



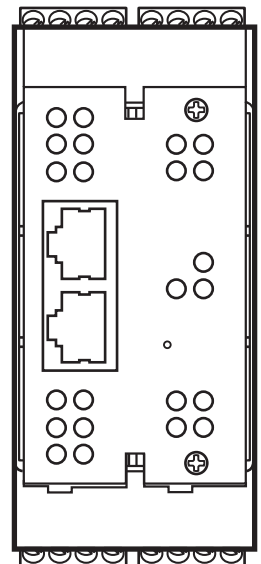
Device manual
IO-Link master ProfiNet

UK

ecomat300

AY1000

7391081/00 02/2016



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Chapter 1. Introduction

This document provides installation, configuration, and embedded web interface information for the ifm IO-Link master.

The web interface provides a platform so that you can easily configure, review diagnostic pages, and access advanced features, such as the ability to:

- Upload the latest AY1000 images or applications
- Set up user accounts with different user levels and passwords
- Load IODD files and configure IO-Link device parameters
- Implement manual or automatic data storage (upload or download)
- Implement device and/or data validation

The AY1000 installation includes the following procedures.

1. Connect the power and Ethernet cable ([Page 9](#)).
2. Configure PROFINET IO ([Page 11](#)).
3. If necessary, upload the latest images for the latest features ([Page 39](#)).
4. Connect the IO-Link and digital I/O devices ([Page 43](#)).
5. Use the web interface to configure the following:
 - a. If desired, upload the appropriate IODD files for your IO-Link devices ([Page 51](#)) for IO-Link device configuration.
 - b. Use the **Diagnostic** pages to monitor or troubleshoot your devices.

Chapter 2. Hardware Installation

Use the following procedures to install the AY1000 hardware:

- [Connecting to the Network](#) on Page 9
- [Connecting the Power](#) on Page 9
- [Mounting the AY1000](#) on Page 10

Note: The AY1000 must be installed in a suitable fire, electrical, mechanical enclosure.

2.1. Connecting to the Network

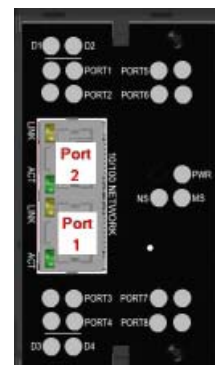
The AY1000 provides two Fast Ethernet (10/100BASE-TX) standard RJ45 connectors.

Pin	Signal
1	Tx+
2	Rx+
3	Tx-
4	Rx-

You can use this procedure to connect the AY1000 to the network or IO controller.

1. Securely connect one end of the RJ45 Ethernet cable to either Ethernet port.
2. Connect the other end to the network or an IO controller.
3. Optionally, use the other Ethernet port to daisy-chain to another Ethernet device.

Note: If you do not connect the AY1000 to an IO controller, an IO controller needs to be connected to the network for PROFINET IO configuration.

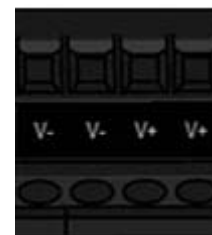


2.2. Connecting the Power

The AY1000 provides two redundant power inputs with screw terminals on the top and bottom of the unit.

Note: Use either power terminal (top or bottom) but **DO NOT** use both to supply power to the AY1000.

Signal	Description
V-	24VDC Power Supply Return
V-	24VDC Power Supply Return
V+	Primary +24VDC Supply
V+	Secondary +24VDC Supply



Power Supply	Values
Power Supply In V+	4A (Maximum) †
IO-Link Connectors Ports 1 - 8 C/Q L+	200 mA (Maximum) 200 mA (Maximum)
Digital IO (D1 and D2 D3 and D4) D2, D4 L+	200 mA (Maximum) 200 mA (Maximum)
IOLM Power	100mA @ 24VDC (V _S)
Power Supply Out	
† The sum of the following must not exceed V+ maximum input current: <ul style="list-style-type: none"> - IO-Link Mode module power - Actual C/Q current for each IO-Link port and for D2 and D4 output - Actual U_S current for each IO-Link port 	

You can use this procedure to connect the AY1000 to a power supply.

Note: Power should be disconnected from the power supply before connecting it to the AY1000. Otherwise, your screwdriver blade can inadvertently short your terminal connections to the grounded enclosure.

1. Insert positive and negative wires (12-24AWG) into the V+ and V- contacts.

Note: Use either power terminal (top or bottom) but **DO NOT** use both to supply power to the AY1000.
2. Tighten the wire-clamp screws to prevent the wires from coming loose.
3. Apply the power and verify that the following LEDs are lit indicating that you are ready to program the IP address and then attach your IO-Link or digital I/O devices.
 - **PWR** - green lit LED indicates the AY1000 is receiving power.
 - **LINK** should be lit (green) to indicate a valid network connection.
 - **ACT** blinks if there is network traffic between the AY1000 and the network.
 - **EIP 1/2** should be lit (green) indicating that the link is up if both connectors are connected.
 - Port LEDs should display in this manner if there is no device attached:
 - IO-Link port LED should be flashing green indicating that it is searching for an IO-Link device.
 - **DI** should be off to indicate that there is no device attached to the port.



If the LEDs indicate that you are ready to go to the next installation step, Refer to [Chapter 3. Initial Configuration](#) on Page 19 to configure the network information.

If the LEDs do not meet the above conditions, you can refer to the *AY1000 LEDs* table on [Page 94](#) in the [Troubleshooting](#) chapter.

2.3. Mounting the AY1000

You may want to mount the AY1000 after programming the IP address and connecting the IO-Link and digital input/output devices.

1. Slide the metal latch down, hook the top of AY1000 to the DIN rail and release the latch.
2. Verify that is tightly mounted.

Note: You may want to connect the IO-Link devices before attaching the AY1000 to the DIN rail. Use [Chapter 6. Connecting Devices](#) on Page 43 if you require IO-Link cabling information.

Chapter 3. Configuring the AY1000 with STEP 7

3.1. Overview

PROFINET IO configuration procedures vary between software versions but the following configuration steps are required in all cases. Refer to your STEP 7 documentation, if you require step-by-step procedures.

1. Download, unzip, and upload the GSD file for the IO-Link master (AY1000).
2. Insert the AY1000 in the PROFINET IO system.
3. Configure the IP address for the AY1000.
4. Assign the PROFINET Device Name.
5. Set the IO Device Update Time.
6. Configure the IO-Link ports.
 - a. Configure IO-Link port modules.
 - b. Configure port status modules.
 - c. If desired, configure data storage, automatic or manual - upload or download.
 - d. If desired, configure device validation and data validation.
7. Use [Chapter 12. PROFINET IO Reference Information](#) on Page 85 to complete configuration after attaching the IO-Link devices.

The following subsections provides PROFINET IO configuration procedures using **STEP 7 V5.5**:

- *Installing the GSD File (STEP 7 V5.5)*
- *Configuring the AY1000 (STEP 7 V5.5)*
- [IP Address Assignment](#) on Page 12
- [Device Name Assignment](#) on Page 20
- [Setting the IO Device Update Time](#) on Page 22
- [Configuring IO-Link Ports](#) on Page 23

3.2. Installing the GSD File (STEP 7 V5.5)

Use the following procedure to install the GSD file for PROFINET IO using STEP 7 V5.5.

1. Unzip **GSDML-V2.31-ifm-IOLink-yyyyymmdd.zip** to a working directory.
2. Open **SIMATIC STEP 7 | HW Config**.
3. Use **Menu Options | Install GSD Files** to install the GSD file.
4. If an older version of the GSD file was installed before, you may need to remove the AY1000 object from an existing project, and reinsert it after the new GSDML file is installed.

3.3. Configuring the AY1000 (STEP 7 V5.5)

Select the AY1000 from the *Hardware Catalog* window and insert it into a PROFINET-IO- System in the **HW Config** (PROFINET IO -> Additional Field Device -> I/O -> ifm electronic -> AY1000) as shown in Figure 1.

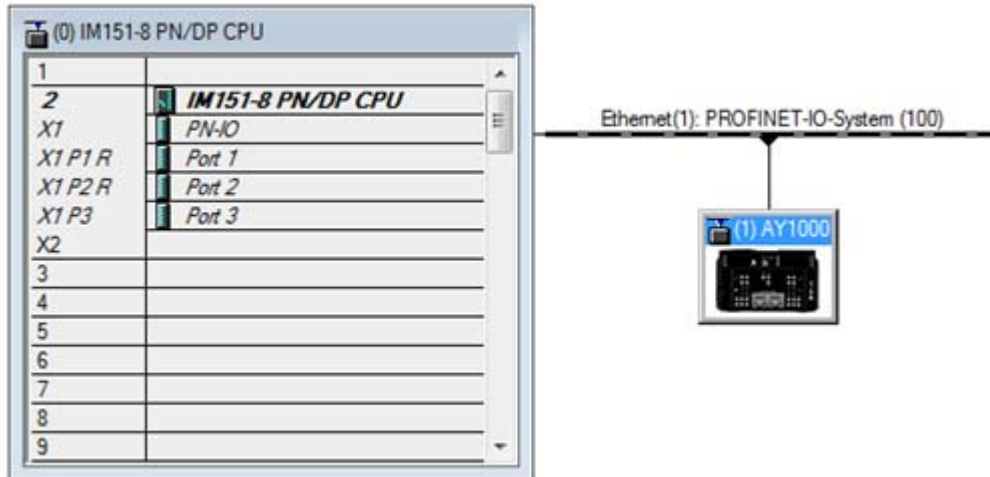


Figure 1: Inserting an AY1000 into a PROFINET IO System

3.4. IP Address Assignment

AY1000s support three methods for IP address assignment according to *GSDHML Specification V2.31*.

- **DCP** - The DAP supports IP address assignment via Discovery and basic Configuration Protocol (DCP). See [3.4.1. Assigning an IP Address via IO Controller \(DCP\)](#) on Page 13 for procedures.
- **DHCP** - The DAP supports the Dynamic Host Configuration Protocol for IP address assignment. See [3.4.2. Assigning an IP Address via DHCP](#) on Page 14 for procedures.
- **LOCAL** - The DAP supports a device specific method for IP address assignment. See [3.4.3. Assigning an IP Address Statically \(LOCAL\)](#) on Page 16 for procedures.

3.4.1. Assigning an IP Address via IO Controller (DCP)

An IO controller can assign an IP address to the AY1000 via DCP. The IO controller and the AY1000 have to be on the same subnet. The AY1000 default IP address is: 192.168.1.250 and the subnet mask is 255.255.255.0.

1. Double-click the **X1 PNIO-IO** interface of the IO control to open the *Properties* window.
2. On the **General** tab, click the **Properties** button, which opens the *Ethernet interface Properties* window.
3. Uncheck the **Use different method to obtain IP address** option.
4. Manually enter the IP address and subnet mask for the IO controller.

In this example the IO controller was assigned an IP address of 10.0.0.31 and a subnet mask of 255.0.0.0.

5. Double-click the AY1000, check **Assign IP address via IO controller** as shown in Figure 3.
6. On the **General** tab, click the **Ethernet** button, which opens the *Ethernet interface properties* window, where you can specify what IP address the IO controller should assign to the AY1000.

Steps 2 through 4 are necessary in STEP 7 V5.5 so that both the IO controller and the AY1000 are on the same subnet. Otherwise, the **Assign IP address via IO controller** function may not work correctly.

In this example, IP address 10.0.0.100 is assigned to the AY1000 via the IO controller.

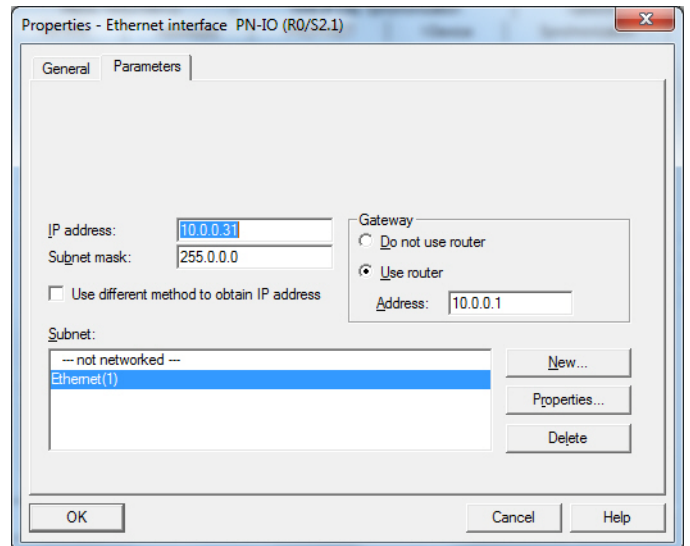


Figure 2: IO Controller Ethernet Interface Properties

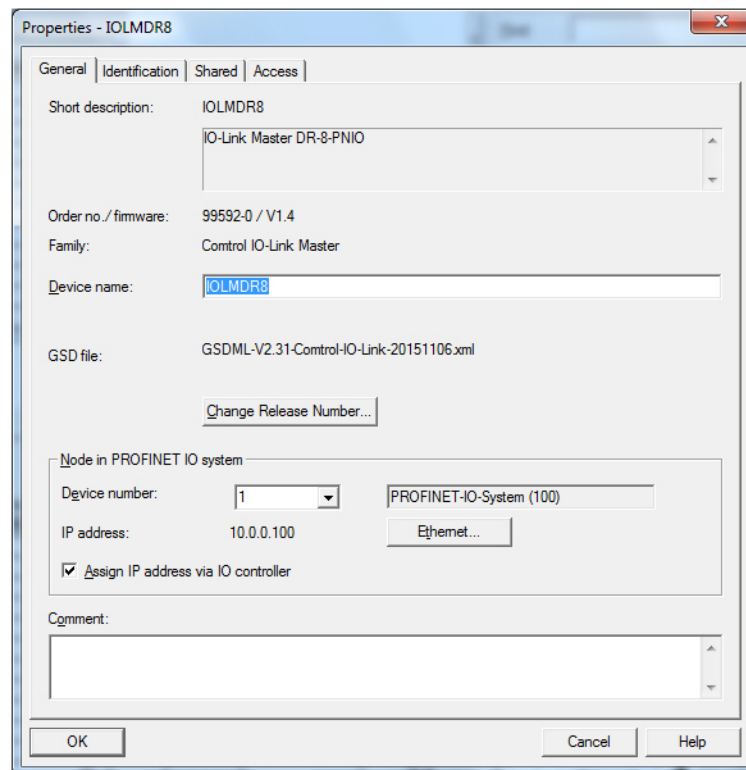


Figure 3: AY1000 Properties

3.4.2. Assigning an IP Address via DHCP

The AY1000 supports DHCP for IP address assignment. DHCP is disabled by default.

Use the following steps to enable DHCP.

Note: The AY1000 default IP address is: 192.168.1.250 and the subnet mask is 255.255.255.0. You may need to change your laptop or PC IP address range to access the AY1000 web interface or you can use [PortVision DX](#) to change the IP address without changing your settings.

1. Open a web browser and enter the AY1000 IP address.
2. Click **Configuration | Network**.
3. Click **EDIT** button.

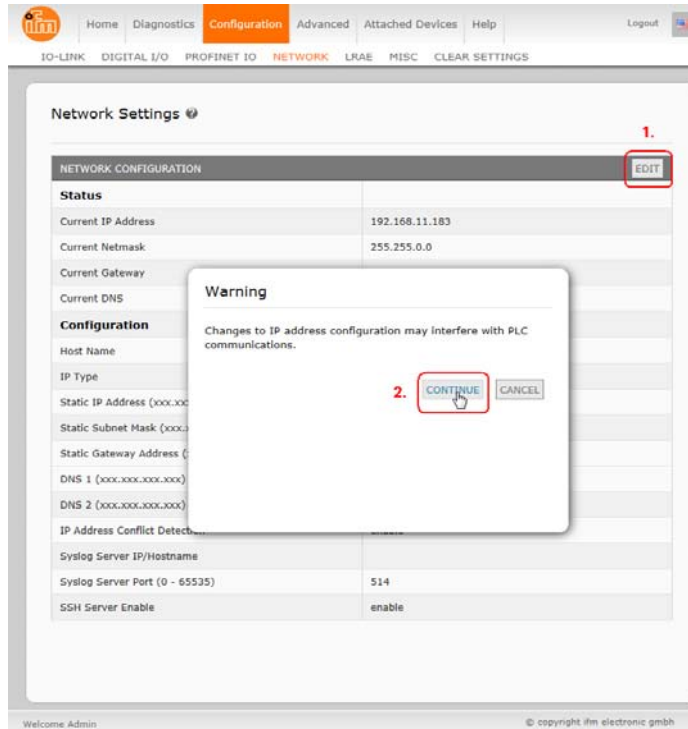


Figure 3: Web Network Configuration Page

4. Change IP Type from static to dhcp.

The screenshot shows the 'Network Settings' configuration page. At the top, there is a navigation bar with 'Configuration' highlighted. Below it, a sub-header reads 'NETWORK CONFIGURATION' with 'CANCEL' and 'SAVE' buttons. The main content area is divided into two sections: 'Status' and 'Configuration'.

Status	
Current IP Address	192.168.11.183
Current Netmask	255.255.0.0
Current Gateway	192.168.0.253
Current DNS	

Configuration	
Host Name	<input type="text"/>
IP Type	dhcp
DNSmode	automatic
IP Address Conflict Detection	enable
Syslog Server IP/Hostname	<input type="text"/>
Syslog Server Port (0 - 65535)	514
SSH Server Enable	enable

At the bottom of the page, it says 'Welcome Admin' and '© copyright ifm electronic gmbh'.

5. Click the SAVE button.

Once DHCP is enabled, the AY1000 attempts to obtain an IP address from a DHCP server. If a new IP address is assigned by a DHCP server, then the AY1000 switches to the new IP address immediately. This may interfere with communications between the device and the IO controller.

The **Obtain IP address from a DHCP server** option in the *Edit Ethernet Node* window in STEP 7 ([Figure 4](#)) is not supported. DHCP can only be enabled or disabled via the web interface.

Note: An IO controller can overwrite DHCP IP assignment by assigning IP address via DCP.

The next configuration step is to assign the device name, go to [3.5. Device Name Assignment](#) on Page 20.

3.4.3. Assigning an IP Address Statically (LOCAL)

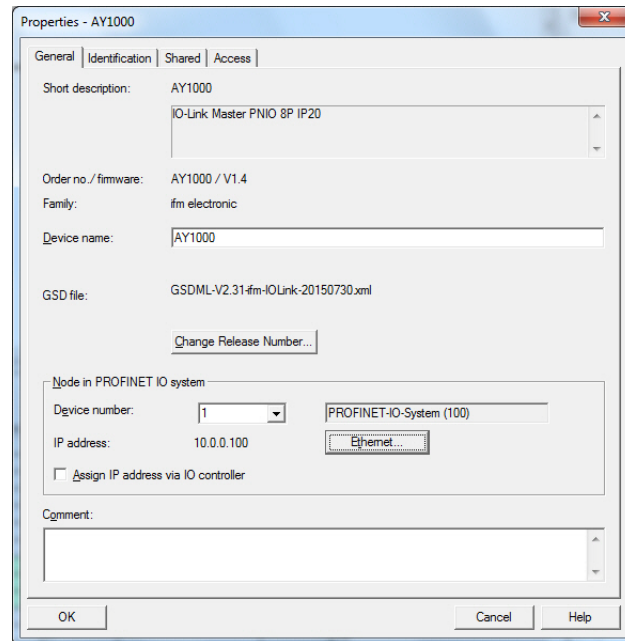
IP addresses can also be assigned statically using one of the following methods:

- The **LOCAL** method as defined in the GSDML Specification
- Embedded web interface

3.4.3.1. Assign IP Address Statically Using STEP 7

Use the following procedure if you want to use the LOCAL method using STEP 7.

1. In the STEP 7 *HW Config* window, double-click the AY1000 object to open up the *Properties* window.



2. Uncheck the **Assign IP address via IO controller** option and click **OK**.

The IO controller will not attempt to assign IP address to the AY1000. You must assign a static IP address to the AY1000 manually.

3. Select the AY1000 in **HW Config**, open the *Edit Ethernet Node* window (Figure 4) by using menu **PLC | Ethernet | Edit Ethernet Node** option.

4. Once opened, click the **Browse** button, which opens the *Browse Network* window.

The AY1000 should be displayed as an ifm IO-Link master with a default IP address of 192.168.1.250.

5. Select the AY1000 and click the **OK** button to return to the *Edit Ethernet Node* window.

6. Enter the desired IP configurations.

In [Figure 4](#), the AY1000 was configured to use a static IP address 10.0.0.100, subnet mask 255.0.0.0 and no router.

- Click the **Assign IP Configuration** button, the IP configuration is assigned to the AY1000.

The screenshot shows the 'Edit Ethernet Node' dialog box with the following configuration:

- Ethernet node:** MAC address: 00-02-01-80-27-11, Nodes accessible online: Browse...
- Set IP configuration:** Use IP parameters (selected). IP address: 10.0.0.100, Subnet mask: 255.0.0.0. Gateway: Do not use router (selected), Use router (unselected), Address: [empty].
- Obtain IP address from a DHCP server:** (unselected)
- Identified by:** Client ID (selected), MAC address (unselected), Device name (unselected). Client ID: [empty].
- Assign device name:** Device name: ay1000, Assign Name button.
- Reset to factory settings:** Reset button.
- Buttons:** Close, Help.

Figure 4: Configure IP Address and Device Name

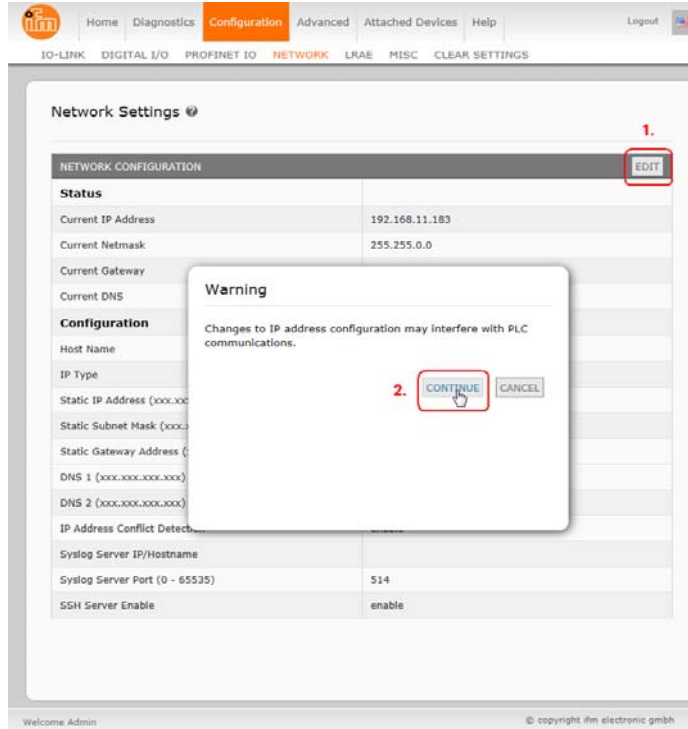
The next configuration step is to assign the device name, go to [3.5. Device Name Assignment](#) on Page 20.

3.4.3.2. Assign IP Address Statically Using the Web Page

You can use the following procedure to configure a static IP address. The AY1000 web interface switches to the new IP address immediately.

Note: The AY1000 default IP address is: 192.168.1.250 and the subnet mask is 255.255.255.0. You may need to change your laptop or PC IP address range to access the AY1000 web interface or you can use [PortVision DX](#) to change the IP address without changing your settings.

1. Open a web browser and enter the AY1000 IP address.
2. Click **Configuration | Network**.
3. Click **EDIT** button.



4. If necessary, change the **IP Type** to **static**.
5. Enter an IP address, subnet mask, and gateway address.

6. If applicable, enter the DNS1 and DNS2 addresses.

The screenshot shows the 'Network Settings' configuration page. The 'NETWORK CONFIGURATION' section is active, and the 'SAVE' button is highlighted with a red box. The configuration table is as follows:

NETWORK CONFIGURATION	
Status	
Current IP Address	192.168.11.183
Current Netmask	255.255.0.0
Current Gateway	192.168.0.253
Current DNS	
Configuration	
Host Name	<input type="text"/>
IP Type	static
Static IP Address (xxx.xxx.xxx.xxx)	192.168.11.183
Static Subnet Mask (xxx.xxx.xxx.xxx)	255.255.0.0
Static Gateway Address (xxx.xxx.xxx.xxx)	192.168.0.253
DNS 1 (xxx.xxx.xxx.xxx)	<input type="text"/>
DNS 2 (xxx.xxx.xxx.xxx)	<input type="text"/>
IP Address Conflict Detection	enable
Syslog Server IP/Hostname	<input type="text"/>
Syslog Server Port (0 - 65535)	514
SSH Server Enable	enable

7. Click the **SAVE** button.

The next configuration step is to assign the device name, go to [3.5. Device Name Assignment](#) on Page 20.

3.5. Device Name Assignment

Use one of the following methods to configure the Device Name.

- STEP 7 - refer to the following procedure
- Web interface - see [3.5.2. Using the Web Interface to Assign the Device Name](#) on Page 21 for information about using the AY1000 Configuration | PROFINET IO page.

3.5.1. Assign the Device Name in STEP 7

Use the following procedure to configure the Device Name using STEP 7.

1. Select the AY1000, open the *Edit Ethernet Node* window using the **PLC | Ethernet | Edit Ethernet Node** menu.
2. Click the **Browse** button to open the *Browse Network* window.
The unit should be displayed as an ifm IO-Link master with an empty device name.
3. Select the unit and click the **OK** button to return to the *Edit Ethernet Node* window.

The screenshot shows the 'Edit Ethernet Node' dialog box. It is divided into several sections:

- Ethernet node:** MAC address: 00-02-01-80-27-11. A 'Browse...' button is next to it.
- Set IP configuration:** Use IP parameters. IP address: 10.0.0.100. Subnet mask: 255.0.0.0. Gateway: Do not use router, Use router. Address: [empty field].
- Obtain IP address from a DHCP server.
- Identified by:** Client ID, MAC address, Device name. Client ID: [empty field].
- Assign device name:** Device name: ay1000. Assign Name button.
- Reset to factory settings:** Reset button.
- Buttons: Close, Help.

4. Set the device name. PROFINET IO Device Names are not case-sensitive. In this example, the device name was set to AY1000.

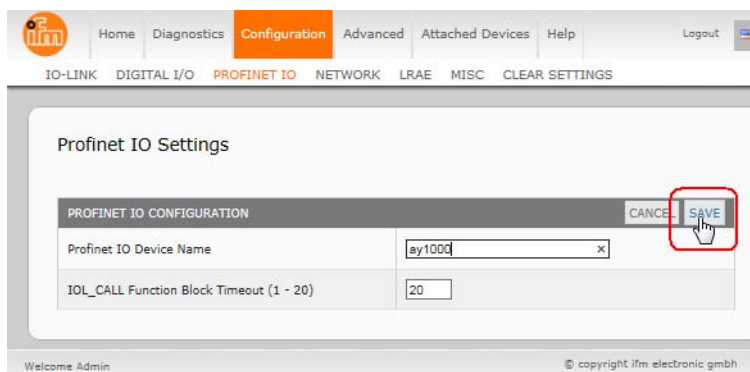
If there is a cyclic communication between the device and an IO controller, the cyclic communication has to be stopped before the device name can be changed.

3.5.2. Using the Web Interface to Assign the Device Name

You can use the **Configuration | Profinet IO Settings** page to assign the device name for PROFINET IO with the IO-Link master.

Note: Changes to device name using the web interface take effect immediately. It may interfere with the communication between the device and IO controller.

1. If necessary, open the AY1000 web interface with your web browser using the IP address.
2. Click **Configuration | PROFINET IO Settings**.
3. Click the **EDIT** button.
4. Enter the **PROFINET IO Device Name**.
The **PROFINET IO Device Name** is the same as the name later used to configure PROFINET IO for the AY1000. The **PROFINET IO Device Name** is not case-sensitive.
5. If necessary, change the **IOL_CALL Function Block Timeout (1-20)** value to reflect your environment.
6. Click **SAVE**.

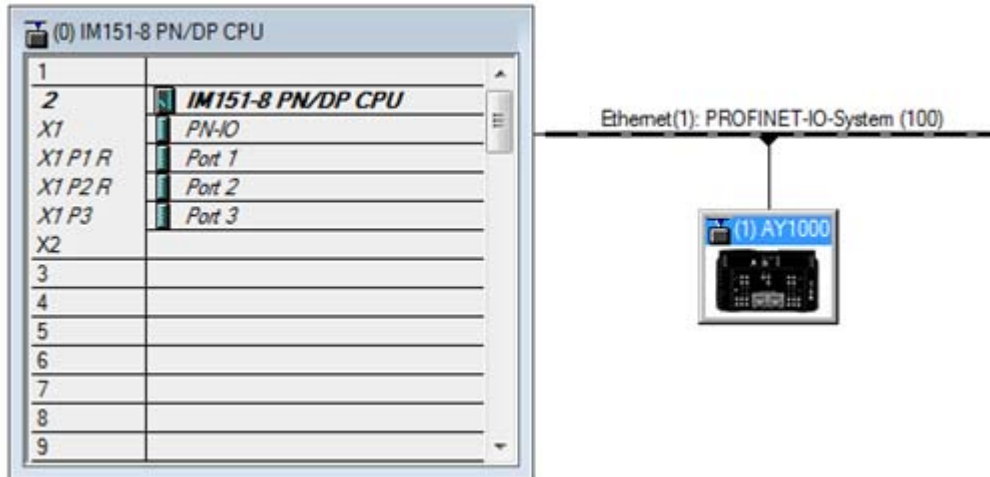


Parameter	Description
PROFINET IO Device Name (Default: empty)	<p>The device name must be specified according to DNS conventions.</p> <ul style="list-style-type: none"> • Restricted to a total of 240 characters (letters, digits, dash or period) • Parts of the name within the device name; in other words, a string between two periods, must not exceed a maximum of 63 characters. • No special characters such as umlauts (ä, ö etc.), brackets, underscore, slash, blank etc. The dash is the only permitted special character. • The device name must not begin or end with the "-" character. • The device name must not begin with numbers. • The device name must not have the structure n.n.n.n (n = 0...999). • The device name must not begin with the character string "port-xyz-" (x , y, z = 0...9).
IOL_CALL Function Block Timeout (1-20) (Default: 20)	The timeout value in seconds for IOL_CALL function block.

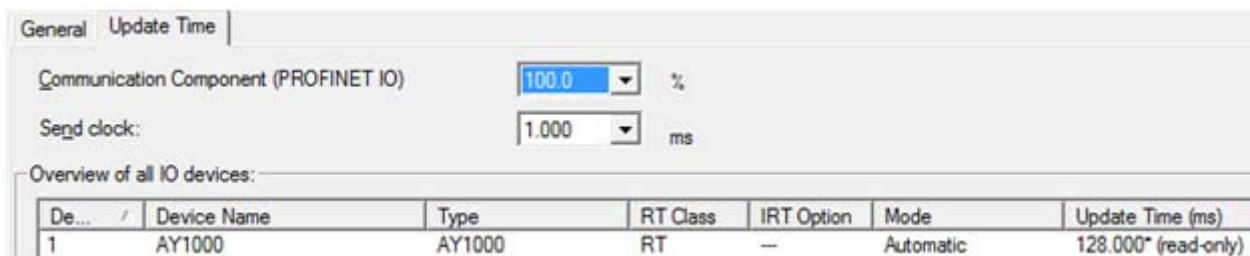
3.6. Setting the IO Device Update Time

Use the following procedure to set the IO Device Update Time.

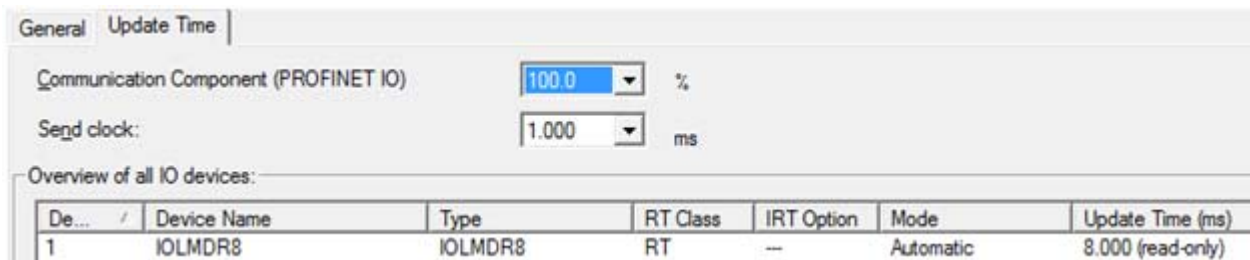
1. Double-click the **Ethernet(1): PROFINET-IO-System (100)**.



2. In the *Properties - PROFINET IO-System* window, select the **Update Time** tab, as shown in the image below.



Configuring IO Device Update Timer



Configuring IO Device Update Timer

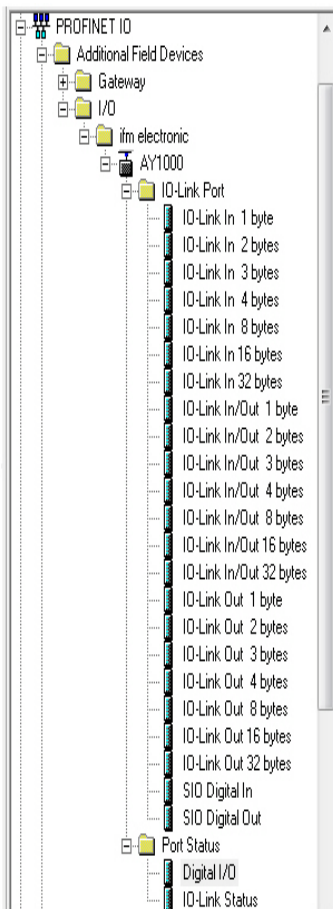
3. Set the desired update time. The fastest IO device update time is 8ms.

3.7. Configuring IO-Link Ports

The IO-Link master gateway has two categories of IO modules:

- [3.7.1. IO-Link Port Modules](#) on Page 23
- [3.7.2. Port Status Modules](#) on Page 28

IO modules are used to configure IO-Link ports and exchange PDI and PDO data with various IO-Link devices and digital I/O devices. The following image shows available modules of the AY1000.



IO-Link master Gateway Modules

3.7.1. IO-Link Port Modules

An IO-Link port can be configured as one of the following:

- IO-Link Mode
- SIO Digital In Mode
- SIO Digital Out Mode.

IO-Link Port modules are used to configure the mode of an IO-Link port.

All the IO-Link modules start with the **IO-Link** (that is: IO-Link In, IO-Link Out and IO-Link In/Out) configure the corresponding IO-Link port as IO-Link Mode. An SIO Digital In module configures the IO-Link port as SIO Digital In Mode. Similarly, an SIO Digital Out module configures the port as SIO Digital Out Mode.

- An **IO-Link module** can be input only, output only or both. In addition, there are different modules with various IO data sizes (1 to 32 bytes). For example, the IO-Link In/Out 4 bytes module is for an IO-Link device that supports up to 4-byte PDI data and 4-byte PDO data. If you do not find an exact matching IO size, select the next size (larger). For instance, use IO-Link in 16-bytes module for an IO-Link device that has 10-byte PDI data. The unused PDI data is filled with zeros.
- For **SIO Digital In module**, the PDI data is fixed at 1-byte. A high voltage on the IO-Link port C/Q Pin results in a 0x01 PDI data; a low voltage on the C/Q Pin results in a 0x00 PDI data.
- For **SIO Digital Out module**, the PDO data is fixed at 1-byte. A zero output value from an SIO Digital Out module sets the IO-Link port C/Q pin to low voltage. Any non-zero output value sets the C/Q pin to high voltage.

<i>IO-Link Port Module Input Data Format</i>	
Byte Offset	Description
0	PDI Data Block byte 0
1	PDI Data Block byte 1
...	...
31	PDI Data Block byte 31

<i>IO-Link Port Module Output Data Format</i>	
Byte Offset	Description
0	PDO Data Block byte 0
1	PDO Data Block byte 1
...	...
31	PDO Data Block bytes 31

IO-Link Port modules are allowed in Slot 1 to 8. Slot 1 corresponds to IO-Link Port 1, Slot 2 corresponds to IO-Link Port 2, and so forth. If a slot is unpopulated, the corresponding IO-Link port is not configured. That port uses the previously configured settings, or default settings if it has not been configured before.

3.7.1.1. IO-Link Port Settings

Additional IO-Link port settings can be configured by using module parameters.

3.7.1.2. IO-Link Port Module Parameters

Use the following information to configure IO-Link port module parameters.

1. Double-click an IO-Link Port module.
2. Select the **Parameters** table. Available parameters are shown in the following figure and the table describes how to use the parameters.

Parameter	Value
IO-Link Port Config	
Minimum Cycle Time	4
Data Storage Config	
Automatic Upload Enable	Off
Automatic Download Enable	Off
Validation Config	
Device Validation Mode	None
Vendor Id	0
Device Id	0
Serial Num	
Data Validation Mode	None
PDI Length	0
PDO Length	0

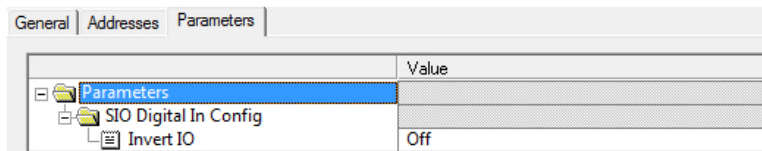
IO-Link Port Module Parameters	
IO-Link Port Config	
Minimum Cycle Time (Default: 4) Valid range: 4-538ms	The minimum or fastest cycle time at which the IO-Link device may operate. You can leave the Minimum Cycle Time set to the default value and the IO-Link master negotiates with the IO-Link device for its minimum cycle time. The <i>IO-Link Diagnostics</i> page displays the Actual Cycle Time , which is the negotiated cycle time.
Data Storage Config	
Automatic Data Storage Upload Enable <i>Default: Off</i>	<p>When this option is initially set to On, the AY1000 saves the data storage (if the data storage is empty) from the IO-Link device to that port. Some IO-Link devices update the data storage contents if you use the Teach buttons on the IO-Link device, but that is determined by the IO-Link device manufacturer.</p> <p>Automatic upload occurs when the Automatic Upload Enable option is set to On and one of these conditions exists:</p> <ul style="list-style-type: none"> • There is no upload data stored on the gateway. • The IO-Link device executes a requests_ at upload function (generally because you have changed the configuration via Teach buttons). <p>Do not enable both Automatic Upload and Automatic Download at the same time, the results are not reliable among IO-Link device manufacturers.</p> <p>When a port contains data storage for an IO-Link device and if you attach a device whose Vendor and Device ID do not match, the IO-Link LED on the AY1000 flashes red to indicate a wrong device is attached. In addition, the <i>IO-Link Diagnostics</i> page displays DV: Wrong Sensor in the IOLink State field.</p> <p>You should not enable Automatic Upload until after you have configured the IO-Link device attached to the port unless you want to capture the default settings. Refer to 10.1. Data Storage on Page 67 for more information.</p>

IO-Link Port Module Parameters	
Automatic Data Storage Download Enable <i>Default: Off</i>	<p>The data stored on the AY1000 port is downloaded to the IO-Link device if:</p> <ol style="list-style-type: none"> 1. This option is selected. 2. The data stored on the AY1000 port contains the same Vendor ID and Product ID as the IO-Link device connected to the port. 3. The data stored on the AY1000 port is different than that of the IO-Link device. 4. The IO-Link device requests an upload and the Automatic Upload Enable option is set to Off. <p>If you change configuration parameters on the IO-Link device and want the parameters to remain loaded on the IO-Link device, you must disable the Automatic Download option because otherwise the AY1000 will reload the data storage on the port down to the IO-Link device.</p> <p>Do not enable both Automatic Upload and Automatic Download at the same time, the results are not reliable among IO-Link device manufacturers.</p>
Validation Config	
Device Validation Mode <i>(Default: None)</i>	<p>Device Validation Mode provides these options:</p> <ul style="list-style-type: none"> • None - this disables Device Validation Mode. • Compatible - permits a compatible IO-Link device (same Vendor ID and Device ID) to function on the corresponding port. • Identical - only permits an IO-Link device to function on the corresponding port as defined in the following fields. <ul style="list-style-type: none"> - Vendor ID - Device ID - Serial Number
Vendor Id (0-65535)	This is required if you select a Device Validation Mode other than None .
Device Id (0-16777215)	This is required if you select a Device Validation Mode other than None .
Serial Num	This is required if you select Identical for the Device Validation Mode .
Data Validation Mode <i>(Default: None)</i>	<p>There are three Data Validation Modes:</p> <ul style="list-style-type: none"> • None - no data validation is performed on the port. • Loose - the slave device's PDI/PDO lengths must be less than or equal to the user-configured values. • Strict - the slave device's PDI/PDO lengths must be the same as the user-configured values.
PDI Length (0-32)	<p>This is input length of the PDI data field.</p> <p>This is required if you select a Data Validation Mode other than None.</p>
PDO Length (0-32)	<p>This is input length of the PDO data field.</p> <p>This is required if you select a Data Validation Mode other than None.</p>

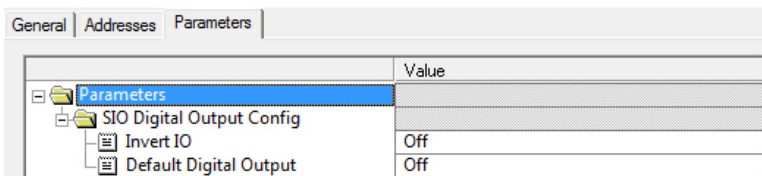
3.7.1.3. SIO Digital In/Out Module Parameters

Use the following procedure to configure SIO digital in/out module parameters.

1. Double-click an SIO Digital In or SIO Digital Output module.
2. Select the **Parameters** table. Available parameters are shown in the next two images and the table describes SIO digital input and output module parameters.



SIO Input Module Parameter



SIO Output Module Parameters

SIO Digital Input and Output Module Parameters	Description
<i>SIO Digital Input</i>	
Invert IO (Default: False)	If enabled, this inverts the I/O value. <ul style="list-style-type: none"> • False (Disabled - Do not invert IO) • True (Enabled - Invert IO) <p>Note: <i>This does not affect the Auxiliary Input.</i></p>
<i>SIO Digital Output</i>	
Invert IO (Default: False)	If enabled, this inverts the I/O value. <ul style="list-style-type: none"> • False (Disabled - Do not invert IO) • True (Enabled - Invert IO) <p>Note: <i>This does not affect the Auxiliary Input.</i></p>
Default Digital Output (Default: Off)	Defines the default digital output value that is used at startup and when there is no active PDO controller. <ul style="list-style-type: none"> • Off (low voltage) • On (high voltage)

3.7.2. Port Status Modules

There are two **Port Status** modules:

- IO-Link Status Module
- Digital I/O Module.

3.7.2.1. IO-Link Status Module

IO-Link Status module is a 4-byte input only module that provides status information of all IO-Link ports. The following table shows the data format of IO-Link Status module.

Byte Offset	Status Byte Description
0	IO-Link Active
1	IO-Link PDI Valid
2	IO-Link Auxiliary Input
3	IO-Link Error

Each IO-Link port is mapped into one bit of each byte in the IO-Link Status module as shown in this table. For

<i>Bit Map of IO-Link Active, IO-Link Error, and Auxiliary Input Modules</i>								
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IO-Link Port	Port 8	Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1

IO-Link Active status byte (offset 0), a bit one means the corresponding IO-Link port is active. An IO-Link port is considered as active when it is configured correctly and has a working IO-Link device attached.

A bit one in IO-Link PDI Valid status byte (offset 1) means the PDI data from the corresponding IO-Link port is valid. PDI Valid is only applicable to IO-Link port modules that have input data.

- If there are any errors detected when communicating with the IO-Link device, the corresponding bit in the IO-Link Error status byte (offset 2) will be set to 1.
- If a high voltage is detected on the auxiliary input of an IO-Link port, the corresponding bit in the IO-Link Auxiliary Input status byte (offset 3) will be set to 1.

See the following table for the description of each byte of the **IO-Link Status** module.

Status Byte	Status Bit Description
IO-Link Active	<ul style="list-style-type: none"> • 0: IO-Link port is not active, no IO-Link device is detected. • 1: IO-Link port is active, an IO-Link device is detected and operational.
IO-Link PDI Valid	<ul style="list-style-type: none"> • 0: IO-Link port PDI data is not valid. • 1: IO-Link port PDI data is valid.
IO-Link Auxiliary Input	<ul style="list-style-type: none"> • 0: Low voltage detected on the auxiliary pin of an IO-Link port. • 1: High voltage detected on the auxiliary pin of an IO-Link port.
IO-Link Error	<ul style="list-style-type: none"> • 0: No error detected • 1: An error detected. The further information about the error is available in PROFINET IO channel diagnostics.

3.7.2.2. Digital I/O Module

Digital I/O module has 1-byte input and 1-byte output. There are a total of four digital I/O ports: DIO 1-4. DIO 2 and DIO 4 can be configured as outputs. Use the following table to map DIO pins into bits of Digital IO module.

For input, a bit one means that high voltage is detected on that DIO pin. A zero means low voltage is detected on the DIO pin. Bits 4-7 are not in use and always return as zeros.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
DIO Input	0	0	0	0	DIO 4	DIO 3	DIO 2	DIO 1
DIO Output	-	-	-	-	DIO 4	-	DIO 2	-

To use DIO 2 and DIO 4 as outputs, first they need to be configured as digital output.

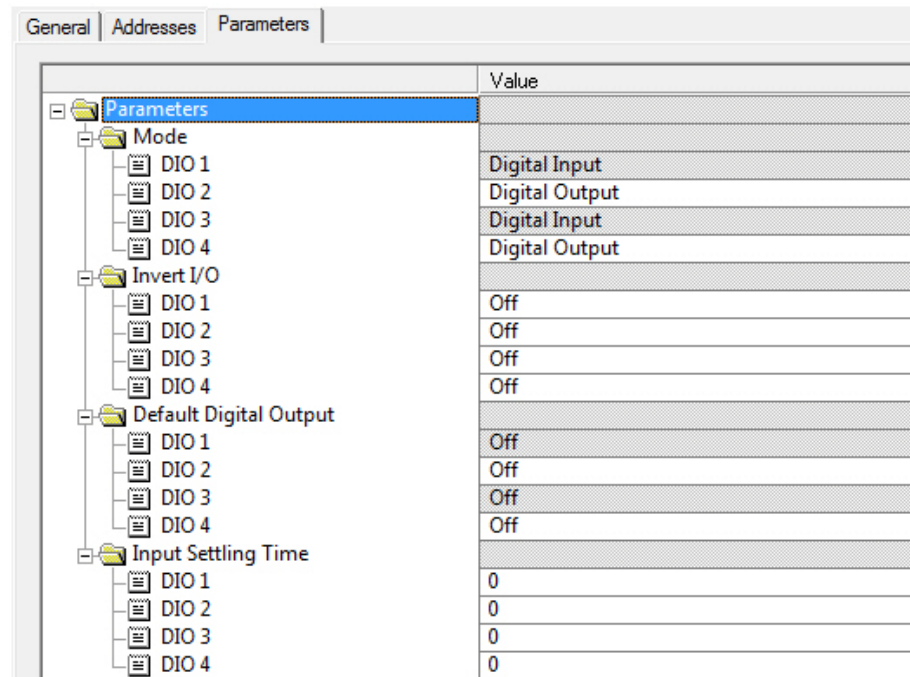
Use the following procedure to configure digital output.

1. Double-click the **Digital I/O** module to open up the *Parameters* window, as shown in the following figure.
2. Change the parameter **Mode** of DIO 2 and DIO 4 to **Digital Output**.

Once configured, writing a one to Bit 1 and Bit 3 of the Digital I/O module output sets DIO 2 and DIO 4 pins to high. Clearing Bit 1 and Bit 3 to zero sets DIO 2 and DIO 4 pins to low.

Note: Only Bit 1 and Bit 3 of the Digital I/O module output are in use. Changing the value of other bits has no effects.

The following table shows the description of available parameters of Digital I/O Module.



Parameter	Value
Parameters	
Mode	
DIO 1	Digital Input
DIO 2	Digital Output
DIO 3	Digital Input
DIO 4	Digital Output
Invert I/O	
DIO 1	Off
DIO 2	Off
DIO 3	Off
DIO 4	Off
Default Digital Output	
DIO 1	Off
DIO 2	Off
DIO 3	Off
DIO 4	Off
Input Settling Time	
DIO 1	0
DIO 2	0
DIO 3	0
DIO 4	0

Digital I/O Module Parameters	Description
Mode (Default: Digital Input)	<ul style="list-style-type: none">• Digital Input - monitors the digital input status on the DIO terminal screw connection• Digital Output - sets the digital output to either the default setting or value received from a controller.
Invert I/O (Default: Off)	If enabled, this inverts the I/O value. If Mode is set to Digital Input , this inverts the input status. If Mode is set to Digital Output , this inverts both input and output. <ul style="list-style-type: none">• False (Disabled - Do not invert IO)• True (Enabled - Invert IO)
Default Digital Output (Default: Off)	Defines the default digital output value at startup before a controller can set the digital output, or when communication to all controller(s) has been lost. <ul style="list-style-type: none">• Off (low voltage)• On (high voltage)
Input Settling Time 0-10000ms (Default: 0ms)	If non-zero and Mode is set to Digital Input , the required time that the input status must remain constant before an input status change is reported.

3.7.3. Configuring IO-Link Ports with the Web Interface

IO-Link port settings (for example, port mode, minimum cycle time, data storage, validation, and device validation) should be configured through STEP 7 by adding correct modules and setting modules' parameters. Optionally, the same settings can be changed through the web interface.

Note: Any changes made through the web interface are overwritten when an application relation is established between a gateway and an IO controller.

This page provides special features such as Data Storage, Device Validation, and Data Validation.

Note: Do not configure Data Storage until the IO-Link device is configured. Data Storage, Device Validation, and Data Validation are discussed in [Chapter 10. Utilizing AY1000 Features](#) on Page 67.

You can use this procedure to configure IO-Link settings for each IO-Link port.

If an IO-Link device is attached to the port, no configuration is required for operation. If a digital input or output device is attached, it is necessary to change the **Port Mode**.

1. If necessary, open the IO-Link master web interface with your web browser using the IP address.
2. Click **Configuration | IO-Link Settings**.
3. Click the **EDIT** button for the port or ports that you want to configure.

The screenshot displays the 'IO-Link Settings' web interface. At the top, there is a navigation bar with 'Home', 'Diagnostics', 'Configuration' (highlighted), 'Advanced', 'Attached Devices', and 'Help'. Below this is a sub-navigation bar with 'IO-LINK', 'DIGITAL I/O', 'PROFINET I/O', 'NETWORK', 'LRAE', 'MISC', and 'CLEAR SETTINGS'. The main content area is titled 'IO-Link Settings' and features a table with two columns: 'PORT 1' and 'PORT 2'. The 'EDIT' button for PORT 1 is circled in red. A red text box in the top right corner of the table area reads 'Collapse and expand to customize your view.' The table contains various configuration options such as Port Name, Port Mode, Invert IO, Default Digital Output, Minimum Cycle Time, Data Storage Config, and Validation Config.

Note: You can click each **EDIT** button and open all ports to quickly configure port parameters.

4. Make appropriate selections for the device that you connected to that port.

Make sure you select the **DigitalIn** option for a digital input device and the **DigitalOut** option for a digital output device for the **Port Mode**.

The AY1000 negotiates the **Minimum Cycle Time** so it is not necessary to set a cycle time unless you need a specific cycle time.

You can use the help system if you require definitions or values for the options or refer to the following table.

Note: Do not configure Data Storage until the IO-Link device is configured.

Note: Do not enable **Automatic Download** and then attempt device configuration as **Automatic Download** changes the settings back to what is stored on the AY1000. **Data Storage**, **Device Validation**, and **Data Validation** are discussed in [Chapter 10. Utilizing AY1000 Features](#) on Page 67.

5. Click the **SAVE** button for each port.
6. Return to the **IO-Link Diagnostics** page to verify that your changes have taken affect. The **Configuration | IO-Link Settings** 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:</i> IO-Link	Selected IO-Link port mode. Valid settings are: <ul style="list-style-type: none"> • Reset - Select to disable a port or to reset/restart an IO-Link port. • IO-Link - Select to connect and operate an IO-Link device on the port. • Digital In - Select if a DI device is attached to the port. • Digital Out - Select if a DO device is attached to the port.
Invert IO <i>Default:</i> False	If enabled and the Port Mode is Digital In or Digital Out , this option inverts the I/O value. <ul style="list-style-type: none"> • False (Disabled - Do not invert IO) • True (Enabled - Invert IO) <p>Note: This option does not affect the Auxiliary Input.</p>
Default Digital Output <i>Default:</i> Off	If the port mode is Digital Out , defines the default digital output value that is used at startup and when there is no active PDO controller. <ul style="list-style-type: none"> • Off (low voltage) - 0 • On (high voltage) - 24V
Minimum Cycle Time <i>Default:</i> 4	The minimum, or fastest, cycle time at which the IO-Link device may operate. The valid range is 4-538 ms. You can leave the Minimum Cycle Time set to the default value and the IO-Link master negotiates with the IO-Link device for its minimum cycle time. The IO-Link Diagnostics page displays the Actual Cycle Time , which is the negotiated cycle time.

IO-LINK Settings Page (Continued)	
Data Storage Config	
Storage Contents	Indicates that the data storage for the port is empty or displays the Vendor ID and Product ID of the data stored on that port.
Automatic Data Storage Upload Enable <i>Default: Off</i>	<p>When this option is initially set to On, the AY1000 saves the data storage (if the data storage is empty) from the IO-Link device to that port. Some IO-Link devices update the data storage contents if you use the Teach buttons on the IO-Link device, but that is determined by the IO-Link device manufacturer.</p> <p>Automatic upload occurs when the Automatic Upload Enable option is set to On and one of these conditions exists:</p> <ul style="list-style-type: none"> • There is no upload data stored on the gateway. • The IO-Link device executes a requests_ at upload function (generally because you have changed the configuration via Teach buttons). <p>Do not enable both Automatic Upload and Automatic Download at the same time, the results are not reliable among IO-Link device manufacturers.</p> <p>When a port contains data storage for an IO-Link device and if you attach a device whose Vendor and Device ID do not match, the IO-Link LED on the AY1000 flashes red to indicate a wrong device is attached. In addition, the <i>IO-Link Diagnostics</i> page displays DV: Wrong Sensor in the IOLink State field.</p> <p>You should not enable Automatic Upload until after you have configured the IO-Link device attached to the port unless you want to capture the default settings. Refer to 10.1. Data Storage on Page 67 for more information.</p>
Automatic Data Storage Download Enable <i>Default: Off</i>	<p>The data stored on the AY1000 port is downloaded to the IO-Link device if:</p> <ol style="list-style-type: none"> 1. This option is selected. 2. The data stored on the AY1000 port contains the same Vendor ID and Product ID as the IO-Link device connected to the port. 3. The data stored on the AY1000 port is different than that of the IO-Link device. 4. The IO-Link device requests an upload and the Automatic Upload Enable option is set to Off. <p>If you change configuration parameters on the IO-Link device and want the parameters to remain loaded on the IO-Link device, you must disable the Automatic Download option because otherwise the AY1000 will reload the data storage on the port down to the IO-Link device.</p> <p>Do not enable both Automatic Upload and Automatic Download at the same time, the results are not reliable among IO-Link device manufacturers.</p>
Data Storage Manual Ops	<p>The Manual Data Storage Ops option provides the following functionality, if data storage is supported by the IO-Link device.</p> <ul style="list-style-type: none"> • CLEAR - this clears any stored data for an IO-Link device on this port. • UPLOAD - this uploads and stores the IO-Link device configuration on the AY1000. • DOWNLOAD - this downloads the stored IO-Link device configuration from the AY1000 to the IO-Link device attached to this port if the Vendor ID and Device ID match.

IO-LINK Settings Page (Continued)	
Validation Config	
Device Validation Mode (Default: None)	<p>Device Validation Mode provides these options:</p> <ul style="list-style-type: none"> • None - this disables Device Validation Mode. • Compatible - permits a compatible IO-Link device (same Vendor ID and Device ID) to function on the corresponding port. • Identical - only permits an IO-Link device to function on the corresponding port as defined in the following fields. <ul style="list-style-type: none"> - Vendor ID - Device ID - Serial Number
Vendor Id (0-65535)	<p>This is required if you select a Device Validation Mode other than <i>None</i>.</p> <p>The Vendor ID can be manually entered in this field or click the GET ATTACHED button and the IO-Link master propagates the Vendor ID in this field.</p>
Device Id (0-16777215)	<p>This is required if you select a Device Validation Mode other than <i>None</i>.</p> <p>The Device ID can be manually entered in this field or click the GET ATTACHED button and the IO-Link master propagates the Device ID in this field.</p>
Serial Num	<p>This is required if you select Identical for the Device Validation Mode.</p> <p>The Serial Number can be manually entered in this field or click the GET ATTACHED button and the IO-Link master propagates the serial number in this field.</p>
Data Validation Mode (Default: None)	<p>There are three Data Validation Modes:</p> <ul style="list-style-type: none"> • None - no data validation is performed on the port. • Loose - the slave device's PDI/PDO lengths must be less than or equal to the user-configured values. • Strict - the slave device's PDI/PDO lengths must be the same as the user-configured values.
PDI Length (0-32)	<p>This is input length of the PDI data field.</p> <p>This is required if you select a Data Validation Mode other than <i>None</i>.</p> <p>The PDI Length can be manually entered in this field or click the GET ATTACHED button and the IO-Link master propagates the PDI length in this field.</p>
PDO Length (0-32)	<p>This is input length of the PDO data field.</p> <p>This is required if you select a Data Validation Mode other than <i>None</i>.</p> <p>The PDO Length can be manually entered in this field or click the GET ATTACHED button and the IO-Link master propagates the PDO length in this field.</p>
GET ATTACHED (Button)	<p>After opening a port for editing, you can click the GET ATTACHED button instead of manually entering data in the following fields:</p> <ul style="list-style-type: none"> • Vendor Id • Device Id • Serial Num • PDI Length • PDO Length

Chapter 4. AY1000 Device Configuration

The following topics are discussed in this chapter.

- [Setting User Accounts and Passwords](#) on Page 35
- [Configuring Miscellaneous Settings](#) on Page 38

4.1. Setting User Accounts and Passwords

The AY1000 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 - IO-Link Settings	Yes	Yes	View-only
Configuration - Digital I/O Settings	Yes	Yes	View-only
Configuration - PROFINET IO	Yes	Yes	View-only
Configuration - Network	Yes	View-only	No
Configuration - Misc	Yes	Yes	Yes
Configuration - Clear Settings	Yes	No	No
Advanced - Software	Yes	No	No
Advanced - Accounts	Yes	No	No
Advanced - Log Files	Yes	Yes	Yes
Advanced - Licenses	Yes	Yes	Yes
Attached Devices - IO-Link Device Description Files	Yes	Yes	View-only
Attached Devices - IO-Link Device Configuration Summary	Yes	Yes	View-only
Attached Devices - IO-Link Device - Port	Yes	Yes	View-only

You can use this procedure to set up passwords for the AY1000.

1. Open your browser and enter the AY1000 IP address.
2. Click **Advanced | 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**.

The screenshot shows the 'Accounts' configuration page in the AY1000 web interface. The navigation bar includes 'Home', 'Diagnostics', 'Configuration', 'Advanced' (selected), 'Attached Devices', and 'Help'. Below the navigation bar are sub-tabs for 'SOFTWARE', 'ACCOUNTS', 'LOG FILES', and 'LICENSES'. The main content area is titled 'Accounts' and contains three sections for 'ADMIN', 'OPERATOR', and 'USER'. Each section has a 'NO PASSWORD' label and a checkbox. The 'ADMIN' section has input fields for 'Old Password', 'New Password', and 'Confirm Password'. The 'OPERATOR' section has input fields for 'New Password' and 'Confirm Password'. The 'USER' section has input fields for 'New Password' and 'Confirm Password'. An 'Apply' button is located at the bottom right of the page.

10. Close the new window that displays a *Password saved* banner.

Accounts

Passwords saved : AdminPassword, OperatorPassword, UserPassword

ADMIN	(PASSWORD IS CONFIGURED)	<input type="checkbox"/>
Old Password	<input type="text"/>	
New Password	<input type="password"/>	
Confirm Password	<input type="password"/>	

OPERATOR	(PASSWORD IS CONFIGURED)	<input type="checkbox"/>
New Password	<input type="password"/>	
Confirm Password	<input type="password"/>	

USER	(PASSWORD IS CONFIGURED)	<input type="checkbox"/>
New Password	<input type="password"/>	
Confirm Password	<input type="password"/>	

Apply

11. Click the **Log out** button on the top navigation bar.

12. Re-open the web interface by selecting the appropriate user type in the drop list and entering the password.

Home

User: Admin

Password: [masked]

Log out

http://192.168.11.196/index.php/login

© copyright ifm electronic gmbh

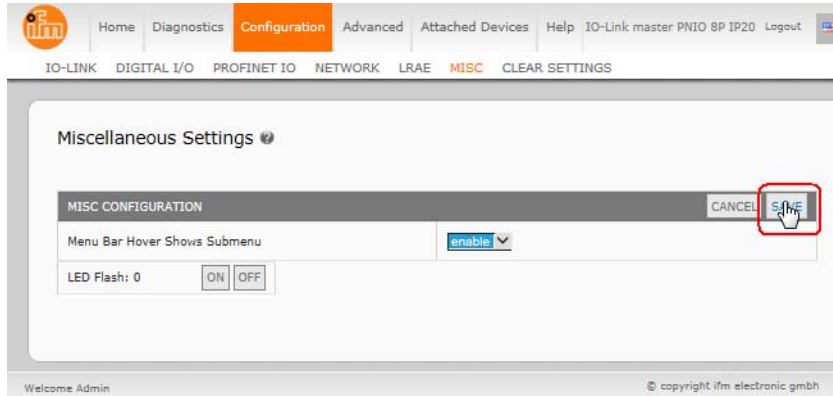
4.2. Configuring Miscellaneous Settings

The **Miscellaneous Settings** page includes these options:

- **Menu Bar Hover Shows Submenu**

This option displays sub-menus for a category when you hover over the category name.

For example, if you hover over **Advanced**, the **SOFTWARE**, **ACCOUNTS**, **LOG FILES**, and **LICENSES** sub-menus display. You can click any submenu and avoid opening the default menu for a category.



- **LED Flash**

You can force the IO-Link port LEDs on the AY1000 into a flashing tracker pattern that allows you to easily identify a particular unit.

- Click the **ON** button to enable the LED tracker feature on the AY1000. The LEDs remain flashing until you disable the LED tracker feature
- Click the **OFF** button to disable the LED tracker.

Chapter 5. Updating Images and Applications

This chapter provides an overview of the software (images and applications) on the AY1000. In addition it contains procedures to update images ([Page 41](#)) and application subassemblies ([Page 42](#)).

After verifying that the AY1000 contains the latest software, the next step is to configure the port characteristics using [Chapter 3. Configuring the AY1000 with STEP 7](#) on Page 11.

5.1. Images and Application Subassemblies Overview

The AY1000 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 AY1000 **ADVANCED | Software** page.

The screenshot shows the 'Software' page in the AY1000 Advanced interface. The page has a navigation bar with 'Home', 'Diagnostics', 'Configuration', 'Advanced' (highlighted), 'Attached Devices', and 'Help'. Below the navigation bar are tabs for 'SOFTWARE', 'ACCOUNTS', 'LOG FILES', and 'LICENSES'. The main content area is titled 'Software' and contains two sections: 'IMAGES' and 'APPLICATIONS'. Each section has a table listing components and their versions, with an 'UPDATE' button for each row. At the bottom, there is an 'Update Application' section with a 'Browse...' button, an 'Install' button, and a 'REBOOT' button.

IMAGES		
U-Boot Bootloader	1.13	UPDATE
FPGA	0.02	UPDATE
System - Primary	1.12	UPDATE
System - Backup	1.12	UPDATE
Application Base	1.3.5	UPDATE

APPLICATIONS	
application-manager	1.3.0.2
configuration-manager	1.3.0.5
discovery-protocol	1.3.0.2
event-log	1.3.0.0
indappmgr	1.3.0.13
iolink-driver	1.3.0.7
profinetio	1.3.0.6
web-help	1.3.9.1
web-user-interface	1.3.1.22

Update Application

Optionally, you can use PortVision DX to load all images or application subassemblies.

Note: *PortVision DX displays the main application base version, which in this case is PROFINET IO. Use the Software page to determine other image or application versions.*

5.1.1. Images

The following table discusses AY1000 images.

AY1000 Images	
U-Boot Bootloader	<p>U-Boot is a high-level Bootloader that has networking and console command line capabilities. Among other things, it implements a TFTP server and ifm Corporation's new discovery protocol.</p> <p>This verifies that a Linux kernel image exists in NAND, then copies it to RAM and starts the AY1000. The U-Boot version is displayed after the image name.</p>
FPGA	<p>The FPGA partition/image contains configuration data used by programmable hardware within the AY1000 unit. FPGA images are unique to the hardware and protocol type. Make sure you download the correct image for your platform.</p>
uImage - Primary/ Backup	<p>The uImage contains the Linux kernel and the RAM-resident root file system. It does not contain industrial protocol support or application-specific features.</p> <p>There is a Primary and Backup version loaded on the AY1000. The AY1000 automatically reloads the Backup uImage if the file system corrupted.</p> <p>The uImage version is displayed after the Primary/Backup uImage.</p>
Application Base	<p>The Application Base image comprises a flash-resident file system containing applications and protocol support.</p> <p>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.</p> <p>The application subassemblies in the Application Base image are displayed in the lower portion of the SOFTWARE page.</p> <p>The Application Base assembly has a 3-tuple version number: (for example, 1.3.18).</p>

5.1.2. Application Subassemblies

Application subassemblies are the components of the Application Base image. Application subassemblies have a 4-tuple version number (for example, 1.3.18.3). 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 1.3.18.3 was tested with application base version 1.3.18. 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 1.20.2. It will not install on a device with application base version 1.21.5.

AY1000 Application Subassemblies	
application-manager	The Application Manager version loaded on the AY1000.
configuration-manager	The Configuration Manager version loaded on the AY1000.
discovery-protocol	The Discovery Protocol version loaded on the AY1000.
event-log	The Event log version loaded on the AY1000.
iolink-driver	The IO-Link driver version loaded on the AY1000.
io-link manager	The IO-Link manager version loaded on the AY1000, which provides support for PROFINET IO.
profinetio	The PROFINET IO version loaded on the AY1000.
web-help	The web interface help version loaded on the AY1000.
web-user-interface	The web interface version loaded on the AY1000.

5.2. Using the Web Interface to Update Software

The upper portion of the **Advanced | Software** page is used to update the AY1000 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.

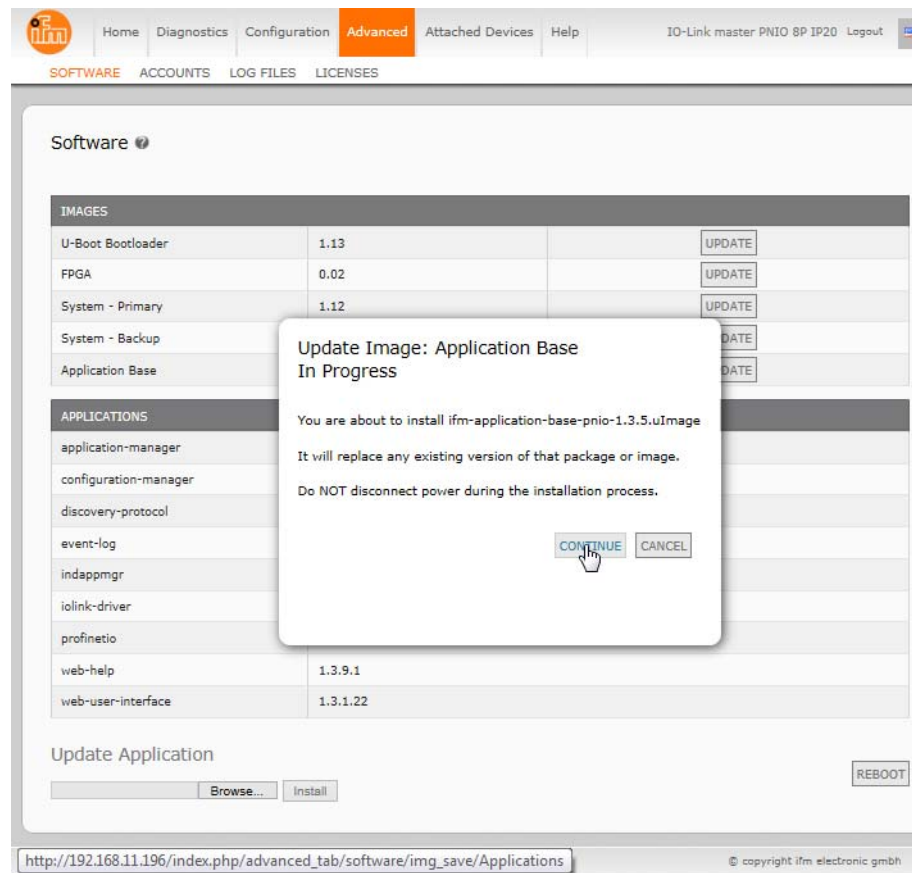
5.2.1. Updating Images

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

1. Download the latest image from the [ifm web site](#).

Note: Make sure that you download the appropriate software for your model. For example, the FPGA images are unique for different hardware models and protocol.

2. Open your browser and enter the IP address of the AY1000.
3. Click **Advanced | SOFTWARE**.
4. Click the **UPDATE** button next to the image you want to update.
5. Click the **Browse** button, navigate to the file location, highlight the image, and click **Open**.
6. Click the **Install** button.



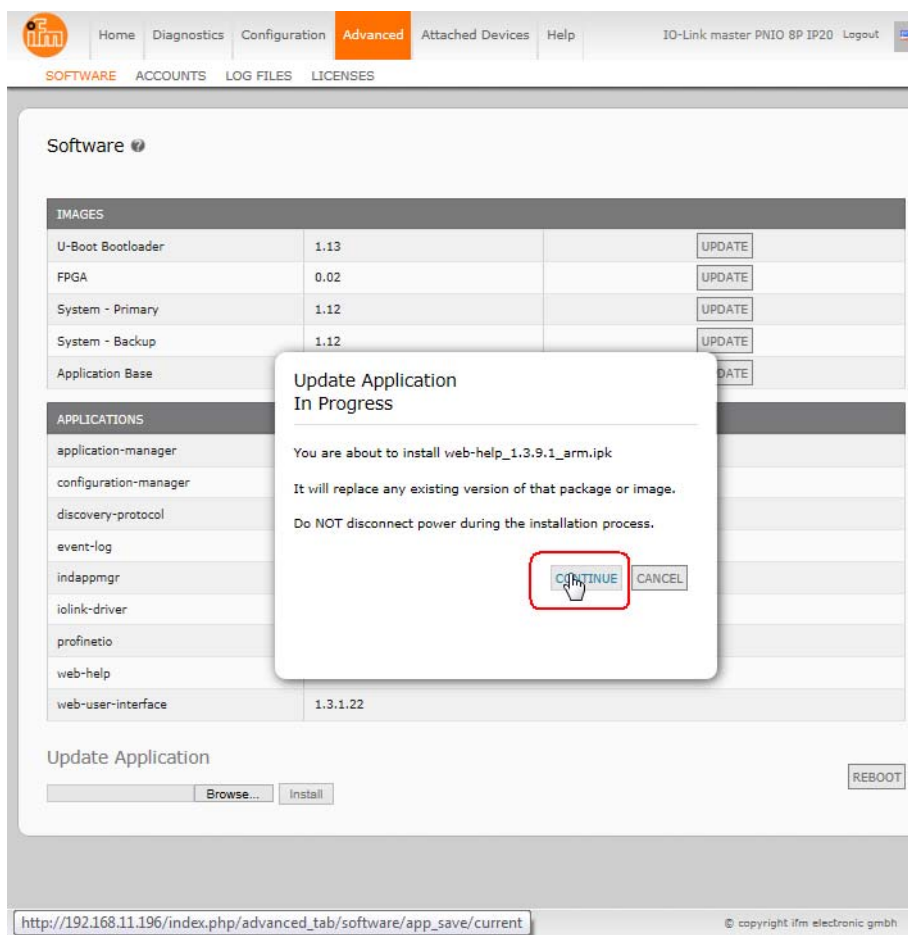
7. Click the **CONTINUE** button to the *Update Image* message.
8. Click **OK** to close the *Update Image Successful* message.

Note: Some images may require the AY1000 web server to restart.

5.2.2. Updating Application Subassemblies

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

1. Download the latest application from the [ifm web site](#).
2. Open your browser and enter the IP address of the AY1000.
3. Click **Advanced** and **SOFTWARE**.
4. Click the **Browse** button under **Update Application** navigate to the file location, highlight the application, 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 6. Connecting Devices

This chapter discusses connecting devices to the AY1000.

6.1. Connecting Devices to IO-Link Ports

The following provides information about the IO-Link ports.

Signal	Description	Value
L+	Power Supply Output (+)	200mA @ 24V (Maximum)
L-	Power Supply Output (-)	
DI	Digital Input	Not applicable.
C/Q	Communication signal, which supports SDCI (IO-Link) or SIO (standard input/output)	200mA @ 24V (Maximum)



Use the appropriate procedure to connect devices to the IO-Link ports.

- [Connecting IO-Link Devices](#) on Page 44
- [Connecting Digital Input Devices to IO-Link Ports](#) on Page 44

6.1.0.1. Tips When Connecting Devices to the AY1000

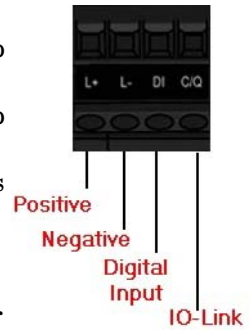
The following tips may be useful when connecting devices to the AY1000 because it may be difficult to manipulate the wire-clamp screws on the adjacent ports.

- If you are going to connect devices to Digital I/O ports (**D1** through **D4**), connect the digital devices before connecting devices to IO-Link ports.
- Connect a device to IO-Link Port 1 before IO-Link Port 2
- Connect a device to IO-Link Port 4 before IO-Link Port 3
- Connect a device to IO-Link Port 5 before IO-Link Port 6
- Connect a device to IO-Link Port 8 before IO-Link Port 7

6.1.0.2. Connecting IO-Link Devices

Use the following procedure to connect IO-Link devices to the IO-Link ports.

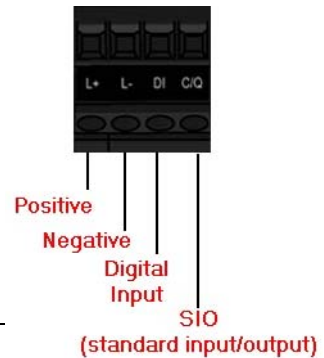
1. Insert the IO-Link device negative wire into the **L-** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
2. Insert the IO-Link device positive wire into the **L+** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
3. If applicable, insert the DI wire into the **DI** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
4. Insert the IO-Link wire into the **C/Q** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
5. If necessary, configure IO-Link parameters for each port. Refer to the help system for detailed port configuration information.



6.1.0.3. Connecting Digital Input Devices to IO-Link Ports

You can use an IO-Link port as a digital in port if you wish to do so.

1. Insert the IO-Link device negative wire into the **L-** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
2. Insert the IO-Link device positive wire into the **L+** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
3. If applicable, insert the DI wire into the **DI** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
4. Refer to the help system for detailed port configuration information.



6.1.0.4. Connecting DIO Devices to IO-Link Ports

You can use an IO-Link port to connect and operate a digital input or output device.

1. Insert the IO-Link device negative wire into the **L-** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
2. Insert the IO-Link device positive wire into the **L+** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
3. If applicable, insert the DI or DO wire into the **C/Q** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
4. Refer to the help system for detailed port configuration information.

6.2. Connecting Devices to the Digital IO Ports (IOLM DR-8-PNIO)

The IOLM DR-8-PNIO provides two digital input (DI) ports and two digital IO ports.

Signal	Description	Specifications
L+	Power Supply (+)	200mA @ 24V (maximum)
L-	Power Supply (-)	
DI	Digital Input	
DIO	Digital I/O	200mA @ 24V (maximum)



You can connect a digital input device to DI and/or DIO. DIO supports digital out.

6.2.1. Connecting to DI

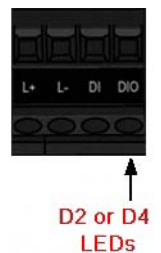
Use this procedure to connect a digital input device using the **DI** terminal on a DIO port.

1. Insert the IO-Link device negative wire into the **L-** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
2. Insert the IO-Link device positive wire into the **L+** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
3. Insert the DI wire into the **DI** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
4. Go to the **Configuration | Digital I/O Settings** page to configure the port. If necessary, refer to the help system.



6.2.2. Connecting to DIO

1. Insert the IO-Link device negative wire into the **L-** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
2. Insert the IO-Link device positive wire into the **L+** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
3. Insert the DI wire into the **DIO** contact and tighten the wire-clamp screws to prevent the wire from coming loose.
4. Go to the **Configuration | Digital I/O Settings** page to configure the port. If necessary, refer to the help system or [Chapter 7. Dedicated Digital I/O Port Configuration](#) on Page 47.



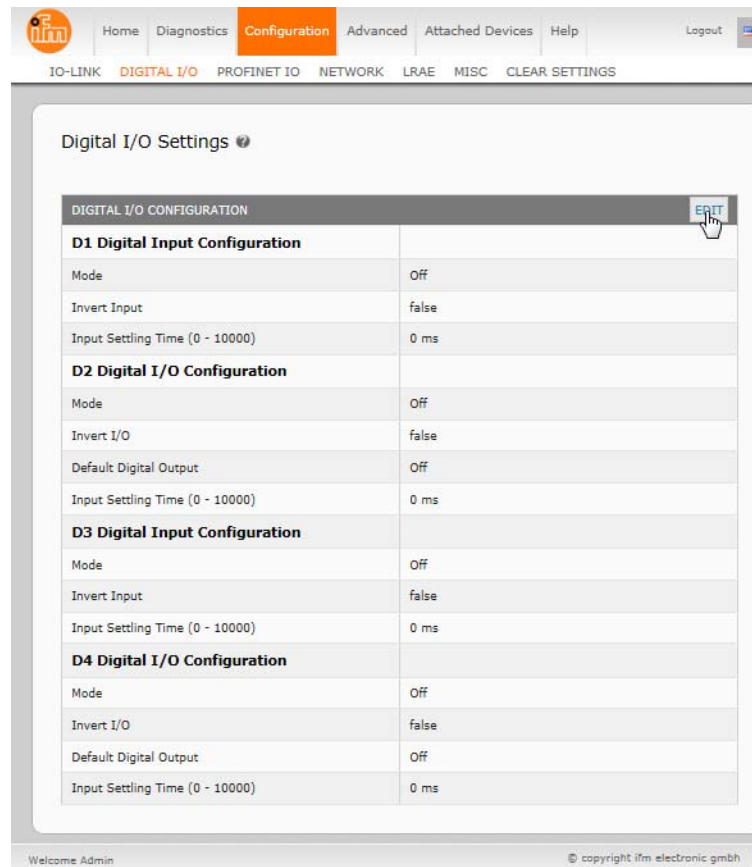
Chapter 7. Dedicated Digital I/O Port Configuration

This section discusses dedicated digital IO port (D1 through D4) configuration, including:

- [Digital I/O Settings Page](#)
- [Editing Digital I/O Settings](#) on Page 48
- [Digital I/O Setting Parameters](#) on Page 49

7.1. Digital I/O Settings Page

Use the **Configuration | Digital I/O** page to configure the dedicated DIO port characteristics for the AY1000. **D1** and **D2** are located next to IO-Link Port 1 and **D3** and **D4** are located next to IO-Link Port 4.



The screenshot displays the 'Digital I/O Settings' page. At the top, there is a navigation bar with 'Configuration' highlighted. Below it, a sub-menu includes 'DIGITAL I/O'. The main content area is titled 'Digital I/O Settings' and contains a table for 'DIGITAL I/O CONFIGURATION'. An 'EXIT' button is visible in the top right corner of the table area.

DIGITAL I/O CONFIGURATION	
D1 Digital Input Configuration	
Mode	Off
Invert Input	false
Input Settling Time (0 - 10000)	0 ms
D2 Digital I/O Configuration	
Mode	Off
Invert I/O	false
Default Digital Output	Off
Input Settling Time (0 - 10000)	0 ms
D3 Digital Input Configuration	
Mode	Off
Invert Input	false
Input Settling Time (0 - 10000)	0 ms
D4 Digital I/O Configuration	
Mode	Off
Invert I/O	false
Default Digital Output	Off
Input Settling Time (0 - 10000)	0 ms

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7.2. Editing Digital I/O Settings

You can use this procedure to configure digital I/O characteristics for the digital I/O ports.

1. If necessary, open the AY1000 web interface with your web browser using the IP address.
2. Click **Configuration | Digital I/O**.
3. Click the **EDIT** button.
4. Make appropriate selections for the digital I/O device or devices that you will connect to the ports. You can use the help system if you require definitions or values for the options or [Digital I/O Setting Parameters](#) on Page 49.

Digital I/O Settings

DIGITAL I/O CONFIGURATION

CANCEL SAVE

D1 Digital Input Configuration	
Mode	Digital-Input
Invert Input	<input type="checkbox"/>
Input Settling Time (0 - 10000)	10 ms
D2 Digital I/O Configuration	
Mode	Digital-Output
Invert I/O	<input type="checkbox"/>
Default Digital Output	On
Input Settling Time (0 - 10000)	10 ms
D3 Digital Input Configuration	
Mode	Off
Invert Input	<input type="checkbox"/>
Input Settling Time (0 - 10000)	0 ms
D4 Digital I/O Configuration	
Mode	Off
Invert I/O	<input type="checkbox"/>
Default Digital Output	Off
Input Settling Time (0 - 10000)	0 ms

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5. Click the **SAVE** button.

7.3. Digital I/O Setting Parameters

The **Configuration | Digital I/O Settings** page supports the following options.

Digital I/O Settings Page	
D1 Digital Input Configuration	
Mode <i>Default = Off</i>	Selects the Mode : <ul style="list-style-type: none"> • Off – No monitoring of the digital input pin. • Digital-Input – monitors the digital input status
Invert Input <i>Default= False</i>	If Mode is set to Digital-Input , the input status is inverted.
Input Settling Time (0 - 10000ms) <i>Default= 0ms</i>	If non-zero and Mode is set to Digital-Input , the required time that the input status must remain constant before an input status change is reported.
D2 Digital I/O Configuration	
Mode <i>Default= Off</i>	Selects the Mode : <ul style="list-style-type: none"> • Off – No monitoring or setting of the digital I/O pin. • Digital-Input – monitors the digital input status • Digital-Output – sets the digital output to either the default setting or value received from a controller.
Invert I/O <i>Default= False</i>	If selected: <ul style="list-style-type: none"> • If Mode is set to Digital-Input, the input status is inverted. • If Mode is set to Digital-Output, the output setting is inverted.
Default Digital Output <i>Default= Off</i>	If Mode is set to Digital Output , defines the default digital output setting: <ul style="list-style-type: none"> • At startup before a controller can set the digital output. • When communication to all controller(s) has been lost. Possible settings: <ul style="list-style-type: none"> • Off - low voltage • On – high voltage
Input Settling Time (0 - 10000ms) <i>Default= 0ms</i>	If non-zero and Mode is set to Digital-Input , the required time that the input status must remain constant before an input status change is reported.

Digital I/O Settings Page	
D3 Digital Input Configuration	
Mode <i>Default= Off</i>	Selects the Mode : <ul style="list-style-type: none"> • Off – No monitoring of the digital input pin. • Digital-Input – Monitors the digital input status
Invert Input <i>Default= False</i>	If Mode is set to Digital-Input , the input status is inverted.
Input Settling Time (0 - 10000) <i>Default= 0ms</i>	If non-zero and Mode is set to Digital-Input , the required time that the input status must remain constant before an input status change is reported.
D4 Digital I/O Configuration	
Mode <i>Default= Off</i>	Selects the Mode : <ul style="list-style-type: none"> • Off – No monitoring or setting of the digital I/O pin. • Digital-Input – Monitors the digital input status • Digital-Output – sets the digital output to either the default setting or value received from a controller.
Invert I/O <i>Default= False</i>	If selected: <ul style="list-style-type: none"> • If Mode is set to Digital-Input, the input status is inverted. • If Mode is set to Digital-Output, the output setting is inverted.
Default Digital Output <i>Default= Off</i>	If Mode is set to Digital Output , defines the default digital output setting: <ul style="list-style-type: none"> • At startup before a controller can set the digital output. • When communication to all controller(s) has been lost. Possible settings: <ul style="list-style-type: none"> • Off - low voltage • On – high voltage
Input Settling Time (0 - 10000) <i>Default= 0ms</i>	If non-zero and Mode is set to Digital-Input , the required time that the input status must remain constant before an input status change is reported.

Chapter 8. Loading and Managing IODD Files

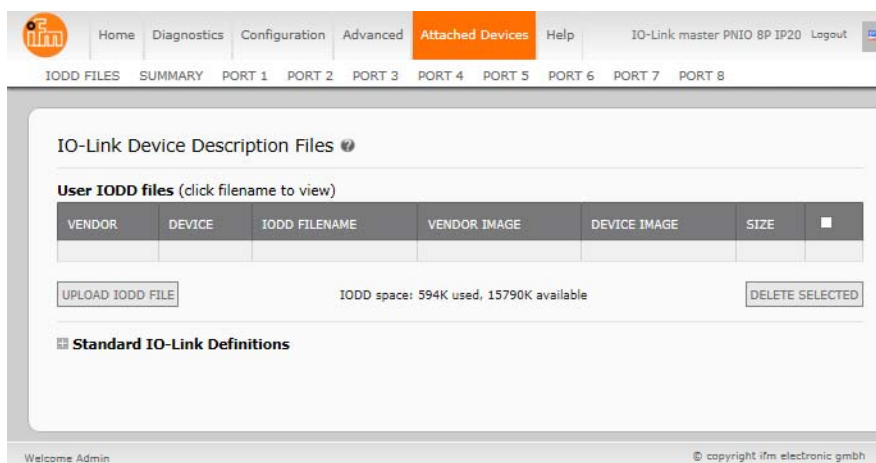
There are several **Attached Devices** pages that support IO-Link Device Description (IODD) file management.

- [IO-Link Device Description Files Page](#) - load IODD files from the IO-Link device manufacturer onto the AY1000.
- [IO-Link Device Configuration Summary Page](#) on Page 57 - verify the correct files were loaded for each IO-Link device or use the page to .
- The **Port** pages are discussed in [Chapter 9. Configuring IO-Link Devices](#) on Page 59.

8.1. IO-Link Device Description Files Page

Use the **IO-Link Device Description Files** page to update (upload) and delete IO-Link Device Description (IODD) files associated with this AY1000. In addition, you can review the IODD **xml** file using the **VIEW** button after loading the IODD file.

Note: You will need to download the appropriate IODD files from your IO-Link device manufacturer.



The AY1000 provides 15790K of space to store IODD files. The AY1000 includes the following default IODD files, which cannot be deleted.

- **IODD-StandardDefinitions1.0.1.xml**
- **IODD-StandardUnitDefinitions1.0.1.xml**
- **IODD-StandardDefinitions1.1.xml**
- **IODD-StandardUnitDefinitions1.1.xml**

8.1.1. Preparing IODD Files to Upload

After downloading the IODD files for the IO-Link device from the IO-Link sensor or actuator manufacturer, you may need to unzip the file and locate the appropriate **xml** file for the device.

- Some IODD zip files contain the **xml** files and supporting image files for a single product. This type of zip file can be immediately loaded onto the AY1000.
- Some IODD zip files contain the files for multiple products. If you upload this type of IODD zip file, the AY1000 loads the first **xml** file and the associated image files, which may or may not correspond to the IO-Link device connected to the port. If you need to zip the appropriate files, the following information may be useful:
 - Unzip the package and locate the **xml** file needed for your IO-Link device.
 - Open the **xml** file and search for the **productID**, which identifies the IO-Link device.
 - Zip the **xml** file along with the supporting images. There are several ways to locate the supporting images:
 - Locate the appropriate images using the **xml** file.
 - Load only the **xml** file and the AY1000 notifies you what files are missing. Use the **UPDATE** feature to upload the missing images.
 - Zip the **xml** with all of the images and the AY1000 ignores (and not upload) any unused files and notifies which files did not upload.

Note: *Image files are not required for IO-Link device configuration.*

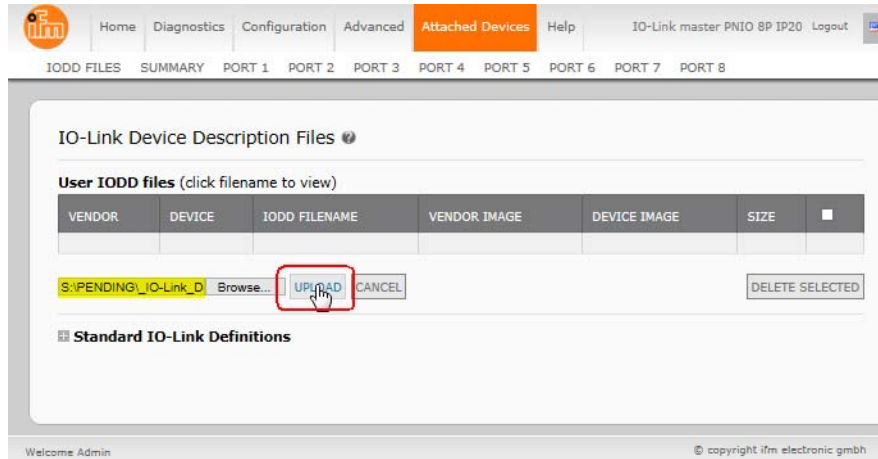
Use the appropriate discussion for your IODD files.

- [Uploading IODD Zip Files](#)
- [Uploading xml Files or Supporting Files](#) on Page 54

8.1.2. Uploading IODD Zip Files

You can use the following procedure to upload IODD zip files.

1. Click **Attached Devices** and **IODD FILES**.
2. Click the **UPLOAD IODD FILE** button.
3. Click the **Browse** button.
4. Highlight the zip file, click **Open** and then the **UPLOAD** button.



Note: Only images referenced in the xml file load to the AY1000 and the remaining files are ignored.

Upload

Status:

The IODD file has been updated successfully.

Some potential problems are listed below:

Ignored File(s):
ifm-io-link-con-pic.png
ifm-sm-icon.png

OK

5. If desired, you can view the **xml** file by clicking the **IODD FILENAME** in the table.
6. Optionally, verify that the correct **xml** file was loaded using the **Summary** page ([Page 57](#)).

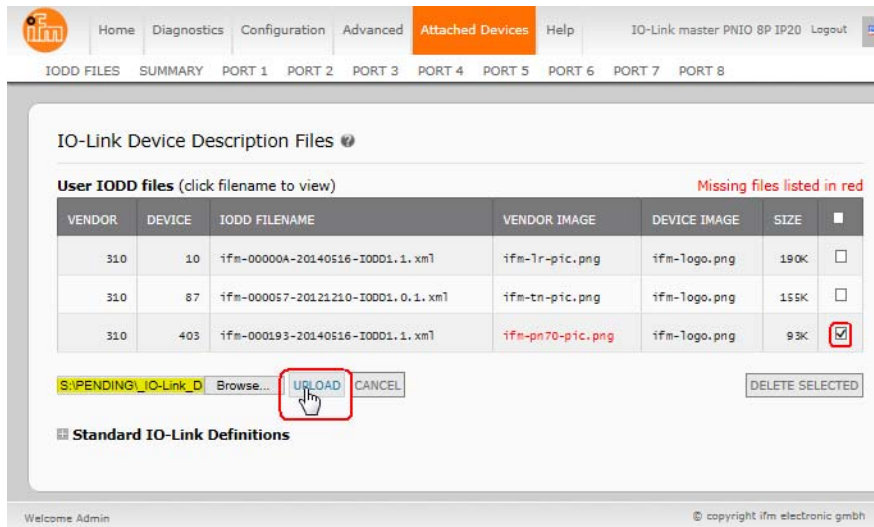
8.1.3. Uploading xml Files or Supporting Files

You can use the following procedure to upload xml, or supporting image files.

1. Click **Attached Devices** and **IODD FILES**.
2. Click the **UPLOAD IODD FILE** button.
3. Click the **Browse...** button.

Note: The xml file must be loaded before the AY1000 will load the associated image files.

4. Highlight the **xml** or image file and click **Open**.
5. Click the **UPLOAD** button.
6. Optionally, use the following steps to load image files:
 - a. Select the row in the table that contains the **xml** file.

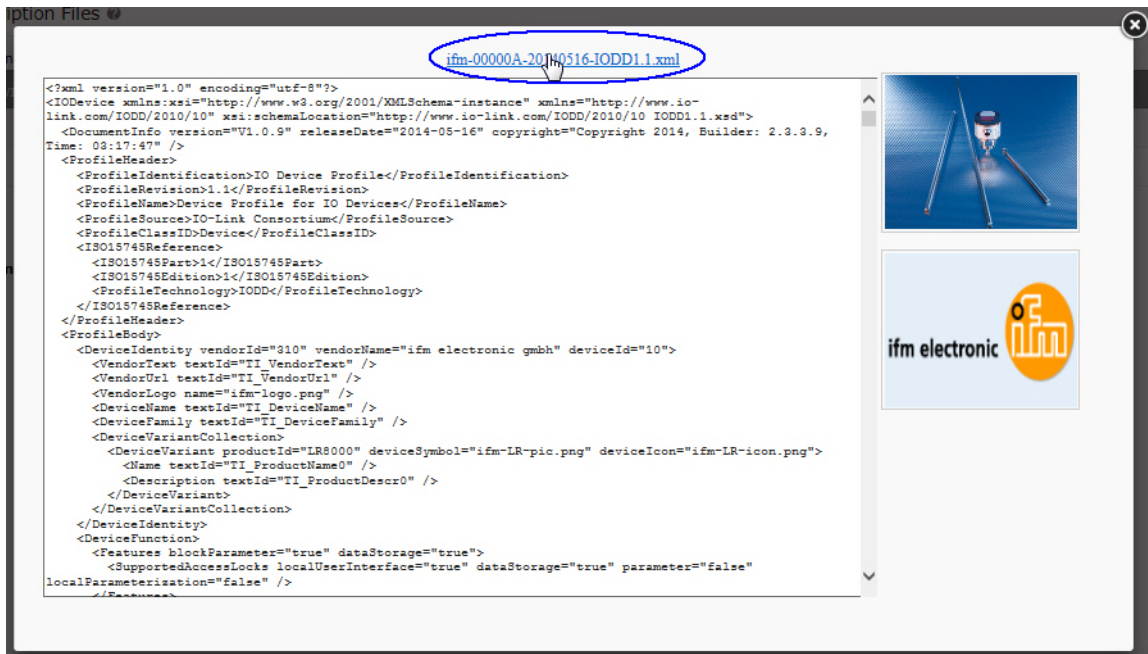


- b. Click the **UPLOAD IODD FILE** button.
- c. Click the **Browse** button.
- d. Highlight the image and click **Open**.
- e. Click the **UPLOAD** button.
- f. If desired, you can view the **xml** file by clicking the IODD FILENAME in the table.
- g. Optionally, verify that the correct **xml** file was loaded using the **Summary** page ([Page 57](#)).

8.1.4. Viewing and Saving IODD Files

Use the following procedure to view the contents of an IODD file.

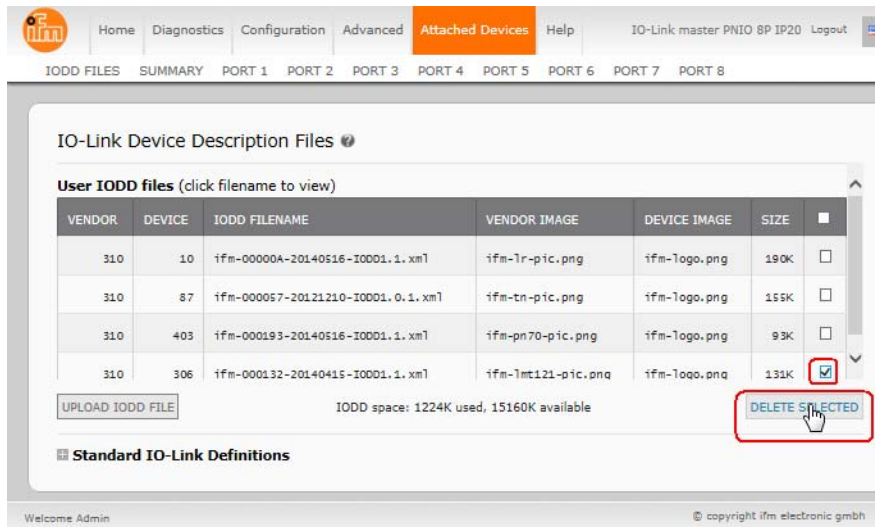
1. If necessary, click **Attached Devices** and **IODD Files**.
2. Click the **IODD FILENAME** in the table that you want to review. A pop up window displays the contents of the IODD file.
3. Optionally, click the file name hyperlink at the top of the window to view the formatted file or if you want to save a copy of the file to another location.



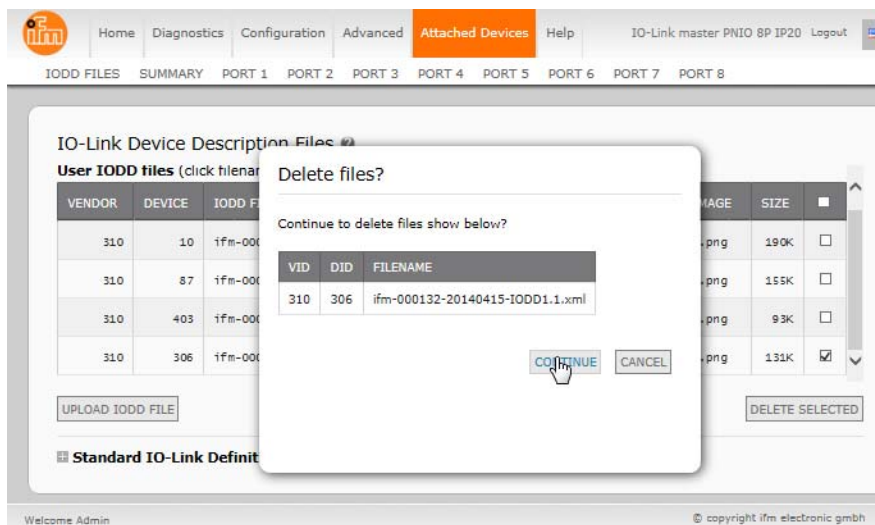
8.1.5. Deleting IODD Files

Use the following procedure to delete an IODD file set from the AY1000.

1. If necessary, click **Attached Devices** and **IODD Files**.
2. Check the corresponding row of the IODD file that you want to delete.
3. Click the **DELETE SELECTED** button.



4. Click **CONTINUE** to the *Delete files?* message.



8.2. IO-Link Device Configuration Summary Page

The **IO-Link Device Configuration Summary** page provides basic device configuration (device profile) information for ports with valid IO-Link devices attached. The **Configuration Summary** page retrieves information that resides on the IO-Link device from the manufacturer.

A file name displayed in the **IODD Name** field for a port indicates that a valid IODD file is associated with that device. If the field is empty, that indicates that a valid IODD file has not been loaded.

You can review complete IODD file information on a port by port basis by clicking the **MORE** button next to the port in question or by clicking the **PORT** menu selection in the navigational bar.

Use the following steps to access the **IO-Link Device Configuration Summary** page.

1. Click **Attached Devices**.
2. Click **SUMMARY**.

***Note:** The Configuration Summary page takes several minutes to completely load as each device is queried.*

3. Click the **MORE** button or the corresponding **Port** (in the navigational bar) to configure the IO-Link device parameters for a specific device. See [Chapter 9. Configuring IO-Link Devices](#) on Page 59 for more information.

DEVICE SETTINGS	PORT1	MORE	PORT2	MORE	PORT3	MORE	PORT4	MORE	PORT5
Vendor Name	ifm electronic GmbH		ifm electronic gmbh						
VENDOR	310		310						
DEVICE	87		10						
Description	Temperature sensor, -40°C t o 150°C								
IO-Link Version	1.0		1.1						
Hardware Version	AC		AF						
Firmware Version	124		354						
Baud Rate	38400		38400						
SIO Mode	Yes		Yes						
Min Cycle Time	2.3 ms		2.3 ms						
IODD Name	ifm-000057-20121210-IOD D1.0.1.xml		ifm-00000A-20140516-IOD D1.1.xml						
Serial Number	U0170110112		d0015151013						

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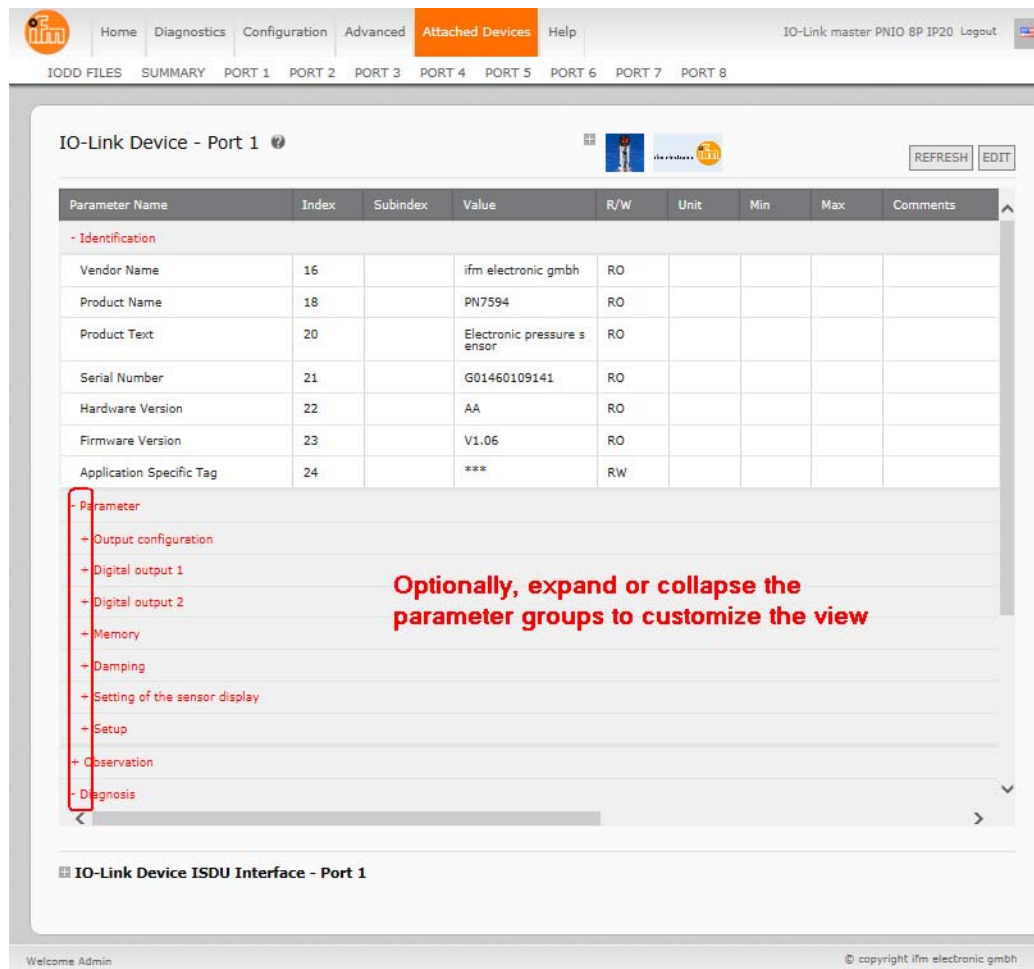
Chapter 9. Configuring IO-Link Devices

This chapter discusses using the **Attached Devices | Port** pages to change IO-Link device parameters.

Note: *Optionally, you can use traditional methods such as: PLC interfaces to configure the IO-Link devices.*

9.1. Port Pages Overview

You can use the **Attached Devices | Port** page for a port to review and easily edit the IO-Link device configuration.



The **Port** page provides two IO-Link device configuration methods:

- **IO-Link Device Port** table (GUI), which depends on the appropriate IODD file loaded from the IO-Link device manufacturer onto the AY1000. To use the **IO-Link Device Port** table for configuring IO-Link devices, refer to the following subsections:
 - [Editing Parameters - IO-Link Device - Port Table](#) on Page 60
 - [Resetting IO-Link Device Parameters to Factory Defaults](#) on Page 62

- **IO-Link Device ISDU Interface - Port**, which can be used with or without IODD files loaded. Refer to the following information to use the **IO-Link Device ISDU Interface - Port** method:
 - The *IO-Link Device Operator Manual* from the device manufacturer is needed to use the **IO-Link Device ISDU Interface** since ISDU block index and ISDU sub-index numbers are required.
 - [Editing Parameters - IO-Link Device ISDU Interface - Port](#) on Page 63

9.2. Editing Parameters - IO-Link Device - Port Table

Use the following procedure to edit IO-Link device parameters using the **IO-Link Device Port** table.

Note: *You may want to verify that the **Automatic Download Enable for Data Storage** option on the **Configuration | IO-Link Settings** page is **NOT** set to **On** as this can cause unreliable results on the corresponding port.*

1. If you have not done so, load the IODD file from the IO-Link device manufacturer ([Chapter 8. Loading and Managing IODD Files](#) on Page 51).
2. Access the appropriate **Port** page by clicking **Attached Devices** and then the **Port** number that you want to configure.
3. Click the **EDIT** button after all of the device information is populated in the table.
4. Scroll down the table and make appropriate parameter changes for your environment.

Note: *An IODD file may not contain every IO-Link device setting depending on the IO-Link device manufacturer. If you need to change a parameter that is not displayed in the **IO-Link Device - Port** table, you can refer to the *IO-Link device Operators Manual* and use the **IO-Link Device ISDU Interface** to change the settings.*

You may need to scroll to the right in the table to view applicable parameter values if the parameter is not selectable in a drop list.

IO-Link Device - Port 1

Parameter Name	Index	Subindex	Value	R/W	Unit	Min	Max	Comments	
- Identification									
Vendor Name	16		ifm electronic gmbh	RO					
Product Name	18		PN7594	RO					
Product Text	20		Electronic pressure s ensor	RO					
Serial Number	21		G01460109141	RO					
Hardware Version	22		AA	RO					
Firmware Version	23		V1.06	RO					
Application Specific Tag	24		Sensor#39	RW					
- Parameter									
- Output configuration									
Ou1	580		4	RW		3	6	value range:3;4;5;6	
Ou2	590		4	RW		3	6	value range:3;4;5;6	
P-n	500		0	RW		0	1	value range:0;1	
+ Digital output 1									
+ Digital output 2									
+ Memory									
+ Damping									
- Setting of the sensor display									
Uni	551		1	RW		0	2	value range:0;1;2	
COLR	554		3	RW		2	11	value range:2;3;4;5;6;7;8;9;10; 11	
diS	552		<input type="checkbox"/> <input type="checkbox"/> 2	RW					

IO-Link Device ISDU Interface - Port 1

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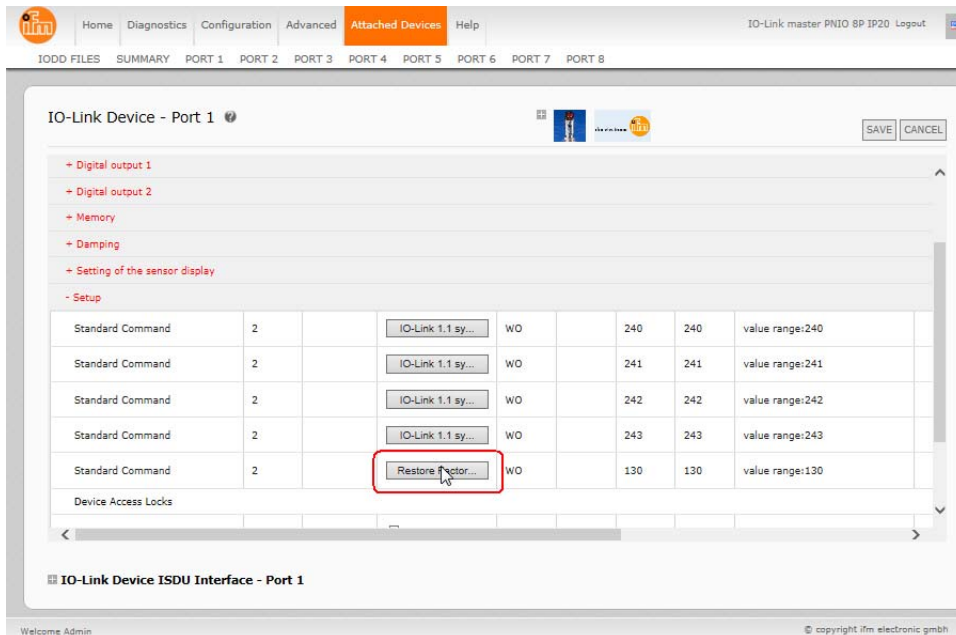
5. Click the **SAVE** button after editing the parameters.
6. Optionally, click the **REFRESH** button to confirm the parameter changes.

9.3. Resetting IO-Link Device Parameters to Factory Defaults

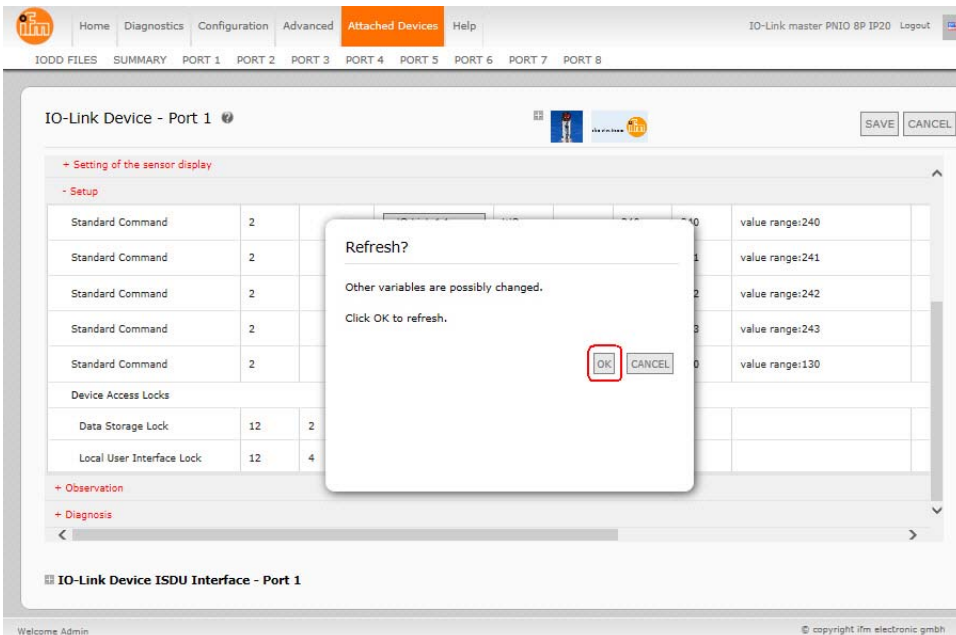
In the event you want to reset the IO-Link device to factory default, typically the IODD file provides the ability from the IO-Link device manufacturer. Use the following example to reset an IO-Link device.

1. Click the **EDIT** button and locate the **Restore Factory** button.
2. Click the **Restore Factory** or **Load Factory Settings** button.

Note: The name of the button is determined by the IO-Link device manufacturer.



3. Click **OK** when the *Refresh* message appears.



4. Optionally, click the **REFRESH** button to verify the settings.

9.4. Editing Parameters - IO-Link Device ISDU Interface - Port

The **IO-Link Device ISDU Interface** follows these guidelines:

- If necessary, convert hexadecimal ISDU index numbers to decimal, you must enter the decimal value for the ISDU Block Index and ISDU Sub-index numbers.
- You must enter the hexadecimal value for the IO-Link device parameters.

If the appropriate IODD files has been loaded, you can use the **IO-Link Device - Port** table to determine the index numbers and acceptable values for each parameter.

Note: An IODD file may not contain every IO-Link device setting depending on the IO-Link device manufacturer. If you need to change a parameter that is not displayed in the **IO-Link Device - Port** table, you can refer to the *IO-Link Device Operators Manual*.

If an IODD file has not been loaded for an IO-Link device, you can use the *IO-Link Device Operator's Manual* to determine the ISDU indexes.

Please note:

- You must enter the decimal value for the ISDU Block Index and ISDU Sub-index.
- The **GET** button retrieves the parameter value in hex from the IO-Link device. You may want to retrieve values to determine the data length.



- The **SET** button sends the value to the IO-Link device.



- After successfully changing a parameter, the IO-Link master responds with a command executed notification.



- This message means that the IO-Link device defines the entry as an invalid setting.



- This message indicates that the IO-Link device cannot read the specified ISDU Block Index and Sub-index.



IO-Link Device ISDU Interface - Port 1

ISDU Block Index: 880
ISDU Sub-index: 10

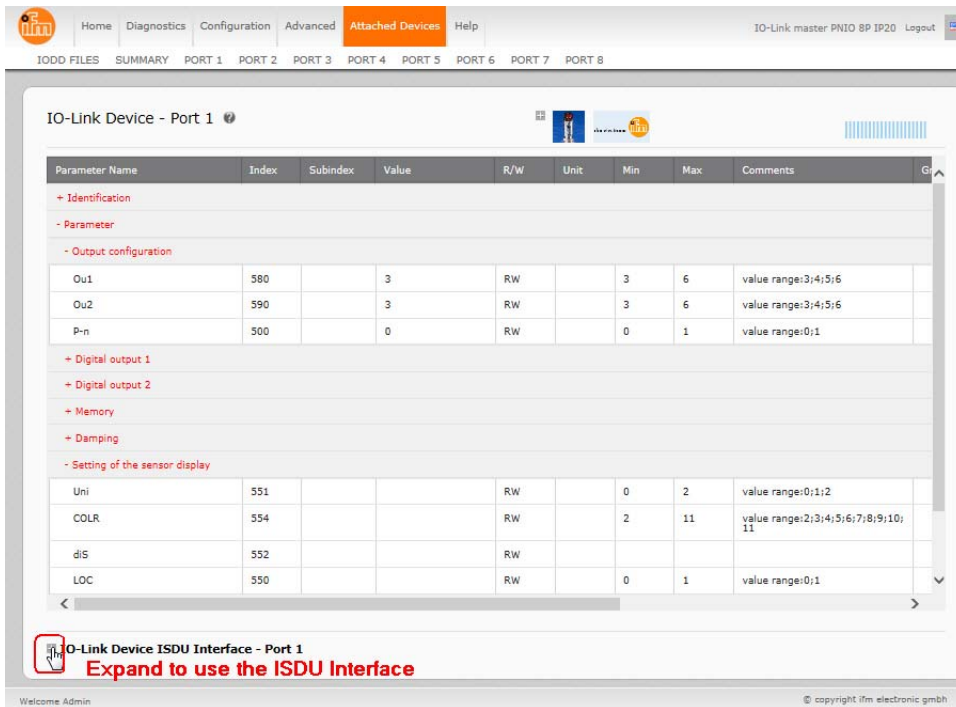
GET
SET

other failure (read)

Use the following procedure to edit parameters using the **IO-Link Device ISDU Interface - Port**.

Note: You may want to verify that the *Automatic Download Enable for Data Storage* option on the *Configuration | IO-Link Settings* page is **NOT** set to **On** as this can cause unreliable results on the corresponding port.

- Click the **+** next to the **IO-Link Device ISDU Interface** to open the interface.



IO-Link Device ISDU Interface - Port 1

Parameter Name	Index	Subindex	Value	R/W	Unit	Min	Max	Comments
+ Identification								
- Parameter								
- Output configuration								
Ou1	580		3	RW		3	6	value range:3;4;5;6
Ou2	590		3	RW		3	6	value range:3;4;5;6
P-n	500		0	RW		0	1	value range:0;1
+ Digital output 1								
+ Digital output 2								
+ Memory								
+ Damping								
- Setting of the sensor display								
Uni	551			RW		0	2	value range:0;1;2
COLR	554			RW		2	11	value range:2;3;4;5;6;7;8;9;10;11
diS	552			RW				
LOC	550			RW		0	1	value range:0;1

IO-Link Device ISDU Interface - Port 1
Expand to use the ISDU Interface

- Enter the ISDU Block Index number (decimal) that you want to edit.
- If applicable, enter the ISDU Sub-index (decimal).
- Edit the parameter (hex) and click the **SET** button.



IO-Link Device ISDU Interface - Port 1

ISDU Block Index: 87
ISDU Sub-index: 28

GET
SET

- Verify that a *command executed* message returns.

6. If the IODD file is loaded, optionally click **REFRESH** to verify your changes.

The screenshot displays the 'IO-Link Device - Port 1' configuration interface. At the top, there is a navigation bar with tabs for Home, Diagnostics, Configuration, Advanced, Attached Devices (selected), and Help. The main content area is titled 'IO-Link Device - Port 1' and includes a 'REFRESH' button and an 'EDIT' button. Below the title is a table of parameters:

Product Name	18	LMT121	RO					
Product Text	20	Electronic level sens or	RO					
Serial Number	21	u0062130814	RO					
Hardware Version	22	AF	RO					
Firmware Version	23	102	RO					
Application Specific Tag	24		RW					

Below the table, there are sections for 'Parameter', 'Output Configuration', and 'Digital Output 1'. The 'Digital Output 1' section is expanded, showing a table of parameters:

SP1	67	40	RW	%	4	98	value range:4-98
rP1	68	29	RW	%	2	96	value range:2-96
dr1	79	0	RW	S	0	100	value range:0-100

At the bottom, there is a section for 'IO-Link Device ISDU Interface - Port 1' with input fields for 'ISDU Block Index' (value: 67) and 'ISDU Sub-index'. Below these fields are 'GET' and 'SET' buttons. To the right of these fields is a text area containing the message 'command executed'.

Chapter 10. Utilizing AY1000 Features

This chapter discusses using the following features:

- **Data Storage** (automatic and manual) to upload or download IO-Link v1.1 device parameters
- **Device Validation** (identical or compatible) to dedicate a port or ports to specific IO-Link devices
- **Data Validation** (strict or loose) to verify data integrity
- **Menu Bar Hover Shows Submenu**, which provides an option to navigate the submenu structure quickly.

Note: You must configure data storage, device validation, data validation in PROFINET IO using Step 7. You can use data storage on the web page for temporary data storage related tasks.

10.1. Data Storage

Data storage is typically supported by IO-Link **v1.1** devices. *Data storage* means that you can upload parameters from an IO-Link device to the AY1000 and/or download parameters from the AY1000 to the IO-Link device. This feature can be used to:

- Quickly and easily replace a defective IO-Link device
- Configure multiple IO-Link devices with the same parameters as fast as it takes to connect and disconnect the IO-Link device

To determine whether an IO-Link (v1.1) device supports data storage, you can check one of the following:

- **IO-Link Diagnostics** page - check the **Data Storage Capable** field to see if it displays **Yes**.
- **IO-Link Configuration** page - check to see if **UPLOAD** and **DOWNLOAD** buttons display under the **Data Storage Manual Ops** group. If only a **Clear** button displays, the device on the port does not support data storage.

10.1.1. Uploading Data Storage to the AY1000

The IO-Link device manufacturer determines which parameters are saved for data storage. Remember, the IO-Link device should be configured before enabling data storage unless you are using data storage to back up the default device configuration.

There are two methods to upload Data Storage using the **Configuration | IO-Link** page:

- **Automatic Enable Upload** - If a port is set to **On** for this option, the AY1000 saves the data storage (if the data storage is empty) from the IO-Link device to that port. Some IO-Link devices update the data storage contents if you use the Teach buttons on the IO-Link device, but that is determined by the IO-Link device manufacturer.

When this option is enabled and another IO-Link device (different Vendor ID and Device ID), the **IO-Link Diagnostics** page displays a *DV: Wrong Sensor* in the **IO-Link State** field and the IO-Link port LED flashes red, indicating a hardware fault.

Automatic upload occurs when the **Automatic Upload Enable** option is set to **On** and one of these conditions exists:

- There is no upload data stored on the gateway.
- The IO-Link device executes a **requests_ at upload** function (generally because you have changed the configuration via Teach buttons).

You should not enable **Automatic Upload** until after you have configured the IO-Link device attached to the port unless you want to capture the default settings.

Note: Do not enable both Automatic Upload and Download at the same time, the results are not reliable among IO-Link device manufacturers.

- **Data Storage Manual Ops: UPLOAD** - Selecting the **UPLOAD** button saves the data storage from the IO-Link device to that port. The contents of the data storage does not change unless it is uploaded again or cleared. Another IO-Link device with a different Vendor ID and Device ID can be attached to the port without causing a hardware fault.

10.1.2. Downloading Data Storage to the IO-Link Device

There are two methods to download Data Storage using the **Configuration | IO-Link Device** page:

- **Automatic Download Enable** - An automatic download occurs when the **Automatic Download Enable** option is set to **On** and one of these conditions exists:
 - The original IO-Link device is disconnected and an IO-Link device who's configuration data differs from the stored configuration data.
 - The IO-Link device requests an upload and the **Automatic Upload Enable** option is set to **Off**.

Note: Do not enable both Automatic Upload and Download at the same time, the results are not reliable among IO-Link device manufacturers.

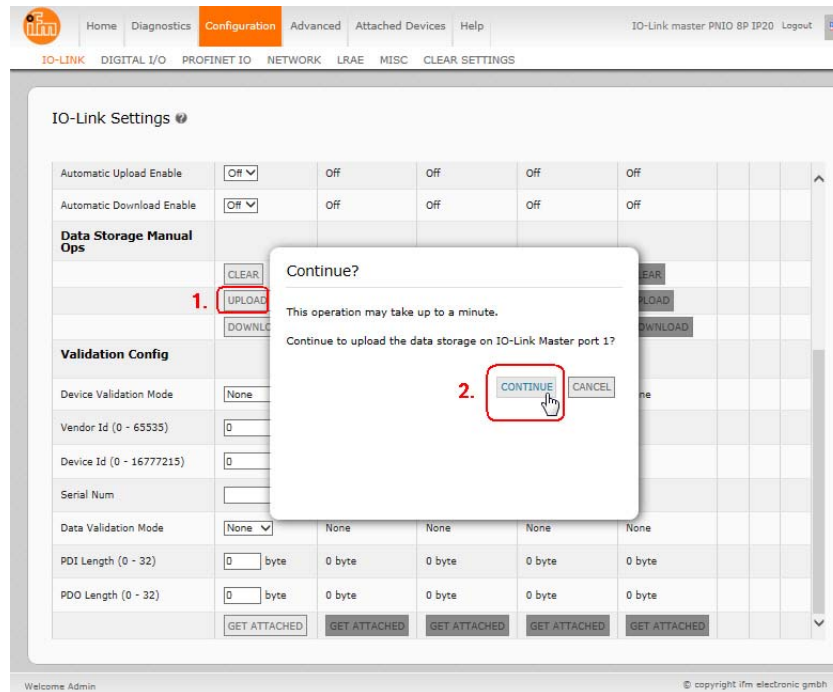
- **Data Storage Manual Ops: DOWNLOAD** - Selecting the **DOWNLOAD** button downloads the data storage from the that port to the IO-Link device.

If an IO-Link device with a different Vendor ID and Device ID is attached to the port and a manual download is attempted, the AY1000 issues a hardware fault.

10.1.3. Automatic Device Configuration

Use the following steps to use an AY1000 port to configure multiple IO-Link devices with the same configuration parameters.

1. If necessary, configure the IO-Link device as required for the environment.
2. Click **Configuration| IO-Link**.
3. Click the **EDIT** button for the port for which you want to store the data on the AY1000.
4. Click the **UPLOAD** button.



5. Click the **CONTINUE** button to the *Continue to upload the data storage on IO-Link master port [number]* message.
6. Click the **Ok** button to the *Data storage upload successful on Port [number]* message.

7. Set the Automatic Download Enable option to On.

The screenshot shows the 'IO-Link Settings' configuration page. The table below represents the configuration for five ports:

IO-LINK PORT CONFIG	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5
	<input type="button" value="CANCEL"/> <input type="button" value="SAVE"/>	<input type="button" value="EDIT"/>	<input type="button" value="EDIT"/>	<input type="button" value="EDIT"/>	<input type="button" value="EDIT"/>
Port Name	FlowMeter#59	Temp#1	Pressure#19	Temp#96	Proximity#80
Port Mode	IOLink	IOLink	IOLink	IOLink	IOLink
Invert IO	<input type="checkbox"/>	false	false	false	false
Default Digital Output	Off	Off	Off	Off	Off
Minimum Cycle Time (4 - 538)	4 ms	4 ms	4 ms	4 ms	4 ms
Data Storage Config					
Storage Contents	310:392	empty	empty	empty	empty
Automatic Upload Enable	Off	Off	Off	Off	Off
Automatic Download Enable	On	Off	Off	Off	Off
Data Storage Manual Ops					
	<input type="button" value="CLEAR"/>	<input type="button" value="CLEAR"/>	<input type="button" value="CLEAR"/>	<input type="button" value="CLEAR"/>	<input type="button" value="CLEAR"/>
	<input type="button" value="UPLOAD"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="UPLOAD"/>
	<input type="button" value="DOWNLOAD"/>	<input type="button" value="DOWNLOAD"/>	<input type="button" value="DOWNLOAD"/>	<input type="button" value="DOWNLOAD"/>	<input type="button" value="DOWNLOAD"/>

8. Click SAVE.

9. Click **Diagnostics | IO-Link**.

10. Replace the IO-Link device on that port with the IO-Link device for which you want configured automatically.

11. Verify that the IO-Link device displays operational **Port Status** and the appropriate IO-Link State.

12. Repeat Steps [10](#) and 11 for as many device as you want to configure.

10.1.4. Automatic Device Configuration Backup

The following procedure shows how to utilize data storage to automatically backup an IO-Link device configuration.

Remember, if you adjust parameters using Teach buttons those values may or not may be updated in the data storage, which depends on the IO-Link device manufacturer. If you are unsure, you can always use the manual **UPLOAD** feature to capture the latest settings.

1. Click **Configuration | IO-Link**.
2. Click the **EDIT** button for the port for which you want to store the data on the AY1000.
3. Select **On** in the drop list for **Automatic Data Storage Upload Enable**.

IO-Link Settings

IO-LINK PORT CONFIG	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5
	EDIT	CANCEL SAVE	EDIT	EDIT	EDIT
Port Name	FlowMeter#59	Temp#1	Pressure#19	Temp#96	Proximity#80
Port Mode	IOLink	IOLink	IOLink	IOLink	IOLink
Invert IO	false	<input type="checkbox"/>	false	false	false
Default Digital Output	Off	Off	Off	Off	Off
Minimum Cycle Time (4 - 538)	4 ms	4 ms	4 ms	4 ms	4 ms
Data Storage Config					
Storage Contents	310:392	empty	empty	empty	empty
Automatic Upload Enable	Off	On	Off	Off	Off
Automatic Download Enable	On	Off	Off	Off	Off
Data Storage Manual Ops					
	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR
	UPLOAD	UPLOAD	UPLOAD	UPLOAD	UPLOAD
	DOWNLOAD	DOWNLOAD	DOWNLOAD	DOWNLOAD	DOWNLOAD

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4. Click **SAVE**.

When the **Configuration | IO-Link** page is refreshed, the **Storage Contents** field displays the **Vendor ID** and **Device ID**. In addition, the **IO-Link Diagnostics** page displays **Upload-Only** in the **Automatic Data Storage Configuration** field.

10.2. Device Validation

Device validation is supported by many IO-Link devices. **Device Validation Mode** provides these options:

- **None** - this disables **Device Validation Mode**.
- **Compatible** - permits a compatible IO-Link device (same Vendor ID and Device ID) to function on the corresponding port.
- **Identical** - only permits an IO-Link device (same Vendor ID, Device ID, and serial number) to function on the corresponding port.

Use this procedure to configure device validation.

1. Click **Configuration | IO-Link Settings**.
2. Click the **EDIT** button.
3. Select **Compatible** or **Identical** for the **Device Validation** mode.

Note: *Identical Device Validation requires a device serial number to operate.*

4. Click the **GET ATTACHED** button or manually complete the Vendor ID, Device ID, and serial number.

If the device does not have a serial number, you should not select **Identical** because the AY1000 requires a serial number to identify a specific device.

5. Click the **SAVE** button. If the wrong or incompatible device is connected to the port, the IO-Link port LED flashes red and no IO-Link activity occurs on the port until the issue is resolved.

The screenshot shows the 'IO-Link Settings' configuration page. The 'Validation Config' section for PORT 3 is highlighted with a red box, showing 'Device Validation Mode' set to 'Identical' (marked with a red '1'), 'Vendor Id' as 310, 'Device Id' as 313, and 'Serial Num' as W0047090512. The 'GET ATTACHED' button for PORT 3 is also highlighted with a red box and marked with a red '2'. The 'SAVE' button at the top of the table is highlighted with a red box and marked with a red '3'.

IO-LINK PORT CONFIG	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5
Port Name	FlowMeter#59	Temp#1	Pressure#19	Temp#96	Proximity#80
Port Mode	IOLink	IOLink	IOLink	IOLink	IOLink
Invert IO	false	false	<input type="checkbox"/>	false	false
Default Digital Output	Off	Off	Off	Off	Off
Minimum Cycle Time (4 - 538)	4 ms	4 ms	4 ms	4 ms	4 ms
Data Storage Config					
Storage Contents	310:392	310:323	empty	empty	empty
Automatic Upload Enable	Off	Off	Off	Off	Off
Automatic Download Enable	On	Off	Off	Off	Off
Data Storage Manual Ops					
	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR
			UPLOAD	UPLOAD	UPLOAD
			DOWNLOAD	DOWNLOAD	DOWNLOAD
Validation Config					
Device Validation Mode	None	None	Identical	None	None
Vendor Id (0 - 65535)	0	0	310	0	0
Device Id (0 - 16777215)	0	0	313	0	0
Serial Num			W0047090512		
Data Validation Mode	None	None	None	None	None
PDI Length (0 - 32)	0 byte	0 byte	2 byte	0 byte	0 byte
PDO Length (0 - 32)	0 byte	0 byte	0 byte	0 byte	0 byte
	GET ATTACHED	GET ATTACHED	GET ATTACHED	GET ATTACHED	GET ATTACHED

In addition, the **IO-Link Diagnostics** page displays the following information.

IO-Link Diagnostics **This image does not display the complete Diagnostics page.** STOP LIVE UPDATES RESET STATISTICS

IO-LINK PORT STATUS		PORT 2	PORT 6
Port Name		Temp#62	IOLink Port 6
Port Mode		IOLink	IOLink
Port Status		Inactive	Inactive
IOLink State		DV:WrongSensor	Init
Device Vendor Name			
Device Product Name			
Device Serial Number			

10.3. Data Validation

You can use this procedure to configure data validation.

1. Click **Configuration | IO-Link Settings**.
2. Click the **EDIT** button on the port you want to configure for data validation.
3. Select **Loose** or **Strict** to enable data validation.
 - **Loose** - the slave device's PDI/PDO lengths must be less than or equal to the user-configured values.
 - **Strict** - the slave device's PDI/PDO lengths must be the same as the user-configured values.
4. Click the **GET ATTACHED** button or manually enter the PDI and PDO length.

IO-Link Settings

IO-LINK PORT CONFIG	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5
Port Name	FlowMeter#59	Temp#1	Pressure#19	Temp#96	Proximity#80
Port Mode	IOLink	IOLink	IOLink	IOLink	IOLink
Invert IO	false	<input type="checkbox"/>	false	false	false
Default Digital Output	Off	Off	Off	Off	Off
Minimum Cycle Time (4 - 538)	4 ms	4 ms	4 ms	4 ms	4 ms
Data Storage Config					
Storage Contents	310:392	310:323	empty	empty	empty
Automatic Upload Enable	Off	Off	Off	Off	Off
Automatic Download Enable	On	Off	Off	Off	Off
Data Storage Manual Ops					
	<input type="button" value="CLEAR"/>	<input type="button" value="CLEAR"/>	<input type="button" value="CLEAR"/>	<input type="button" value="CLEAR"/>	<input type="button" value="CLEAR"/>
	<input type="button" value="UPLOAD"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="UPLOAD"/>	<input type="button" value="UPLOAD"/>
	<input type="button" value="DOWNLOAD"/>	<input type="button" value="DOWNLOAD"/>	<input type="button" value="DOWNLOAD"/>	<input type="button" value="DOWNLOAD"/>	<input type="button" value="DOWNLOAD"/>
Validation Config					
Device Validation Mode	None	None	Identical	None	None
Vendor Id (0 - 65535)	0	310	310	0	0
Device Id (0 - 16777215)	0	323	313	0	0
Serial Num		10015300514	W0047090512		
Data Validation Mode	None	Strict	None	None	None
PDI Length (0 - 32)	0 byte	2 byte	2 byte	0 byte	0 byte
PDO Length (0 - 32)	0 byte	0 byte	0 byte	0 byte	0 byte
	<input type="button" value="GET ATTACHED"/>	<input type="button" value="GET ATTACHED"/>	<input type="button" value="GET ATTACHED"/>	<input type="button" value="GET ATTACHED"/>	<input type="button" value="GET ATTACHED"/>

5. Click the **SAVE** button.

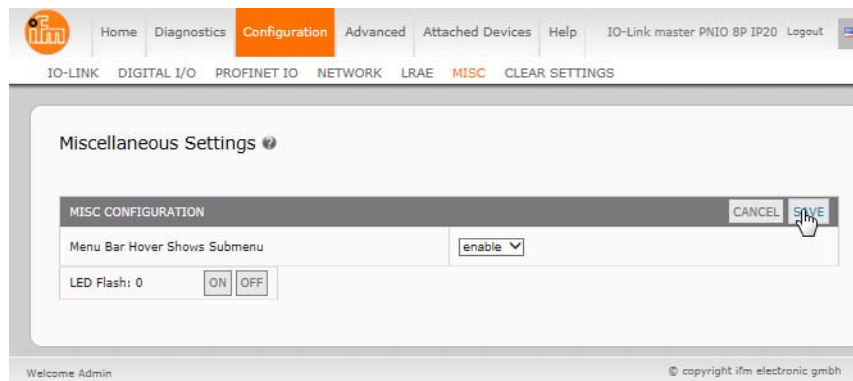
If data validation fails, the IO-Link port LED flashes red and the **IO-Link Diagnostics** page displays an error.

10.4. Using the Menu Bar Hover Shows Submenu Option

Use this procedure to enable the **Menu Bar Hover Shows Submenu** option. If you enable this feature it displays the submenus for a category when you hover over the category name.

For example, if you hover over **Advanced**, the **SOFTWARE**, **ACCOUNTS**, **LOG FILES**, and **LICENSES** submenus display. You can click any submenu and avoid opening the default menu for a category.

1. Click **Configuration | MISC**.
2. Click the **EDIT** button.
3. Click **Enable** next to the **Menu Bar Hover Shows Submenu** option.
4. Click **SAVE**.



10.5. IO-Link Test Event Generator

You can use the **IO-Link Test Event Generator** to send messages through the AY1000. The generated events are displayed in the **Diagnostics | IO-Link Settings** page under the **Last Events** field and the syslog.

IO-Link Test Event Generator Descriptions	
Port	The port number to which you want to send an event.
Mode	This is the first item in the event generated. <ul style="list-style-type: none"> • Single: generates Single in the event. • Coming: generates Active in the event • Going: generates Cleared in the event
Type	This is the second item in the event generated. <ul style="list-style-type: none"> • Message: generates Message in the event. • Warning: generates Warning in the event. • Error: generates Error in the event.
Instance	This is the level in which the event is generated. This is not displayed in the generated event. <ul style="list-style-type: none"> • unknown • physical • datalink • applayer • application

IO-Link Test Event Generator Descriptions	
Source	<p>This is the source in which the event is generated. This is the third item in the generated event.</p> <ul style="list-style-type: none"> • local: simulation generated from the AY1000, which displays as Local in the event. • remote: simulation of an IO-Link device event, which displays as Device in the generated event.
PDI	<p>This indicates whether to send valid or invalid PDI, which is not displayed in the generated event.</p> <ul style="list-style-type: none"> • valid • invalid
Code	<p>This is the fourth and fifth items in the generated event.</p> <ul style="list-style-type: none"> • 0x0000: generates a s_pdu_check event • 0x0001: generates a s_pdu_flow event • 0x0002: generates a m_pdu_check event • 0x0003: generates a s_pdu_illegal event • 0x0004: generates a m_pdu_illegal event • 0x0005: generates a s_pdu_buffer event • 0x0006: generates a s_pdu_inkr event • 0x0007: generates an s_pd_len event • 0x0008: generates an s_no_pdin event • 0x0009: generates an s_no_pdout event • 0x000a: generates an s_channel event • 0x000b: generates an m_event event • 0x000c: generates an a_message event • 0x000d: generates an a_warning event • 0x000e: generates an a_device event • 0x000f: generates an a_parameter event • 0x0010: generates a devicelost event • 0x0011, 13 - 17: generates an unknown event • 0x0012: generates a s_desina event

Chapter 11. Using the Diagnostics Pages

This chapter provides information about the following **Diagnostics** pages.

- [IO-Link Port Diagnostics](#)
- [Digital I/O Diagnostics](#) on Page 80
- [PROFINET IO Diagnostics Page](#) on Page 81

11.1. IO-Link Port Diagnostics

Use the **IO-Link Diagnostics** page to determine the status of the IO-Link configuration.

IO-LINK PORT STATUS	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5	PORT 6	PORT 7	PORT 8	
Port Name	Temp #1	Faultster #29	Faultster #30	Temp #36	Proximity #80	Pressure #19	Magnetic #101	Temp #83	
Port Mode	IOLink	IOLink	IOLink	IOLink	IOLink	IOLink	IOLink	IOLink	
Port Status	Operational, PDI valid	Operational, PDI valid	Operational, PDI valid	Operational, PDI valid	Operational, PDI valid	Operational, PDI valid	Operational	Operational, PDI valid	
IO-Link State	Operate	Operate	Operate	Operate	Operate	Operate	Operate	Operate	
Device Vendor Name	ifm electronic gmbh	ifm electronic gmbh	ifm electronic gmbh	ifm electronic gmbh	ifm electronic gmbh	ifm electronic gmbh	SDCX AG	ifm electronic GmbH	
Device Product Name	TAD091	SM9001	SM9001	TAD081	KQ6001	PR7007	MP6-032TLTQ0	TAD031	
Device Serial Number	40013000314	40046171013	40031171013	40010900314		40047090012	10071010	1007110112	
Device Hardware Version	A0	A8	A8	A0	AC	A0	1.00	AC	
Device Firmware Version	317	313	313	319	402	090	V5.14	124	
Device IO-Link Version	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	
Actual Cycle Time	18.8ms	5.0ms	5.0ms	33.6ms	100.8ms	4.0ms	4.0ms	4.0ms	
Device Minimum Cycle Time	18.8ms	3.0ms	3.0ms	33.6ms	100.8ms	2.3ms	2.3ms	2.3ms	
Configured Minimum Cycle Time	4ms	4ms	4ms	4ms	4ms	4ms	4ms	4ms	
Data Storage Capable	Yes	Yes	Yes	Yes	Yes	Yes	No	No	
Judgment Data Storage Configuration	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	
Auxiliary Input (AI) Bit Status	On	Off	Off	On	Off	Off	Off	Off	
Device PDI Data Length	2	8	8	8	2	2	2	2	
PDI Data Valid	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	
Last In PDI Data (MS Byte PDI)	17 de	00 00 00 00 00 00 de 8f	00 00 00 00 00 00 de 70	0a 04 0a 00 00 de 07 00 00	03 10	00 00	00 00	0a 29	
Device PDD Data Length	0	0	0	0	0	0	0	0	
PDD Data Valid									
Last In PDD Data (MS Byte PDD)									
Time Since Initialization	0:00:21	0:00:21	0:00:21	0:00:21	0:00:21	0:00:21	0:00:21	0:00:21	
Process Data Errors	2	4	5	0	0	3	0	3	
Process Data Retries	1	1	2	0	0	1	1	1	
Total Events	5	6	8	2	2	5	3	5	
First Events	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Single Error Local.0002h 5 Single Warning Local.0010h 6 NoF	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Single Error Local.0002h 5 Single Warning Local.0010h 6 NoF	1 Single Error Local.0002h 2 Warning Warning Local.0010h 3 Warning Message Local.0024h 4 Single Error Local.0002h 5 Warning Error Local.0010h 6 NoF	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h
Last Events	2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Single Error Local.0002h 5 Single Warning Local.0010h 6 NoF	1 Single Error Local.0002h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Single Error Local.0002h 5 Single Warning Local.0010h 6 NoF	1 Single Error Local.0002h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Single Error Local.0002h 5 Single Warning Local.0010h 6 NoF	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h	1 Single Message Local.0024h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h	1 Single Error Local.0002h 2 Warning Error Local.0010h 3 Warning Error Local.0020h 4 Warning Error Local.0010h 5 Warning Error Local.0010h 6 Warning Error Local.0010h
ISDU Statistics									
ISDU Read Cmd Attempts	7	7	7	7	7	7	7	6	
ISDU Read Cmd Errors	0	0	0	0	0	0	0	0	
ISDU Write Cmd Attempts	0	0	0	0	0	0	0	0	
ISDU Write Cmd Errors	0	0	0	0	0	0	0	0	

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

IO-Link Diagnostics	
Port Name	This is an optional friendly port name, which can be configured in the Configuration IO-Link page.
Port Mode	Displays the active device mode: <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	Displays the port status: <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.
IO-Link State	<ul style="list-style-type: none"> • Operate - Port is functioning correctly in IO-Link mode but has not received valid PDI data. This may also display during a data storage upload or download. • Init - The port is attempting initialization. • Reset - One of the following conditions exists: <ul style="list-style-type: none"> - The Port Mode configuration is set to Reset. - The Port Mode configuration is set to DigitalIn or DigitalOut. • DS - Wrong Sensor - Hardware failure (IO-Link LED also flashes red) because there is Data Storage on this port, which does not reflect the attached device. • DV - Wrong Sensor - Hardware failure (IO-Link LED also flashes red) because Device Validation is configured for this port and the wrong device is attached. • DS - Wrong Size - Hardware failure (IO-Link LED also flashes red) because the size of the configuration on the device does not match the size of the configuration stored on the port. • Comm Lost - Temporary state after a device is disconnected and before the port is re-initialized. • Pre-operate - Temporary status displayed when the device: <ul style="list-style-type: none"> - Is starting up after connection or power-up. - Uploading or downloading automatic data storage.
Device Vendor Name	Displays the Device Vendor Name as stored in ISDU Index 16.
Device Product Name	Displays the device product name as stored in ISDU Index 18.
Device Serial Number	Displays the device serial number as stored in ISDU Index 21.
Device Hardware Version	Displays the device hardware version as stored in ISDU Index 22.
Device Firmware Version	Displays 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.
Actual Cycle Time	This is the actual, or current, cycle time of the IO-Link connection to the device.

IO-Link Diagnostics (Continued)	
Device Minimum Cycle Time	This is the minimum, or fastest, cycle time supported by the connected IO-Link device.
Configured Minimum Cycle Time	Configured in the Configuration IO-Link page, this is the minimum cycle time the IO-Link master will allow the port to operate at. The Actual Cycle Time , which is negotiated between the IO-Link master and the device, will be at least as long as the greater of the Configured Minimum Cycle Time and the Device Minimum Cycle Time .
Data Storage Capable	Displays whether the IO-Link device on a port supports the data storage feature. Not all IO-Link devices support the data storage feature.
Automatic Data Storage Configuration	Displays whether a port is configured to automatically upload data from the IO-Link device or download data from the AY1000 to the IO-Link device. Disabled displays if automatic upload or download are not enabled.
Auxiliary Input (AI) Bit Status	The current status of the auxiliary bit as received on DI of the IO-Link port.
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 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.
PDO Data Valid	Status of PDO data being received from controller(s).
Last Tx PDO Data (MS Byte First)	The last Tx PDO data.
Time Since Initialization	The time since the last port initialization.
Process Data Errors	The number of process data errors the port received.
Process Data Retries	The number of process data retries the port performed.
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.
ISDU Statistics	
ISDU Read Cmd Attempts	The number of read ISDU command attempts.
ISDU Read Cmd Errors	The number of read ISDU command errors.
ISDU Write Cmd Attempts	The number of write ISDU command attempts.
ISDU Write Cmd Errors	The number of write ISDU command errors.

11.2. Digital I/O Diagnostics

The **Digital I/O Diagnostics** page may be useful when trying to troubleshoot port issues related to configuration. The following table provides information about the **Digital I/O Diagnostics** page.

Digital I/O Diagnostics	
Mode	Displays the current configured operating mode of the digital I/O pin. <ul style="list-style-type: none">• Off• Digital-Input• Digital-Output (Pins D2 and D4 only)
Invert I/O	Displays the current configured Invert I/O setting: <ul style="list-style-type: none">• On (Invert I/O)• Off (Do not invert I/O)
Input Settling Time (ms)	Displays the current configured input settling time.
Status	Displays the current status of the digital I/O pin. <ul style="list-style-type: none">• On (high voltage)• Off (low voltage)
Status Changes	Displays the number of times that the status of the digital I/O pin has changed.

11.3. PROFINET IO Diagnostics Page

The **PROFINET IO Diagnostics** page may be useful when trying to troubleshoot communications or port issues related to PROFINET IO configuration.

The screenshot displays the 'Profinet IO Diagnostics' interface. At the top, there is a navigation bar with 'Diagnostics' highlighted. Below this, the page title 'Profinet IO Diagnostics' is shown along with 'UPDATE', 'STOP LIVE UPDATES', and 'RESET STATISTICS' buttons. The main content area is divided into two primary sections:

- PROFINET IO GENERAL STATUS:** A table with two columns. The first column lists various status metrics, and the second column shows their values.

PROFINET IO GENERAL STATUS	
Active Application Relationships	0
Application Relationship 1 Uptime	
Application Relationship 2 Uptime	
Total Application Relationships Established	0
IDL_CALL Function Block Requests	0
IDL_CALL Function Block Errors	0
Configuration Errors	0
System Errors	0
PROFINET IO Frames Transmitted	273
PROFINET IO Transmit Errors	0
PROFINET IO Frames Received	5289
PROFINET IO Receive Errors	0
Record Reads	0
Record Read Errors	0
Ethernet Port 1 Link Status	100Mbps Full Duplex
Ethernet Port 2 Link Status	Link Down
First Error String	No Error Detected
Last Error String	
- PROFINET IO PORT STATUS:** A table with 8 columns representing PORT 1 through PORT 8. The first column lists various port-related metrics, and the subsequent columns show the values for each port. All values in this table are 0.

PROFINET IO PORT STATUS	PORT 1	PORT 2	PORT 3	PORT 4	PORT 5	PORT 6	PORT 7	PORT 8
Application Relationship								
PDI Reads	0	0	0	0	0	0	0	0
PDI Reads Truncated	0	0	0	0	0	0	0	0
PDI Read Errors	0	0	0	0	0	0	0	0
PDO Writes	0	0	0	0	0	0	0	0
PDO Write Errors	0	0	0	0	0	0	0	0
Event Reads	0	0	0	0	0	0	0	0
Event Read Errors	0	0	0	0	0	0	0	0
Get Port Mode Errors	0	0	0	0	0	0	0	0
Set Port Mode Errors	0	0	0	0	0	0	0	0
ISDU Request Msgs from PLC (s)	0	0	0	0	0	0	0	0
ISDU Invalid Requests	0	0	0	0	0	0	0	0
Valid ISDU Responses from Port	0	0	0	0	0	0	0	0
ISDU Response Timeouts	0	0	0	0	0	0	0	0
Maximum ISDU Request Response Time								
Average ISDU Request Response Time								
Minimum ISDU Request Response Time								
ISDU Read Commands	0	0	0	0	0	0	0	0
ISDU Read Failures	0	0	0	0	0	0	0	0
ISDU Write Commands	0	0	0	0	0	0	0	0
ISDU Write Failures	0	0	0	0	0	0	0	0
Process Alarms	0	0	0	0	0	0	0	0
Return of Submodule Alarms	0	0	0	0	0	0	0	0
Channel Diagnostics Alarms Added	0	0	0	0	0	0	0	0
Channel Diagnostics Alarm Removed	0	0	0	0	0	0	0	0
Alarm Errors	0	0	0	0	0	0	0	0

At the bottom of the page, there is a footer with 'Welcome Admin' on the left and '© copyright ilm electronic gmbh' on the right.

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

PROFINET IO Diagnostics	
Active Application Relationships	Displays the current number of active PROFINET IO connections.
Application Relationship 1 Uptime	The uptime of the first application relationship.
Application Relationship 2 Uptime	The uptime of the second application relationship.
Total Application Relationships Established	The total number of application relationships that have been established since power up.
IOL_CALL Function Block Requests	The total number of IOL_CALL function block requests received.
IOL_CALL Function Block Errors	The number of errors when handling IOC_CALL function block requests.
Configuration Errors	The number of system configuration related errors.
System 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.
PROFINET IO Frames Transmitted	The total number of transmitted PROFINET IO frames.
PROFINET IO Transmit Errors	The number of errors when transmitting PROFINET IO frames.
PROFINET IO Frames Received	The total number of received PROFINET IO frames.
PROFINET IO Receive Errors	The number of errors when receiving PROFINET IO frames.
Record Reads	The total number of record read requests received.
Record Read Errors	The number of errors when handing record read requests.
Ethernet Port 1 Link Status	Current link status of Ethernet Port 1.
Ethernet Port 2 Link Status	Current link status of Ethernet Port 2.
First Error String	Text description of the first error that occurred.
Last Error String	Text description of the last error that occurred.
PROFINET IO Port Status	
Application Relationship	The application relationship (1 or 2) that the IO-Link port belongs to.
PDI Reads	The number of PDI reads.
PDI Reads Truncated	The number of PDI reads that are truncated due to size.
PDI Read Errors	The number of errors when reading PDI.
PDO Writes	The number of PDI writes.
PDO Write Errors	The number of errors when reading PDO.
Event Reads	The number of IO-Link events.
Event Read Errors	The number of errors when reading IO-Link events.
Get Port Mode Errors	The number of errors when getting IO-Link port mode.
Set Port Mode Errors	The number of errors when setting IO-Link port mode.

PROFINET IO Diagnostics (Continued)	
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 PROFINET IO with one or more invalid commands.
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 .
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 PROFINET IO.
ISDU Read Failures	The number of errors when processing ISDU read commands.
ISDU Write Commands	Displays the number of ISDU write commands received over PROFINET IO.
ISDU Write Failures	The number of errors when processing ISDU write commands.
Process Alarms	The number of process alarms sent to PLC.
Return of Submodule Alarms	The number of Return of Submodule alarms sent to PLC.
Channel Diagnostics Alarms Added	The number of channel diagnostics alarms sent to PLC.
Channel Diagnostics Alarms Removed	The number of channel diagnostics alarms removed from PLC.
Alarm Errors	The number errors when handling PROFINET IO alarms.

Chapter 12. PROFINET IO Reference Information


12.1. Sample IO-Link master Gateway Configuration

In this section we use an example to demonstrate how to configure and use an IO-Link gateway..

Slot	Module	Order num...	I address	Q address	Diagnostic add...	Comm...	Access
0	AY1000	AY1000			2042*		Full
X1	Interface				2041*		Full
X1 P1	Port 1				2040*		Full
X1 P2	Port 2				2039*		Full
1	IO-Link In 2 bytes		5...6				Full
2	IO-Link In/Out 2 bytes		7...8	1...2			Full
3	SIO Digital In		9				Full
4	SIO Digital Out			3			Full
5							
6							
7							
8							
9	IO-Link Status		0...3				Full
10	Digital I/O		4	0			Full
11							

- The first IO-Link device, which supported 2 bytes of PDI data, was connected to IO-Link Port 1. The PDI data were mapped into the process image at address IW 5 of the IO controller, as shown in the figure above. The IO controller could read the current PDI data from the IO-Link device at IW 5.
- The second IO-Link device, which supported 2 bytes of PDI data and 2 bytes of PDO data, was connected to IO-Link Port 2. The PDI data were mapped into the process image at address IW 7. The PDO data were mapped into process image at address QW 2. The IO controller could access PDI and PDO via the two memory locations.
- IO-Link Port 3 and Port 4 were configured as SIO Digital In and SIO Digital Out. The IO controller could read the input status of the C/Q pin of Port 3 at IB 9, and set the output C/Q pin value of Port 4 by writing to QB 3. IO-Link port status was reported through the module in Slot 9. The 4-byte port status was available at IB 0 to IB 3.
- A Digital I/O module was plugged in Slot 10. DIO 2 and 4 were configured as digital outputs. The IO controller could reads digital input status at IB 4 and set digital output at QB 0.

Using a variable table, as shown in the following, we monitored and modified the IO data directly.

		Address	Symbol	Display format	Status value	Modify value
1		IB 0	"Status_Active"	BIN	2#0000_1111	
2		IB 1	"Status_PDInvalid"	BIN	2#0000_0111	
3		IB 2	"Status_AuxiliaryInput"	BIN	2#0000_1111	
4		IB 3	"Status_Error"	BIN	2#0000_0000	
5		IW 5	"P1_IOLinkIn2bytes"	HEX	W#16#090E	
6		IW 7	"P2_IOLinkIn2bytes"	HEX	W#16#03F6	
7		QW 1	"P2_IOLinkOut2bytes"	HEX	W#16#0000	
8		IB 9	"P3_SIOInput"	HEX	B#16#01	
9		QB 3	"P4_SIOOutput"	HEX	B#16#01	B#16#01
10		IB 4	"DIO_Input"	BIN	2#0000_1111	
11		QB 0	"DIO_Output"	BIN	2#0000_1010	2#0000_1010

Monitor and Modify IO Data via Variable Table

IB 0-3 were input data from **IO-Link Status** module (Slot 9). IB 0 was IO-Link Active, IB 1 was PDI Valid, IB 2 was Auxiliary Input, and IB 3 was IO-Link Error. According to the current value of IB 0, Ports 1-4 were active. IB 1 showed the PDI data of Ports 1-3 were valid. Port 4 was an output module therefore, the PDI valid bit was zero. IB 2 showed that the auxiliary input pins of Port 1-4 were high. No errors were detected so IB 3 was zero.

The PDI data of Port 1 was 0x090E (IW 5). The PDI data of Port 2 was 0x03F6 (IW 7).

In this example, we used wires to connect the C/Q pin and auxiliary input pin of Port 3 and Port 4 together, creating a testing loopback. Then we changed QB 3 to 0x01, which set the C/Q Pin of Port 4 and both auxiliary input pins of Port 3 and 4 to high. IB 9 showed the status of the C/Q pin of Port 3 was high (0x01). The high status of auxiliary input pins of Ports 3 and 4 was reflected in IB 2.

To test digital I/O ports, we created testing loopbacks by connecting DIO 1 to 2, and DIO 3 to 4 with wires. Then we changed QB 0 to 2#0000_1010, which set the DIO 2 and DIO 4 to high. IB 4 showed the input status of DIO 1-4 were high (2#0000_1111).

Slot 5-8 (Port 5-8) and Slot 11 were open. They could be used by another IO controller via a second application relationship.

12.2. Read PDI Data as Record Data

For IO modules that have input data, the Port Qualifier and PDI data can also be read by using the SFB52 RDREC (read record). The following table shows the available record read indexes for the IO-Link masterAY1000.

Index	Description
100..131	1-32 byte of PDI data from an IO-Link Port module in Slot 1
200..231	1-32 byte of PDI data from an IO-Link Port module in Slot 2
300..331	1-32 byte of PDI data from an IO-Link Port module in Slot 3
400..431	1-32 byte of PDI data from an IO-Link Port module in Slot 4
500..531	1-32 byte of PDI data from an IO-Link Port module in Slot 5
600..631	1-32 byte of PDI data from an IO-Link Port module in Slot 6
700..731	1-32 byte of PDI data from an IO-Link Port module in Slot 7
800..831	1-32 byte of PDI data from an IO-Link Port module in Slot 8
900	1-4 byte of PDI data from a Port Status module in Slot 9
1000	1-4 byte of PDI data from a Port Status module in Slot 10
1100	1-4 byte of PDI data from a Port Status module in Slot 11
1200	1-4 byte of PDI data from a Port Status module in Slot 12

Using the same example in [12.1. Sample IO-Link master Gateway Configuration](#) on Page 85; a record read request of 2-bytes at index 100 would return the current PDI data of the IO-Link device attached to Port 1. A record read request of 1-byte at Index 900 would return the current IO-Link port active status.

Reading partial PDI data via record read request is supported. For an instance, an IO-Link device that supports 32-bytes PDI data is connected to IO-Link Port 5. A record read request of 32-bytes at Index 500 returns the whole 32-bytes of PDI data. Another record read request of 4-bytes at Index 529 returns the last 4-bytes of the PDI data. This provides flexibility in being able to get only the interested data from a large PDI data block.

If a record read requests more data than the IO module or IO-Link device supports, IO-Link master returns the available PDI data and fills the remaining data with zeros. Again using the same example in [12.1. Sample IO-Link master Gateway Configuration](#) on Page 85; a record read request of 4-bytes at Index 100 returned 0x09 0x0E 0x00 0x00, where 0x09 and 0x0E were the actual PDI data.

IO-Link master returns an error if a record read request contains an invalid index.

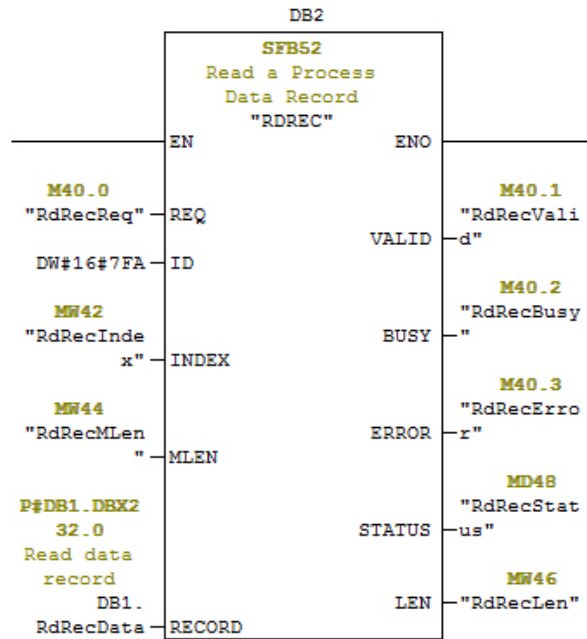
Writing PDO Data to an IO-Link device via data record write service is not supported. This is because that the new PDO data written by a record write will only last for one update cycle. The next cycle the IO controller overwrites the new PDO data with the old cyclic data from the process image.

12.3. Using the SFB52 RDREC

To use the SFB52 **RDREC**, specify the index of the requested module in **INDEX**. Specify the maximum number of bytes you want to read in **MLEN**. The selected length of the target area **RECORD** should have at least the length of **MLEN** bytes.

TRUE on output parameter **VALID** verifies that the data record has been successfully transferred into the target area **RECORD**. In this case, the output parameter **LEN** contains the length of the fetched data in bytes.

The output parameter **ERROR** indicates if a data record transmission error has occurred. In this case, the output parameter **STATUS** contains the error information.



SFB52 Read a Process Data Record

12.4. Read and Write ISDU with the FB IOL_CALL

The function block **IOL_CALL** represents the conversion of the communication standardized for the IO-Link technology to and from IO-Link devices. The IO-Link Master supports the **IOL_CALL** function block. It can be used to access an ISDU of an IO-Link device.

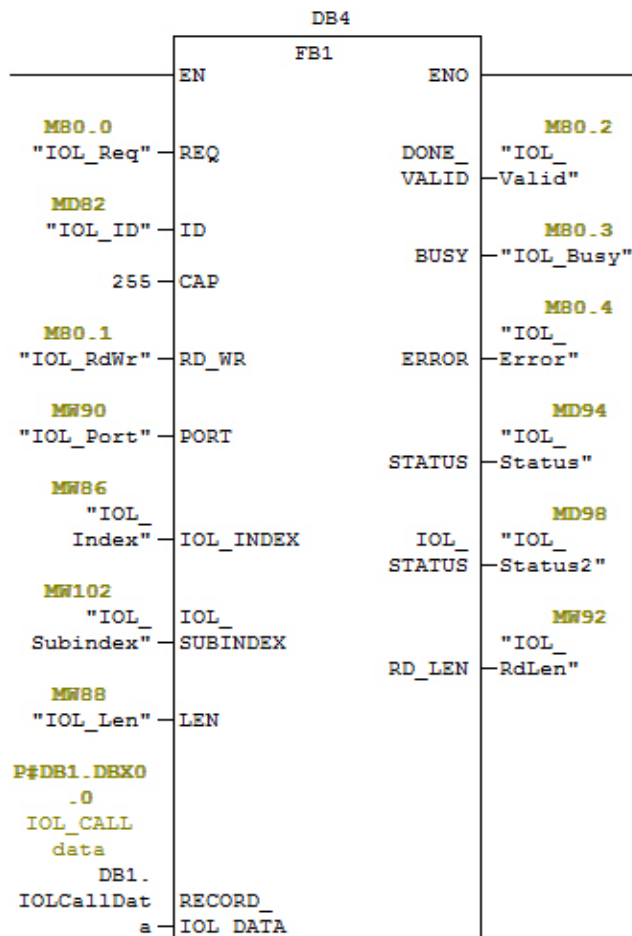
The **IOL_CALL** function block and the library description are available at: <http://support.automation.siemens.com/WW/view/en/82981502>

To use **IOL_CALL** function block, do the following:

1. Set **CAP** to 255.
2. Specify **PORT** to be the IO-Link port number (1 to 8) at which the IO-Link device is connected.
3. Set **IOL_INDEX** and **IOL_SUBINDEX** to be the index and subindex of the requested ISDU. **RECORD_IOL_DATA** requires the full specification of the DB parameters, i.e. **P#DB1.DBX0.0** byte 232.
The target area **RECORD_IOL_DATA** must have enough available bytes to hold the requested ISDU block up to 232 bytes.
4. Set **RD_WR** to 0 for read and 1 for write. For write, also specify the length of the data to be written in **LEN**. A positive edge on **REQ** starts the **IOL_CALL** request.

BUSY is set to 1 when the **IOL_CALL** request is in progress. Once completed, **DONE_VALID** is set to 1 if there was no error. Otherwise, **ERROR** is set and **STATUS** and **IOL_STATUS** contain the error information. For the remainder of the **IOL_CALL** function block parameters and complete error information, refer to the **IOL_CALL** library description.

Parameter	Description
CAP	Access point of the IOL_CALL function. Use 255.
PORT	IO-Link port number at which the IO-Link device is operated, port number 1 through 8. All other values: not supported.
IOL_INDEX	Address parameter INDEX (IO-Link device). 0 - 32767: index of ISDU
IOL_SUBINDEX	Address parameter SUBINDEX (IO-Link device). <ul style="list-style-type: none"> • 0: not support • 1 - 255: subindex of ISDU



IOL_CALL Function Block

The **IOL_CALL** function block has a 20 seconds timeout value. If the request takes longer than 20 seconds, the process is aborted and a timeout error is returned. The AY1000 also has a timeout value for **IOL_CALL** request. The default timeout value is 20 seconds. It can be changed through the web page (**Configuration -> PROFINET IO**).

12.5. Diagnostic Alarm

Events from IO-Link master and IO-Link devices are mapped to PROFINET alarms and channel diagnostics according to the IO-Link on *PROFINET Working Document Version 13.4.2015* with some modifications.

12.5.1. IO-Link Event Mapping Overview

IO-Link events are mapped into **PROFINET Alarms and Channel Diagnostics** using the following table. Each appearing IO-Link event (mode Coming) results in adding channel diagnostics. Each disappearing IO-Link event (mode Going) results in removing channel diagnostics. IO-Link events that have mode Single will be mapped to PROFINET process alarm.

IO-Link Event Mapping	
IO-Link Event Mode	PROFINET
Single	Process alarm
Coming	Add channel diagnostics
Going	Remove channel diagnostics

In addition, only IO-Link events that have the type of Error or Warning are mapped to PROFINET channel diagnostics. Type Message IO-Link events are not mapped.

12.5.2. IO-Link EventCode Mapping

IO-Link events that are generated by IO-Link devices (remote events) are mapped to PROFINET diagnostics using **ChannelErrorType** 0x500 and 0x501.

- For an **EventCode** that is between 0x0000 and 0x7FFF, **ChannelErrorType** 0x500 is used. The **EventCode** is directly mapped to **ExtChannelErrorType**.
- For an **EventCode** that is between 0x8000-0xFFFF, **ChannelErrorType** 0x501 is used. The **EventCode** is mapped to **ExtChannelErrorType** with the MSB set to 0.
- For IO-Link events that are generated by IO-Link master (local events), **ChannelErrorType** 0x502 is used. **EventCode** is directly mapped to **ExtChannelErrorType**.

The following table summaries how IO-Link EventCode is mapped to PROFINET diagnostics.

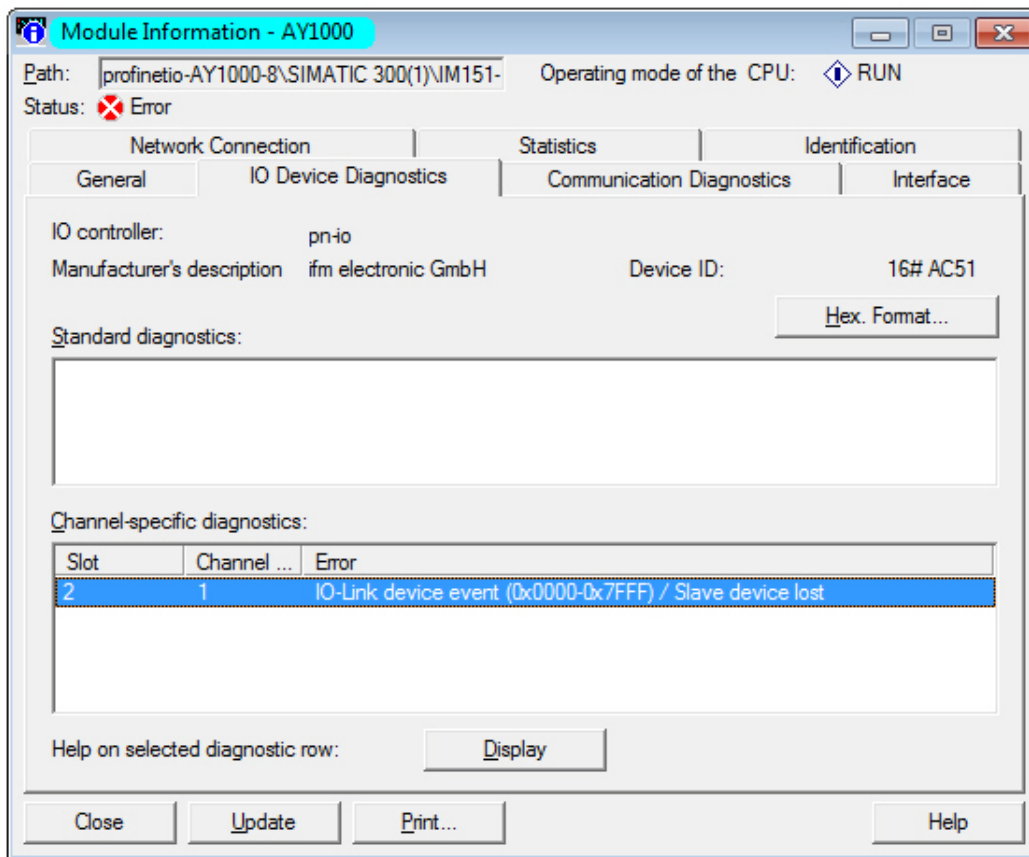
IO-Link EventCode Mapping				
Source	EventCode	ChannelError Type	ExtChannel ErrorType	Comment
IO-Link Device (remote)	0x0000-0x7FFFF	0x500	0x0000-0x7FFFF	Direct mapping of EventCode to ExtChannelErrorType (e.g. EventCode 0x6321 will be mapped to ExtChannelErrorType 0x6321)
IO-Link Device (remote)	0x8000-0xFFFF	0x501	0x0000-0x7FFFF	Mapping of EventCode to ExtChannelErrorType. Set MSB (EventCode) to "0" (e.g. EventCode 0x8005 -> ExtChannelErrorType 0x0005)
IO-Link master (local)	0x0000-0x7FFFF	0x502	0x0000-0x7FFFF	Direct mapping of local EventCode to ExtChannelErrorType

The following table lists some of the EventCode that ifm IO-Link master generates.

IO-Link EventCode	ExtChannelErrorType	Description
0x0001	0x0001	Slave PDU Flow
0x0002	0x0002	Master PDU checksum error
0x0003	0x0003	Slave illegal PDU
0x0004	0x0004	Master illegal PDU
0x0005	0x0005	Slave PDU buffer
0x0006	0x0006	Slave PD INKR
0x0007	0x0007	Slave PD length
0x0008	0x0008	Slave no PDI
0x0009	0x0009	Slave no PDO
0x000A	0x000A	Slave channel
0x000B	0x000B	Master event
0x000C	0x000C	Application message
0x000D	0x000D	Application warning
0x000E	0x000E	Application device
0x000F	0x000F	Application parameter
0x0010	0x0010	Slave device lost
0x0012	0x0012	Slave DESINA
0x001A	0x001A	Slave wrong sensor
0x001B	0x001B	Slave retry
0x001E	0x001E	Power short circuit
0x001F	0x001F	Power sensor
0x0020	0x0020	Power actuator
0x0021	0x0021	Power fault
0x0022	0x0022	Power reset

IO-Link EventCode	ExtChannelErrorType	Description
0x0023	0x0023	Slave fallback
0x0024	0x0024	Master preoperate
0x0028	0x0028	Data storage ready
0x0029	0x0029	Data storage identity fault
0x002A	0x002A	Data storage size fault
0x002B	0x002B	Data storage upload fault
0x002C	0x002C	Data storage download fault
0x002F	0x002F	Data storage device locked fault

The following image shows a *Slave device lost* event that was available in the diagnostics when an IO-Link device was disconnected from an IO-Link port. In the figure, Slot 2 means that the device was connected to IO-Link Port 2. The event will be removed from the diagnostics when the device is reconnected to the same IO-Link port.



IO-Link Events through PROFINET Channel Diagnostics

Chapter 13. Troubleshooting

This chapter provides the following information:

- *Troubleshooting*
- [AY1000 LEDs](#) on Page 94

13.1. Troubleshooting

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

- Check to make sure LEDs are not reporting an issue using [AY1000 LEDs](#) on Page 94.
- 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.
 - Verify that the Ethernet hub and any other network devices between the system and the IO-Link master are powered up and operating.
- Verify that you are using the correct types of cables on the correct connectors and that all cables are connected securely.
- Disconnect and re-connect the IO-Link device, or optionally, use the **Configuration | IO-Link** page to **Reset** the port, and then set the **Port Mode** back to **IO-Link**.
- Reboot or power cycle the AY1000. Use the **Advanced | Software** page to reboot the AY1000.
- Verify that the **Port Mode** matches the device, for example: IO-Link, Digital In, Digital Out, or Reset (port is disabled).
- If you are receiving an error that indicates a hardware fault, check the **Configuration | IO-Link** page for the port experiencing the fault.
 - Check the settings for the **Automatic Upload Enable** and **Automatic Download Enable** options. If the Vendor ID or Device ID of the attached device does not match, a hardware fault is generated.
 - Make sure if the port contains data storage that the Vendor ID and Device ID match the device attached to the port. If it does not, **CLEAR** the data storage or move the device to another port.
 - Check the Device Validation and Data Validation settings. If the attached device does not meet these settings, a hardware fault is issued.
- Open the IO-Link master web interface and review the following pages to see if you can locate a problem:
 - **IO-Link Diagnostics**
- If you have a spare IO-Link master, try replacing the IO-Link master.

13.2. AY1000 LEDs

The AY1000 (8-port IP20 DIN rail model) provides these LEDs.

AY1000 LEDs	
PWR	A lit green PWR LED indicates that the IO-Link master is powered.
MS (Module Status)	<p>The MS LED provides the following information:</p> <ul style="list-style-type: none"> • Off = No errors or there is no PLC connection • Flashing green and red = Self-test • Flashing green = Standby – not configured • Steady green = Operational • Flashing red <ul style="list-style-type: none"> - One or more errors detected when NS is off - Fatal error when NS is also flashing red • Steady red = Maintenance required or demanded
NS (Network Status)	<p>The NS LED provides the following information:</p> <ul style="list-style-type: none"> • Off = No PLC connection • Flashing green and red = Self-test • Flashing green = An IP address is configured, but no connections are established • Steady green = PLC connection established • Flashing red = Fatal error when MS is also flashing • Steady red = Duplicate IP address on network
Port 1-8	<p>This LED provides the following information about the IO-Link port.</p> <ul style="list-style-type: none"> • Off: SIO mode - signal is low or disabled • Yellow: SIO mode - signal is high • Flashing red: Hardware fault - make sure that configured IO-Link settings on the port do not conflict with the device that is attached: <ul style="list-style-type: none"> - Automatic Upload and/or Download is enabled and it is not the same device. - Device Validation Mode is enabled and it is not the correct device. - Data Validation Mode is enabled but there is an error. • Solid red - PDI of the attached IO-Link device is invalid. • Solid Green: An IO-Link device is connected and communicating • Blinking Green: Searching for IO-Link devices
D1-4	<p>The D1 - D4 LEDs indicates digital input.</p> <ul style="list-style-type: none"> • Off: DI signal is low or disconnected • On: DI signal is high
Dual Ethernet Ports	<p>The Ethernet LEDs provide the following information:</p> <ul style="list-style-type: none"> • Green/Solid = Link • Yellow/Solid = Activity

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