



Modbus/TCP Reference Manual



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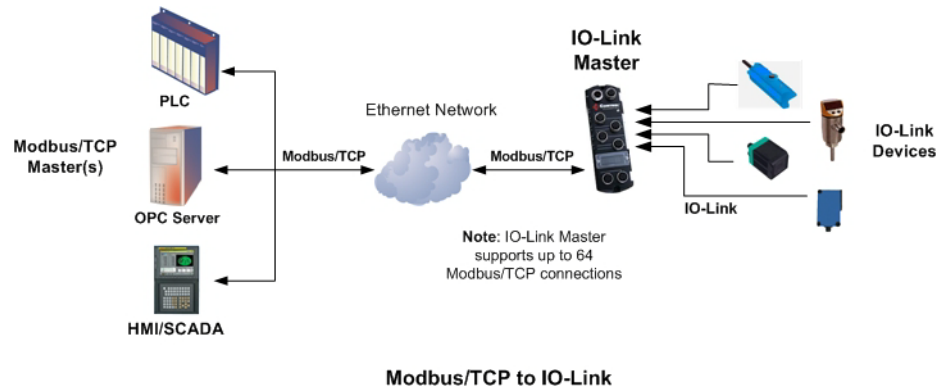
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Chapter 1. Modbus/TCP Interface

The IO-Link Master provides a slave-mode Modbus/TCP interface that provides:

- Read access to the PDI and PDO data blocks for each IO-Link port
- Write access to the PDO data block for each IO-Link port
- Write access to send SPDU requests to each IO-Link port
- Read access to SPDU responses from each IO-Link port
- Read access to the Port Information Block for each IO-Link port



1.1. Modbus Function Codes

This table shows the supported Modbus function codes.

Message Type	Function Code	Maximum Message Size
Read Holding Registers	3	250 Bytes (125 Words)
Write Single Register	6	2 bytes (1 Word)
Write Multiple Registers	16 (10 hex)	246 Bytes (123 Words)
Read/Write Holder Registers	23 (17 hex)	Write: 242 bytes (121 Words) Read: 246 bytes (123 Words)

1.2. Modbus Address Definitions

The address definitions for Modbus/TCP interface are shown in the following table.

	IO-Link Port 1	IO-Link Port 2	IO-Link Port 3	IO-Link Port 4	Access	Length
Multiple Port PDI Data Block(s)	999 (Base 0) 1000 (Base 1)	1999 (Base 0) 2000 (Base 1)	2999 (Base 0) 3000 (Base 1)	3999 (Base 0) 4000 (Base 1)	Read- Only	Configurable per port (s)
Port Specific PDI Data Block	1000 (Base 0) 1001 (Base 1)	2000 (Base 0) 2001 (Base 1)	3000 (Base 0) 3001 (Base 1)	4000 (Base 0) 4001 (Base 1)	Read- Only	Configurable per port
Multiple Port PDO Data Block(s)	1049 (Base 0) 1050 (Base 1)	2049 (Base 0) 2050 (Base 1)	3049 (Base 0) 3050 (Base 1)	4049 (Base 0) 4050 (Base 1)	Read/ Write	Configurable per port(s)
Port Specific PDO Data Block	1050 (Base 0) 1051 (Base 1)	2050 (Base 0) 2051 (Base 1)	3050 (Base 0) 3051 (Base 1)	4050 (Base 0) 4051 (Base 1)	Read/ Write	Configurable per port
Receive SPDU Response	1100 (Base 0) 1101 (Base 1)	2100 (Base 0) 2101 (Base 1)	3100 (Base 0) 3101 (Base 1)	4100 (Base 0) 4101 (Base 1)	Read- Only	4 to 125 Words
Transmit SPDU Request	1300 (Base 0) 1301 (Base 1)	2300 (Base 0) 2301 (Base 1)	3300 (Base 0) 3301 (Base 1)	4300 (Base 0) 4301 (Base 1)	Write- Only	4 to 123 Words
<i>Port Information Block (Continuous Block)</i>						232 Words
Vendor Name	1500 (Base 0) 1501 (Base 1)	2500 (Base 0) 2501 (Base 1)	3500 (Base 0) 3501 (Base 1)	4500 (Base 0) 4501 (Base 1)	Read- Only	64 Chars 32 Words

	IO-Link Port 1	IO-Link Port 2	IO-Link Port 3	IO-Link Port 4	Access	Length
Vendor Text	1532 (Base 0)	2532 (Base 0)	3532 (Base 0)	4532 (Base 0)	Read- Only	64 Chars
	1533 (Base 1)	2533 (Base 1)	3533 (Base 1)	4533 (Base 1)		32 Words
Product Name	1564 (Base 0)	2564 (Base 0)	3564 (Base 0)	4564 (Base 0)	Read- Only	64 Chars
	1565 (Base 1)	2565 (Base 1)	3565 (Base 1)	4565 (Base 1)		32 Words
Product Id	1596 (Base 0)	2596 (Base 0)	3596 (Base 0)	4596 (Base 0)	Read- Only	64 Chars
	1597 (Base 1)	2597 (Base 1)	3597 (Base 1)	4597 (Base 1)		32 Words
Product Text	1628 (Base 0)	2628 (Base 0)	3628 (Base 0)	4628 (Base 0)	Read- Only	64 Chars
	1629 (Base 1)	2629 (Base 1)	3629 (Base 1)	4629 (Base 1)		32 Words
Serial Number	1660 (Base 0)	2660 (Base 0)	3660 (Base 0)	4660 (Base 0)	Read- Only	16 Chars
	1661 (Base 1)	2661 (Base 1)	3661 (Base 1)	4661 (Base 1)		8 Words
Hardware Revision	1668 (Base 0)	2668 (Base 0)	3668 (Base 0)	4668 (Base 0)	Read- Only	64 Chars
	1669 (Base 1)	2669 (Base 1)	3669 (Base 1)	4669 (Base 1)		32 Words
Firmware Revision	1700 (Base 0)	2700 (Base 0)	3700 (Base 0)	4700 (Base 0)	Read- Only	64 Chars
	1701 (Base 1)	2701 (Base 1)	3701 (Base 1)	4701 (Base 1)		32 Words
Device PDI Length	1732 (Base 0)	2732 (Base 0)	3732 (Base 0)	4732 (Base 0)	Read- Only	1 Word
	1733 (Base 1)	2733 (Base 1)	3733 (Base 1)	4733 (Base 1)		
Device PDO Length	1733 (Base 0)	2733 (Base 0)	3733 (Base 0)	4733 (Base 0)	Read- Only	1 Word
	1734 (Base 1)	2734 (Base 1)	3734 (Base 1)	4734 (Base 1)		

1.3. Multiple Port Process Data (PDI and PDO) Access via Modbus TCP

The process data has been grouped together in order to minimize the number of Modbus messages required to interface to the IO-Link master. The PDI and PDO data for multiple ports can be received or transmitted by one message.

	Modbus Holding Register Address (Base 1)	Controller Port 1 Access		Controller Port 2 Access		Controller Port 3 Access		Controller Port 4 Access	
		Read (Input)	Write (Output)	Read (Input)	Write (Output)	Read (Input)	Write (Output)	Read (Input)	Write (Output)
Read (Input) Process Data Input	1000 (Port 1)								
	2000 (Port 2)								
	3000 (Port 3)								
	4000 (Port 4)								
Read (Input) Process Data Output	1050 (Port 1)								
	2050 (Port 2)								
	3050 (Port 3)								
	4050 (Port 4)								
Write (Output) Process Data Output	1050 (Port 1)								
	2050 (Port 2)								
	3050 (Port 3)								
	4050 (Port 4)								

Modbus Read/Write Access *where*:

- All PDI data can be read with one Modbus Read Holding Registers message.
- All PDO data can be read with one Modbus Read Holding Registers read message.
- All PDO data can be written with one Modbus Write Holding Registers message.
- Controller Read access:
 - The PDI data from one or more ports may be read with one message. (i.e.: If addressing port 1, at address 1000, ports one to four may be read in one message.)
 - The PDO data from one or more ports may be read with one message. (i.e.: If addressing port 1, at address 1050, ports one to four may be read in one message.)
 - Partial PDI and PDO data reads are allowed.
 - The length of the Read message can range from 1 to the total, configured PDI or PDO length for all ports starting at the addressed port.
- Controller Write (Output) access:
 - Only PDO data may be written.
 - The PDO data for one or more ports may be written with one Write Holding Registers message.
 - Partial PDO data writes are not allowed.
 - The length of the Write message must be equal to the total of the configured PDO lengths for all ports to be written. The one exception is that the data length of the last port to be written must be equal to or greater than the device PDO length for that port.

Chapter 2. IO-Link Port Configuration

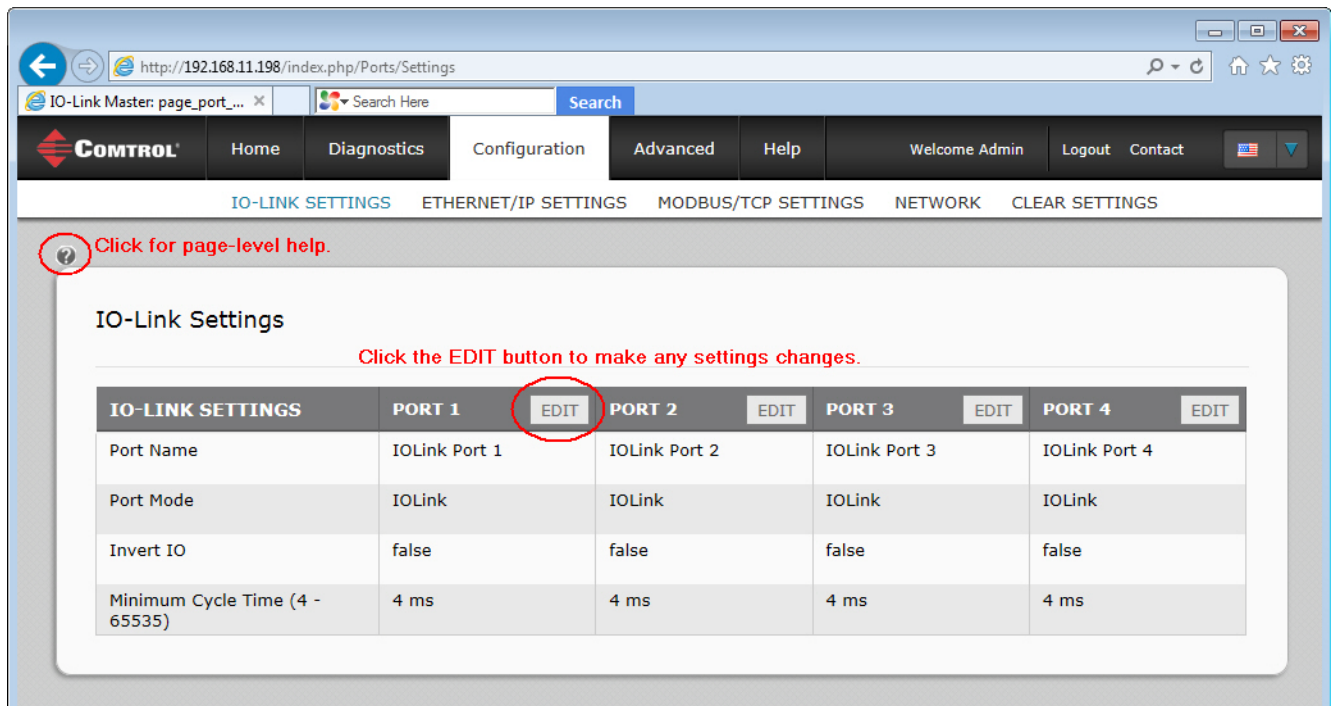
This section discusses port configuration, which includes these topics:

- [2.1. IO-Link Settings Configuration Page](#)
- [2.2. EtherNet/IP Settings Configuration Page](#) on Page 15

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

2.1. IO-Link Settings Configuration Page

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



Click for page-level help.

IO-Link Settings

Click the EDIT button to make any settings changes.

IO-LINK SETTINGS	PORT 1	EDIT	PORT 2	EDIT	PORT 3	EDIT	PORT 4	EDIT
Port Name	IOLink Port 1		IOLink Port 2		IOLink Port 3		IOLink Port 4	
Port Mode	IOLink		IOLink		IOLink		IOLink	
Invert IO	false		false		false		false	
Minimum Cycle Time (4 - 65535)	4 ms		4 ms		4 ms		4 ms	

2.1.1. 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 [2.1.2. IO-Link Settings Parameters](#) on Page 14.
5. Click the **SAVE** button.
6. Repeat for each port that requires configuration changes.

2.1.2. 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. <ul style="list-style-type: none"> • Standard ASCII characters • Max length = 80 characters
Port Mode <i>Default: IO-Link</i>	Selected IO-Link Port Mode. Valid settings are: <ul style="list-style-type: none"> • Reset • IO-Link • Digital In • Digital Out
Invert IO <i>Default: False</i>	If enabled and the <i>Port Mode</i> is Digital In or Digital Out, inverts the I/O value. 0= False (Disabled - Do not invert IO) 1= True (Enabled - Invert IO) <i>Note: Does not affect the Auxiliary Input.</i>
Minimum Cycle Time <i>Default: 4</i>	The minimum, or fastest, cycle time that the IO-Link device may operate at. The valid range is 4-65535 ms.

2.2. EtherNet/IP Settings Configuration Page

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

The screenshot shows a web browser window displaying the 'EtherNet/IP Settings' configuration page. The browser address bar shows 'http://192.168.11.198/index.php/EtherNet/IP/Settings'. The page has a navigation menu with 'CONTROL' and 'Home', 'Diagnostics', 'Configuration', 'Advanced', 'Help', 'Welcome Admin', 'Logout', and 'Contact'. Below the navigation is a sub-menu with 'IO-LINK SETTINGS', 'ETHERNET/IP SETTINGS', 'MODBUS/TCP SETTINGS', 'NETWORK', and 'CLEAR SETTINGS'. The main content area is titled 'EtherNet/IP Settings' and contains a table with columns for 'ETHERNET/IP SETTINGS', 'PORT 1', 'EDIT', 'PORT 2', 'EDIT', 'PORT 3', 'EDIT', and 'PORT 4', 'EDIT'. The table lists various settings for four ports, including ISDU Data Settings, Process Data Settings, Transfer Mode Settings, Read/Write Tag/File Settings, and Write PDI to Tag/File Settings.

ETHERNET/IP 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 Data Block Format (To PLC)	word (16 bit)		word (16 bit)		word (16 bit)		word (16 bit)	
PDI Data Byte-Swap Method	word (16 bit) byte-swap		word (16 bit) byte-swap		word (16 bit) byte-swap		word (16 bit) byte-swap	
PDO Data Block Size (From PLC)	32-bytes		32-bytes		32-bytes		32-bytes	
PDO Data Block Format (From PLC)	word (16 bit)		word (16 bit)		word (16 bit)		word (16 bit)	
PDO Data Byte-Swap Method	word (16 bit) byte-swap		word (16 bit) byte-swap		word (16 bit) byte-swap		word (16 bit) byte-swap	
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:								
PDI Receive Mode(s) (To PLC)	Polling Class1		Polling Class1		Polling Class1		Polling Class1	
PDO Transmit Mode (From PLC)	Class1		Class1		Class1		Class1	
Read/Write Tag/File Settings:								
PLC IP Address (xxx.xxx.xxx.xxx)	0.0.0.0		0.0.0.0		0.0.0.0		0.0.0.0	
PLC Controller Slot Number (0 - 64)	0		0		0		0	
PLC Type	ControlLogix		ControlLogix		ControlLogix		ControlLogix	
Write PDI to Tag/File Settings:								
PDI Tag/File Name								
Append PDO to PDI Data	false		false		false		false	
Maximum PLC Update Rate (10 - 65535)	40 ms		40 ms		40 ms		40 ms	
Heartbeat Update Enable	false		false		false		false	
Heartbeat Update Rate (50 - 65535)	1000 ms		1000 ms		1000 ms		1000 ms	
Read PDO from Tag/File Settings:								
PDO Tag/File Name								
PLC Poll Rate (10 - 65535)	1000 ms		1000 ms		1000 ms		1000 ms	

2.2.1. Editing EtherNet/IP Settings

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

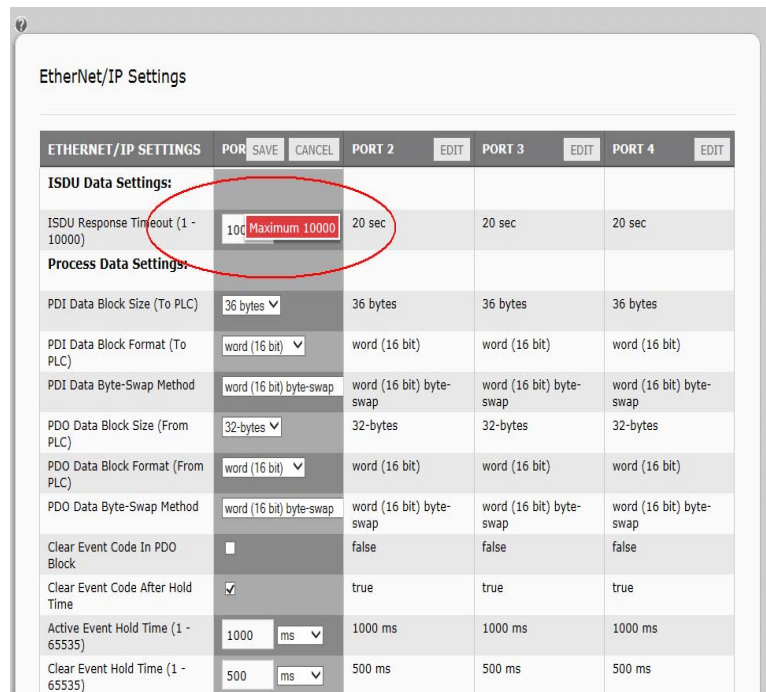
1. If necessary, open the IO-Link Master web interface with your web browser using the IP address.
2. Click **Configuration** in the menu bar.
3. Click the **ETHERNET/IP SETTINGS** submenu.
4. Click the **EDIT** button for the port that you want to configure.
5. Make appropriate selections for the IO-Link device that you will connect to that port.

You can use the help system if you require definitions or values for the options or [2.2.2. EtherNet/IP Settings Parameters](#) on Page 17.

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.

2.2.2. EtherNet/IP Settings Parameters

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

EtherNet/IP Settings Page	
<i>ISDU Data Settings</i>	
ISDU Response Timeout <i>Default: 20 seconds</i>	<p>The time that the IO-Link Master's EtherNet/IP interface waits for a response to an ISDU request.</p> <p>The timeout needs to set long enough to allow all commands within the ISDU request to be processed.</p> <p>Valid range: 1-10,000 seconds</p>
<i>Process Data Settings</i>	
PDI Data Block Size (To PLC) <i>Default: 36-bytes</i>	<p>The configurable PDI data block length. Supported optional lengths are:</p> <ul style="list-style-type: none"> • 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) <i>Default: Word-16</i>	<p>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:</p> <ul style="list-style-type: none"> • Byte-8 (8-bit or SINT) • Word-16 (16-bit or INT) • Dword-32 (32-bit or DINT) <p><i>Note: The Data Block Format is independent of the PDI Data Byte-Swap Method.</i></p> <p><i>This setting is not used for the SLC, PLC-5 and MicroLogix PLCs which are always Word-16.</i></p>
PDI Data Byte-Swap Method <i>Default: Work (16-bit) byte swap</i>	<p>If enabled, the IO-Link Master swaps the data bytes in word (2 byte) format or dword (4 byte) format.</p> <p>Supported values are:</p> <ul style="list-style-type: none"> • 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 <p><i>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).</i></p>

EtherNet/IP Settings Page (Continued)	
<p>PDO Data Block Size (From PLC) <i>Default: 32-bytes</i></p>	<p>The configurable PDO data block length. Supported optional lengths are:</p> <ul style="list-style-type: none"> • Event code not included: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> - 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): <ul style="list-style-type: none"> - 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): <ul style="list-style-type: none"> - 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
<p>PDO Data Block Format (From PLC) <i>Default: Word-16</i></p>	<p>Data format of PDO data block received from the PLC(s) in Class 1 or Read from TagOrFile PDO Transfer Modes. Formats include:</p> <ul style="list-style-type: none"> • Byte-8 (8-bit) • Word-16 (16-bit) • Dword-32 (32-bit) <p><i>Note: The Data Block Format is independent of the PDO Data Byte-Swap Method.</i></p> <p><i>This setting is not used for the SLC, PLC-5 and MicroLogix PLCs which are always Word-16.</i></p>

EtherNet/IP Settings Page (Continued)	
PDO Data Byte-Swap Method <i>Default: Word (16-bit) byte-swap</i>	If enabled, the IO-Link Master swaps the data bytes in word (2 byte) format or dword (4 byte) format. Supported values are: <ul style="list-style-type: none"> • 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 <i>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).</i>
Clear Event Code in PDO Block <i>Default: False</i>	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: <ul style="list-style-type: none"> • True = expect event code • False = no event code, expect only PDO data
Clear Event Code After Hold Time <i>Default: True</i>	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: <ul style="list-style-type: none"> • True = clear event code after hold time • False = do not clear event code after hold time
Event Active Hold Time <i>Default: 1000 ms</i>	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. <ul style="list-style-type: none"> • Valid range: 1-65535 • Valid Units: <ul style="list-style-type: none"> - ms (milliseconds) - sec (seconds) - min (minutes) - hours - days
Clear Event Hold Time <i>Default: 500 ms</i>	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. <ul style="list-style-type: none"> • Valid range: 1-65535 • Valid Units: <ul style="list-style-type: none"> - ms (milliseconds) - sec (seconds) - min (minutes) - hours - days

EtherNet/IP Settings Page (Continued)	
<i>Transfer Mode Settings</i>	
PDI Receive Mode(s) <i>Default: Polling, Class1</i>	Determines which PDI Receive (To PLC) Modes are enabled. Supported modes are: <ul style="list-style-type: none"> • Polling • Class1 • Write-to-TagOrFile
PDO Transmit Mode <i>Default: Class 1</i>	Supported modes are: <ul style="list-style-type: none"> • Off • PLC-Writes • Class1 • Read-from-TagOrFile
<i>Read / Write Tag / File Settings</i>	
PLC IP Address <i>Default: 0.0.0.0</i>	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 <i>Default: 0</i>	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 <i>Default: ControlLogix</i>	Indicates the type of PLC that the tag(s) or file(s) are written to and/or read from. Supported PLC Types are: <ul style="list-style-type: none"> • ControlLogix • SLC • PLC-5 • MicroLogix
<i>Write PDI to Tag / File Settings</i>	
PDI Tag/File Name <i>Default: blank</i>	The tag or file name to place the PDI data block. <ul style="list-style-type: none"> • ControlLogix family: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> - 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 <i>Default: False</i>	If selected, the IO-Link Master appends any PDO data to the end of the PDI data. <ul style="list-style-type: none"> • False = Do not append PDO data • True = Append PDO data

EtherNet/IP Settings Page (Continued)	
Maximum PLC Update Rate <i>Default: 40ms</i>	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 <i>Default: False</i>	If selected, the IO-Link Master updates the PDI data block at the Heartbeat Update Rate . <ul style="list-style-type: none"> • False = Heartbeat update disabled • True = Heartbeat update enabled
Heartbeat Update Rate <i>Default: 1000ms</i>	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.
<i>Read PDO from Tag / File Settings</i>	
PDO Tag/File Name <i>Default: blank</i>	The tag or file name that the IO-Link Master reads the PDO data block from. <ul style="list-style-type: none"> • ControlLogix family: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> - 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 <i>Default: 1000ms</i>	The frequency which the IO-Link Master reads the PDO data block in the Read-from-Tag/File mode. Valid range: 50-65535 ms

Modbus/TCP Settings

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	

Chapter 3. Using the Diagnostics Pages

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

- [3.1. IO-Link Port Diagnostics](#)
- [3.2. EtherNet/IP Diagnostics](#) on Page 26

3.1. IO-Link Port Diagnostics

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

IO-LINK DIAGNOSTICS	PORT 1	PORT 2	PORT 3	PORT 4
Port Mode	IOLink	IOLink	IOLink	IOLink
Port Status	Operational,PDI Valid	Operational,PDI Valid	Operational,PDI Valid	Operational
Device Vendor Name	Siemens AG	SICK AG	SICK AG	ifm electronic gmbh
Device Product Name	SIMATIC RF220R IO-Link	LUT9U-P130L	WTB27C-3P2444	P12794
Device Serial Number		09350547	09510012	W0115081211
Device Hardware Version		0001	1.30	A8
Device Firmware Version	V 1.1.0	1.03	1.47	217
Device IO-Link Version	1.0	1.0	1.0	1.0
Auxiliary Input Bit Status	Off	Off	Off	On
Device PDI Data Length	8	2	1	2
PDI Data Valid	Yes	Yes	Yes	No
Last Rx PDI Data (MS Byte First)	00h,00h,00h,00h,00h,00h,00h,00h	0ah,80h	01h	00h,00h
Device PDD Data Length	8	0	0	0
Lost PDD Controller(s) Errors	0			
PDD Data Valid	Yes			
Last Tx PDD Data (MS Byte First)	00h,02h,00h,00h,00h,00h,00h,00h			
Time Since Initialization	004d 21h:16m:45s.733ms	004d 21h:27m:28s.106ms	004d 21h:27m:28s.108ms	004d 21h:27m:28s.112ms
Lost Communication Count	1	0	0	0
Initialization Attempts	2	1	1	1
Initialization Errors	0	0	0	0
Process Data Errors	1	3	1	6
Process Data Retries	3	1	1	1
Internal Communication Errors	0	0	0	0
Device Communication Errors	0	0	0	0
ISDU Read Cmd Attempts	9512759	5311707	5939333	3452437
ISDU Read Cmd Errors	1086985	0	84074	3
Minimum ISDU Read Cmd Resp Time	37 ms, 1 byte, idx 67, subidx 0	33 ms, 1 byte, idx 85, subidx 0	33 ms, 2 bytes, idx 144, subidx 0	37 ms, 2 bytes, idx 22, subidx 0
Maximum ISDU Read Cmd Resp	167 ms, 24 bytes, idx 18, subidx 0	137 ms, 16 bytes, idx 16, subidx 0	161 ms, 20 bytes, idx 18, subidx 0	205 ms, 32 bytes, idx 24, subidx 0

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	<p>Displays the active device mode:</p> <ul style="list-style-type: none"> • 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	<p>Displays the port status:</p> <ul style="list-style-type: none"> • 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.

3.2. 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.

The screenshot displays the 'EtherNet/IP Diagnostics' page in a web browser. The page title is 'EtherNet/IP Diagnostics' and it includes buttons for 'PAUSE LIVE UPDATES' and 'RESET STATISTICS'. The main content is divided into two sections: 'ETHERNET/IP INTERFACE DIAGNOSTICS' and 'ETHERNET/IP PORT SPECIFIC DIAGNOSTICS'.

ETHERNET/IP INTERFACE DIAGNOSTICS	VALUES			
Active Session Count	3			
Active Connections	2			
Total Connections Established	2			
Connection Timeouts	0			
Connections Closed	0			
Class 3 Messages/Responses Received	4549906			
Broadcast Messages Received	0			
Class 3 Messages/Responses Transmitted	4551321			
Class1 Output Updates (From PLC)	22957549			
Class 1 Output Data Changes (From PLC)	0			
Class1 Input Updates (To PLC)	20206368			
Client Object Requests	4540460			
Good Responses from PLC	8032			
Bad Responses from PLC	0			
No Responses From PLC	0			
Invalid Network Paths	0			
Pending Request Limit Reached	0			
Unexpected Events	0			
Unsupported CIP Class Errors	0			
Unsupported CIP Instance Errors	0			
Unsupported CIP Service Errors	0			
Unsupported CIP Attribute Errors	0			
Unsupported File Errors	0			
System Resource Errors	0			
First Error String	No Error Detected			
Last Error String				

ETHERNET/IP PORT SPECIFIC DIAGNOSTICS	PORT 1	PORT 2	PORT 3	PORT 4
Configuration Errors	0	0	0	0
Invalid Data Errors	0	0	0	0
Active PDO Controller(s)				Class1: 10.0.0.16
PDO Writes to Offline or Read-Only Ports	41256547	41256547	41256547	0
Undeliverable PDI Updates (To PLC)	0	0	0	0
ISDU Request Msgs from PLC(s)	608067	357454	435144	423061
ISDU Invalid Requests	0	0	0	0
ISDU Requests When Port Offline	0	0	0	0
Valid ISDU Responses from Port	608068	357455	435144	423062
ISDU Response Timeouts	0	0	0	0
Unexpected ISDU Responses	0	0	0	0
Maximum ISDU Request Msg Response Time	0.926 sec	0.785 sec	1.216 sec	1.305 sec
Average ISDU Request Msg Response Time	0.508 sec	0.474 sec	0.808 sec	0.839 sec
Minimum ISDU Request Msg Response Time	0.280 sec	0.428 sec	0.560 sec	0.512 sec
ISDU Read Commands	2736303	2144724	2393292	2115306

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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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.
<i>EtherNet/IP Port Specific Diagnostics</i>	
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: <ul style="list-style-type: none"> • The port is configured in IO-Link mode: <ul style="list-style-type: none"> - 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	<p>Displays the number of ISDU requests received over EtherNet/IP when the IO-Link port was offline. This can occur when:</p> <ul style="list-style-type: none"> • 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	<p>Displays the number of unexpected ISDU responses.</p> <p>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.</p>
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.

Chapter 4. Troubleshooting and Technical Support

This section provides the following information:

- [4.1. Troubleshooting](#)
- [4.2. Contacting Technical Support](#) on Page 32
- [4.3. Using Log Files](#) on Page 33

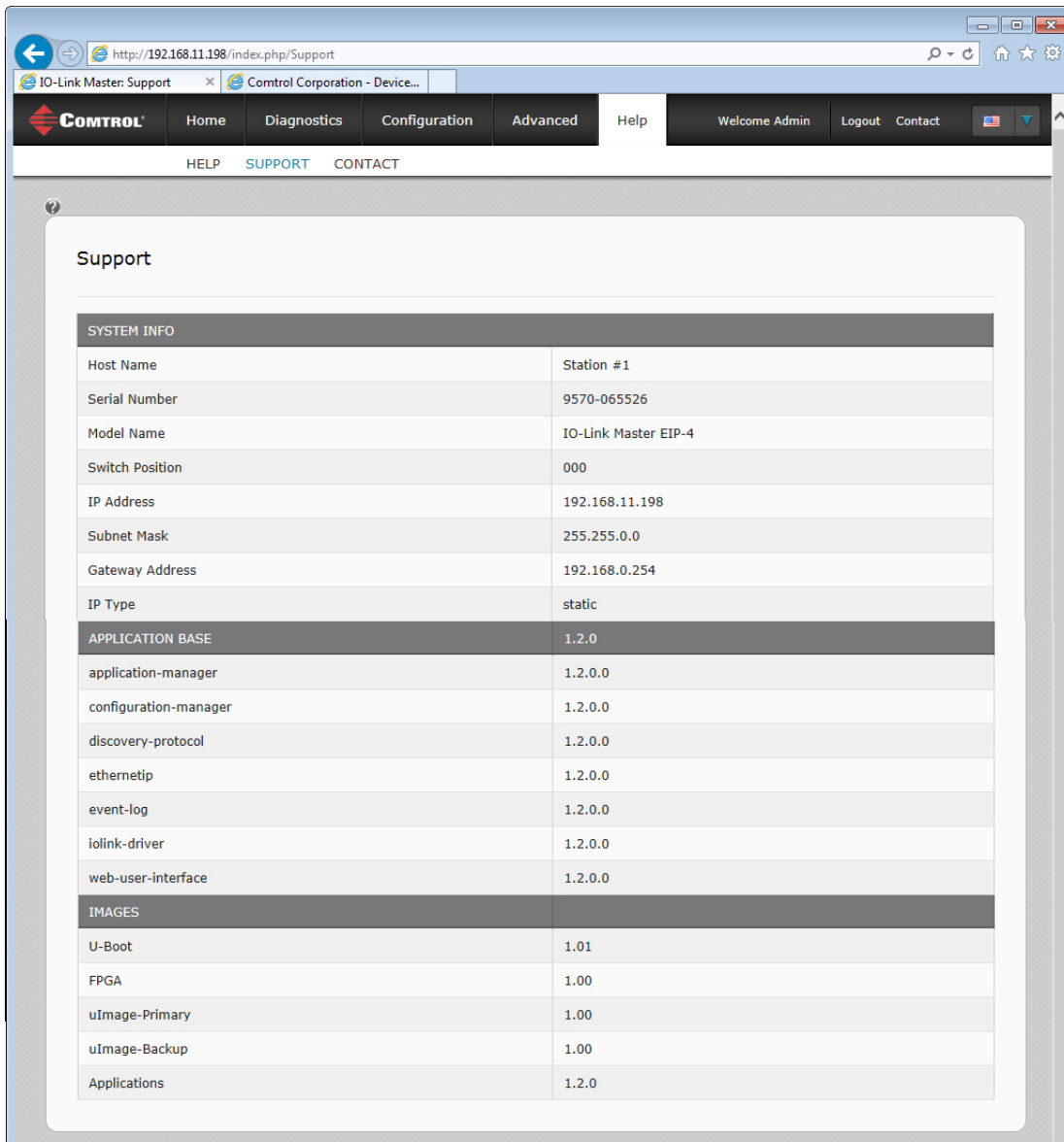
4.1. Troubleshooting

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 the *IO-Link Master 4-EIP User Guide*
- 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.

4.2. 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.



Control 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

4.3. 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.

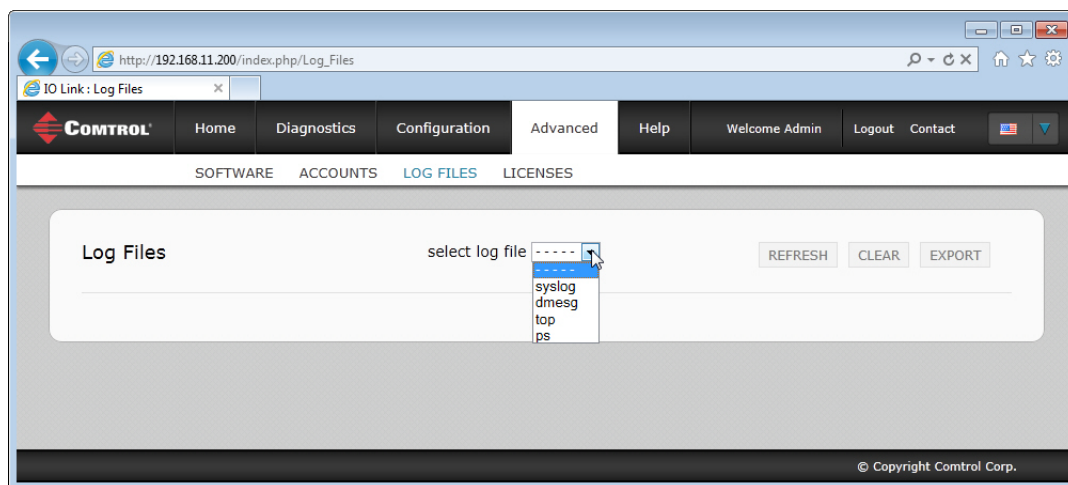
You can use the following procedures to:

- [4.3.1. View a Log File](#) on Page 33
- [4.3.2. Clear a Log File](#) on Page 33
- [4.3.3. Export a Log File](#) on Page 34

4.3.1. 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, [export](#) the log file.

4.3.2. Clear a Log File

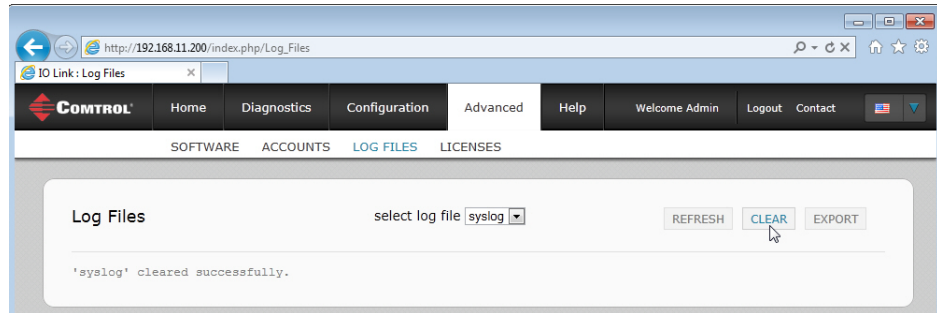
Use this procedure to clear a log file.

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-

Export a Log File

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.

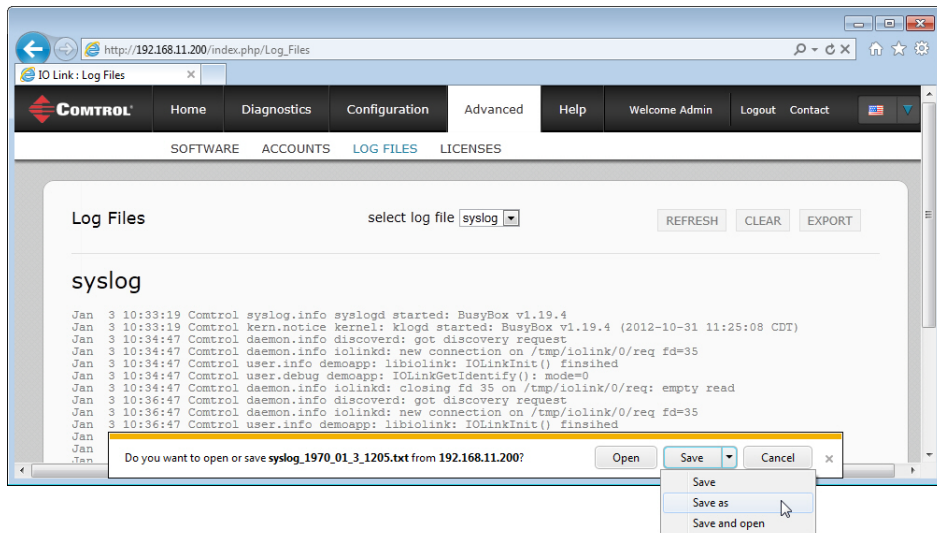


The log file automatically starts logging the latest information.

4.3.3. 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.

