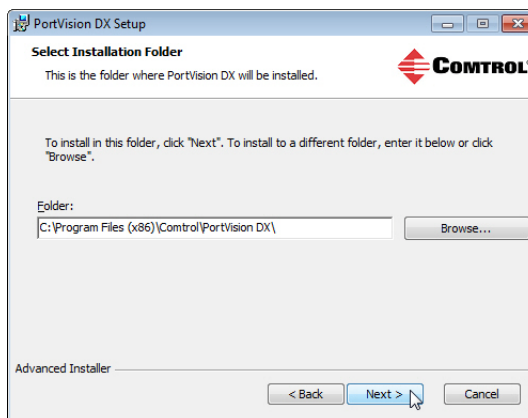
5. Click **Next** to continue the installation.
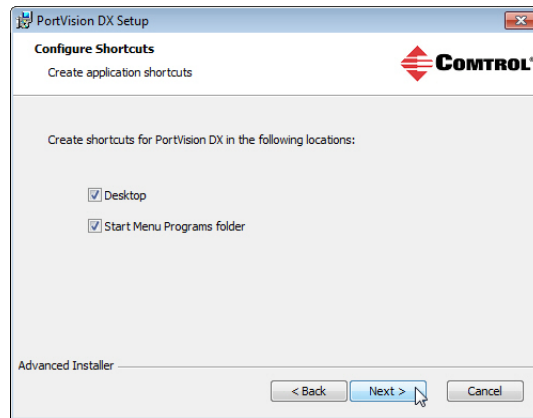
6. Click **Install**.
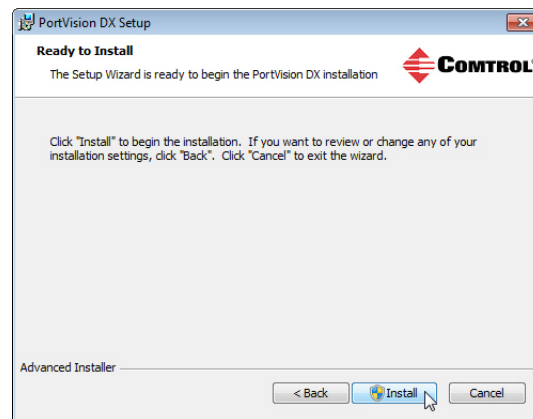
7. Depending on your operating system, you may need to click **Yes** to the **Do you want to allow the following program to install software on this computer** *User Account Control* popup message.

8. Click **Finish**.
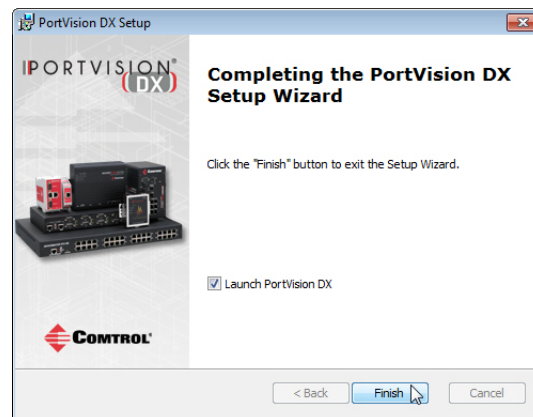
9. Depending on your operating system, you may need to click **Yes** to the **Do you want to allow the following program to make changes on this computer** *User Account Control* popup message.

PortVision DX is installed and you can use the next subsection to program the IP address into the IO-Link Master.

3.1.3. Programming the IP Address

Use the following procedure to program the IP address into the IO-Link Master using PortVision DX.

Note: *Optionally, you can use the web interface to configure or Rotary switch to configure the IP address. You can also refer to* 2.1. Setting the Rotary Switch *on Page 9 or* 3.2. Using the Web Interface *on Page 19.*

The Rotary switch settings override the lower 3 digits (8 bits) of the static IP address configured in PortVision DX or the **Configuration/Network** *page.*

1. Start PortVision DX by using the desktop icon or click PortVision DX in the **Start** menu.

2. Depending on the operating system you may need to click **Yes** to the **Do you want to allow the following program to make changes on this computer** *User Account Control* popup message.

3. Click the **Scan** button to locate your IO-Link Master or IO-Link Masters on the network.
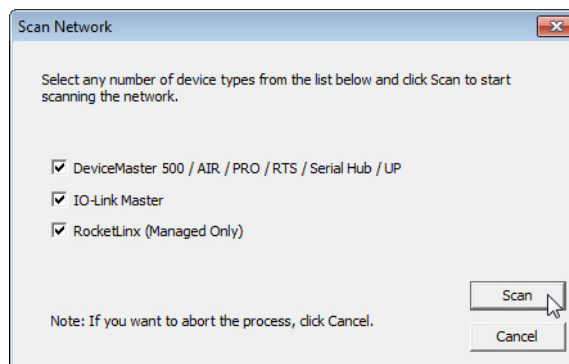
4. Click the hardware types that you want to locate and click **Scan**.

5. Right-click the IO-Link Master that you want to program in the *Device List* pane (lower) and click **Properties**.

Optionally, you can double-click on the IO-Link Master to open the **Properties** tabs. It may take a few moments for the next screen to open.
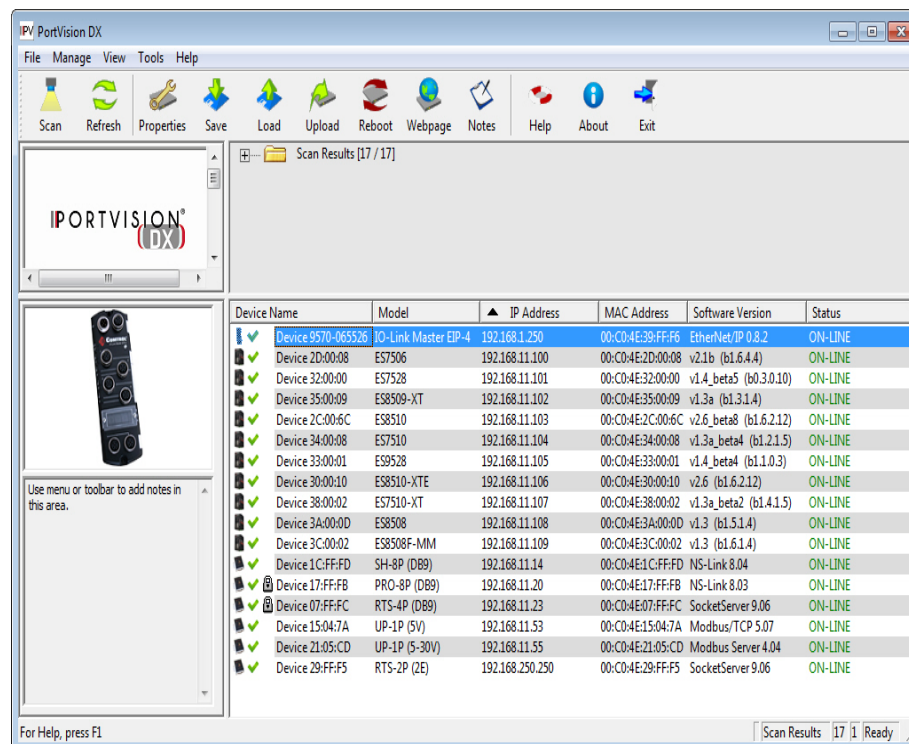
6. Optionally, enter a device name, which displays inPortVision DX on the *Main* screen.

    Note: *The MAC address, Serial Number, and Device Status fields are automatically completed and are status-only fields.*

7. Enter the appropriate network information on the **General** tab.

    You can configure the IO-Link Master for a static IP address or set it to DHCP.

    - If you select **Static** for the IP Type, you must enter a valid IPv4 address. If necessary, see your Network Administrator for a valid IP address for this IO-Link Master.

        The default IP address is: 192.168.1.250.

        - Enter a valid subnet mask for your network. The default Subnet Mask is: 255.255.255.0.

        - Enter a valid IP gateway address for your network. The default Gateway Address is: 0.0.0.0.

    - If you select **DHCP**, this field displays the last IP address programmed into the IO-Link Master.

    Note: *Rotary switch settings override the lower 3 digits (8 bits) of static IP address.*

8. Click **Close** to exit the **Properties** tabs.

9. You wait until PortVision DX polls to display the updated IO-Link Master IP address or you can click **Refresh** until the new IP address is displayed in the *Device List* pane.
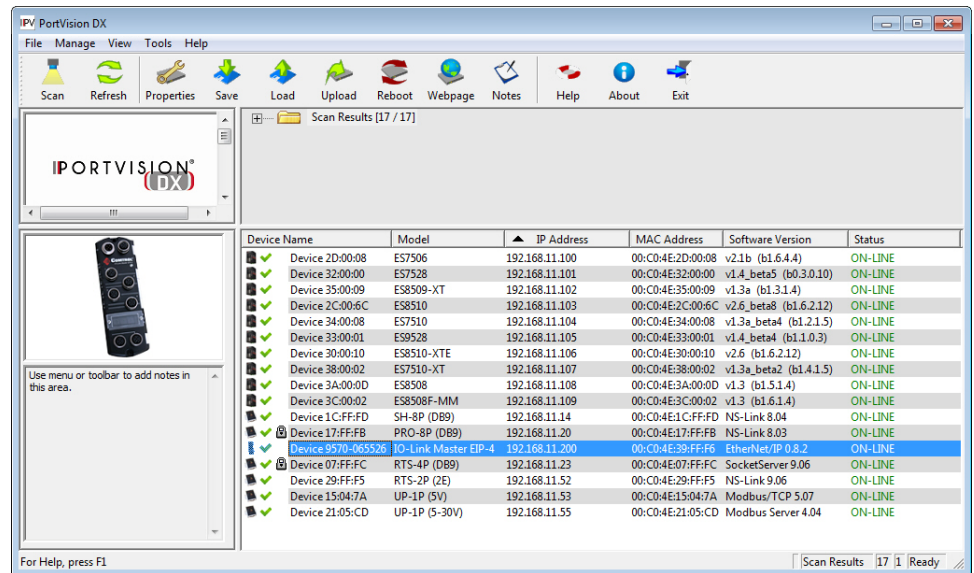
10. If you want to configure any of the following options, go to *3.2. Using the Web Interface* on Page 19:
    - Host name
    - DNS servers
    - Syslog Server IP/Host name
    - Syslog Port
    - SSH Server Enable

You are ready to configure the ports, refer to *Chapter 4. IO-Link Port Configuration* on Page 25.

3.2. Using the Web Interface

This subsection discusses using the web interface to configure the IP address.

*Note: The rotary switch settings override the lower 3 digits (8 bits) of static IP address configured on the* **Configuration/Network** *page. The default rotary switch setting uses the settings configured in the flash.*

Optionally, you can use the web interface to configure the upper 9 digits (24 bits) and the rotary switch to configure the lower 3 digits (8 bits) of the static IP address. You can also refer to 2.1. Setting the Rotary Switch on Page 9 for additional information.

You can use the following procedure to configure the IO-Link Master network settings if you have administrative rights.

1. Open the IO-Link Master web interface using one of these method:
   • From PortVision DX, highlight the IO-Link Master and click the **Webpage** button or right-click the IO-Link Master in the *Device List* pane (lower pane) and click **Webpage**.
   • Open your browser and enter the IP address of the IO-Link Master.
   Note: The default IP address is 192.168.1.250.
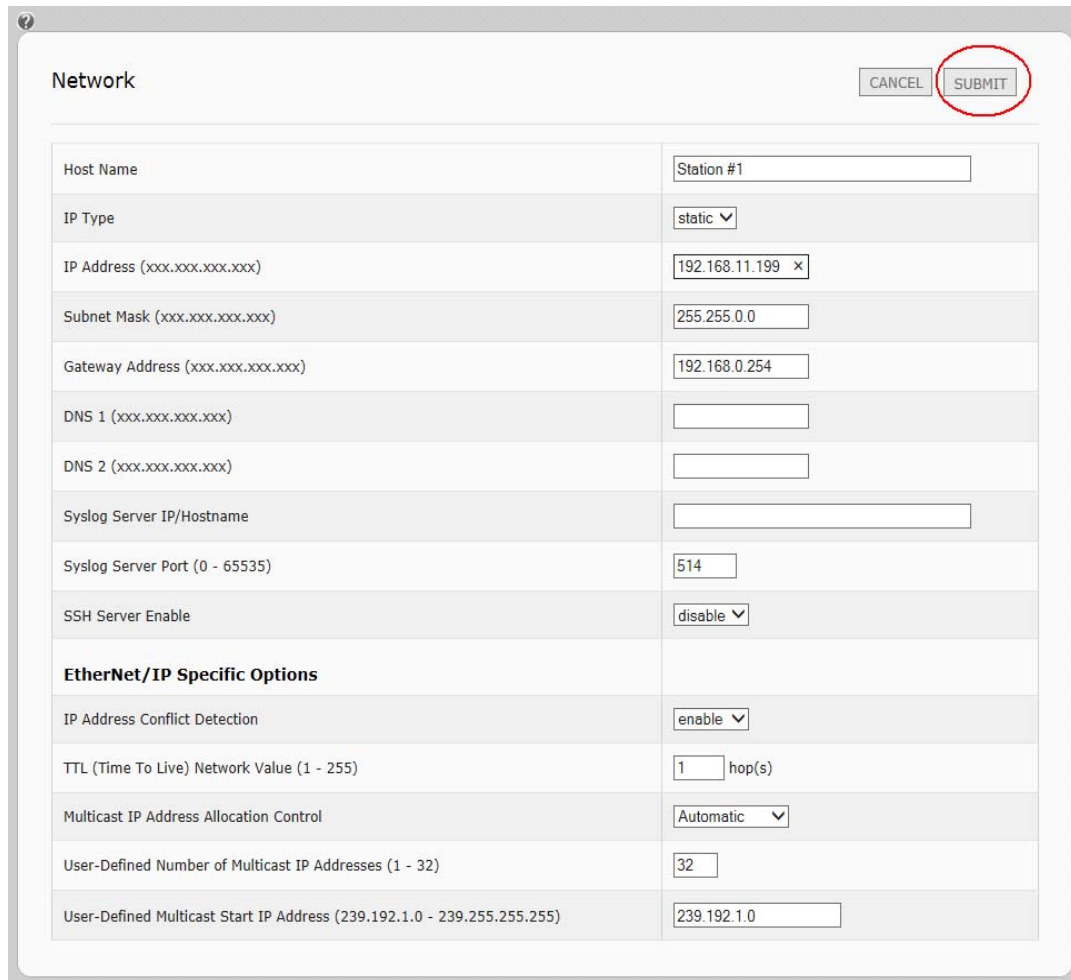
2. Click **Configuration** and then **NETWORK**.

3. Click the **EDIT** button.
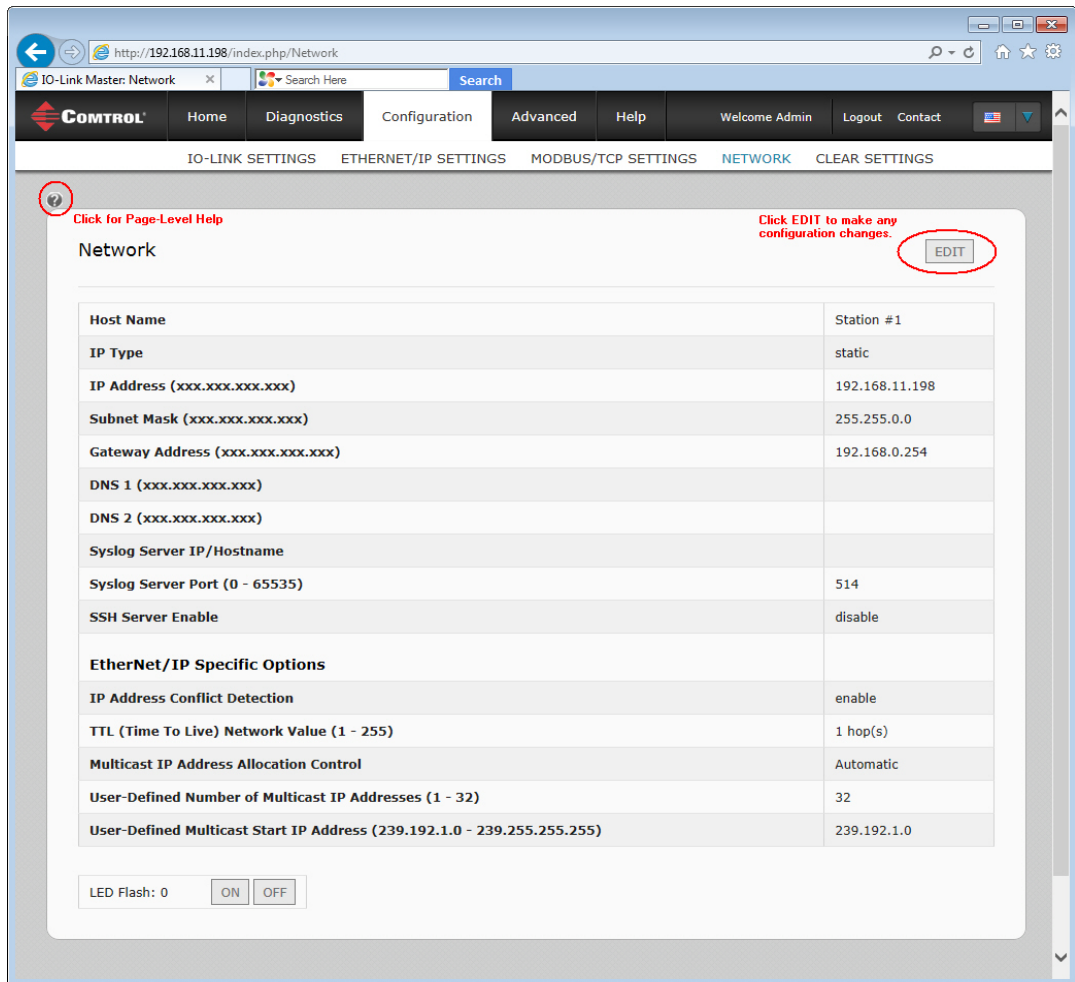
4. Optionally, enter a host name to identify this IO-Link Master.
5. Select the IP type, **Static** or **DHCP**.
    - If using a static IP address, enter the static IP address, subnet mask and IP gateway address.
    - If using DNS:
        - Enter the DNS primary server IP address.
        - Optionally, enter the DNS secondary server IP address.
6. If you want the IO-Link Master to send syslog messages to a syslog server:
    a. Enter the syslog server's IP address (or host name if using DNS).
    b. Enter the syslog server's port number (default is 514).
7. If you want to enable the SSH server, click **Enable**.
8. Optionally, configure **EtherNet/IP Specific Settings**. You can refer to the help system for information about these settings.

9. Click **Submit** to save the changes.

10. If you want to return to the web page, you must enter the new IP address.

3.3. Setting up Passwords

The IO-Link Master is shipped from the factory without passwords. See the following table if you want to see how permissions are granted.

Page	Admin	Operator	User
Log-in	Yes	Yes	Yes
Home	Yes	Yes	Yes
Diagnostics - All	Yes	Yes	Yes
Configuration - Port Settings	Yes	Yes	No
Configuration - Network	Yes	No	No
Advanced - Software	Yes	No	No
Advanced - Accounts	Yes	No	No
Advanced - Log Files	Yes	Yes	Yes
Licences	Yes	Yes	Yes
Help - All	Yes	Yes	Yes

You can use this procedure to set up passwords for the IO-Link Master.

1. Open the IO-Link Master web interface using one of these method:
   - From PortVision DX, highlight the IO-Link Master and click the **Webpage** button or right-click the IO-Link Master in the *Device List* pane and click **Webpage**.
   - Open your browser and enter the IP address of the IO-Link Master.
2. Click **Advanced** and then **ACCOUNTS**.
3. Click the **ADMIN** check box.
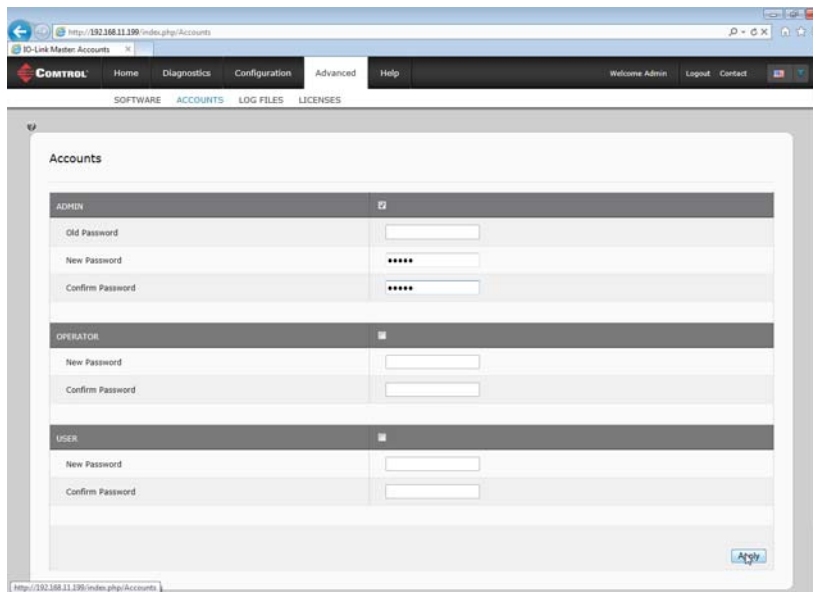
4. If applicable, enter the old password in the **Old Password** text box.
5. Enter the new password in the **New Password** text box.
6. Re-enter the password in the **Confirm Password** text box.
7. Optionally, click the **Operator** check box, enter a new password, and re-enter the password in the **Confirm Password** text box.

8. Optionally, click the **User** check box, enter the new password, and re-enter the password in the **Confirm Password** text box.

9. Click **Apply**.

10. Close the new window that displays a *Password saved* banner.
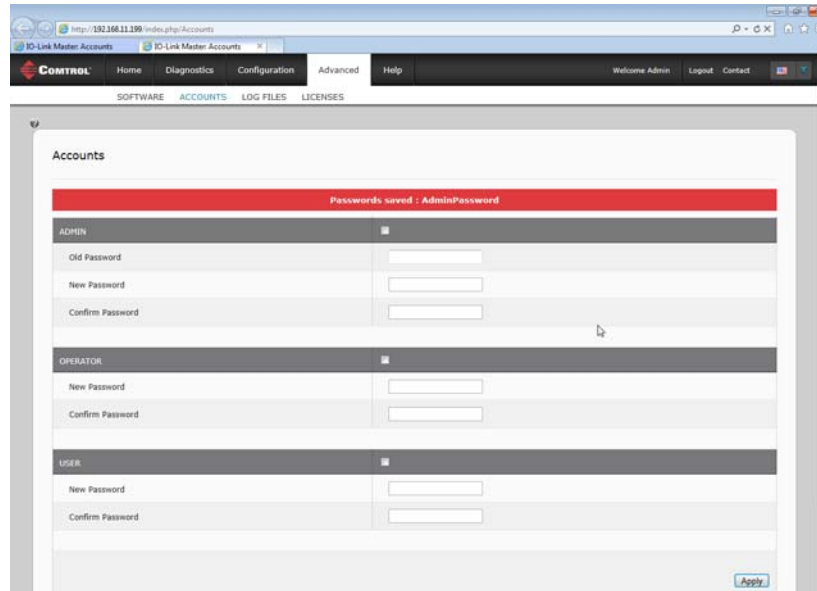
11. Click the **Log out** button (top navigation bar).

12. Re-open the web interface by selecting the appropriate audience in the drop list and entering the password.
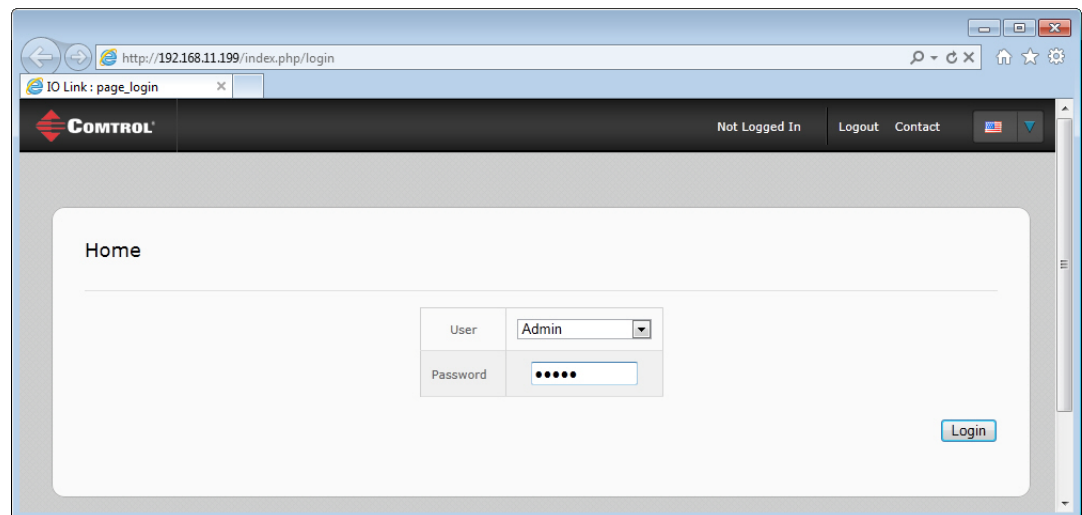
Chapter 4. IO-Link Port Configuration

This section discusses port configuration, which includes these topics:

- *4.1. IO-Link Settings Configuration Page*
- *4.2. EtherNet/IP Settings Configuration Page* on Page 27
- *4.3. Modbus/TCP Settings Configuration Page* on Page 34

Depending on your needs, the IO-Link Master you may not to change many of the default options.
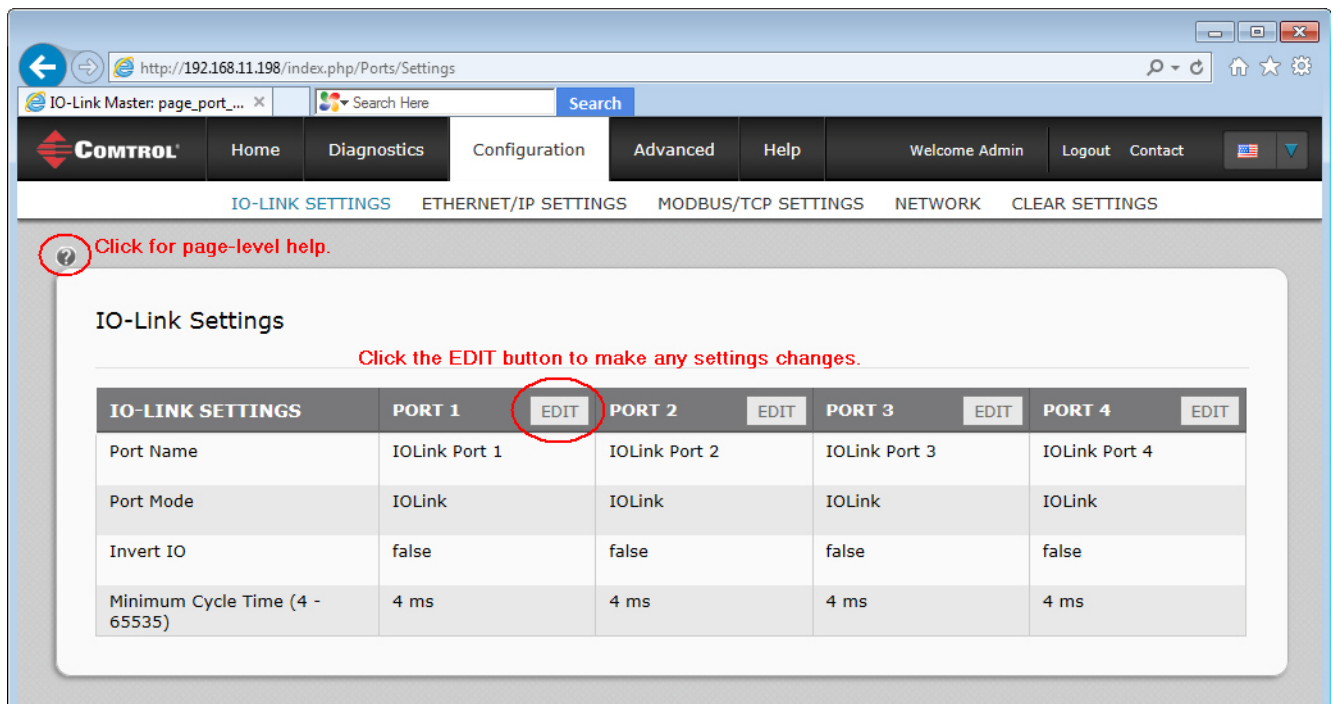
You may want to refer to the following Reference Manuals for additional information. The *IO-Link Master Reference Manuals* also contain information about using the sample programs.

- *IO-Link Master EtherNet/IP Reference Manual*
- *IO-Link Master Modbus/TCP Reference Manual*

Note: The IO-Link Master may work out of the box for ControlLogix PLCs.

4.1. IO-Link Settings Configuration Page

Use the *IO-Link Settings* page to configure IO-Link port characteristics for the IO-Link Master.

4.1.1. Editing IO-Link Settings

You can use this procedure to configure IO-Link characteristics for each port. The following table or help system provides information about each option.

1. If necessary, open the IO-Link Master web interface with your web browser using the IP address or through PortVision DX.

2. Click **Configuration** in the menu bar, which by default loads the *IO-Link Settings* page.

3. Click the **EDIT** button for the port that you want to configure.

4. Make appropriate selections for the IO-Link device that you will connect to that port. You can use the help system if you require definitions or values for the options or *4.1.2. IO-Link Settings Parameters* on Page 26.

5. Click the **SAVE** button.

6. Repeat for each port that requires configuration changes.

4.1.2. IO-Link Settings Parameters

The *IO-Link Settings* configuration page supports the following options.

IO-LINK SETTINGS Page	
Port Name	User defined port or device description. • Standard ASCII characters • Max length = 80 characters
Port Mode *Default*: IO-Link	Selected IO-Link Port Mode. Valid settings are: • Reset • IO-Link • Digital In • Digital Out
Invert IO *Default*: False	If enabled and the *Port Mode* is Digital In or Digital Out, inverts the I/O value. 0= False (Disabled - Do not invert IO) 1= True (Enabled - Invert IO) *Note: Does not affect the Auxiliary Input.*
Minimum Cycle Time *Default*: 4	The minimum, or fastest, cycle time that the IO-Link device may operate at. The valid range is 4-65535 ms.

4.2. EtherNet/IP Settings Configuration Page

Use the *EtherNet/IP Settings* page to configure EtherNet/IP port options.

4.2.1. Editing EtherNet/IP Settings

You can use this procedure to configure EtherNet/IP characteristics for each port.

1. If necessary, open the IO-Link Master web interface with your web browser using the IP address.

2. Click **Configuration** in the menu bar.

3. Click the **ETHERNET/IP SETTINGS** submenu.

4. Click the **EDIT** button for the port that you want to configure.

5. Make appropriate selections for the IO-Link device that you will connect to that port.

    You can use the help system if you require definitions or values for the options or *4.2.2. EtherNet/IP Settings Parameters* on Page 29.

6. Scroll to the top of the page and click the **SAVE** button.

    Make sure that the port now displays the **EDIT** button.

    If it displays the **SAVE** and **CANCEL** buttons, that means that one of the parameters contains an incorrect value. If necessary, scroll down the page, make the needed corrections, and click **SAVE**.

7. Repeat for each port that requires configuration changes.

4.2.2. EtherNet/IP Settings Parameters

The *EtherNET/IP Settings* configuration page supports the following options.

EtherNet/IP Settings Page	
ISDU Data Settings	
ISDU Response Timeout *Default*: 20 seconds	The time that the IO-Link Master's EtherNet/IP interface waits for a response to an ISDU request. The timeout needs to set long enough to allow all commands within the ISDU request to be processed. Valid range: 1-10,000 seconds
Process Data Settings	
PDI Data Block Size (To PLC) *Default*: 36-bytes	The configurable PDI data block length. Supported optional lengths are: • 4-bytes (header only) • 8-bytes (4 bytes data) • 16-bytes (12 bytes data) • 24-bytes (20 bytes data) • 36-bytes (32 bytes data)
PDI Data Block Format (To PLC) *Default*: Word-16	Data format of PDI data block to be transferred to the PLC(s) in Class 1 and/or Write-to-Tag/File PDI Transfer Modes. Supported formats are: • Byte-8 (8-bit or SINT) • Word-16 (16-bit or INT) • Dword-32 (32-bit or DINT) *Note: The Data Block Format is independent of the PDI Data Byte-Swap Method.* *This setting is not used for the SLC, PLC-5 and MicroLogix PLCs which are always Word-16.*
PDI Data Byte-Swap Method *Default*: Work (16-bit) byte swap	If enabled, the IO-Link Master swaps the data bytes in word (2 byte) format or dword (4 byte) format. Supported values are: • No byte-swap – data passed through as received • Word (16-bit) byte-swap – data is byte-swapped in word format • Dword (32-bit) byte-swap – data is byte-swapped in dword format *Note: The byte swapping must be set correctly in order to convert from IO-Link (big-endian byte order), to EtherNet/IP (little-endian byte order).*

EtherNet/IP Settings Page (Continued)	

PDO Data Block Size (From PLC)
 	
Default: 32-bytes
	The configurable PDO data block length. Supported optional lengths are:
	
	• Event code not included:
	   - 4-bytes = all data
	   - 8-bytes = all data
	   - 16-bytes = all data
	   - 24-bytes = all data
	   - 32-bytes = all data
	   - 34-bytes = 32 bytes data, 2 pad bytes
	   - 36-bytes = 32 bytes data, 4 pad bytes
	• Event code included - PDO Data Format = Byte8:
	   - 4-bytes = 2 byte event code, 2 data bytes
	   - 8-bytes = 2 byte event code, 6 data bytes
	   - 16-bytes = 2 byte event code, 14 data bytes
	   - 24-bytes = 2 byte event code, 22 data bytes
	   - 32-bytes = 2 byte event code, 30 data bytes
	   - 34-bytes = 2 byte event code, 32 data bytes
	   - 36-bytes = 2 byte event code, 32 data bytes, 2 byte pad
	• Event code included - PDO Data Format = word (16-bit):
	   - 4-bytes = event code word, data word
	   - 8-bytes = event code word, 3 data words
	   - 16-bytes = event code word, 7 data words
	   - 24-bytes = event code word, 11 data words
	   - 32-bytes = event code word, 15 data words
	   - 34-bytes = event code word, 16 data words
	   - 36-bytes = event code word, 16 data words, pad word
	• Event code included - PDO Data Format = dword (32-bit):
	   - 4-bytes = event code dword
	   - 8-bytes = event code dword, data dword
	   - 16-bytes = event code dword, 3 data dwords
	   - 24-bytes = dword event code, 5 data dwords
	   - 32-bytes = dword event code, 7 data dwords
	   - 34-bytes = dword event code, 7 data dwords, 2 data bytes
	   - 36-bytes = dword event code, 8 data dwords

PDO Data Block Format (From PLC) *Default*: Word-16	Data format of PDO data block received from the PLC(s) in Class 1 or Read from TagOrFile PDO Transfer Modes. Formats include: • Byte-8 (8-bit) • Word-16 (16-bit) • Dword-32 (32-bit) *Note: The Data Block Format is independent of the PDO Data Byte-Swap Method.* *This setting is not used for the SLC, PLC-5 and MicroLogix PLCs which are always Word-16.*

EtherNet/IP Settings Page (Continued)	
PDO Data Byte-Swap Method *Default*: Word (16-bit) byte-swap	If enabled, the IO-Link Master swaps the data bytes in word (2 byte) format or dword (4 byte) format. Supported values are: • No byte-swap – data passed through as received • Word (16-bit) byte-swap – data is byte-swapped in word format • Dword (32-bit) byte-swap – data is byte-swapped in dword format *Note: The byte swapping must be set correctly in order to convert from EtherNet/IP (little-endian byte order), to IO-Link (big-endian byte order).*
Clear Event Code in PDO Block *Default*: False	If enabled, the IO-Link Master expects the first 2 bytes, word, or dword of the PDO block to be used for event code handling. Supported values are: • True = expect event code • False = no event code, expect only PDO data
Clear Event Code After Hold Time *Default*: True	If enabled, the IO-Link Master clears any event code reported in the PDI data block after the **Event Active Hold Time**. Supported values are: • True = clear event code after hold time • False = do not clear event code after hold time

Event Active Hold Time
 	
Default: 1000 ms
	If **Clear Event Code After Hold** time is enabled, the time period an event code is reported in the PDI block before it is cleared.
	• Valid range: 1-65535
	• Valid Units:
	  - ms (milliseconds)
	  - sec (seconds)
	  - min (minutes)
	  - hours
	  - days

Clear Event Hold Time
 	
Default: 500 ms
	Once an event code has been cleared, the time an event code stays cleared in the PDI block before another event code can be reported.
	• Valid range: 1-65535
	• Valid Units:
	  - ms (milliseconds)
	  - sec (seconds)
	  - min (minutes)
	  - hours
	  - days

EtherNet/IP Settings Page (Continued)	
Transfer Mode Settings	
PDI Receive Mode(s) *Default*: Polling, Class1	Determines which PDI Receive (To PLC) Modes are enabled. Supported modes are: • Polling • Class1 • Write-to-TagOrFile
PDO Transmit Mode *Default*: Class 1	Supported modes are: • Off • PLC-Writes • Class1 • Read-from-TagOrFile
Read/Write Tag/File Settings	
PLC IP Address *Default*: 0.0.0.0	The PLC IP Address is required if either **Write-to-TagOrFile** or **Read-from-TagOrFile** mode are enabled. Format: xxx.xxx.xxx.xxx
PLC Controller Slot Number *Default*: 0	The PLC Controller Slot Number is required if either **Write-to-TagOrFile** or **Read-from-TagOrFile** mode are enabled. Valid range: 0-64
PLC Type *Default*: ControlLogix	Indicates the type of PLC that the tag(s) or file(s) are written to and/or read from. Supported PLC Types are: • ControlLogix • SLC • PLC-5 • MicroLogix
Write PDI to Tag/File Settings	

PDI Tag/File Name
Default: *blank*
	The tag or file name to place the PDI data block.
	• ControlLogix family:
	  - Tags must be same type as **PDI Data Format** (SINT, INT or DINT).
	  - Tags must be an array.
	  - Tags must be at least as long as the **PDI Data Block Length**.
	• SLC/PLC-5/MicroLogix:
	  - Files must be of INTEGER (16-bit) type.
	  - Files must be named with standard file name conventions (i.e: N10:0, N21:30, etc)
	  - The file must be at least as long as the **PDI Data Block Length**.

Append PDO to PDI Data *Default*: False	If selected, the IO-Link Master appends any PDO data to the end of the PDI data. • False = Do not append PDO data • True = Append PDO data

EtherNet/IP Settings Page (Continued)	
Maximum PLC Update Rate *Default*: 40ms	The maximum rate at which the IO-Link Master updates the PDI tag or file. This parameter is used to ensure that the PLC receives all state changes. Setting the update rate to 10 ms effectively disables this feature. The valid range is 10 to 65535 ms.
Heartbeat Update Enable *Default*: False	If selected, the IO-Link Master updates the PDI data block at the **Heartbeat Update Rate**. • False = Heartbeat update disabled • True = Heartbeat update enabled
Heartbeat Update Rate *Default*: 1000ms	If **Heartbeat Update Enable** is selected, the rate at which the IO-Link Master updates the PDI data block in the **Write-to-Tag/File** mode. The valid range is 50 to 65535 ms.
Read PDO from Tag/File Settings	

PDO Tag/File Name
Default: *blank*
	The tag or file name that the IO-Link Master reads the PDO data block from.
	• ControlLogix family:
	  - Tags must be same type as **PDO Data Format** (SINT, INT or DINT).
	  - Tags must be an array.
	  - Tags must be at least as long as the **PDO Data Block Length**.
	• SLC/PLC-5/MicroLogix:
	  - Files must be of INTEGER (16-bit) type.
	  - Files must be named with standard file name conventions (i.e: N10:0, N21:30, etc)
	The file must be at least as long as the **PDO Data Block Length**.

PLC Poll Rate *Default*: 1000ms	The frequency which the IO-Link Master reads the PDO data block in the Read-from-Tag/File mode. Valid range: 50-65535 ms

4.3. Modbus/TCP Settings Configuration Page

You can use the *Modbus/TCP Settings* page to configure Modbus/TCP with the IO-Link Master.

MODBUS/TCP SETTINGS	PORT 1	EDIT	PORT 2	EDIT	PORT 3	EDIT	PORT 4	EDIT
ISDU Data Settings:								
ISDU Response Timeout (1 - 10000)	20 sec		20 sec		20 sec		20 sec	
Process Data Settings:								
PDI Data Block Size (To PLC)	36 bytes		36 bytes		36 bytes		36 bytes	
PDI Byte-Swap Method	no byte-swap		no byte-swap		no byte-swap		no byte-swap	
PDO Data Block Size (From PLC)	32-bytes		32-bytes		32-bytes		32-bytes	
PDO Byte-Swap Method	no byte-swap		no byte-swap		no byte-swap		no byte-swap	
Append PDO to PDI Data	false		false		false		false	
Clear Event Code In PDO Block	false		false		false		false	
Clear Event Code After Hold Time	true		true		true		true	
Active Event Hold Time (1 - 65535)	1000 ms		1000 ms		1000 ms		1000 ms	
Clear Event Hold Time (1 - 65535)	500 ms		500 ms		500 ms		500 ms	
Transfer Mode Settings:								
Slave Mode Device ID (1 - 247)	1		1		1		1	
PDI Receive Mode(s) (To PLC)	Slave		Slave		Slave		Slave	
PDO Transmit Mode(s) (From PLC)	Slave		Slave		Slave		Slave	

4.3.1. Editing Modbus/TCP Settings

1. If necessary, open the IO-Link Master web interface with your web browser using the IP address.

2. Click **Configuration** in the menu bar.

3. Click the **MODBUS/TCP SETTINGS** submenu.

4. Click the **EDIT** button for the port that you want to configure.

5. Make appropriate selections for the IO-Link device that you will connect to that port. You can use the help system if you require definitions or values for the options or *4.3.2. Modbus/TCP Settings Parameters* on Page 35.

6. Scroll to the top of the page and click the **SAVE** button.

    Make sure that the port now displays the **EDIT** button.

    If it displays the **SAVE** and **CANCEL** buttons, that means that one of the parameters contains an incorrect value. If necessary, scroll down the page, make the needed corrections, and click **SAVE**.

4.3.2. Modbus/TCP Settings Parameters

The following table illustrates the *Modbus/TCP Settings* page.

Modbus/TCP Settings Page	
ISDU Response Timeout *Default* = 20 seconds	The time that the IO-Link Master's Modbus/TCP interface waits for a response to an ISDU request. The timeout needs to set long enough to allow all commands within the ISDU request to be processed. Valid range: 1-10,000 seconds
Process Data Settings	
PDI Data Block Size *Default*: 36-bytes	The configurable PDI data block length. Optional lengths are: • 4-bytes (header only) • 8-bytes (4 bytes data) • 16-bytes (12 bytes data) • 24-bytes (20 bytes data) • 36-bytes (32 bytes data)
PDI Byte-Swap Method *Default*: No byte-swap	If enabled, the IO-Link Master swaps the data bytes in word (2 byte) format or dword (4 byte) format. Options include: • No byte-swap – data passed through as received • Word (16-bit) byte-swap – data is byte-swapped in word format • Dword (32-bit) byte-swap – data is byte-swapped in dword format *Note:* *Because both IO-Link and Modbus/TCP use big-endian byte ordering, byte swapping typically is not required for word and dword data.* *Byte swapping is most commonly required when receiving byte (8-bit) data and it is desired to place the first data byte in the least significant byte position of the holding register. For these cases, word (16 bit) byte-swap is typically used.*

Modbus/TCP Settings Page (Continued)	
PDO Data Block Size *Default*: 32-bytes	The configurable PDO data block length. Optional lengths are: Event code not included: • 4-bytes = 2 data words • 8-bytes = 4 data words • 16-bytes = 8 data words • 24-bytes = 12 data words • 32-bytes = 16 data words • 34-bytes = 16 data words, 1 pad word Event code included: • 4-bytes = event code word, 1 data word • 8-bytes = event code word, 3 data words • 16-bytes = event code word, 7 data words • 24-bytes = event code word, 11 data words • 32-bytes = event code word, 15 data words • 34-bytes = event code word, 16 data words
PDO Byte-Swap Method *Default*: No byte-swap	If enabled, the IO-Link Master swaps the data bytes in word (2 byte) format or dword (4 byte) format. Options include: • No byte-swap – data passed through as received • Word (16-bit) byte-swap – data is byte-swapped in word format • Dword (32-bit) byte-swap – data is byte-swapped in dword format *Note: Because both IO-Link and Modbus/TCP use big-endian byte ordering, byte swapping typically is not required for word and dword data.* *Byte swapping is most commonly required when sending byte (8-bit) data to the IO-Link device and it is desired to send the least significant byte of the holding register first. For these cases, word (16 bit) byte-swap is typically used.*
Append PDO to PDI Data *Default*: False	If selected, the IO-Link Master appends any PDO data to the end of the PDI data. • False = Do not append PDO data • True = Append PDO data
Clear Event Code in PDO Block *Default*: False	If enabled, the IO-Link Master expects the first word of the PDO block to be used for event code handling. Values are: • True = expect event code • False = no event code, expect only PDO data
Clear Event Code After Hold Time *Default*: True	If enabled, the IO-Link Master clears any event code reported in the PDI data block after the **Event Active Hold Time**. Values are: • True = clear event code after hold time • False = do not clear event code after hold time

| **Modbus/TCP Settings Page (Continued)**	
Event Active Hold Time *Default*: 1000 ms	If **Clear Event Code After Hold Time** is enabled, the time period an event code is reported in the PDI block before it is cleared. Valid range: 1-65535 Valid Units are: • ms (milliseconds) • sec (seconds) • min (minutes) • hours • days
Clear Event Hold Time *Default*: 500 ms	Once an event code has been cleared, the time an event code stays cleared in the PDI block before another event code can be reported. • Valid range: 1-65535 • Valid Units: • ms (milliseconds) • sec (seconds) • min (minutes) • hours • days
Transfer Mode Settings	
Slave Mode Device ID *Default*: 1	The Modbus Device ID used to access this IO-Link port. Range: 1-247
PDI Receive Mode(s) *Default*: Slave	Determines which PDI Receive (To PLC) Modes are enabled. The selectable modes is Slave. *Note: Not selecting slave mode disables Modbus/TCP access to the PDI data block.*
PDO Transmit Mode *Default*: Slave	Selectable Modes are: • Disabled • Slave

Chapter 5. Connecting Devices to the Ports

5.1. Connecting to IO-Link Ports

The IO-Link Master provides four IO-Link ports with M12 connectors (5-pin female/A coded).

Note: *Make sure that you tighten the cables properly to maintain IP67 capabilities.*

This table provides signal information for the IO-Link connectors.
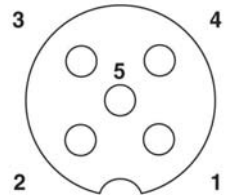
Pin	Signal	Description
1	L+	Power supply (+)
2	DI	Digital input
3	L-	Power supply (-)
4	C/Q	Communication signal, which supports SDCI (IO-Link) or SIO (standard input/output)
5	N/A	Not connected

This table provides information that you may need regarding the IO-Link connectors.

Current and Power	Value
Maximum IO-Link Supply	200mA
Maximum C/Q Current: High Low	200mA 200mA
Peak C/Q Current: High Low	500mA 500mA
C/Q & DI Input: Maximum Minimum	Power Input +0.5VDC -0.5VDC
SDCI (IO-Link) Transmission Rates: COM1 COM2 COM3	4.8Kbps 38.4Kbps 230.4Kbps

Note: *IO-Link ports must have an approved cable or protective cover attached to the port guarantee IP67 compliance.*
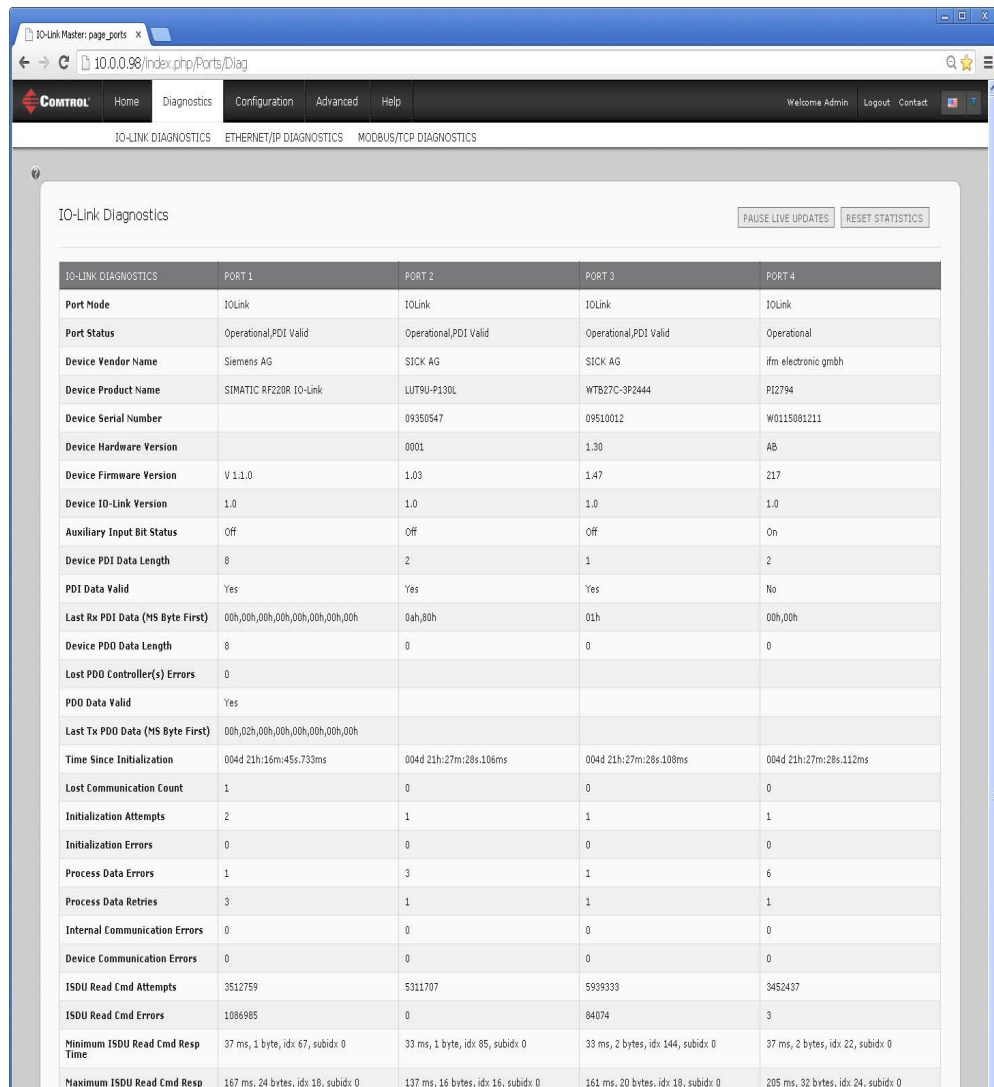
Chapter 6. Using the Diagnostics Pages

This section provides information about the following **Diagnostics** web pages.

- *6.1. IO-Link Port Diagnostics*
- *6.2. EtherNet/IP Diagnostics* on Page 44
- *6.3. Modbus/TCP Diagnostics* on Page 48

6.1. IO-Link Port Diagnostics

The *IO-Link Diagnostics* page may be useful when trying to troubleshoot port issues related to IO-Link configuration.

Note: *This image does not illustrate the complete Diagnostics page.*

The following table provides information about the *IO-Link Diagnostics* page.

IO-Link Diagnostics	
Port Mode	Displays the active device mode: • Reset = The port is configured to disable all functionality. • IO-Link = The port is configured to IO-Link mode. • Digital In = The port is configured to operate as a digital input. • Digital Out = The port is configured to operate as a digital output.
Port Status	Displays the port status: • Inactive = The port is in active state. Typically, this indicates that the device is either not attached or not detected. • Initializing = The port is in the process of initializing. • Operational = The port is operational and, if in IO-Link mode, communications to the IO-Link device has been established. • PDI Valid = The PDI data is now valid. • Fault = The port has detected a fault and is unable to re-establish communications.
Device Vendor Name	Displays the Device Vendor Name as stored in ISDU Index 16.
Device Product Name	The Device Product Name as stored in ISDU Index 18.
Device Serial Number	The Device Serial Number as stored in ISDU Index 21.
Device Hardware	The Device Hardware Version as stored in ISDU Index 22.
Device Firmware	The Device Firmware Version as stored in ISDU Index 23.
Device IO-Link Version	The supported Device IO-Link Version as stored in ISDU Index 0.
Auxiliary Bit Status	The current status of the auxiliary bit as received on Pin 2 of the IO-Link port.
Last Rx PDI Data (MS Byte First)	The last Rx PDI data as received from the IO-Link device.
Device PDO Data Length	The supported Device PDO Data Length, in bytes, as stored in ISDU Index 0.
Lost PDO Controller(s) Errors	The number of times that the PDO controller(s) were present and then lost connection.
PDO Data Valid	Status of PDO data being received from controller(s).
Device PDI Data Length	The supported Device PDI Data Length, in bytes, as stored in ISDU Index 0.
PDI Data Valid	Current status of PDI data as received from the IO-Link device.
Last Tx PDO Data	The last Tx PDO data.
Time Since Initialization	The time since the last port initialization.
Lost Communication Count	The number of times that communication has been lost to the IO-Link device.
Initialization Attempts	The number of times the IO-Link port was initialized.
Initialization Errors	The number of port initialization errors that occurred.
Process Data Errors	The number of process data errors the port received.
Process Data Retries	The number of process data retries the port performed.
Internal Communication Errors	The number of IO-Link Master internal communication errors that occurred on this port.
Device Communication Errors	The number of device specific communication errors that occurred.

IO-Link Diagnostics (Continued)	
ISDU Read Cmd Attempts	The number of read ISDU command attempts.
ISDU Read Cmd Errors	The number of read ISDU command errors.
Minimum ISDU Read Cmd Resp Time	The minimum, or shortest, read ISDU command response time.
Maximum ISDU Read Cmd Resp Time	The maximum, or longest, read ISDU command response time.
Average ISDU Read Cmd Resp Time	The average ISDU read command response time.
Average ISDU Read Cmd Byte Time	The average per-byte read ISDU command response time.
ISDU Write Cmd Attempts	The number of write ISDU command attempts.
ISDU Write Cmd Errors	The number of write ISDU command errors.
Minimum ISDU Write Cmd Resp Time	The minimum, or shortest, write ISDU command response time.
Maximum ISDU Write Cmd Resp Time	The maximum, or longest, write ISDU command response time.
Average ISDU Write Cmd Resp Time	The average ISDU write command response time.
Average ISDU Write Cmd Byte Time	The average per-byte ISDU write command response time.
Total Events	The total number of events that were received on this port.
First Events	Up to the first, or oldest, three events that were received on this port.
Last Events	Up to the last, or most recent, three events that were received on this port.

6.2. EtherNet/IP Diagnostics

The *EtherNet/IP Diagnostics* page may be useful when trying to troubleshoot EtherNet/IP communications and port issues related to EtherNet/IP configuration.

Note: *This image does not illustrate the complete Diagnostics page.*

The following table provides information about the *EtherNet/IP Diagnostics* page.

EtherNet/IP Diagnostics	
Active Session Count	The number of active Ethernet/IP sessions. A session can: • Support both Class 1 I/O and Class 3 Messages • Can be initiated by either the PLC or the IO-Link Master • Can be terminated by either the PLC or the IO-Link Master
Active Connections	The current number of active connections (both Class 1 and 3).
Total Connections Established	The total number of connections that have been established.
Connection Timeouts	The number of connections that have closed due to timing out.
Connections Closed	The number connections that have closed due to a standard processes.
Class 3 Messages/ Responses Received	The number of Class 3 messages and responses received from the PLC or PLCs.
Broadcast Messages Received	The number of broadcast messages received from PLC or PLCs.
Class 3 Messages/ Responses Transmitted	The number of Class 3 messages and responses sent to the PLC or PLCs.
Class 1 Output Updates (From PLC)	The number of Class 1 output data updates received from the PLC or PLCs.
Class 1 Output Data Changes (From PLC)	The number of changes in Class 1 output data received from the PLC.
Class 1 Input Data Updates (To PLC)	The number of Class 1 input data updates sent to the PLC or PLCs.
Client Object Requests	The number of Class 3 requests to the IO-Link Master vendor specific objects.
Good Responses from PLC	The number of good responses from messages sent to PLC or PLCs.
Bad Responses from PLC	Displays the number of bad responses from messages sent to the PLC or PLCs. Bad responses are typically returned for such errors as: • Incorrect tag or file names • Incorrect tag or file data types • Incorrect tag or file data sizes • PLC is overloaded and cannot handle the amount of Ethernet traffic • PLC malfunction
No Responses from PLC	Displays the number of no responses from messages sent to the PLC or PLCs. No responses are typically returned for such errors as: • Incorrect IP address • Incorrect PLC configuration • PLC malfunction • PLC is overloaded and cannot handle the amount of Ethernet traffic
Invalid Network Paths	Displays the number of network path errors on messages sent to the PLC or PLCs. These are typically caused by incorrect IP address settings.
Pending Request Limit Reached	Displays the number of pending request limit errors. These errors occur when the PLC is sending a continuous stream of messages to the IO-Link Master faster than the IO-Link Master can process them.
Unexpected Events	Displays the number of unexpected event errors. Unexpected event errors occur when the IO-Link Master receives an unexpected message from the PLC such as an unexpected response or unknown message.

EtherNet/IP Diagnostics (Continued)	
Unsupported CIP Class Errors	Displays the number of unsupported CIP class errors. These errors occur when a message that attempts to access an invalid class is received by the IO-Link Master.
Unsupported CIP Instance Errors	Displays the number of unsupported CIP instance errors. These errors occur when a message that attempts to access an invalid instance is received by the IO-Link Master.
Unsupported CIP Service Errors	Displays the number of unsupported CIP service errors. These errors occur when a message that attempts to access an invalid service is sent to the IO-Link Master.
Unsupported CIP Attribute Errors	Displays the number of unsupported CIP request attribute errors. These errors occur when a message that attempts to access an invalid attribute is sent to the IO-Link Master.
Unsupported File Errors	Displays the number of messages from SLC/PLC-5/MicroLogix PLCs that attempt to access an unsupported file address.
System Resource Errors	Displays the number of system resource errors. These errors indicate a system error on the IO-Link Master such as operating system errors or full message queues. These errors typically occur when the PLC or PLCs are sending messages to the IO-Link Master faster than the IO-Link Master can process them.
First Error String	Text description of the first error that occurred.
Last Error String	Text description of the last error that occurred.
EtherNet/IP Port Specific Diagnostics	
Configuration Errors	Displays the number of improper configuration errors. These errors occur when the IO-Link Master receives a message that cannot be performed due to an invalid configuration.
Invalid Data Errors	Displays the number of invalid message data errors. These errors occur when the IO-Link Master receives a message that cannot be performed due to invalid data.
Active PDO Controller(s)	Lists the controller interface(s) type, (Class 1 or Class 3), and IP address that are controlling the PDO data.
PDO Writes to Offline or Read-Only Ports	Displays the number of PDO write messages that were dropped due to any of the following: • The port is configured in IO-Link mode: - There is no device connected to the port. - The IO-Link device is off-line. - The IO-Link device does not support PDO data. • The PDO Transmit Mode (To PLC) is disabled. • The port is configured in Digital Input mode.
Undeliverable PDI Updates (To PLC)	Displays the number of PDI update messages that could not be delivered to the PLC in the Write-to-Tag/File method. Undeliverable updates may result when: The IO-Link Master cannot complete an Ethernet connection to the PLC. The PDI data is changing faster than the **Maximum PLC Update Rate**.
ISDU Request Msgs From PLC(s)	Displays the number of ISDU request messages received from the PLC(s) or other controllers. These request messages may contain one or multiple ISDU commands.
ISDU Invalid Requests	Displays the number of ISDU requests received over EtherNet/IP with one or more invalid commands.

EtherNet/IP Diagnostics (Continued)	
ISDU Requests When Port Offline	Displays the number of ISDU requests received over EtherNet/IP when the IO-Link port was offline. This can occur when: • The IO-Link port is initializing, such as after start-up. • There is no IO-Link device attached to the port. • The IO-Link device is not responding. • Communication to the IO-Link device has been lost.
Valid ISDU Responses From Port	Displays the number of valid ISDU response messages returned from the IO-Link port interface and available to the PLC(s). The response messages contain results to the ISDU command(s) received in the request message.
ISDU Response Timeouts	Displays the number of ISDU requests that did not receive a response within the configured **ISDU Response Timeout**.
Unexpected ISDU Responses	Displays the number of unexpected ISDU responses. Unexpected responses may occur when an ISDU response is received after the ISDU request has timed out. This typically requires setting the **ISDU Response Timeout** to a longer value.
ISDU Read Commands	Displays the number of ISDU read commands received over EtherNet/IP.
Maximum ISDU Request Msg Response Time	Displays the maximum time period required to process all commands within an ISDU request message. The response is not available until all ISDU command(s) contained in the request have been processed.
Average ISDU Request Msg Response Time	Displays the average time period required to process the ISDU request message(s). The response is not available until all ISDU command(s) contained in the request have been processed.
Minimum ISDU Request Msg Response Time	Displays the minimum time period required to process all commands within an ISDU request message. The response is not available until all ISDU command(s) contained in the request have been processed.
ISDU Write Commands	Displays the number of ISDU write commands received over EtherNet/IP.
ISDU NOP Commands	Displays the number of ISDU NOP (no operation) commands received over EtherNet/IP.

6.3. Modbus/TCP Diagnostics

The *Modbus/TCP Diagnostics* page may be useful when trying to troubleshoot Modbus/TCP communications or port issues related to Modbus/TCP configuration.
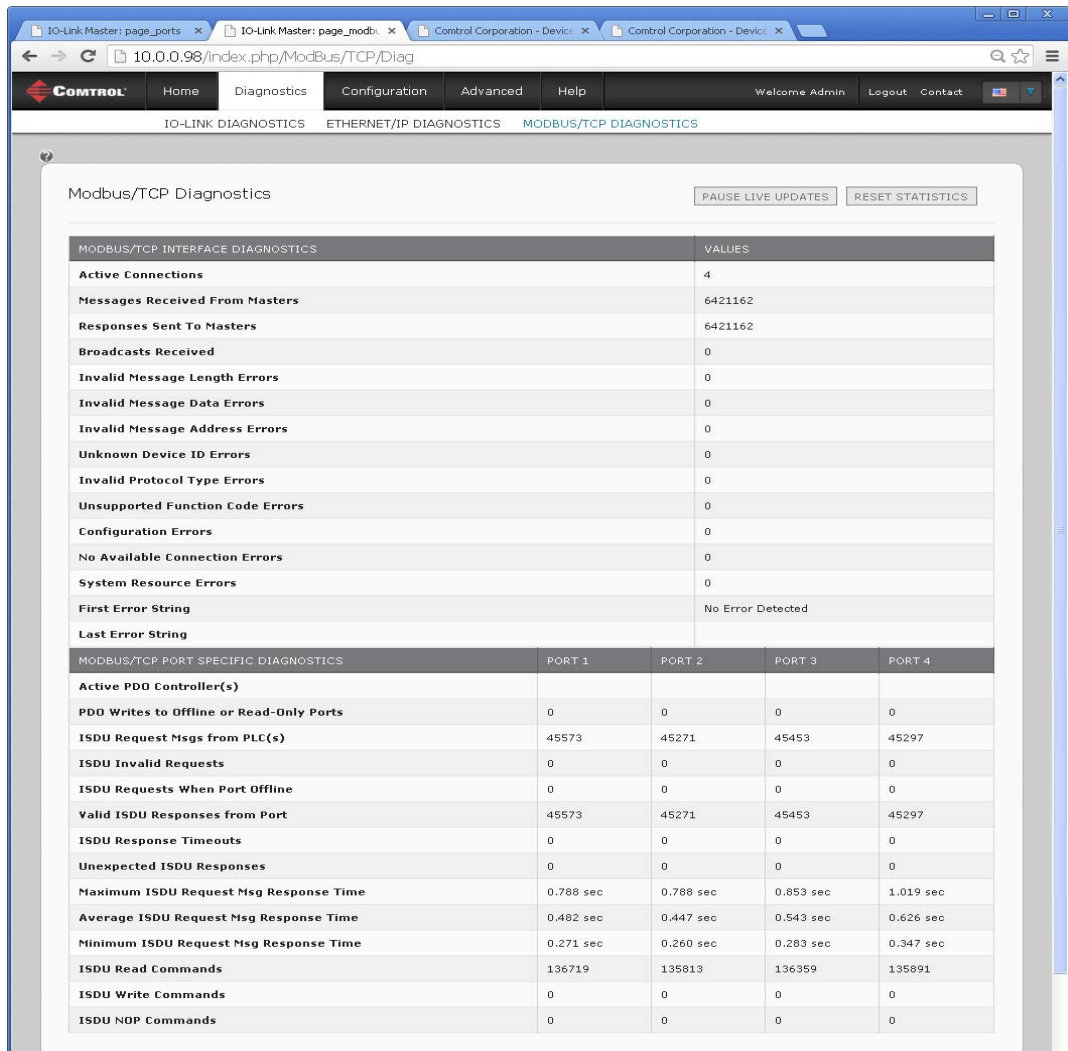
The following table provides information about the *Modbus/TCP Diagnostics* page.

Modbus/TCP Diagnostics	
Active Connections	Displays the current number of active Modbus/TCP connections.
Messages Received from Masters	Displays the number of Modbus messages received from Modbus/TCP Masters.
Responses Sent to Masters	Displays the number of Modbus responses sent to Modbus/TCP Masters.
Broadcasts Received	Displays the number of broadcast Modbus/TCP messages received.
Invalid Message Length Errors	Displays the number of Modbus messages received with incorrect length fields.
Invalid Message Data Errors	Displays the number of invalid message data errors. These errors occur when the IO-Link Master receives a message that cannot be performed due to invalid data.

Modbus/TCP Diagnostics (Continued)	
Invalid Message Address Errors	Displays the number of invalid message address errors. These errors occur when the IO-Link Master receives a message that cannot be performed due to an invalid address.
Unknown Device ID Errors	Displays the number of unknown device ID errors. These errors occur when the IO-Link Master receives a message that is addressed to a device ID other than the configured **Slave Mode Device ID.**
Invalid Protocol Type Errors	Displays the number of invalid message protocol type errors. These errors occur when the IO-Link Master receives a Modbus/TCP message that specifies a non-Modbus protocol..
Unsupported Function Code Errors	Displays the number of invalid Modbus function code errors. These errors occur when the IO-Link Master receives a message that cannot be performed due to an unsupported Modbus function code.
Configuration Errors	Displays the number of improper configuration errors. These errors occur when the IO-Link Master receives a message that cannot be performed due to an invalid configuration.
No Available Connection Errors	Displays the number of Modbus/TCP connection attempts that were rejected due to no available connections. This occurs when the number of Modbus/TCP connections has reached the limit.
System Resource Errors	Displays the number of system resource errors. These errors indicate a system error on the IO-Link such as operating system errors or full message queues. These errors typically occur when the PLC(s) are sending messages to the IO-Link Master faster than the IO-Link Master can process them.
First Error String	Text description of the first error that occurred.
Last Error String	Text description of the last error that occurred.
Modbus/TCP Port Specific Diagnostics	
Active PDO Controller(s)	Lists the controller interface(s) type, (Class 1 or Class 3), and IP address that are controlling the PDO data.

PDO Writes to Offline or Read-Only Ports	Displays the number of PDO write messages that were dropped due to any of the following:
	
	• The port is configured in IO-Link mode:
	  - There is no device connected to the port.
	  - The IO-Link device is off-line.
	  - The IO-Link device does not support PDO data.
	• The PDO Transmit Mode (To PLC) is disabled.
	• The port is configured in Digital Input mode.

ISDU Request Msgs From PLC(s)	Displays the number of ISDU request messages received from the PLC(s) or other controllers. These request messages may contain one or multiple ISDU commands.
ISDU Invalid Requests	Displays the number of ISDU requests received over Modbus/TCP with one or more invalid commands.
ISDU Requests When Port Offline	Displays the number of ISDU requests received over Modbus/TCP when the IO-Link port was offline. This can occur when: • The IO-Link port is initializing, such as after start-up. • There is no IO-Link device attached to the port. • The IO-Link device is not responding. • Communication to the IO-Link device has been lost.

Modbus/TCP Diagnostics (Continued)	
Valid ISDU Responses From Port	Displays the number of valid ISDU response messages returned from the IO-Link port interface and available to the PLC(s). The response messages contain results to the ISDU command(s) received in the request message.
ISDU Response Timeouts	Displays the number of ISDU requests that did not receive a response within the configured **ISDU Response Timeout**.
Unexpected ISDU Responses	Displays the number of unexpected ISDU responses. Unexpected responses may occur when an ISDU response is received after the ISDU request has timed out. This typically requires setting the **ISDU Response Timeout** to a longer value.
Maximum ISDU Request Msg Response Time	Displays the maximum time period required to process all commands within an ISDU request message. The response is not available until all ISDU command(s) contained in the request have been processed.
Average ISDU Request Msg Response Time	Displays the average time period required to process the ISDU request message(s). The response is not available until all ISDU command(s) contained in the request have been processed.
Minimum ISDU Request Msg Response Time	Displays the minimum time period required to process all commands within an ISDU request message. The response is not available until all ISDU command(s) contained in the request have been processed.
ISDU Read Commands	Displays the number of ISDU read commands received over Modbus/TCP.
ISDU Write Commands	Displays the number of ISDU write commands received over Modbus/TCP.
ISDU NOP Commands	Displays the number of ISDU NOP (no operation) commands received over Modbus/TCP.

Chapter 7. Updating Images and Application Subassemblies

This section discusses the following topics:

- *7.1. Images and Application Subassemblies Overview*
- [7.2. Using PortVision DX to Update Software](#) on Page 53
- [7.3. Using the Web Interface to Update Software](#) on Page 54

7.1. Images and Application Subassemblies Overview

This subsection discusses images and application subassemblies. The IO-Link Master is loaded with the latest images at the factory but you may need to update images or application subassemblies to have access to the latest features.

You can view all image and application versions in the IO-Link Master **ADVANCED/Software** web page. PortVision DX displays the main application base version, which in this case is EtherNet/IP.

7.1.1. Images

The following table discusses IO-Link Master images.

IO-Link Master Images	
U-Boot Bootloader	U-Boot is a high-level bootloader that has networking and console command line capabilities. Among other things, it implements a TFTP server and Comtrol Corporation's new discovery protocol.
	This verifies that a Linux kernel image exists in NAND, then copies it to RAM and starts the IO-Link Master. The U-Boot version is displayed after the image name.
FPGA	The FPGA partition/image contains configuration data used by programmable hardware within the IO-Link Master unit.
uImage - Primary/Backup	The uImage contains the Linux kernel and the RAM-resident root file system. It does not contain industrial protocol support or application-specific features.
	There is a Primary and Backup version loaded on the IO-Link Master. The IO-Link Master automatically reloads the Backup uImage if the file system corrupted.
	The uImage version is displayed after the Primary/Backup uImage.
Application Base	The Application Base image comprises a flash-resident file system containing application and protocol support.
	The Application Base is built from a collection of application subassemblies -- each of which may be updated individually between releases of the application base as a whole.
	The application subassemblies in the Application Base image are displayed in the lower portion of the **SOFTWARE** web page.
	The Application Base assembly has a 2-tuple version number: (for example, 1.10).

7.1.2. Application Subassemblies

Application subassemblies are the components of the Application Base image. Application subassemblies have 3-tuple or 4-tuple version numbers (for example, 1.10.1). The first two values in a subassembly version correspond to the version of the application base assembly for which it was built and tested.

For example, a subassembly with version 1.10.3 was tested with application base version 1.10. When using the **SOFTWARE** page or PortVision DX, an application subassembly can install only if its version number matches that of the installed application base assembly. A subassembly with a version of 1.20.2.4 only installs if the application base version is 1.20. It will not install on a device with application base version 1.09 or 1.20.

| IO-Link Master Application Subassemblies	
application-manager	The Application Manager version loaded on the IO-Link Master.
configuration-manager	The Configuration Manager version loaded on the IO-Link Master.
discovery-protocol	The Discovery Protocol version loaded on the IO-Link Master.
ethernetip	The EtherNet/IP interface loaded on the IO-Link Master.
event-log	The Event log version loaded on the IO-Link Master.
iolink-driver	The IO-Link version loaded on the IO-Link Master.
web-user-interface	The web interface version loaded on the IO-Link Master.
ethernetip	The EtherNet/IP version loaded on the IO-Link Master.

7.2. Using PortVision DX to Update Software

Use the following procedure to update software (images or application subassemblies) on the IO-Link Master.

1. If necessary, start PortVision DX.
2. Right-click the IO-Link Master that you want to update and click **Advanced** and then **Upload Firmware**.
3. Browse to the location you saved the software, highlight the file name, and click **Open**.
4. Click **Yes** to the *Upload Firmware... Important Notice*.
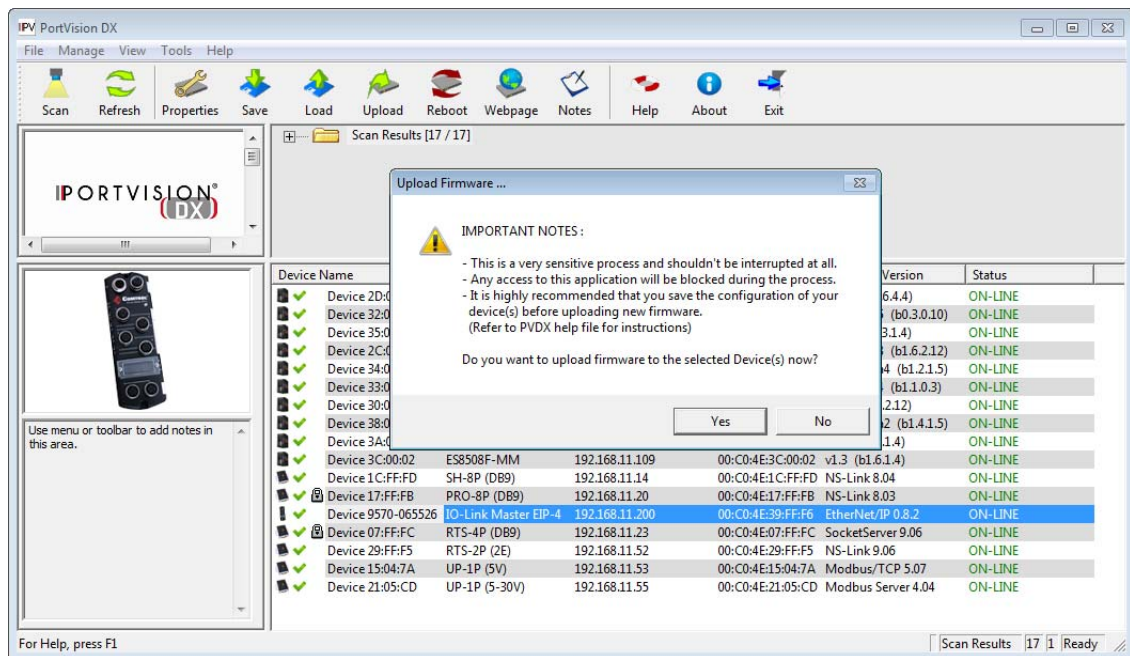
5. Click **Ok** to the *Upload Firmware... Status* message.
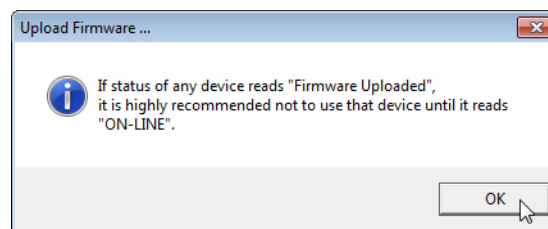
You may notice that PortVision DX first displays a *Firmware uploaded* status message. After the next PortVision DX polling cycle the status message displays *ON-LINE*.
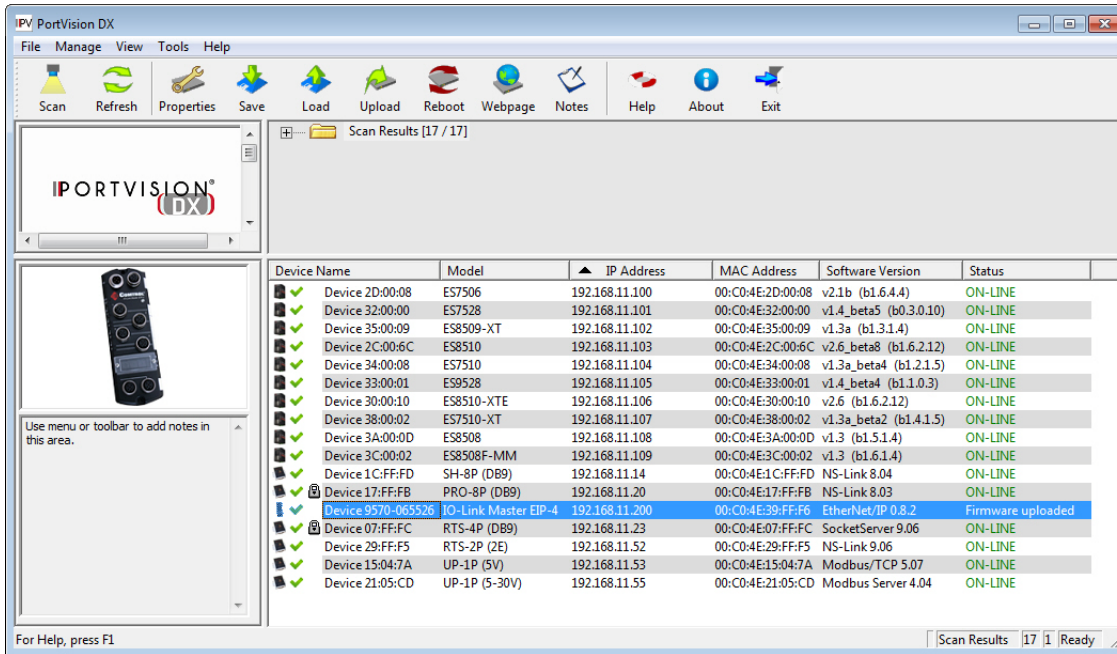

7.3. Using the Web Interface to Update Software

The upper portion of this page is used to update the IO-Link Master images. The lower portion of this page is used for updating application subassemblies that are integrated in the Application Base. Typically, the latest application subassemblies are available in the Application Base image. There may times when a feature enhancement or bug fix is available in an application subassembly and not yet available in the Application Base image.
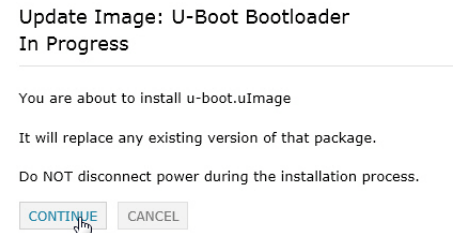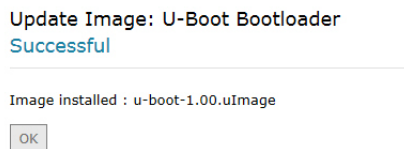
7.3.1. Updating Images

Use this procedure to upload images using the **SOFTWARE** page.

1. Download the latest image from the Comtrol ftp site.

2. Open the IO-Link Master web interface using one of these methods:

   • From PortVision DX, highlight the IO-Link Master and click the **Webpage** button or right-click the IO-Link Master in the *Device List* pane and click **Webpage**.

   • Open your browser and enter the IP address of the IO-Link Master.

3. Click **ADVANCED** and **SOFTWARE**.

4. Click the **UPDATE** button next to the image you want to update.

5. Click the **Browse** button (or Choose **File**, depending on the web browser), navigate to the file location, highlight the image file, and click **Open**.

6. Click the **Install** button.
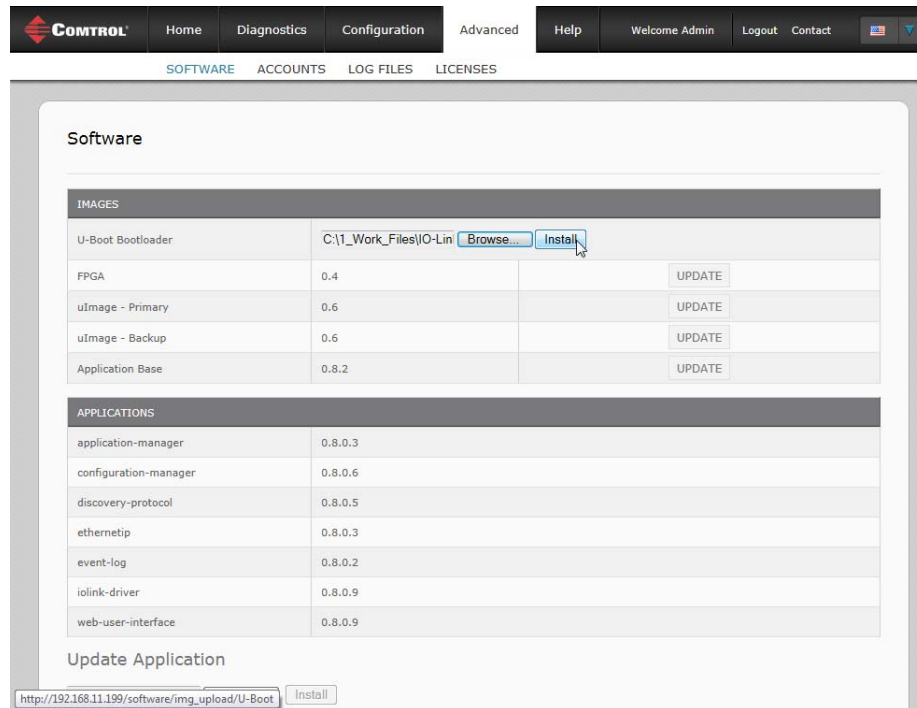
7. Click the **CONTINUE** button to the *Update Image* message.
8. Click **Ok** to close the *Update Image Successful* message.


7.3.2. Updating Application Subassemblies

Use this procedure to upload applications using the **Software** page.

1. Download the latest application from the Comtrol Corporation ftp site.
2. Open the IO-Link Master web interface using one of these method:
    • From PortVision DX, highlight the IO-Link Master and click the **Webpage** button or right-click the IO-Link Master in the *Device List* pane and click **Webpage**.
    • Open your browser and enter the IP address of the IO-Link Master.
3. Click **ADVANCED** and **SOFTWARE**.
4. Click the **Browse** button (Choose **File**, depending on the web browser) under **Update Application** navigate to the file location, highlight the image file, and click **Open**.

5. Click the **Install** button.
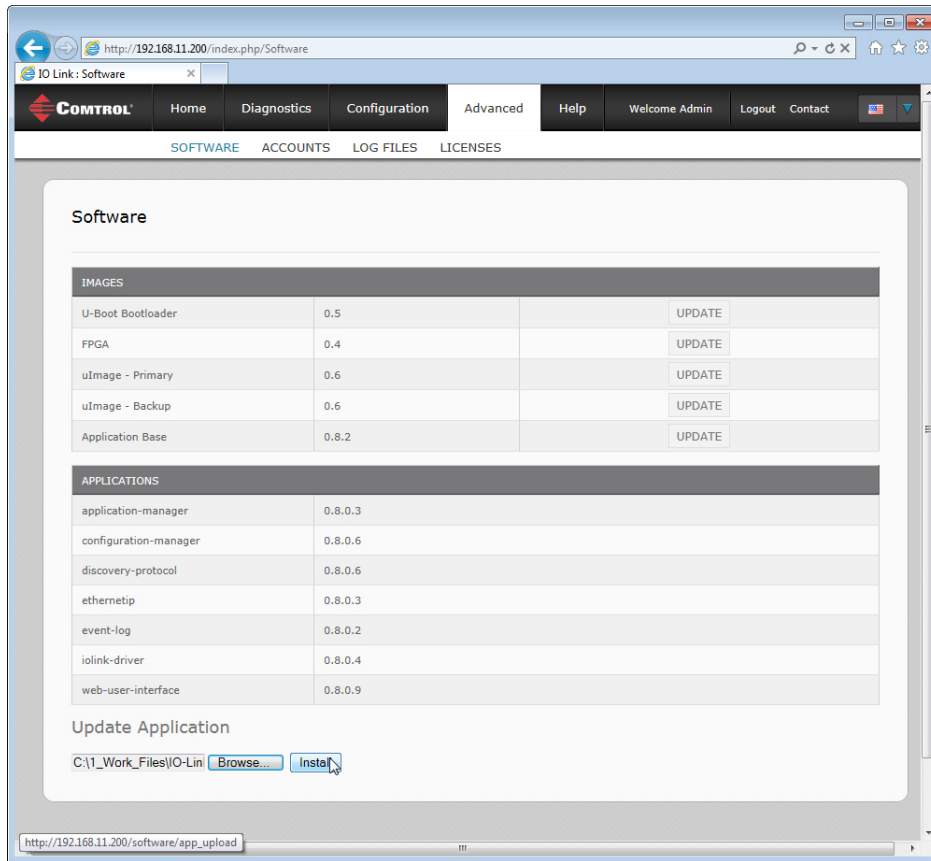
6. Click the **CONTINUE** button to the *Update Application* message.

7. Click **Ok** to close the *Update Application Successful* message.

Chapter 8. Troubleshooting and Technical Support

This section provides the following information:

- *8.1. Troubleshooting*
- *8.2. Contacting Technical Support* on Page 58
- *8.3. Using Log Files* on Page 59

8.1. Troubleshooting

Before contacting Technical Support, you may want to try the following:

- Open the IO-Link Master web interface and review the following web pages:
    - IO-Link Diagnostics
    - EtherNet/IP Diagnostics
    - Modbus/TCP Diagnostics
- Reboot the IO-Link Master
- Verify that you are using the correct types of cables on the correct connectors and that all cables are connected securely.
- Check to make sure LEDs are not reporting an issue using *2.5. IO-Link Master LEDs* (Page 12)
- Verify that the network IP address, subnet mask, and gateway are correct and appropriate for the network. Make sure that the IP address programmed into the IO-Link Master matches the unique reserved IP configured address assigned by the system administrator.
- If using DHCP, the host system needs to provide the subnet mask. The gateway is optional and is not required for a purely local network.
- Remember that if the rotary switches are set to a non-default position, the rotary switches override the lower 3 digits (8 bits) of the static IP address configured in the **Network** page or in PortVision DX.
- Verify that the Ethernet hub and any other network devices between the system and the IO-Link Master are powered up and operating.
- If you have a spare IO-Link Master, try replacing the IO-Link Master.

8.2. Contacting Technical Support

You may want to access the **Help/SUPPORT** page when you call Technical Support, as they may request the information displayed on the **SUPPORT** page.
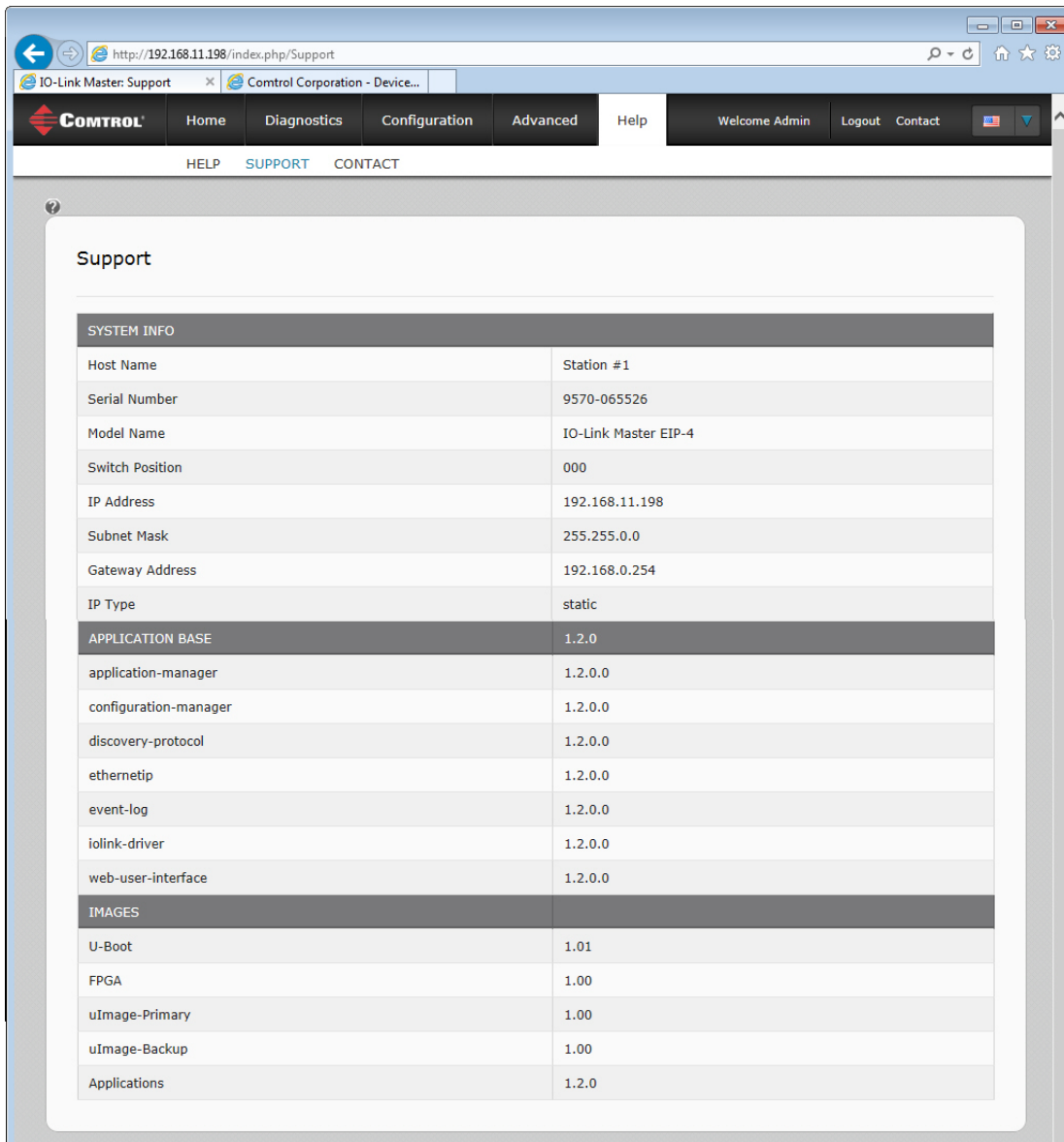
Comtrol Technical Support is available from 8:00AM to 6:00PM (CST), Monday through Friday, excluding major USA holidays.

Contact	Information
Phone	763.957.6000
Downloads	ftp://ftp.comtrol.com/html/default.htm
Web Site	http://www.comtrol.com

8.3. Using Log Files

Log files are available in the IO-Link Master web page. The IO-Link Master provides four different log files that you can view, export, or clear:

- **Syslog** (system log) displays line-by-line activity records.
- **dmesg** displays Linux kernel messages.
- **top** displays which programs are using most of the memory and CPU.
- **ps** displays the running programs
- All log files start up automatically during the startup cycle. Each log file has a size limit of 100KB.

Note: Typically, log files are intended to be used by Technical Support in the event there is a problem.

You can use the following procedures to:

- *8.3.1. View a Log File* on Page 59
- *8.3.2. Clear a Log File* on Page 59
- *8.3.3. Export a Log File* on Page 60

8.3.1. View a Log File

Use this procedure to view a log file.

1. Open the IO-Link Master web interface using one of these method:
   - From PortVision DX, highlight the IO-Link Master and click the **Webpage** button or right-click the IO-Link Master in the *Device List* pane and click **Webpage**.
   - Open your browser and enter the IP address of the IO-Link Master.
2. Click **Advanced** and then **LOG FILES**.
3. Select the log file type from the drop-list.
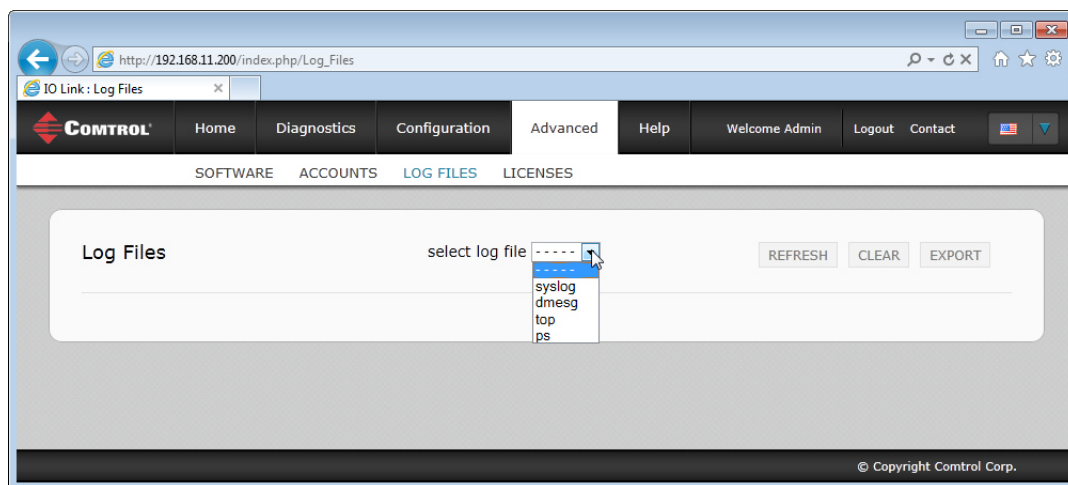
4. Optionally, click the **REFRESH** button to get the latest information.
5. Optionally, <u>export</u> the log file.
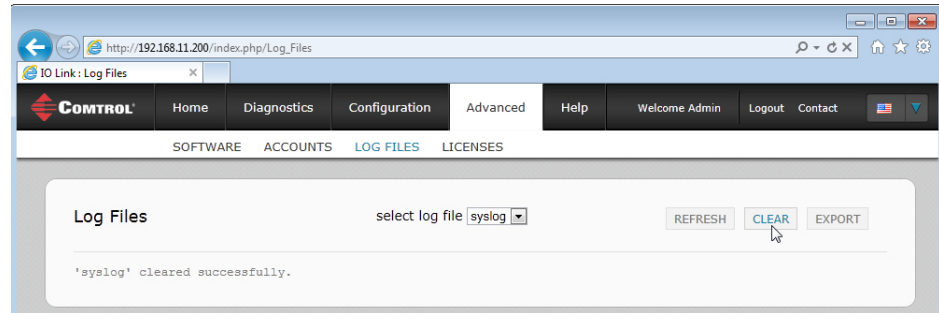
8.3.2. Clear a Log File

Use this procedure to clear a log file.

1. Open the IO-Link Master web interface using one of these method:
   - From PortVision DX, highlight the IO-Link Master and click the **Webpage** button or right-click the IO-

Link Master in the *Device List* pane and click **Webpage**.

- Open your browser and enter the IP address of the IO-Link Master.

2. Click **Advanced** and then **LOG FILES**.

3. Optionally, export the log file.

4. Select the log file type from the drop-list.

5. Click the **CLEAR** button.

The log file automatically starts logging the latest information.

8.3.3. Export a Log File

Use the following procedure to export a log file.

1. Open the IO-Link Master web interface using one of these method:
   - From PortVision DX, highlight the IO-Link Master and click the **Webpage** button or right-click the IO-Link Master in the *Device List* pane and click **Webpage**.
   - Open your browser and enter the IP address of the IO-Link Master.

2. Click **Advanced** and then **LOG FILES**.

3. Select the log file type from the drop-list.

4. Click the **EXPORT** button.

5. Click the **Save** button drop-list and click **Save** to save it to your user folder or **Save as** to browse to or create a new folder in which to place the log file.
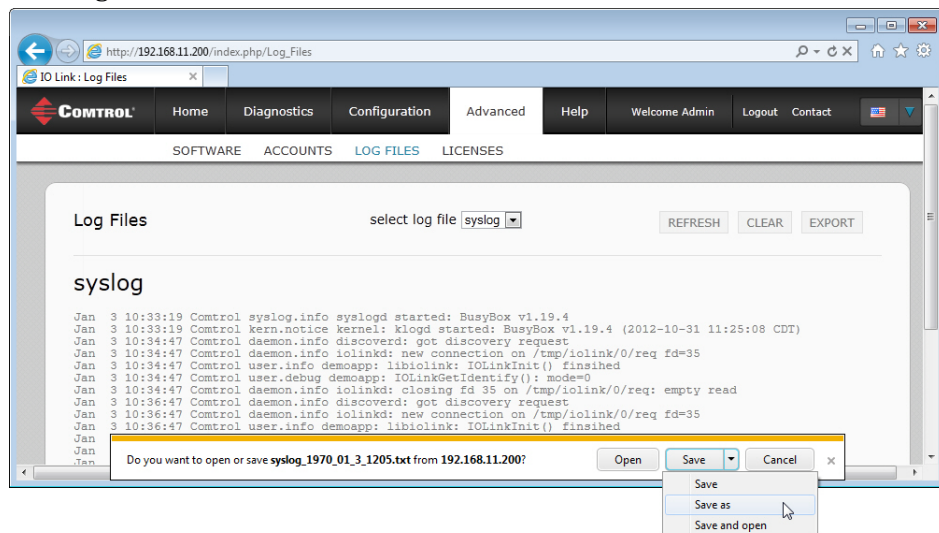
6. Depending on your operating system, you may need to close the pop-up window.

Export a Log File