Advantys ETB

IP67 Ethernet Block I/O Modules for Modbus TCP/IP
User Guide

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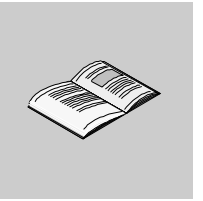
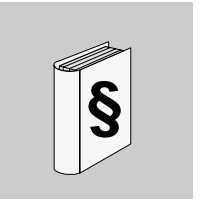


Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage.

PLEASE NOTE

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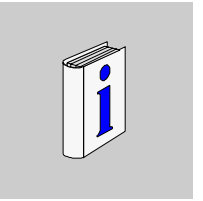
A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

Advantys ETB IP67 Ethernet modules are block I/O with embedded 2-port Ethernet switches. The modules are intended for high-moisture environments, and they provide connectivity to sensors/actuators through Ethernet Modbus messaging.

This document describes the following ETB IP67 models:

Model Number	Description
ETB1EM16CP00	16 I/O points, each point configurable as input or output
ETB1EM16EPP0	16 PNP inputs / 0 outputs
ETB1EM12E04SPP0	12 PNP inputs / 4 PNP outputs
ETB08E08SPP0	8 PNP inputs / 8 PNP outputs

Validity Note

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

Introducing the Advantys ETB I/O Modules

1

Overview

This chapter introduces the Advantys ETB I/O family of modules for Modbus TCP/IP networks.

What's in this Chapter?

This chapter contains the following topics:

Features of the Advantys ETB I/O Modules

Introduction

The Advantys ETB family of I/O modules includes modules designed for use with either the Modbus TCP/IP or the EtherNet/IP protocols. This manual describes modules designed for the Modbus TCP/IP protocol.

Advantys ETB I/O modules combine the functionality of a block I/O with an embedded 2-port Ethernet switch. These modules can be used in applications where I/O is mounted directly on equipment without an enclosure. They can be exposed to water or oil spray.

IP67 Rated

Each Advantys ETB I/O module is housed in an IP67 rated enclosure that when properly installed—according to IEC 60529—provides protection against the ingress of:

- dust
- water, when temporarily immersed (for up to 30 minutes) to a depth of 1 meter

Data Access for the ETB I/O Modbus TCP/IP Module

Module data is accessible via Modbus messaging and embedded web pages, and includes:

- input and output data
- input and output status
- I/O configuration settings
- module Ethernet (Modbus TCP/IP) communication configuration settings
- module firmware data

System View

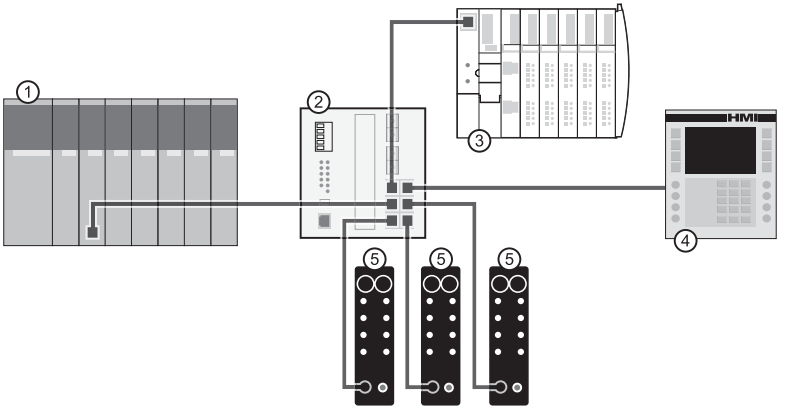
Description

Advantys ETB I/O modules can be used with a protocol compliant scanner as part of control system architecture. The modules' built-in unmanaged 2-port Ethernet switch allows you to use the network topology that meets your application needs. These topologies include the following:

- star
- daisy-chain
- combination of star and daisy-chain

Star

Star topology allows you to connect mixed I/O blocks or additional network equipment. Performing maintenance on one module—for example, by removing the network cable, or by cycling power to the module—does not affect other modules.



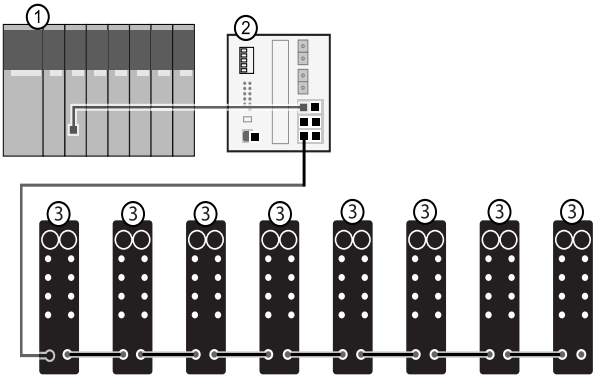
1 Quantum PLC
2 Ethernet switch
3 Advantys STB Island
4 Magelis HMI device
5 Advantys ETB I/O modules

Daisy-chain

You can create a daisy-chain topology by using the module's embedded switch ports to connect a series of up to 8 Advantys ETB I/O modules.

NOTE: When considering the daisy chain topology, note that:

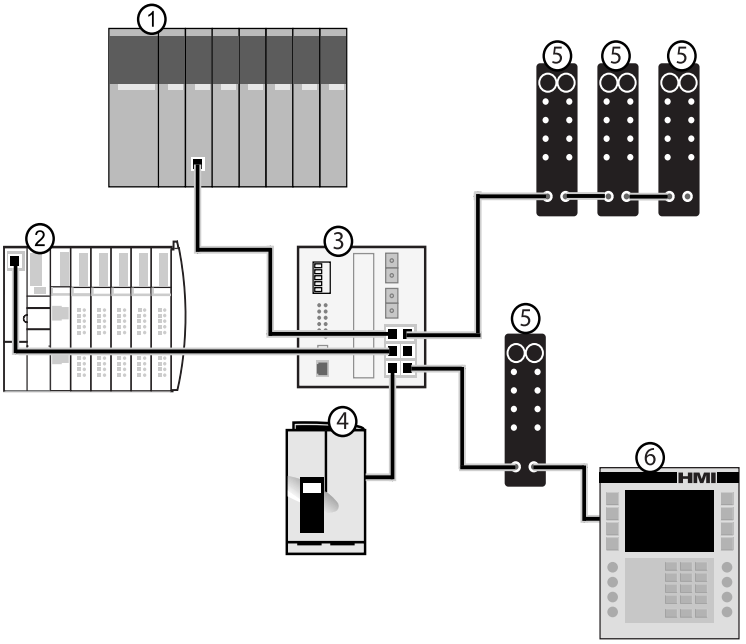
- Performing maintenance on any module not physically located at the end of the daisy chain—for example, by removing the network cable, or by cycling power to the module—affects any modules located down the chain from the maintained module.
- The embedded dual port Ethernet switch located in each module eliminates the need for additional Ethernet switches.



1 Quantum PLC
2 Ethernet switch
3 Advantys ETB I/O modules

Combination of Star and Daisy-chain

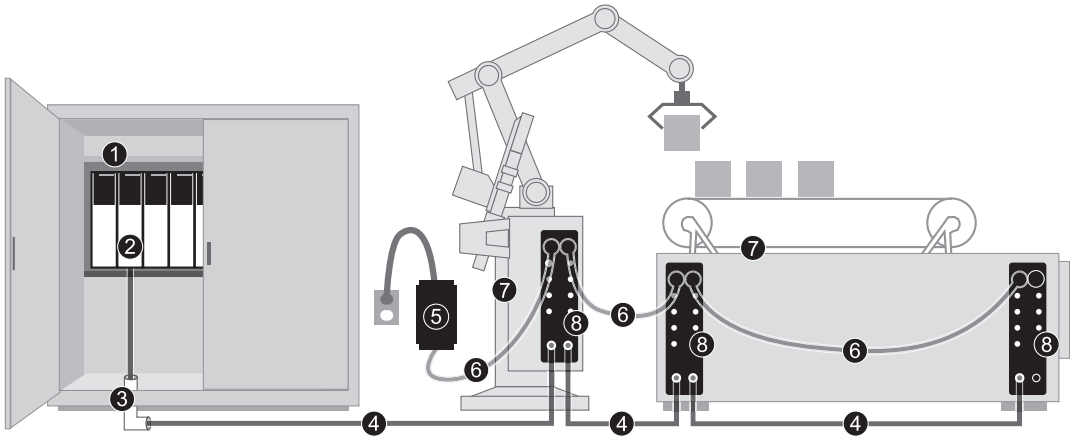
Combining star and daisy-chain topology allows you to connect Advantys ETB I/O modules with mixed I/O blocks or additional network equipment.



1 Quantum PLC
2 Advantys STB Island
3 Ethernet switch
4 Altivar drive
5 Advantys ETB I/O modules
6 Magelis HMI device

Application

This diagram shows you an example of how to arrange your Advantys ETB I/O modules in a daisy-chain topology.



1 cabinet mounted PLC
2 Ethernet interface module on PLC system
3 Ethernet adapter
4 Ethernet connector cable
5 24 VDC power supply
Note: Alternatively, the power supply could be mounted in the cabinet.
6 power supply cable
7 machine
8 Advantys ETB I/O modules mounted on machine

Advantys ETB for Modbus TCP/IP

Introduction

This topic provides you with the part numbers and descriptions of the Advantys ETB I/O modules, as well as the associated cables and accessories.

Advantys ETB I/O Modules for Modbus TCP/IP

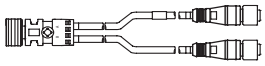
Advantys ETB I/O modules provide 16 I/O points on 8 I/O ports—2 points per port. Each model is distinguished by the number of I/O ports designated as inputs and outputs.

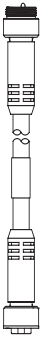
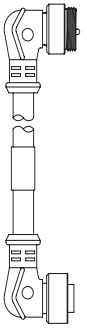
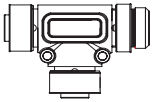
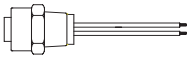
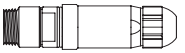
The Modbus TCP/IP product line includes the following modules:

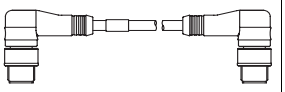
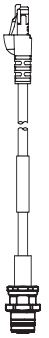
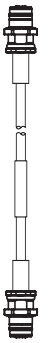
Model Number	Description
ETB1EM16CP00	16 I/O points, each configurable as an input or output **NOTE:** You can configure ETB1EM16CP00 for either PNP or NPN inputs.
ETB1EM16EPP0	16 PNP inputs[1] (0 outputs)
ETB1EM12E04SPP0	12 PNP inputs / 4 PNP outputs[2]
ETB1EM08E08SPP0	8 PNP inputs / 8 PNP outputs
1. PNP Inputs refer to the sensor source or push current from the field sensor to the input circuit of the module. 2. PNP Outputs are the source type output, also referred to as true high output. When energized, the output pushes current through the load to turn on the output point.	

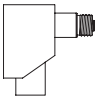
Cables and Accessories

The Modbus TCP/IP product line includes the following cables and accessories:

Type	Model Number	Description	Image
sensing cables	ETXSC412M1M3010	I/O cable - M12 connector - 1 m (3.28 ft) long	
	ETXSC412M1M3020	I/O cable - M12 connector - 2 m (6.56 ft) long	
	ETXSC412M1M3050	I/O cable - M12 connector - 5 m (16.40 ft) long	
	ETXSC412U1M3010	I/O cable - Ultra-Lock™ and M12 connector - 1 m (3.28 ft) long	
	ETXSC412U1M3020	I/O cable - Ultra-Lock™ and M12 connector - 2 m (6.56 ft) long	
	ETXSC412U1M3050	I/O cable - Ultra-Lock™ and M12 connector - 5 m (16.40 ft) long	
	ETXSC412U2M3010	I/O cable - Ultra-Lock™ and M12 connector -1 m (3.28 ft) long	
	ETXSC412U2M3020	I/O cable - Ultra-Lock™ and M12 connector - 2 m (6.56 ft) long	
	ETXSC412U2M3050	I/O cable - Ultra-Lock™ and M12 connector - 5 m (16.40 ft) long	
	ETXSC413U1M3003	I/O splitter cable - Ultra-Lock™ 1 end, M12s other end - 30 cm (0.98 ft) long	

Type	Model Number	Description	Image
power cables	ETXPC511M300040	7/8 mini-change 5 pin power cable, female straight connector, single ended, 4 m (13.12 ft) long	
	ETXPC512M1M3010	7/8 mini-change 5 pin power cable, straight connectors, 1 m (3.28 ft) long	
	ETXPC512M1M3020	7/8 mini-change 5 pin power cable, straight connectors, 2 m (6.56 ft) long	
	ETXPC512M1M3050	7/8 mini-change 5 pin power cable, straight connectors, 5 m (16.40 ft) long	
	ETXPC512M2M4006	7/8 mini-change 5 pin power cable, 90° connectors, 0.6 m (1.97 ft) long	
	ETXPC512M2M4010	7/8 mini-change 5 pin power cable, 90° connectors, 1 m (3.28 ft) long	
	ETXPC512M2M4020	7/8 mini-change 5 pin power cable, 90° connectors, 2 m (6.56 ft) long	
	ETXPC511M400020	7/8 mini-change 5 pin power cable, 90° female connector, single ended, 2 m (6.56 ft) long	
	ETXPC511M400040	7/8 mini-change 5 pin power cable, 90° female connector, single ended, 4 m (13.12 ft) long	
power tee	ETXPA513M	auxiliary power tee, 7/8 mini-change 5 Pin, straight connector	
power receptacle	EXTPA511M3	auxiliary power receptacle, 7/8 mini-change 5 Pin, straight female connectors	
field attachables	ETXPA5M1	field attachable connector, 7/8 mini-change 5 Pin, straight male connectors	
	ETXPA5M3	field attachable connector, 7/8 mini-change 5 Pin, straight female connectors	

Type	Model Number	Description	Image
Ethernet cables	TCSECL2M2M06S2	4 pin Ethernet cable, M12 D coded male to M12 D coded male, 90° connectors, 0.6 m (1.97 ft) long	
	TCSECL2M2M1S2	4 pin Ethernet cable, M12 D coded male to M12 D coded male, 90° connectors, 1 m (3.28 ft) long	
	TCSECL2M2M2S2	4 Pin Ethernet Cable, M12 D coded male to M12 D coded male, 90° connectors, 2 m (6.56 ft) long	
Ethernet patch cord	TCSECL1M3M1S2	straight Ethernet patch cord, RJ45 male to M12 D coded 4 pole male, 1 m (3.28 ft)	
	TCSECL1M3M3S2	straight Ethernet patch cord, RJ45 male to M12 D coded 4 pole male, 3 m (9.84 ft)	
	TCSECL1M3M10S2	straight Ethernet patch cord, RJ45 male to M12 D coded 4 pole male, 10 m (32.81 ft)	
	TCSECL1M3M25S2	straight Ethernet patch cord, RJ45 male to M12 D coded 4 pole male, 25 m (82.02 ft)	
	TCSECL1M3M40S2	straight Ethernet patch cord, RJ45 male to M12 D coded 4 pole male, 40 m (131.23 ft)	
	TCSECL1M1M1S2	straight Ethernet patch cord, M12 D coded 4 pole male to M12 D coded 4 pole male, 1 m (3.28 ft)	
	TCSECL1M1M3S2	straight Ethernet patch cord, M12 D coded 4 pole male to M12 D coded 4 pole male, 3 m (9.84 ft)	
	TCSECL1M1M10S2	straight Ethernet patch cord, M12 D coded 4 pole male to M12 D coded 4 pole male, 10 m (32.81 ft)	
	TCSECL1M1M25S2	straight Ethernet patch cord, M12 D coded 4 pole male to M12 D coded 4 pole male, 25 m (82.02 ft)	
	TCSECL1M1M40S2	straight Ethernet patch cord, M12 D coded 4 pole male to M12 D coded 4 pole male, 40 m (131.23 ft)	

Type	Model Number	Description	Image
sealing plugs	ETXSA12B	sealing plug for M12 connectors - 10 per package	
	ETXPA78BE	sealing plug for 7/8 mini-change connectors external - 1 per package	
	ETXPA78BI	sealing plug for 7/8 mini-change connectors internal - 1 per package	
adapter	ETXADRJM12	adapter RJ 45 to M12, for panel mounting	

Specifications and Physical Description

2

Overview

This chapter describes the physical, electrical, and environmental characteristics of the Modbus TCP/IP modules.

What's in this Chapter?

This chapter contains the following topics:

Specifications

Description

The specifications for each Modbus TCP/IP module are listed below:

CAUTION
Equipment Damage Do not unplug the cables while the module is powered, as this may damage the module's connectors. **Failure to follow these instructions can result in equipment damage.**

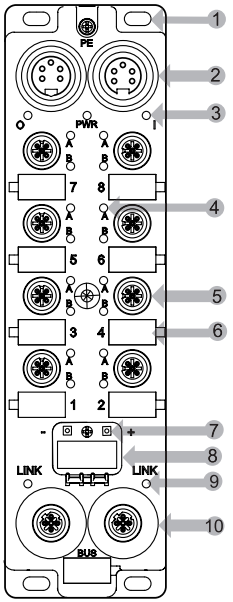
Data	**Model Number**			
	ETB1EM16EPPO	**ETB1EM08E08SPP0**	**ETB1EM12E04SPPO**	**ETB1EM16CP00**
Inputs	16	8	12	16 configurable input and output points
Outputs	0	8	4	
Ethernet connector	M12/Ultra-Lock™ (female D-Code)			
I/O connector	M12/Ultra-Lock™ (A-Code)			
Power in (left) connector	mini Change 5 Pole (male)			
Power out (right) connector	mini Change 5 Pole (female)			
Module and input power	24 VDC (13...30V)			
Output power	N/A	24 VDC (13...30V)		
Output current	N/A	2.0 A / point Sum = 8A Max		
Short circuit current (typical)	N/A	6.5 A		
Output switching frequency	N/A	200 Hz		
Output voltage: on-state drop/point	N/A	1 Vdc		
Output type	N/A	sourcing (PNP)		
Input signal voltage (“0”)	-2V...5V			
Input signal voltage (“1”)	10V...30V			
Input filter	2.5 ms			configurable

Data	Model Number			
	ETB1EM16EPPO	**ETB1EM08E08SPP0**	**ETB1EM12E04SPPO**	**ETB1EM16CP00**
Input short circuit (per point)	600 mA; 24 Vdc current limit on pin 1 (per port)			
Input current (per point)	140 mA			
Input type	PNP			PNP/NPN configurable
Operating temperature	-25° C...+70° C			
Storage temperature	-40° C...+85° C			
Vibration resistance	conforms to IEC68-2-6			
EMC	EN 61000-6-2			
Protection class	IP67			
MTBF	296,000 hours at 30° C GB (ground benign)			

Front Face

Description

The front face of the module includes the mounting holes, connectors, port connector labels, LEDs, push buttons, and the HMI display. The details and locations of these features are shown below.



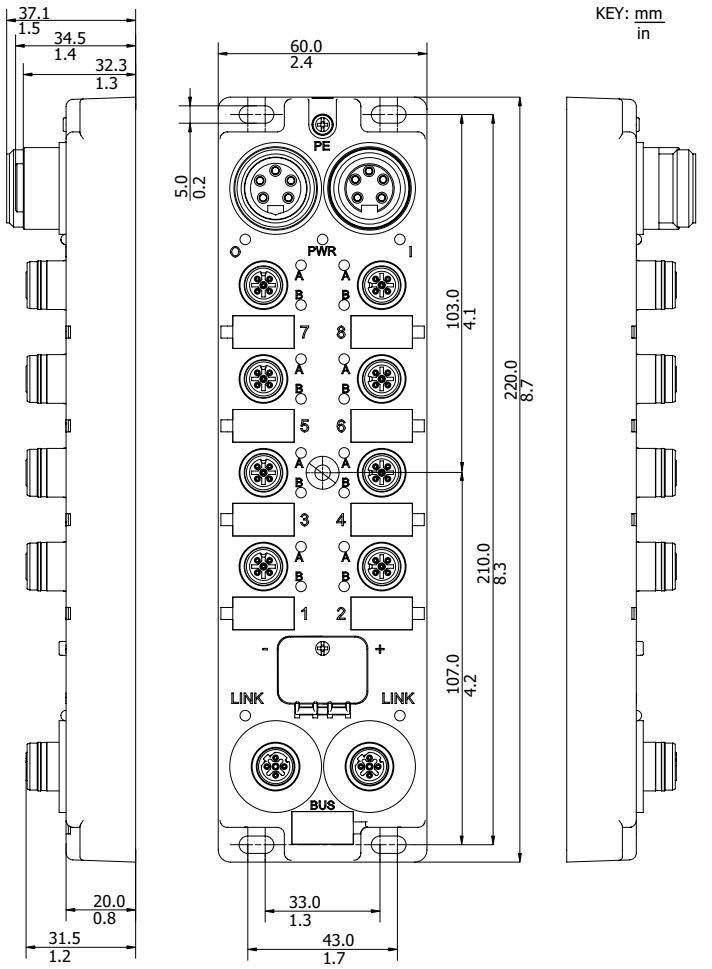
1 five mounting holes, including the center one
2 two 5-pin power connectors including input (left) and output (right) to connect the next module in the system
3 three power LEDs: O = output; PWR = not used; I = both input and module
4 sixteen I/O point LEDs
5 eight 5-pin I/O port connectors numbered from bottom to top (2 points per port connector)
6 eight white port labels
7 two buttons for selecting the method of IP address assignment
8 four-character scrolling display
9 two Link LEDs
10 two 4-pin Ethernet network connectors

NOTE: The MAC address label is located on the back of the module.

Size and Dimensions

Description

The module conforms to the following dimensions:



Connector Pin Assignments

Introduction

The module's pin assignments are described below for:

- 5 pin power connectors (7/8 mini-change cables)
- 5 pin I/O port connectors (M12 or Ultra-Lock™ M12 cables)
- 4 pin Ethernet network connectors (M12 D coded cables)

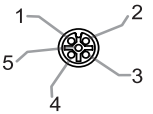
Power Connectors

The pin assignments for the power connectors are outlined in the following figure, with the male on the left and the female on the right.

1 Output Power 0 Vdc
2 Module/Input Power 0 Vdc
3 Protective Earth (PE)
4 Module/Input Power 24 Vdc
5 Output Power 24 Vdc

I/O Port Connectors

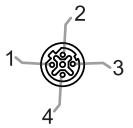
The following figure displays an ETB I/O port connector on the left of the module and its corresponding point assignments. Note that the port connectors on the right side of the module are rotated 90° counter-clockwise from the ones on the left.



1 +24 Vdc
2 Point B Input or Output
3 GND
4 Point A Input or Output
5 PE

Ethernet Network Connectors

The following figure shows the pin assignments of the two Ethernet Network connectors on the module.



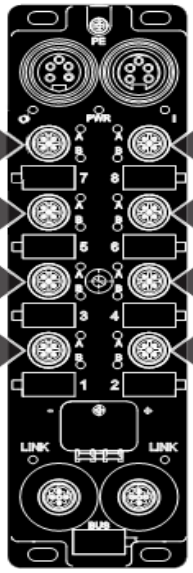
1 TX+
2 RX+
3 TX-
4 RX-

I/O Assignments

Description

The I/O assignments for the modules with fixed I/O sizes are as follows:

8 In 8 Out	12 In 4 Out	16 In	Point	Connector Number
Out 6	Out 2	In 14	7B Point 2	Port 7
Out 5	Out 1	In 13	7A Point 4	
Out 2	In 10	In 10	5B Point 2	Port 5
Out 1	In 9	In 9	5A Point 4	
In 6	In 6	In 6	3B Point 2	Port 3
In 5	In 5	In 5	3A Point 4	
In 2	In 2	In 2	1B Point 2	Port 1
In 1	In 1	In 1	1A Point 4	

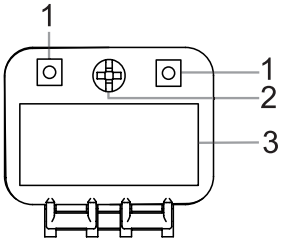


Connector Number	Point	16 In	12 In 4 Out	8 In 8 Out
Port 8	8B Point 2	In 16	Out 4	Out 8
	8A Point 4	In 15	Out 3	Out 7
Port 6	6B Point 2	In 12	In 12	Out 4
	6A Point 4	In 11	In 11	Out 3
Port 4	4B Point 2	In 8	In 8	In 8
	4A Point 4	In 7	In 7	In 7
Port 2	2B Point 2	In 4	In 4	In 4
	2A Point 4	In 3	In 3	In 3

HMI Display

Introduction

The Advantys ETB I/O modules include a 4-character scrolling display with 2 push buttons. Use these tools to configure certain IP address *(see page 46)* parameters and view diagnostic LED messages *(see page 91)*.



1 Push buttons
2 Screw to lock HMI door
3 HMI Display

Configuration

3

Overview

This chapter shows you how to configure the IP and I/O settings for your module. Note that the Application *(see page 67)* chapter provides examples of configuring these settings.

What's in this Chapter?

This chapter contains the following sections:

3.1 Using the Embedded Web Pages

Overview

Advantys ETB I/O modules contain embedded web pages. This section introduces these web pages and shows you how to manage your password. The remaining web pages are described elsewhere in this document.

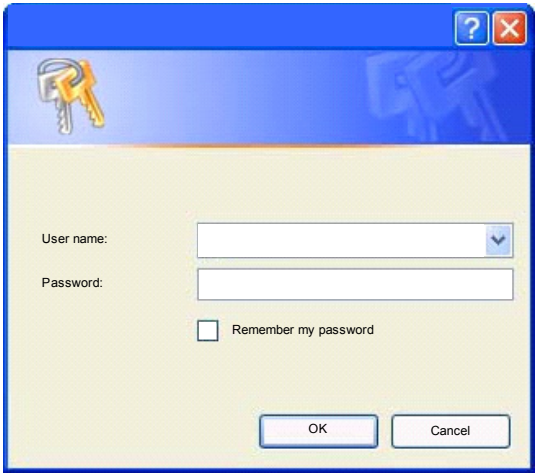
What's in this Section?

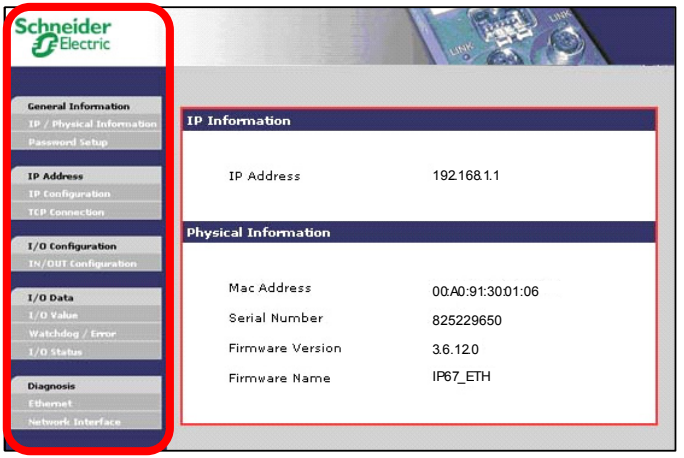
This section contains the following topics:

Accessing the Embedded Web Pages

Introduction

Before you begin, be sure that both your PC and the Advantys ETB I/O module are configured with IP addresses that are located in the same subnet (or, alternatively, are connected via a routing mechanism).

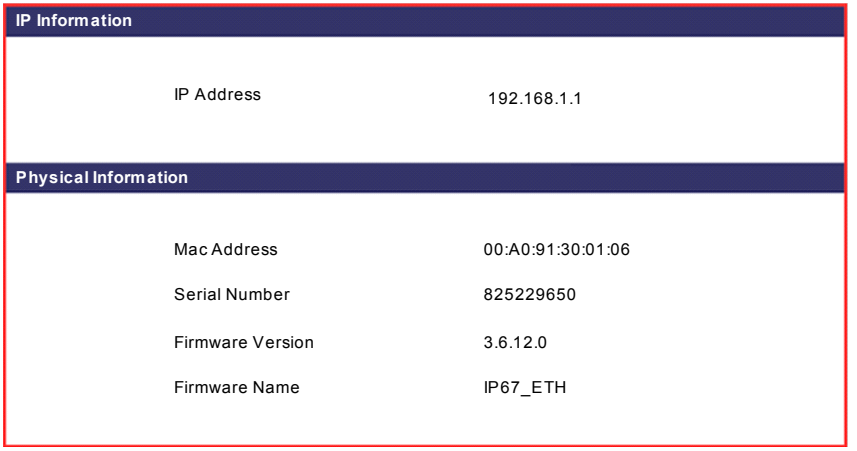
Step	Action	
1	Using either a straight or crossed Ethernet cable, connect the module to a PC running a standard web browser.	
2	On your PC, open a web browser, then:	
	a	Enter the module's IP address in the address line of the browser and hit **Enter** on your keyboard. You can see the IP address on the module's HMI display. If no IP address displays, see the topic on Scrolling LED Messages *(see page 91)*.
	b	A dialog box opens and prompts you for a user name and password. 
3	Enter the factory default settings for **User name** and **Password**: • **User name**: admin • **Password**: admin **NOTE:** If you previously changed the password, you must instead enter the new password in this dialog box.	

Step	Action
4	Click **OK**. The home page is displayed. 
5	Click on a specific web page description on the left side to open that page.

General Information: IP / Physical Information Page

Description

This read only page displays the information describing the selected Advantys ETB I/O module including its: IP address, MAC address, serial number and firmware information.



General Information: Password Setup

Description

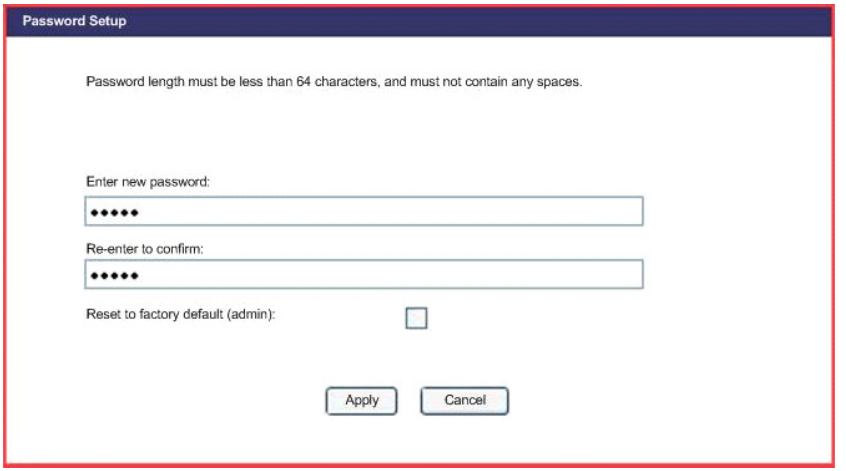
Use this page to modify the password for web page access.

- Click **Apply** to save your changes.

NOTE: You will then need to re-login using your user name and new password.

NOTE: You cannot change the existing user name or add new ones.

- Click **Cancel** to close the window without saving your changes.



3.2 Configuring IP Address Settings

Introduction

This section shows you how to configure the Advantys ETB I/O module's:

- IP parameters for the Advantys ETB I/O module, and
- the IP address for an optional Master IP device

What's in this Section?

This section contains the following topics:

Introducing IP Parameters

Introduction

The module can obtain its IP address from any one of the following 3 sources:

- a static IP address, stored locally on the module, that can be either:
  - a user-defined value, or
  - the factory default value of 192.168.1.1
- a DHCP server
- a BootP server

You can select the source of the IP address by using either:
- web pages *(see page 42)*
- HMI push buttons *(see page 46)*

NOTE: Stop I/O communication with the module before you attempt to change the IP parameters, as no such changes are possible during I/O communication.

NOTE: Assign a unique IP address to each Advantys ETB I/O module before connecting it to your network. Do not simultaneously connect multiple unconfigured Advantys ETB I/O modules to your network, because each unconfigured module is set to the same factory IP address of 192.168.1.1.

NOTE: Your IP address changes take effect—and are displayed on the module's 4-character scrolling HMI panel—when they are made. You do not need to power cycle the module.

Recommended Practices for IP Configuration

Overview

Each method of assigning an IP address has advantages and disadvantages. Unlike the Internet, PLCs typically communicate to I/O modules using an IP address rather than a name. It is key that the module uses the same IP address, even after being power cycled. For the majority of applications, using a static IP address is the easiest to implement; however, it is important for you to choose the method of assigning an IP address that is appropriate for your network environment.

Static

A static IP address is stored locally on the module and is retained even after a power cycle. No IP address server is required on the network. When replacing a module, you need to manually configure the same IP parameters in the replacement module. You also need to manually maintain a list of assigned IP addresses. Do not use duplicate IP addresses on your network.

BootP

A BootP server is required on your network to assign IP parameters to modules. This server can exist on a PC or PLC and must be configured to assign specific IP settings to a module with a specific MAC address. Each time a module is power cycled, it will need to get its IP parameters from the BootP server. If the server is not present, the module will not get an IP address. When replacing a module, you only need to configure the new module for BootP and reconfigure the server to assign the IP settings to the new module's MAC address.

DHCP

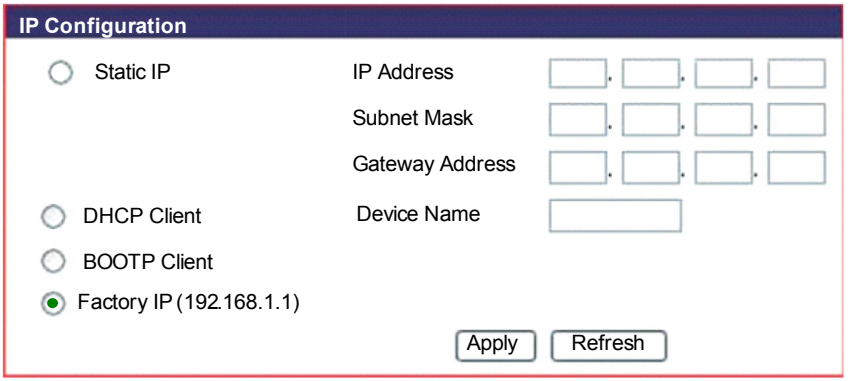
A DHCP server is required on your network to assign IP parameters to modules. This server can exist on a PC or PLC. There are two ways for a module to get its IP parameters from a DHCP server, either by referencing a Device Name or instead a MAC address (if the Device Name is blank). The DHCP server must be configured in a similar manner to assign specific IP settings to a module by either method. Each time a module is power cycled, it needs to get its IP parameters from the DHCP server. If the server is not present, the module will not get an IP address. When replacing a module using a Device Name to assign IP parameters, you need to configure the replacement module for DHCP and set the same Device Name as the module being replaced. If using the MAC address to assign IP parameters, you need configure the replacement module for DHCP and leave the Device Name blank. You also need to change the MAC address used by your DHCP server to that of the replacement module.

Configuring IP Parameters Using Web Pages

Introduction

You can use the module's **IP Configuration** embedded web page *(see page 35)* to:

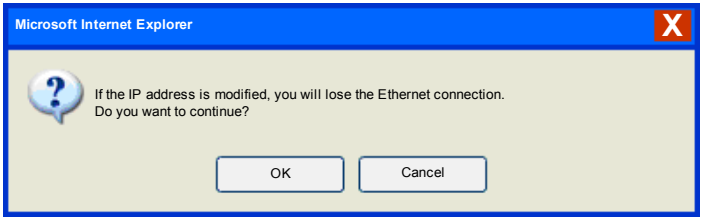
- specify the source of IP parameters for the module,
- configure user-defined static IP parameters, and
- input a **Device Name** value for DHCP server assigned IP parameters.



Accessing the IP Configuration Page

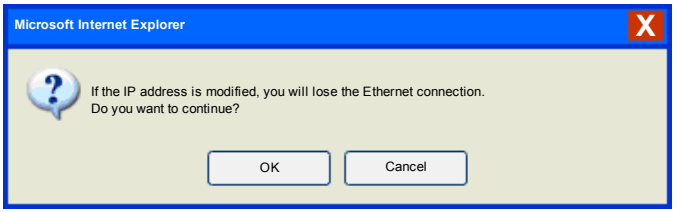
To access the **IP Configuration** embedded web page for IP parameter configuration:

Step	Action
1	Access the embedded web pages *(see page 35)* using the module's present IP address—initially the factory default address of 192.168.1.1. The **Home** page opens.
2	On the left side of the web page, under **IP Address**, select **IP Configuration**.
3	Make your edits in the **IP Configuration** page.

Step	Action
4	After your edits are complete, click **Apply** to save the new IP configuration. The following dialog opens: 
5	Click **OK** to accept your IP parameter changes. **NOTE:** If you changed the actual IP address assigned to the module, you must point your browser to that new address to continue viewing the web pages.

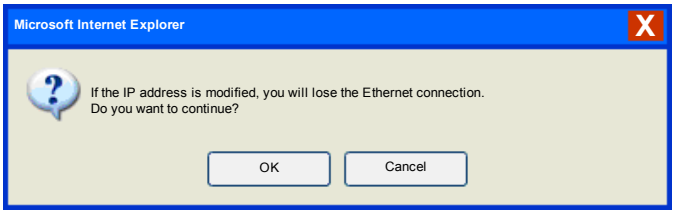
Configuring User-Defined Static IP Parameters

After accessing the **IP Configuration** page, configure user-defined static IP parameters as follows:

Step	Action	
1	Stop all other communication with the module.	
2	In the **IP Configuration** page, select **Static IP**.	
3	Type in values for the following IP parameters:	
	IP Address	4 decimal octet values from 0...255.
	Subnet Mask	4 decimal octet values from 0...255.
	Gateway Address, optional	4 decimal octet values from 0...255.
4	Click **Apply** to save your static IP parameters. The following dialog opens: 	
5	Click **OK** to accept your IP parameter changes.	
6	Look at the module's scrolling 4-character HMI to confirm that the intended IP address is displayed.	
7	Connect to the module using the new IP address.	

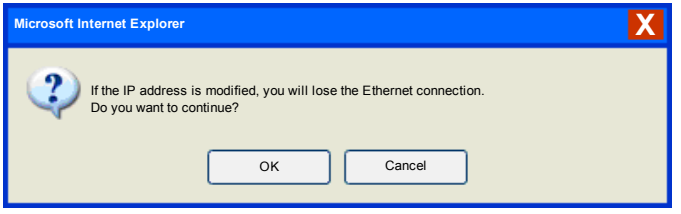
Applying the Factory Default Static IP Address

After accessing the **IP Configuration** page, apply the factory default static IP address as follows:

Step	Action
1	Stop all other communication with the module.
2	In the IP Configuration page, select **Factory IP**. **NOTE:** This also sets the **Subnet Mask** to 255.255.255.0 and the default **Gateway Address** to 0.0.0.0.
3	Click **Apply** to save the factory default IP address of 192.168.1.1. 
4	Click **OK** to accept your IP parameter changes.
5	Look at the module's scrolling 4-character HMI to confirm that the factory default IP address is displayed.
6	Connect to the module using the factory default IP address of 192.168.1.1.

Configuring the Module to Receive IP Parameters from a DHCP Server

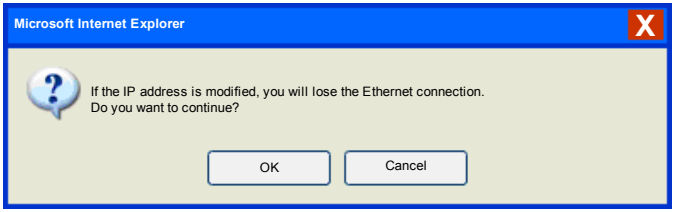
After accessing the **IP Configuration** page, configure the module to receive its IP address from a DHCP server as follows:

Step	Action
1	Stop all other communication with the module.
2	In the IP Configuration page, select **DHCP Client**.
3	Type in a **Device Name**, up to eight alphanumeric characters including underscores. **NOTE:** If the **Device Name** field is left blank, the DHCP server assigns IP parameters based on the module's MAC address.
4	Click **Apply** to save your IP parameter changes. 

Step	Action
5	Click **OK** to accept your IP parameter changes.
6	Configure your DHCP server to serve a constant IP address based either upon a MAC address or a **Device Name**.
7	Physically connect the module to the network.
8	Look at the module's scrolling 4-character HMI to confirm that the intended IP address is displayed.
9	Connect to the module using the new IP address.

Configuring the Module to Receive IP Parameters from a BootP Server

After accessing the **IP Configuration** page, configure the module to receive IP parameters from a BootP server as follows:

Step	Action
1	Stop all other communication with the module.
2	In the **IP Configuration** page, select **BootP Client**.
3	Click **Apply** to save your changes. 
4	Click **OK** to accept your IP parameter changes.
5	Configure your BootP server to serve a constant IP address based upon the MAC address of the module.
6	Physically connect the module to the network.
7	Look at the module's scrolling 4-character HMI to confirm that the intended IP address is displayed.
8	Connect to the module using the new IP address.

Configuring IP Parameters Using HMI Push Buttons

Introduction

You can use the push buttons, located on the front of the module above the 4-character HMI display *(see page 23)*, to:

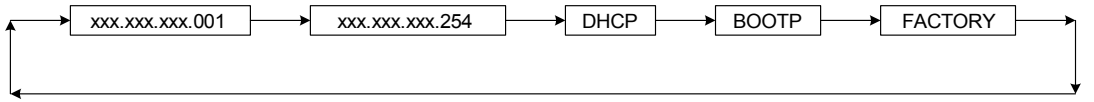
- set the source of the module's IP address,
- assign the factory address of 192.168.1.1, and
- assign a new, static IP address by modifying the last octet of the current IP address

NOTE: The remaining IP parameters—**Subnet Mask**, **Gateway Address**, and **Device Name**—cannot be configured using the HMI push buttons.

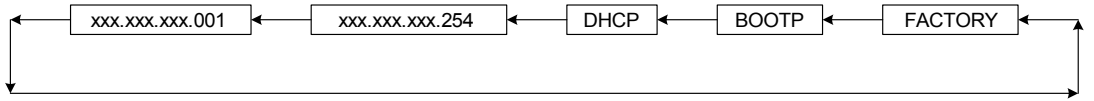
Push Button Behavior

Use the below diagrams when manipulating the push buttons.

The right push button increments:



The left push button decrements:



Manipulating Push Buttons

To set the source of the IP address:

Step	Action
1	Stop all communication with the module.
2	Use a Phillips screwdriver to open the plastic cover on the display.
3	When the IP addressing source is displayed, use the screwdriver or a similar shaped object to toggle either of the push buttons. Press the push button once to advance to the next selection, or hold the button down and the display will increment by itself.

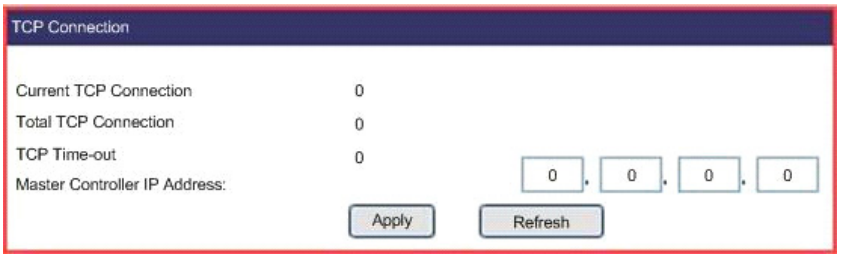
Step	Action	
4	Select the desired source of IP address from the list:	
	xxx	This selection displays the last octet of the present IP address. Make this selection with the push buttons and: ● use either the left or right push button to toggle the last octet of the IP address to a number from 1 to 254 ● use your PC's web browser to navigate to the **IP Configuration** page where you can configure the **Subnet Mask** and **Gateway Address** parameters.
	DHCP	Make this selection with the push buttons and: ● configure a DHCP server with the MAC address or **Device Name**, and ● use your PC's web browser to navigate to the **IP Configuration** page where you can enter the **Device Name** if necessary.
	BootP	Make this selection with the push buttons and configure a BootP server with the MAC address and IP parameters for this module.
	FACTORY	This selection applies the factory IP address, **Subnet Mask**, **Gateway Address**, and **Device Name**.
5	When the desired source displays on the HMI, remove pressure from the push button to select it as the new source of the IP address. Your IP addressing changes will be applied 3 seconds after you remove pressure from the push button.	
6	Look at the module's 4-character HMI to confirm that the desired IP address has been applied.	
7	Replace the plastic cover with a Phillips screwdriver.	
8	Connect to the module using the new IP address.	

IP Address: TCP Connection

Description

Use the **TCP Connection** page to:

- input the IP address of master controller, and
- display TCP connection statistics:



Identifying a Master Controller

Use the **Master Controller IP Address** field to enter the IP address of master device. This device is exclusively permitted to execute write commands to the module's outputs. Other devices can still read the module information. Changes made to the **Master Controller IP Address** field take effect when you click **Apply**.

If the value of this field remains set to the default of 0.0.0.0, no master device is identified, and any device can execute write commands to the module's outputs.

TCP Connection Data

The **TCP Connection** page displays the following statistics describing the module's TCP connection:

Field	Description
Current TCP Connection	This shows the number of presently open TCP connections.
Total TCP Connection	This shows a count of TCP connections since the last **Refresh** command or power cycle.
TCP Time-out	This shows a count of times that communications have been lost since the last **Refresh** command or power cycle.

Click **Refresh** to clear the two counting fields.

3.3 Configuring Module Settings

Overview

This section shows you how to use the embedded web pages to configure the following:

- I/O assignments for the module with configurable I/O
- watchdog settings for Modbus TCP/IP modules

What's in this Section?

This section contains the following topics:

Recommended Practices for Configuring Module Settings

Overview

You can configure the Advantys ETB I/O module's I/O and watchdog settings using either the PLC or web pages.

PLC

Configuring the I/O and watchdog using the PLC, instead of the embedded web pages, is recommended because:

- configuration settings can be saved in the PLC, and can be easily reapplied to a replacement module
- applying configuration settings saved in the PLC reduces the likelihood of errors introduced by manually configuring the module

Web Pages

The embedded web pages offer a convenient method for configuring the module's I/O and watchdog settings. However, configuration settings made to a module via its web pages cannot be transferred to a replacement module.

If you elect to configure a module using its embedded web pages, you should also:

- edit your application program in the PLC to include the same configuration settings, or
- maintain a record of the configuration settings, which can be re-applied if and when the module needs to be replaced

Configuring I/O for ETB1EM16CP00

Introduction

The ETB1EM16CP00 module contains configurable points that can be configured for in, out, or automatic. This topic shows you how to configure the ETB1EM16CP00 module's I/O points and only applies to this specific module.

NOTE: By default, each point is pre-configured as an auto-configurable I/O point.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

If the point is connected to a sensor and used as an input, do not write a 1 to the corresponding output bit of the process image, as this can conflict with the current state of the input.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

In addition to configuring the **I/O Type** (described above) for each point, you can also configure the following settings that apply to all inputs:

- **Input Type**: PNP or NPN
- **Input Filter**: the minimum time period—in milliseconds—an input signal must persist in order for the module to recognize it as valid (and not merely noise).

There are two methods to configure the I/O settings of the module. Regardless of which method you use, you must configure all I/O settings.

- PLC
- embedded web pages

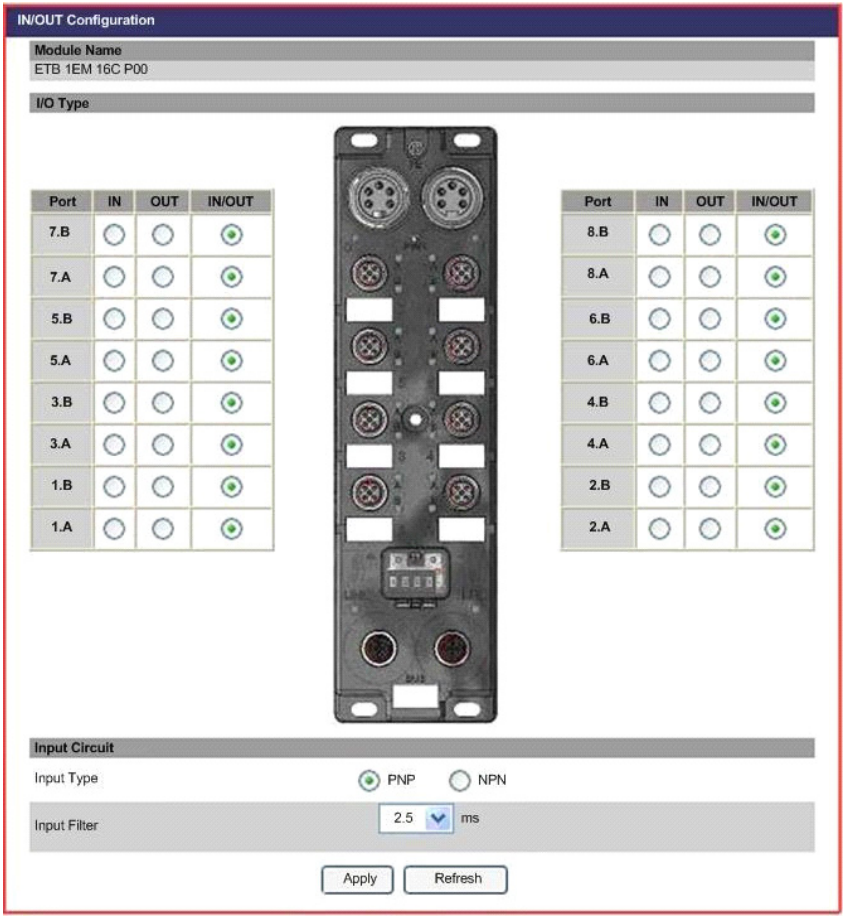
PLC

You can use the PLC to set the I/O configuration. When a configurable I/O point—set to auto-configuration—acts as an output, that output value will appear in both the input and output process images. This is also true for the pre-configured modules. For example, with the ETB1EM08E08SPP0 module, the output shows as an echo in the input process image.

Configuring I/O settings via the PLC simplifies module replacement because the configuration is stored on the PLC and does not have to be re-configured in the web pages when a module is replaced. Refer to the application example *(see page 72)* to configure ETB1EM16CP00 in Unity Pro with a Quantum PLC via a NOE 771 01 communications module.

Web Pages

The **IN/OUT Configuration** page displays the configuration of the module's input and output points. This page is configurable for ETB1EM16CP00, and read only for all other modules.



After you access the embedded web pages *(see page 35)*, you can configure the I/O settings for ETB1EM16CP00 as follows:

Step	Action
1	Navigate to the **IN/OUT Configuration** page by clicking the left pane of the main web page.

2	Select an **I/O Type** for each point:
	● **IN**: the selected point is configured as an input
	● **OUT**: the selected point is configured as an output
	● **IN/OUT**: the selected point will auto-configure as an:
	  ● input, if it detects that it is connected to a sensor, or
	  ● output, if it detects that it is connected to an actuator

3	Select the **Input Type** for all points acting as inputs: ● **PNP** ● **NPN**
4	Select an **Input Filter** value. Valid values include: ● 0 ms ● 0.5 ms ● 1 ms ● 1.5 ms ● 2 ms ● 2.5 ms ● 5 ms
5	Click **Apply** to save your I/O configuration changes.

NOTE: If the module needs to be replaced, you need to re-configure the replacement module with the same parameters.

Configuring the Watchdog

Introduction

During normal operations, each Advantys ETB I/O module remains in continuous communication with the Modbus master (usually a PLC). If communication with the Modbus master is lost, the behavior of the Advantys ETB I/O module's outputs is governed by its watchdog settings.

The following settings are configurable:

Setting	Description
Watchdog Timeout	The time period—in milliseconds—that the module waits after the communication with the Modbus master is lost and before adopting the pre-configured **Watchdog Behavior**.
Watchdog Behavior	The behavior that the module's output points will adopt if communication with the Modbus master is lost for a continuous period greater than the **Watchdog Timeout**. Choices are: • **Apply Output Fallback Value**: places each output into a pre-configured on or off state, or • **Hold Output Value**: maintains the state of each output at the time communication with the Modbus master is lost
Fallback Value (for each output point)	The pre-determined state—on or off—each output point will adopt if communication with the Modbus master is lost for a time period longer than the **Watchdog Timeout**.

The **Watchdog Status** is:
- **inactive** (off), if the module remains in communication with the Modbus master, and
- **active** (on), if communication with the Modbus master is lost

You can configure watchdog settings using either:
- the PLC, or
- the module's embedded web pages

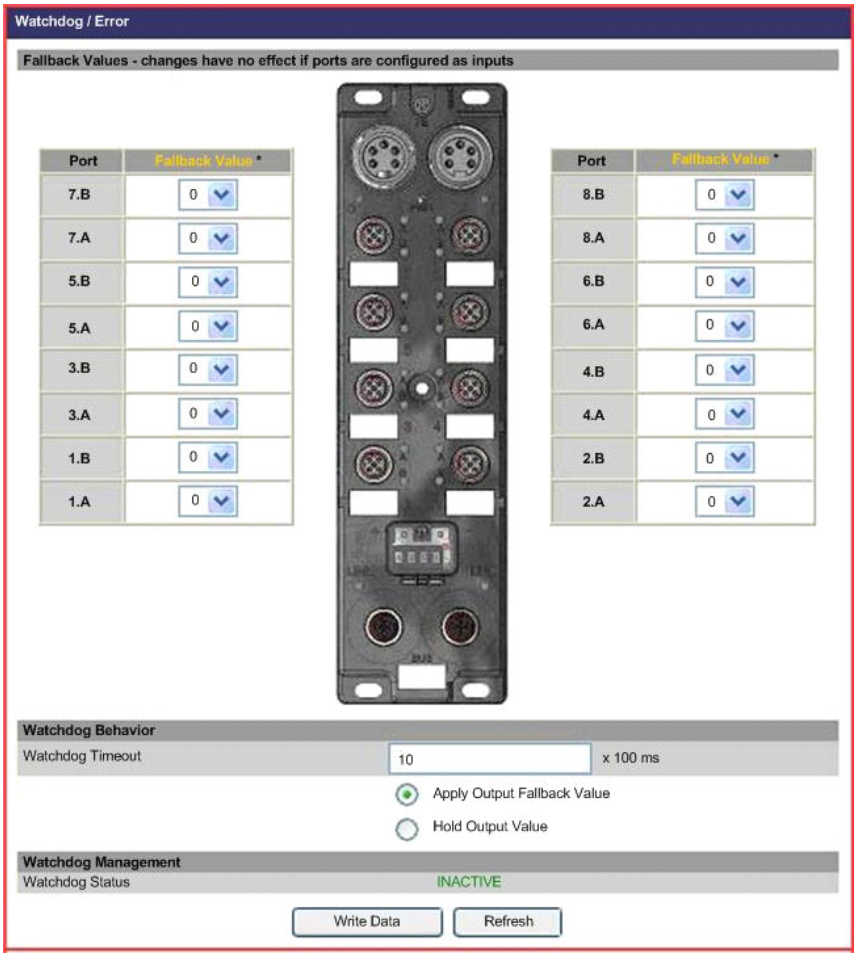
PLC

Configuring the watchdog settings via the PLC simplifies module replacement because the configuration is stored on the PLC and does not have to be re-configured in the web pages when a module is replaced. Refer to the application example *(see page 72)* to configure the module in Unity Pro with a Quantum PLC via a NOE 771 01 communications module.

Web Pages

In the **Watchdog / Error** page, you can:

- configure watchdog settings for the module, and
- view the watchdog state (active or inactive) of the module.



After accessing the embedded web pages *(see page 35)*, select **Watchdog / Error** on the left to open the **Watchdog / Error** web page, where you can configure watchdog behavior:

Step	Action
1	Type in an integer value from 0 to 65535 for **Watchdog Timeout**. This value will be multiplied by 100 ms to determine the timeout. **NOTE:** Setting the timeout value to 0 disables the watchdog. The default timeout is 10 x 100ms = 1s.
2	Select a watchdog behavior: • **Apply Output Fallback Value**: to place each output into its fallback state, or • **Hold Output Value**: to have each output maintain its pre-existing state
3	For each point configured as an output, select a **Fallback Value** describing the behavior of that point if the module enters a fallback state: • 0 = off • 1 = on **NOTE:** These behaviors will only be applied if **Apply Output Fallback Value** is selected.
4	Click **Write Data** to save your changes.

Installing the Module

4

Overview

This chapter describes how to mount the module and attach the cables.

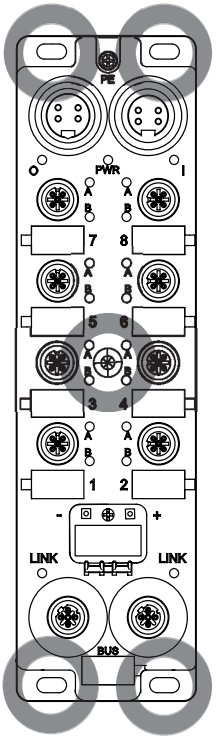
What's in this Chapter?

This chapter contains the following topics:

Mounting the Module

Description

Each module has 5 mounting holes, which are circled in the diagram below. Use of the middle hole is optional. Use M5 (#10) bolts in the perimeter slotted holes and an M4 (#8) bolt in the center hole to attach the module to a flat surface. Make sure to properly torque so as not to overtighten and damage the module case. The topic Size and Dimensions *(see page 27)* provides dimensions that you can use to prepare your panel or machine for mounting.



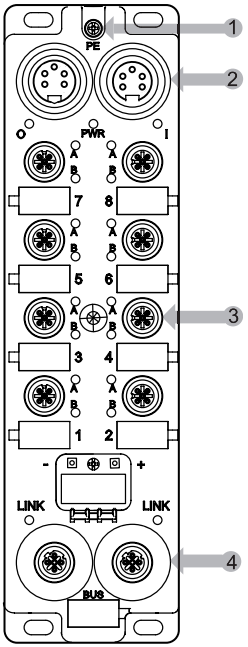
Connecting Cables

Introduction

Connect the cables to complete the physical installation of the module. The chapter I/O Wiring Diagrams *(see page 64)* shows a diagram using Schneider Electric cables *(see page 16)*.

⚠ WARNING
Personal Injury Make sure you disconnect the power before attaching any cables. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Step	Action
1	Attach a PE ground cable per your local electric code.
2	Connect I/O cables.
3	Connect Ethernet network cables.
4	Connect the power cables.
5	Cover unused ports with sealing plugs.



1 Physical Earth (PE)
2 two 5-pin power connectors including input (left) and output (right)
3 eight 5-pin I/O port connectors (2 points each)
4 two 4-pin Ethernet network connectors

Ground Cable

Attach the module to a ground cable with a ring or spade connector at the PE size M3 screw (1 in the above diagram). Refer to your electric code for proper grounding instructions.

I/O Cables

Connect I/O cables to the module (3 in the above diagram) by either screwing a threaded connector to the inside of the port, or by pressing an Ultra-Lock™ connector over the outside of the port. Depending on your application needs, you may elect to use I/O splitter cables.

Ethernet Network Cables

Connect Ethernet network cables to the module (4 in the above diagram) by screwing a threaded connector to the inside of the port.

Power Cables

Connect the power cable (2 in the above diagram) by using a threaded cable connector and screwing it to the outside (power input connector) or inside (power output connector) of the module power connector.

Sealing Plugs

Cover unused ports with sealing plugs. Not covering ports in harsh environments may cause contaminants to come in contact with internal components of the module.

⚠ WARNING

Equipment Damage

Make sure you cover unused ports with sealing plugs to maintain the IP67 rating of the modules.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Use this sealing plug...	To cover this connector...
ETXSA12B	M12 connectors (Ethernet and I/O ports)
ETXPA78BE	7/8 external connectors (power input port)
ETXPA78BI	7/8 internal connectors (power output port)

I/O Wiring Diagrams

5

At a Glance

This chapter shows you examples of how to connect Schneider Electric cables to your module. IEC I/O wiring diagrams are also available for your reference.

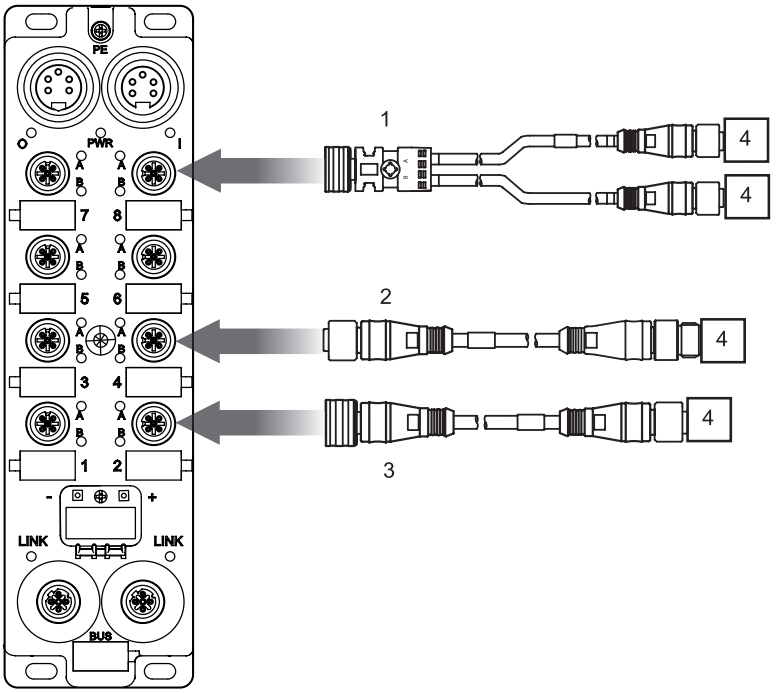
What's in this Chapter?

This chapter contains the following topics:

Module Wired with Schneider Electric Cables

Description

The below image shows you examples of how to connect Schneider Electric cables *(see page 16)* to your module.



1 ETXSC413U1M3003: I/O splitter cable, Ultra-Lock 1 end and M12s other end
2 ETXSC412M1M3010: I/O cable, M12 connectors
3 ETXSC412U1M3010: I/O cable, Ultra-Lock™ 1 end and M12 other end
4 I/O

IEC I/O Wiring Diagrams

Introduction

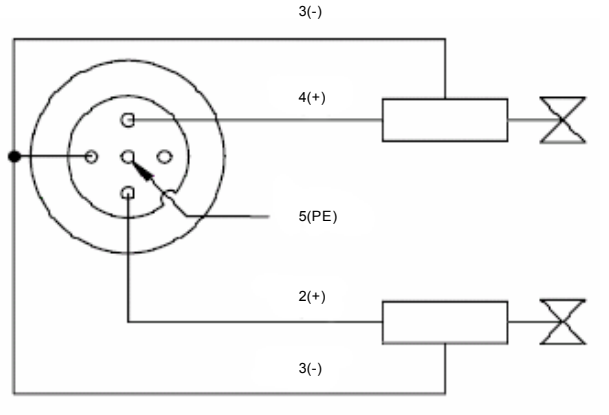
These diagrams show the wiring of an I/O port wired to support:

- 2 outputs
- 2 inputs
- 1 input and 1 output

NOTE: These diagrams are here for your convenience and to aid in troubleshooting.

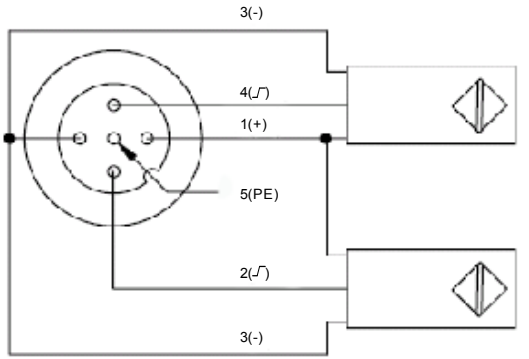
2 Outputs

Use this diagram to field-wire two actuators to a module using 2 outputs per port.



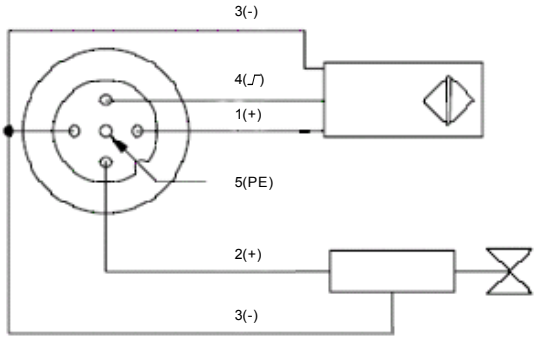
2 Inputs

Use this diagram to field-wire two sensors to a module using 2 inputs per port.



1 Input and 1 Output

The ETB1EM16CP00 is a configurable module that allows you to connect to any combination of up to 16 inputs or outputs. This diagram shows a connection where an input and output are connected to a single port.



Application Example: Configuring the Advantys ETB I/O Module for use with a Quantum Processor

6

Overview

This chapter presents a sample configuration of the ETB1EM16CP00 configurable I/O module, connected to a Quantum PLC via a NOE 771 01 communications module.

The application example shows you how to configure the module's:

- IP parameters, using the module's embedded web pages, and
- I/O and watchdog settings, using Unity Pro running on a PC connected to the Quantum PLC

What's in this Chapter?

This chapter contains the following sections:

6.1 Configuring IP Parameters

Introduction

This application example uses the ETB1EM16CP00 module's embedded web pages to configure its IP parameters.

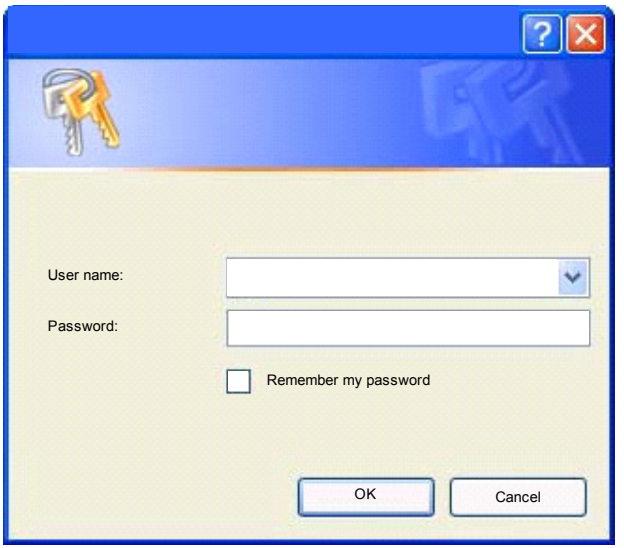
What's in this Section?

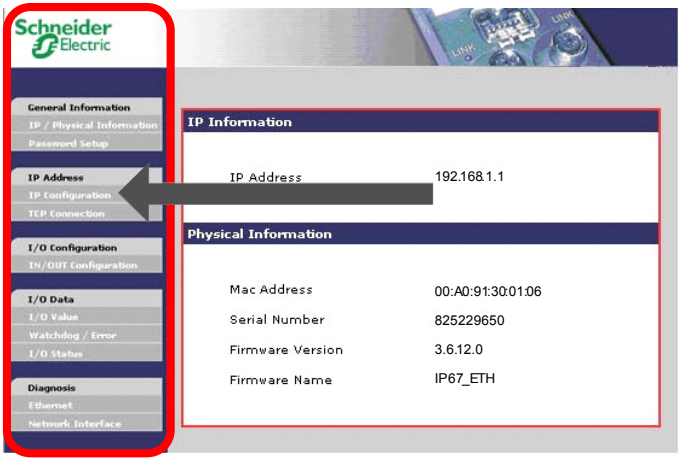
This section contains the following topics:

Accessing the Embedded Web Pages

Description

Follow these steps to access the module's embedded web pages, where you can configure the module's IP addressing settings.

Step	Action
1	Use an Ethernet cable to connect the module to a PC running a standard web browser. **NOTE:** Both the PC and the module must be part of the same subnet.
2	Type the module's factory default IP address of 192.168.1.1 in the address line of your web browser. A dialog opens prompting you for a user name and password. 
3	Enter the following factory default settings: • **User name**: **admin** • **Password**: **admin**

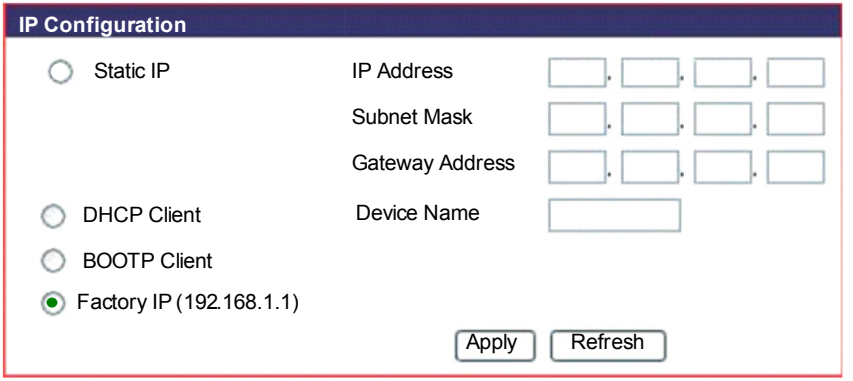
Step	Action
4	Click **OK**. The home page is displayed. 
5	Click on **IP Configuration** on the left side of this screen to open the page where you can configure IP addressing parameters *(see page 71)*.

Setting a Static IP Address

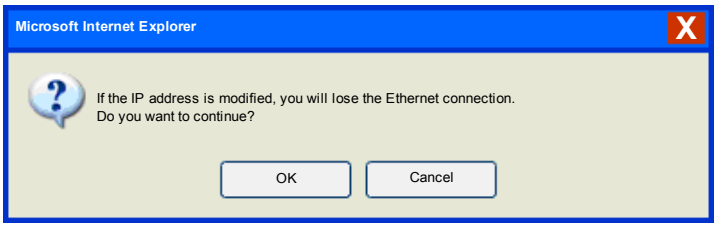
Description

Use the module's IP Configuration web page to set a static IP address and edit the related settings.

The following page opens when you select the description for **IP Configuration**. This page indicates that the module is configured to use the factory default IP address.



To configure the module to use a static IP address, follow these steps:

Step	Action	
1	In the **IP Configuration** page, select **Static IP**.	
2	Type in values for the following IP parameters: **NOTE:** Type in values that are accurate for your module. For the purpose of this example, the following values are used:	
	IP Address	192.168.1.21
	Subnet Mask	255.255.255.0
	Gateway Address	0.0.0.0
3	Click **Apply** to save your static IP configuration settings. The following dialog opens: 	
4	Click **OK** to accept your IP address change.	

6.2 Configuring the I/O and Watchdog in Unity Pro

Introduction

This section of the application example shows you how to use Unity Pro to configure the ETBE1M16CP00 module's inputs, outputs and watchdog settings.

What's in this Section?

This section contains the following topics:

Recommended Practices for Using the PLC

Overview

The below actions are the recommended practices for using the module in conjunction with the PLC. While these steps are preferred for optimal operation, they are not required for normal system function.

MSTR Blocks

Set the following parameters using MSTR blocks to facilitate device replacement:

- I/O Module Configuration
- Save I/O Module Configuration

I/O Data

While in normal operation, continually monitor the global status of the module before trusting input data and writing output data.

- If the global status is 0, you can write I/O data.
- If the global status is 1, do not write I/O data, as the information should not be trusted and the actuator may not turn on.

Code Writing

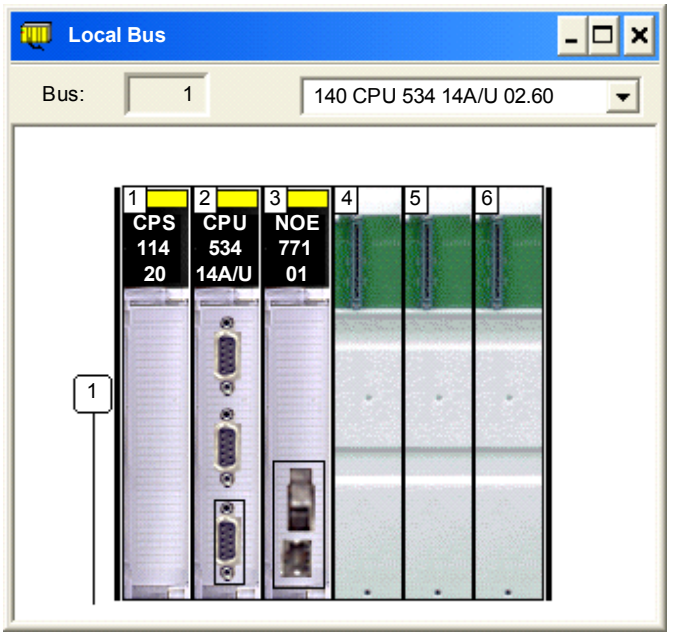
Review module configuration at startup and after any system interruption. The PLC reads the module settings and compares the data to the configuration assignments.

- If the data matches:
  - You can trust the data that is read from the module.
  - You can write new data on the PLC.
- If the data does not match:
  - Do not write new data on the PLC.
  - Instead, rewrite the configuration assignments to the module.
  - Read back the data to confirm a match.
  - If the data matches, you can trust the information read from the module and can write new data on the PLC.

Introducing the Unity Pro Project

Local Bus

The application example includes the following devices comprising the Local Bus in Unity Pro:



Project Components

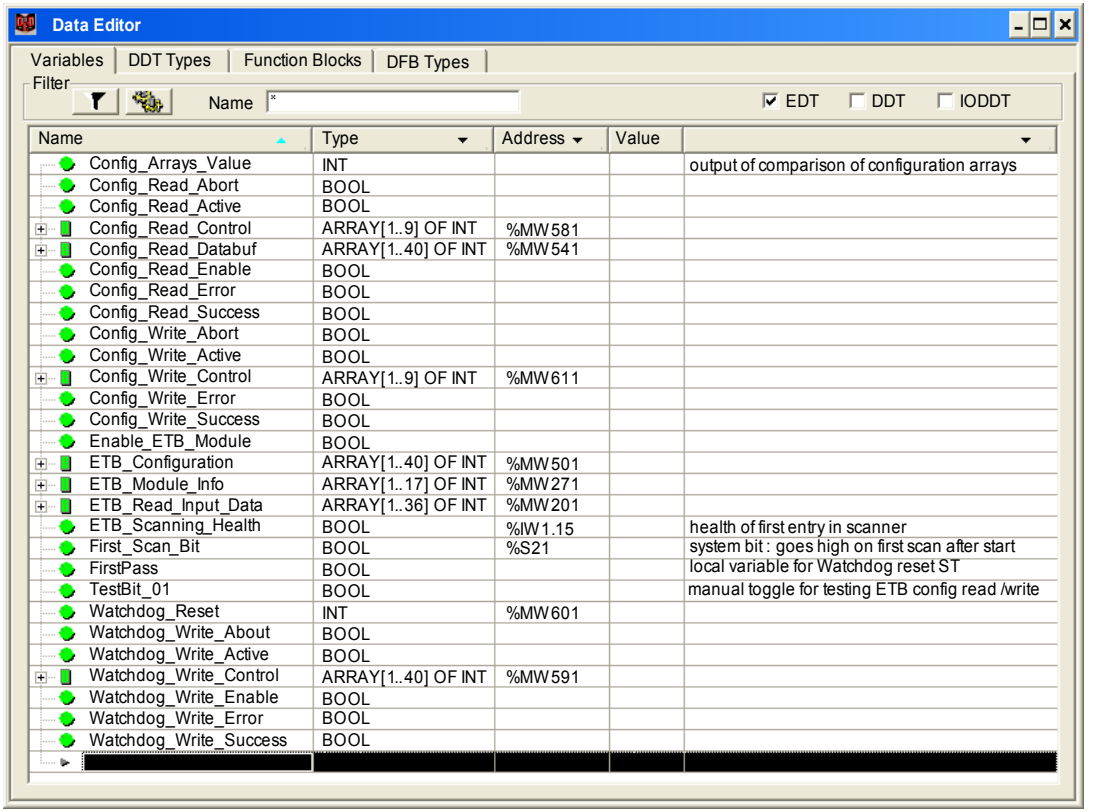
The application example includes the following components, created in Unity Pro and described in the remainder of this section:

- declaration of variables *(see page 75)*, used in the program
- I/O scanning *(see page 79)* by the PLC of module registers
- structured text *(see page 80)* programming, designed to reset the watchdog if communications between the PLC and the module are lost and then restored
- function block *(see page 82)* programming, designed to download the I/O and watchdog settings from the PLC to the module, whenever the PLC detects the values of these settings in the module differ from the same settings stored in the PLC

Declaring Variables in Unity Pro

Introduction

The application includes a collection of variables that are declared in the **Variables** page of the **Data Editor**, as in the following figure. These variables are named so that they describe the purpose they serve in the application program.



Name	Type	Address	Value	
Config_Arrays_Value	INT			output of comparison of configuration arrays
Config_Read_Abort	BOOL			
Config_Read_Active	BOOL			
Config_Read_Control	ARRAY[1..9] OF INT	%MW581		
Config_Read_Databuf	ARRAY[1..40] OF INT	%MW541		
Config_Read_Enable	BOOL			
Config_Read_Error	BOOL			
Config_Read_Success	BOOL			
Config_Write_Abort	BOOL			
Config_Write_Active	BOOL			
Config_Write_Control	ARRAY[1..9] OF INT	%MW611		
Config_Write_Error	BOOL			
Config_Write_Success	BOOL			
Enable_ETB_Module	BOOL			
ETB_Configuration	ARRAY[1..40] OF INT	%MW501		
ETB_Module_Info	ARRAY[1..17] OF INT	%MW271		
ETB_Read_Input_Data	ARRAY[1..36] OF INT	%MW201		
ETB_Scanning_Health	BOOL	%IW1.15		health of first entry in scanner
First_Scan_Bit	BOOL	%S21		system bit : goes high on first scan after start
FirstPass	BOOL			local variable for Watchdog reset ST
TestBit_01	BOOL			manual toggle for testing ETB config read /write
Watchdog_Reset	INT	%MW601		
Watchdog_Write_About	BOOL			
Watchdog_Write_Active	BOOL			
Watchdog_Write_Control	ARRAY[1..40] OF INT	%MW591		
Watchdog_Write_Enable	BOOL			
Watchdog_Write_Error	BOOL			
Watchdog_Write_Success	BOOL			

Of the variables declared above and used in the program, the following variables are of particular significance.

ETB_Configuration

This variable array holds the I/O point and watchdog configuration values that are stored in the PLC. It is also used as the Databuf parameter of a MPB_MSTR function block that writes these stored values to the ETBE1M16CP00 module when the module is initialized, and whenever an I/O or watchdog setting in the PLC differs from the same setting in the module.

Name	Type	Address	Value	Comment
ETB_Configuration	ARRAY[1..40] OF INT	%MW501		
ETB_Configuration[1]	INT	%MW501	10	Watchdog Value
ETB_Configuration[2]	INT	%MW502	0	Watchdog State
ETB_Configuration[3]	INT	%MW503	0	Watchdog Behavior
ETB_Configuration[4]	INT	%MW504	0	Reserved
ETB_Configuration[5]	INT	%MW505	0	State of the Firmware
ETB_Configuration[6]	INT	%MW506	0	Fallback Value for Point 1.A
ETB_Configuration[7]	INT	%MW507	0	Fallback Value for Point 1.B
⋮	⋮	⋮	⋮	⋮
ETB_Configuration[20]	INT	%MW520	1	Fallback Value for Point 8.A
ETB_Configuration[21]	INT	%MW521	1	Fallback Value for Point 8.B
ETB_Configuration[22]	INT	%MW522	1	I/O Configuration for Point 1.A
ETB_Configuration[23]	INT	%MW523	1	I/O Configuration for Point 1.B
⋮	⋮	⋮	⋮	⋮
ETB_Configuration[36]	INT	%MW536	1	I/O Configuration for Point 8.A
ETB_Configuration[37]	INT	%MW537	0	I/O Configuration for Point 8.B
ETB_Configuration[38]	INT	%MW538	0	PNP - NPN Type
ETB_Configuration[39]	INT	%MW539	0	Input Filter Delay
ETB_Configuration[40]	INT	%MW540	0	Reserved

Config_Read_Databuf

This variable array holds the I/O point and watchdog configuration values that are periodically read from the ETBE1M16CP00 module, using a MBP_MSTR function block. This data is compared against the data stored in the ETB_Configuration variable array to check the accuracy of the module's configuration.

Config_Read_Control

This variable array holds the Control parameter elements of a MBP_MSTR block used to read the I/O and watchdog settings in the ETBE1M16CP00 module.

Name	Type	Address	Value	Comment
Config_Read_Control	ARRAY[1..9] OF INT	%MW581		
Config_Read_Control[1]	INT	%MW581	2	Operation type: 2 = READ
Config_Read_Control[2]	INT	%MW582		Error status
Config_Read_Control[3]	INT	%MW583	39	Number of registers to read
Config_Read_Control[4]	INT	%MW584	2050	Starting register to read
Config_Read_Control[5]	INT	%MW585	16#0300	Routing register MSB = 3 for NOE
Config_Read_Control[6]	INT	%MW586	192	Byte 4 of IP address
Config_Read_Control[7]	INT	%MW587	168	Byte 3 of IP address
Config_Read_Control[8]	INT	%MW588	1	Byte 2 of IP address
Config_Read_Control[9]	INT	%MW589	21	Byte 1 of IP address

Config_Write_Control

This variable array also contains the Control parameter elements of a MBP_MSTR block, but in this case for the purpose of performing a write operation. In this case, the contents of the ETB_Configuration variable array are written to the ETBE1M16CP00 module when:

- the module is initialized, or
- the PLC detects that an I/O or watchdog setting in the PLC differs from the same setting in the module

This variable array writes to the same module address ranges that are read by the Config_Read_Control variable array. The values of the elements are also the same as the Config_Read_Control variable array, except that the first element—the Operation type—is set to 1, indicating a write operation.

Watchdog_Write_Control

This variable array contains the Control parameter elements of a MBP_MSTR block. It operates in conjunction with both the structured text and a MBP_MSTR function block to toggle the save client configuration bit ON or OFF, which must be performed after communications are restored and before resuming normal operations. Unlike the Config_Read_Control and Config_Write_Control variable arrays, the Watchdog_Write_Control variable array writes to a single register.

Name	Type	Address	Value	Comment
Watchdog_Write_Control	ARRAY[1..9] OF INT	%MW591		
Watchdog_Write_Control[1]	INT	%MW591	1	Operation type: 1 = WRITE
Watchdog_Write_Control[2]	INT	%MW592		Error status
Watchdog_Write_Control[3]	INT	%MW593	1	Number of registers to read
Watchdog_Write_Control[4]	INT	%MW594	2049	Starting register to read
Watchdog_Write_Control[5]	INT	%MW595	16#0300	Routing register MSB = 3 for NOE
Watchdog_Write_Control[6]	INT	%MW596	192	Byte 4 of IP address
Watchdog_Write_Control[7]	INT	%MW597	168	Byte 3 of IP address
Watchdog_Write_Control[8]	INT	%MW598	1	Byte 2 of IP address
Watchdog_Write_Control[9]	INT	%MW599	21	Byte 1 of IP address

ETB_Input_Data

This variable array holds the data returned by scanning the ETBE1M16CP00 module's inputs. Although the scan includes 36 words of input data, only array element 36—watchdog state—is relevant to this application example, as it is used in the structured text code.

Configuring I/O Scanning

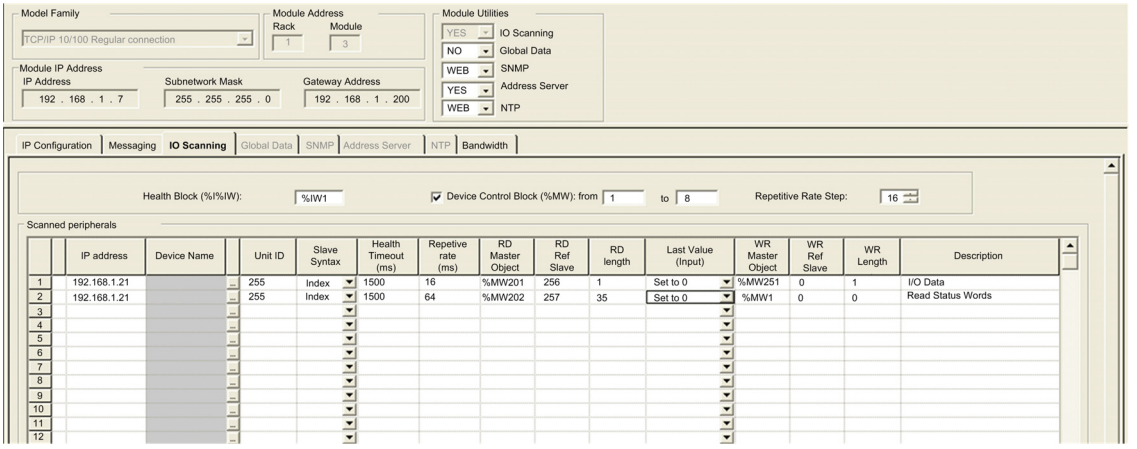
Description

For the purpose of this application example, I/O scanning is configured to read 1 word of input data and 35 words of status data for the ETBE1M16CP00 module, including:

- the input data
- the port identifier
- the current status for each of the 16 communication points (1.A...8.B)
- the event status for each of the 16 communication points (1.A...8.B)
- the module's global status
- the module's power status
- the module's watchdog state

I/O scanning is configured in the **I/O Scanning** page of the **Network Configuration** window. Access this window from the **Project Browser** by selecting **<Project Name> →Communication →Networks →<Network Name>**.

On each scan, the PLC copies 36 words on input data to the ETB_Input_Data *(see page 78)* variable array. The last element in the array—ETB_Input_Data[36]—holds the module's watchdog state. The application's function block code uses this element to toggle the save client configuration register, which thereby resets the watchdog after communications have been lost and then restored.



Resetting the Watchdog with Structure Text Code

Description

When the Advantys ETB I/O module loses communication with the Modbus master, and if the watchdog timeout is set to a value other than 0, the module's watchdog is enabled.

After communication between the Modbus master and the module is restored, the watchdog does not automatically return to its original inactive state, but instead remains active.

Your application must reset the state of the watchdog to inactive, by including instructions that:

- detect that the watchdog is active, and
- toggle ON and OFF the command that saves the module configuration

In the following example—for a Unity Pro project using a Quantum master—structured text code resets the watchdog to its inactive state.

NOTE: A power cycle will also reset the watchdog if communications have been restored.

Example

The sample program uses both structured text and function block code to reset the watchdog. On each scan, first the structured text, then the function block code executes.

This example employs the following variables:

Variable name	Data Type	Starting address		Comment
		in PLC	in Module	
FirstPass	BOOL	—	—	An unassigned variable with default value of FALSE.
Watchdog_Reset	BOOL	%MW601	—	A located variable assigned to the Databuf parameter of a MBP_MSTR block that toggles the save module configuration register.
Watchdog_Write_Enable	BOOL	—	—	An unassigned variable assigned to the Enable parameter of a MBP_MSTR block that toggles the save module configuration register.
ETB_Read_Input_Data *(see page 78)*	ARRAY[1...36] OF INT	%MW201	Modbus Register 400257	The element at array position 36 contains the watchdog state, detected by I/O scanning *(see page 79)*.

The following structured text code, executed in multiple scans, employs the above described variables and operates in conjunction with a MBP_MSTR function block to detect the watchdog state and toggle the save module configuration command, as explained below:

```
IF NOT FirstPass AND ETB_Read_Input_Data[36] = 1 THEN
        WatchDog_Reset := 1;
        Watchdog_Write_Enable := 1;
        FirstPass := TRUE;
ELSIF FirstPass AND ETB_Read_Input_Data[36] = 0 THEN
        WatchDog_Reset := 0;
        Watchdog_Write_Enable := 1;
        FirstPass := FALSE;
END_IF;
```

The following is an example of how this code should execute:

Scan 1:

The conditions required by the IF NOT line are satisfied, because:

- the variable `FirstPass` is false (by default), and
- the variable `ETB_Read_Input_Data[36]`—the watchdog state—is active

Consequently, the next 3 lines of code execute:

- the `Watchdog_Write_Enable` Boolean is turned ON, triggering the operation of a MBP_MSTR block
- the `Watchdog_Reset` Boolean is set to 1, toggling ON the save module configuration register when the MBP_MSTR block executes

The conditions required by the ELSIF line are not yet met, because the watchdog has not yet been set to inactive.

Scan 2 (or later):

The conditions required by the IF NOT line are no longer both satisfied, because the variable `FirstPass` has been set to TRUE (above).

However, the conditions required by the ELSIF line are both satisfied, because:

- the variable `FirstPass` is TRUE, and
- the variable `ETB_Read_Input_Data[36]`—the watchdog state—is now 0, which indicates that the watchdog is again inactive.

Consequently, the next 3 lines of code execute:

- the `Watchdog_Write_Enable` Boolean is turned ON, triggering the operation of a MBP_MSTR block
- the `Watchdog_Reset` Boolean is set to 0, toggling OFF the save module configuration register when the MBP_MSTR block executes

Subsequent scan:

Because none of the conditions required by the IF NOT and the ELSIF lines are satisfied, none of the conditional code executes. Normal operation has resumed.

Configuring I/O with Function Block Code

Introduction

The sample application program employs function block code to:

- check the accuracy of I/O and watchdog settings in the ETBE1M16CP00 I/O module, and
- communicate the watchdog reset after communication between the PLC and the module is restored after a communication loss

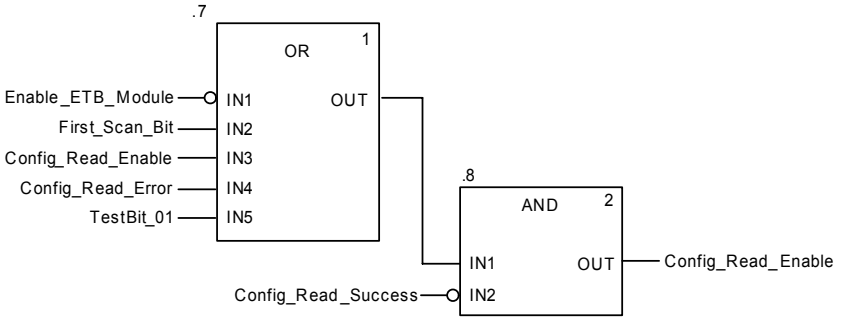
The application includes a total of four sequences of function block code, described below.

Checking I/O and Watchdog Settings

The application program uses the following three function block sequences to check the accuracy of the module's I/O and watchdog settings:

FB Sequence 1:

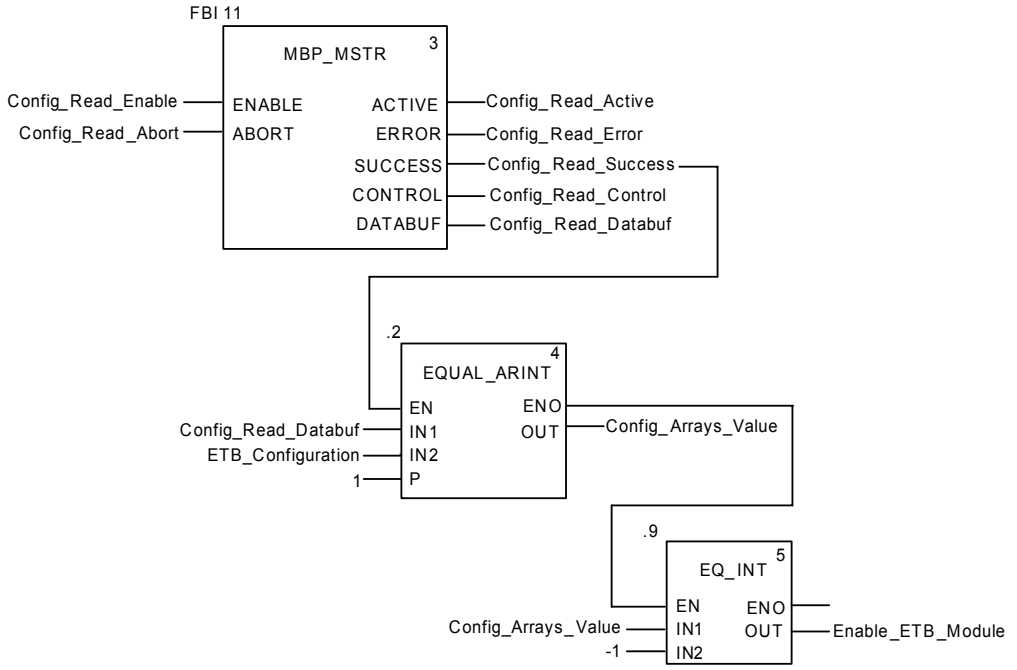
This FB sequence triggers the first read of the ETB module's I/O and watchdog settings. It begins when the `First_Scan_Bit` (a system bit) is set to 1, and runs until the `Config_Read_Success` bit is set to 0 in FB Sequence 2, below.



FB Sequence 2:

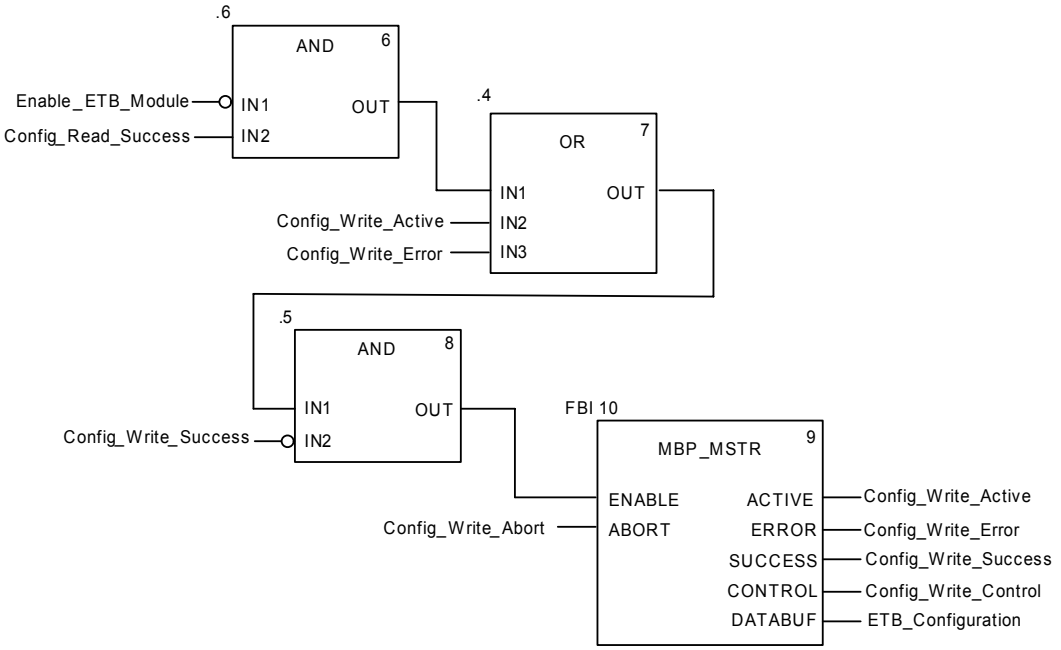
The second FB sequence reads the current I/O and watchdog configuration of the module and compares it against the configuration stored in the `ETB_Configuration` variable. If the two sets of data are:

- the same, the variable `Enable_ETB_Module` is set to 1 and the module continues operations with its present configuration
- different, the variable `Enable_ETB_Module` is set to 0 and the next sequence of function block code executes



FB Sequence 3:

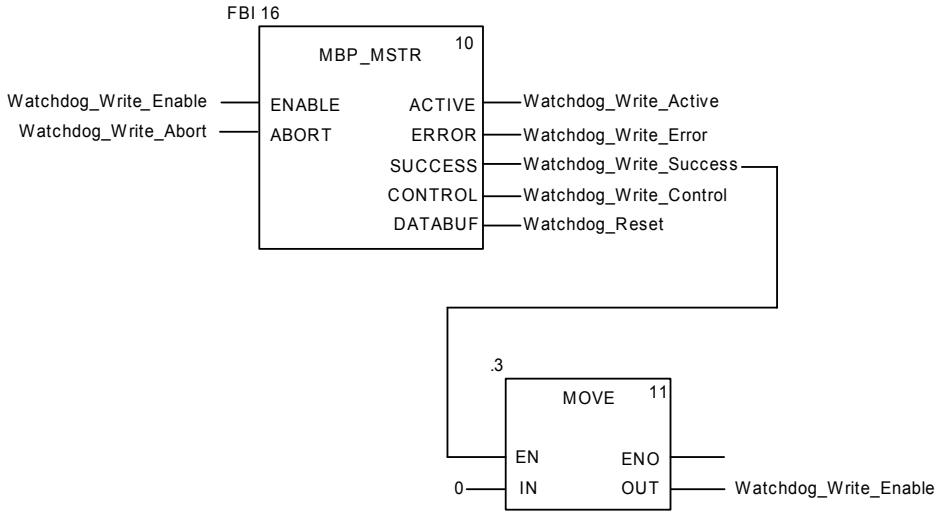
If the I/O and watchdog settings stored in the PLC differ from the data read from the module, FB sequence 3 writes the stored data from the PLC to the module. This sequence runs until the `Config_Write_Success` parameter is set to 1.



Resetting the Watchdog

FB Sequence 4:

The following sequence of FB code works in coordination with the structured text code to toggle the save module configuration word at Modbus register 402050 to ON and then to OFF.



Diagnostics

7

Overview

This chapter describes the tools available for diagnosing the state of the module.

What's in this Chapter?

This chapter contains the following sections:

7.1 LEDs

Introduction

The Advantys ETB I/O modules provide LEDs to diagnose the state of the modules. You can use the LED descriptions in this section to troubleshoot your module.

What's in this Section?

This section contains the following topics:

LED Behaviors

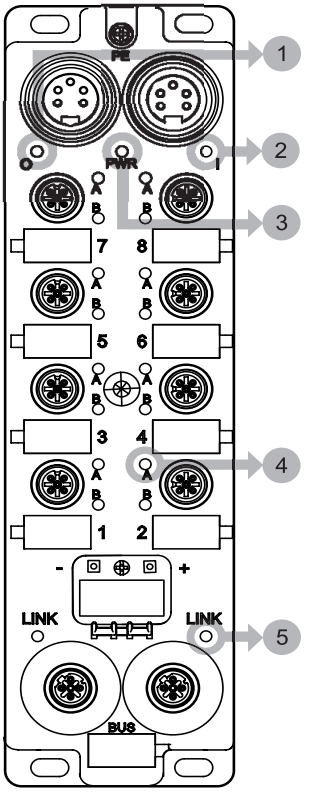
Description

The module provides LEDs for you to visually check its status. You can use the LEDs to monitor power, I/O points, and network link status.

- 2 power LEDs: output (O) and input/module (I)
- 16 logic sided I/O point LEDs
- 2 Ethernet network link LEDs

NOTE: If you cannot see the physical 16 I/O point LEDs, you can instead use the web page labeled I/O Status *(see page 94)*.

The following table shows the LEDs and their indications.

LED Position	Indication
	1 O (green) ● on: output power source present ● off: output power source not present
	2 I (green) ● on: input/module power source present ● off: input/module power source not present
	3 PWR: not used
	4 I/O ● green: input or output active ● red: detected error on I/O points *(see page 28)* ● off: input or output not active
	5 Link ● solid green: link at 100 Mbit without activity ● flashing green: link at 100 Mbit with activity ● solid yellow: link at 10 Mbit without activity ● flashing yellow: link at 10 Mbit with activity

Scrolling LED Messages

Description

The module's scrolling LED displays messages for you to check the module's status. During normal operation, only the source of the IP address, the address itself, and the state of the I/O scanning is displayed. The HMI shows the following specific data when available.

Source information displayed on the HMI:

Message	Description
DHCP	The module is waiting for a response from a DHCP server.
BOOT	The module is waiting for a response from a BootP server.
FACT	The module is applying the factory IP address of 192.168.1.1.

IP address information displayed on the HIMI:

Message	Description
DHCP:192.168.1.1	The IP address of 192.168.1.1 was acquired by a DHCP server.
BOOTP:192.168.1.1	The IP address of 192.168.1.1 was acquired by a BootP server.
FACTORY:192.168.1.1	The IP address is set to the factory IP address of 192.168.1.1.
STATIC:192.168.1.21	The IP address of 192.168.1.21 was manually set by the user, either through the embedded web pages or push buttons.
DEFx	The module detects an IP conflict and defends its own IP address. **NOTE:** x: number of times the module defends its IP address
IP CONFLICT on 192.168.1.1	The module detects an IP address conflict on 192.168.1.1.

Module status information displayed on the HMI:

Message	Description
WLNK	There is no Ethernet link on any ports of the switch.
PING	The module is receiving PING requests on the network.
IO:ERR	A detected I/O error exists on one or more points.
WD:ACTIV	The watchdog was triggered and is now active.

7.2 Diagnostic Web Pages

Introduction

The Advantys ETB I/O modules provide embedded web pages that you can use to display the state of the modules. Use these pages to verify settings and troubleshoot your module.

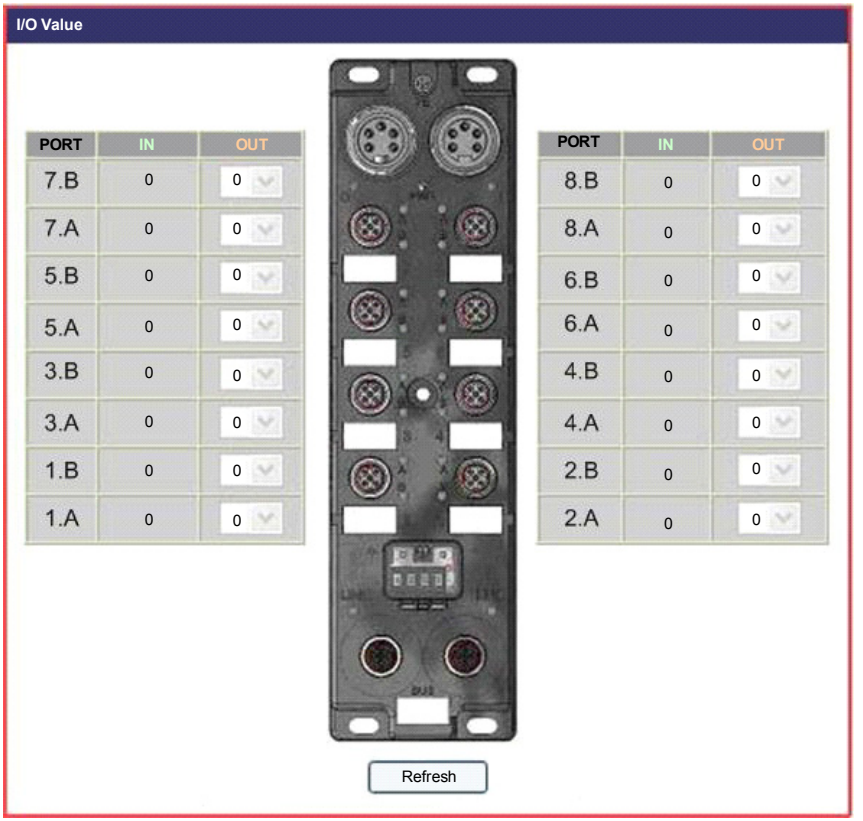
What's in this Section?

This section contains the following topics:

I/O Data: I/O Value

Description

This web page displays the current state of the inputs and outputs for the module. Like all the web pages in this section, this is a static page and you must click **Refresh** to update the information.



I/O Data: I/O Status

Description

This page displays the I/O status of the module. Like all the web pages in this section, this is a static page and you must click **Refresh** to update the information.

NOTE: You can also retrieve the Current Status information by looking at the LEDs *(see page 89)*.

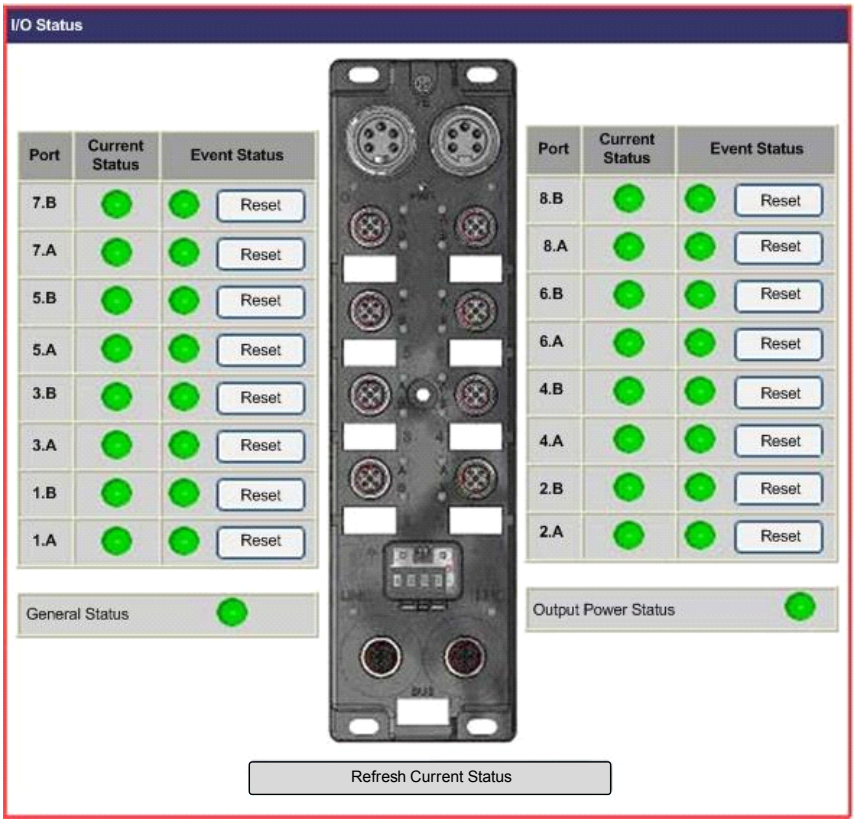
Current Status: shows the current condition of I/O points
- green: no detected output power loss and no detected short circuit on the input power
- red: detected output power loss or detected short circuit on the input power

Event Status: latches Current Status since last cleared
- green: no detected error present with the I/O points since the last reset
- red: detected error present with the I/O points since the last reset

General Status: reflects status of all I/O points
- green: neither the Current Status or Event Status is red
- red: when both the Current Status and Event Status are red, or when just the Event Status is red

Output Power Status: signals presence or absence of output power
- green: output power is present
- red: output power is absent

NOTE: You can also use this web page to reset the Event Status of individual points. Click **Reset** to clear the Event Status for individual I/O points. This also refreshes the web page.


I/O Status
Port
Current Status
Event Status
7.B
Reset
7.A
Reset
5.B
Reset
5.A
Reset
3.B
Reset
3.A
Reset
1.B
Reset
1.A
Reset
General Status
Port
Current Status
Event Status
8.B
Reset
8.A
Reset
6.B
Reset
6.A
Reset
4.B
Reset
4.A
Reset
2.B
Reset
2.A
Reset
Output Power Status
Refresh Current Status

Diagnosis: Ethernet Statistics

Description

This page displays the details of the Ethernet interface counters and Ethernet media counters by port.

- Click **Reset** to set all values to 0.
- Click **Refresh** to update the information on the web page.

NOTE: Port 0 is on the bottom right of the module, and port 1 is on the bottom left.

Interface counters:

Field	Description
In Octets	Number of packets received in the interface
In Ucast Packets	Number of unicast packets received in the interface
In NUcast Packets	Number of non-unicast packets received in the interface
In Discards	Number of inbound packets discarded
In Errors	Number of incoming packets with detected errors (undersize, fragments, oversize, jabbers, detected symbol error, detected CRC error, detected alignment error)
In Unknown Protos	Inbound packets discarded due to unknown or unsupported protocol
Out Octets	Number of output packets transmitted in the interface
Out Ucast Packets	Number of unicast output packets transmitted in the interface
Out NUcast Packets	Number of non-unicast output packets transmitted in the interface
Out Discards	Number of outbound packets discarded
Out Errors	Number of outbound packets that could not be transmitted due to detected errors

Media counters:

Field	Description
Alignment Errors	Number of detected alignment errors in Rx packets
Single Collisions	Successfully transmitted frames on a port for which transmit is inhibited by exactly one collision
Multiple Collisions	Successfully transmitted frames on a port for which transmit is inhibited by more than one collision
Deferred Transmissions	Transmitted packets by a port for which the first transmit attempt is delayed due to the busy medium
Excessive Collisions	Count of frames for which transmit is unsuccessful due to excessive collisions
Frame Too Long	Received oversize packets with good CRC (max: 1536 or 1522 bytes)

Diagnosis: Network Interface

Description

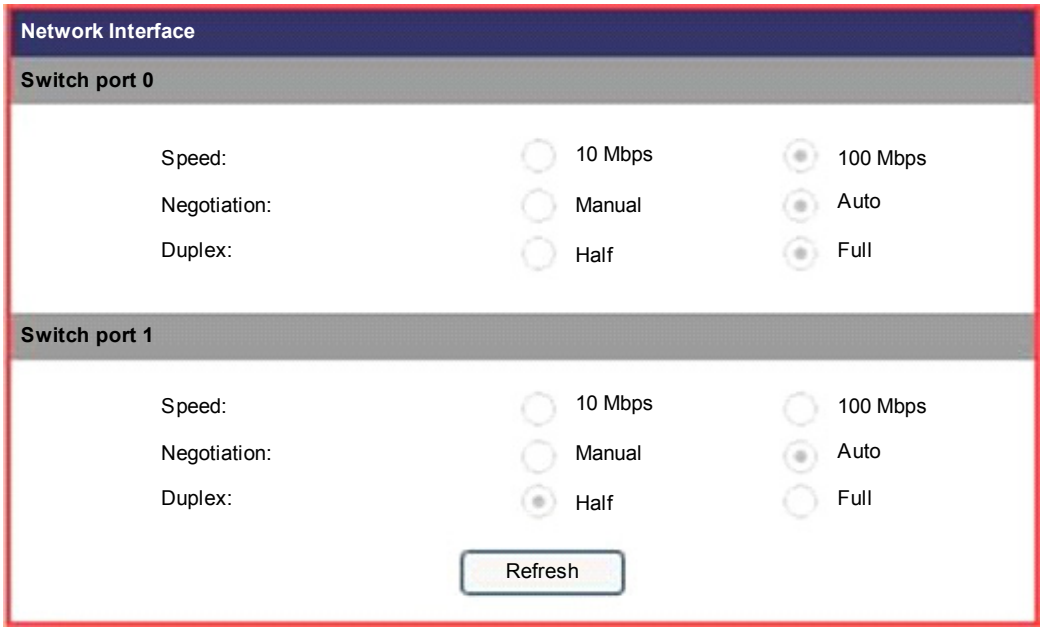
This read only page displays information about the network interface by port:

- Speed
- Negotiation
- Duplex

The module enables auto-negotiation, so the speed and duplex are automatically configured.

Like all the web pages in this section, this is a static page and you must click **Refresh** to update the information.

NOTE: Port 0 is on the bottom right of the module, and port 1 is on the bottom left.



Replacing the Advantys ETB I/O Module

8

Replacing the Module

Introduction

The below steps show you how to replace your Modbus TCP/IP module by first configuring it on a bench. The configuration data from the original module must be transferred to the replacement for proper system operation.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

You must set up the replacement to match the same connections and configurations in the original module, as this is necessary for proper system operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The following table shows the steps needed to replace your module. Details of each step are provided after the table.

Step	Action
1	remove power
2	remove original module
3	apply module power
4	assign IP address and, if required, master controller IP address
5	configure remaining module settings for replacement
6	mount replacement
7	attach cables
8	verify settings and apply output power

Removing Original Module

Remove the power supply, I/O, and network connectors, making note of which cables go to which port. It is recommended that you mark the connector locations appropriately to make sure you reassemble them in the same order. Then detach the module from the mounted surface.

Assigning IP Address and Master Controller IP Address

You must assign the replacement module an IP address, master controller IP address (if applicable), and the related settings identical to the ones assigned to the original.

For a static IP address and the related settings:

- Retrieve the original IP address.
- Refer to the topic Configuring IP Parameters *(see page 43)* to use the web pages, or see the topic Manipulating Push Buttons *(see page 46)* to use the HMI push buttons. Make sure to modify the IP address and the related settings to match those of the original.

For a BootP assigned IP address:

- Retrieve the original IP address.
- Refer to the topic Configuring IP Parameters *(see page 45)* to use the web pages, or see the topic Manipulating Push Buttons *(see page 46)* to use the HMI push buttons. Make sure to modify the server to serve the original IP address to the module's MAC address.

For a DHCP assigned IP address:

- Retrieve the original **Device Name**.
- Refer to the topic Configuring IP Parameters *(see page 44)* to use the web pages, or see the topic Manipulating Push Buttons *(see page 46)* to use the HMI push buttons. Make sure to modify the **Device Name** to match that of the original.

If applicable, make sure you set the master controller IP address to be identical to the one assigned to the original. Refer to the topic Identifying a Master Controller *(see page 48)* for instructions on assigning this address.

Configuring Remaining Module Settings

Configuring the module settings for the replacement depends on how they were configured for the original module.

If configured with the PLC:

- The module settings for the replacement are automatically configured once the IP address and, if applicable, master controller IP address assignments are complete.

If configured with the embedded web pages:

- Obtain the originally configured module settings.
- See the topic on Configuring the Watchdog *(see page 54)* for instructions on assigning module settings such as fallback values, and see the topic on Configuring I/O *(see page 51)* for instructions on configuring the I/O parameters for ETB1EM16CP00.

NOTE: You can only configure the I/O settings for ETB1EM16CP00, and using the PLC will facilitate future module replacement.

Mounting Replacement

Screw the module back in place, making sure to properly torque so as not to overtighten and damage the module case.

Attaching Cables

Attach the cables to the replacement in the same locations as they were on the original module.

Verifying Settings

Verify that the connections and configurations match those of the original module. Then apply output power and check module functionality.

Appendices

Process Image Maps for the Advantys ETB I/O Modules

A

Overview

The following topics describe the Modbus registers that are available for communication purposes in the Advantys ETB I/O modules.

What's in this Chapter?

This chapter contains the following topics:

Modbus Registers

Description

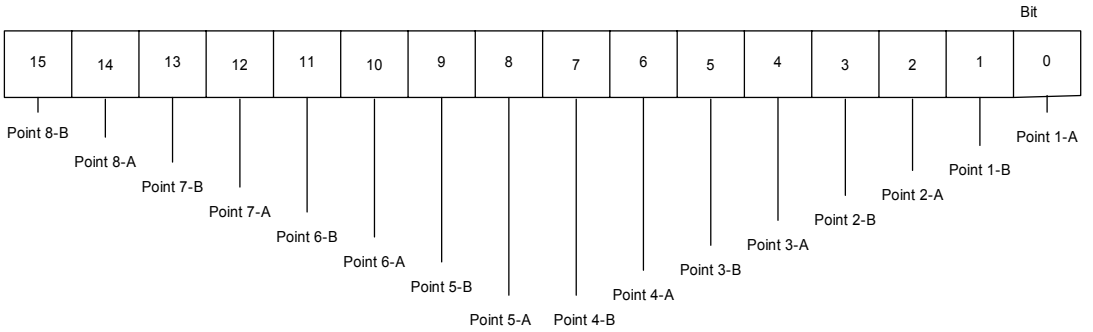
Each module presents a data image containing 3072 registers. These registers are grouped into blocks according to their specific purpose, as shown below.

400001 ↓ 400017	Block 1	17 registers	Output Data
400018 ↓ 400256	Block 2	239 registers	Reserved
400257 ↓ 400292	Block 3	36 registers	Input Data
400293 ↓ 400512	Block 4	219 registers	Reserved
400513 ↓ 400768	Block 5	256 registers	Ethernet Configuration
400769 ↓ 401024	Block 6	256 registers	I/O Module Status
401025 ↓ 402048	Block 7	1024 registers	I/O Module Information
402049 ↓ 403072	Block 8	1024 registers	I/O Configuration

Output Data Registers

Description

Modbus register 400001 maps output data to module I/O points as follows:



The value configured for each output (0 or 1) drives the output point.

Registers 400002...400017 are not used.

Input Data Registers

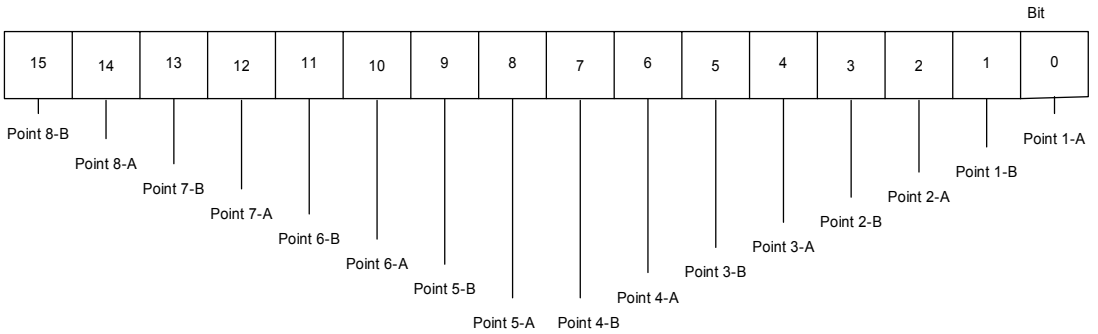
Introduction

The input data image consists of 36 registers:

Register numbers	Description
400257	The data from up to 16 inputs or the echo from the outputs.
400258...400292	The following input status data: • the current status of each input point • the event status of each input point • global status • power status • watchdog status

Input Data

Modbus register 400257 maps input data to module I/O points as follows:



All data presented by Modbus registers 400257 through 400292 are read only.

Input Status Registers

The following registers contain input status data, all of which are assigned to bit 0 within the word.

Modbus Register Address	Access	Length In word	Description
400258	RO	1	PIN P1.A Current Status
400259	RO	1	PIN P1.B Current Status
. . .	. . .	. . .	. . .
400272	RO	1	PIN P8.A Current Status
400273	RO	1	PIN P8.B Current Status
400274	RO	1	PIN P1.A Event Status

Modbus Register Address	Access	Length In word	Description
400275	RO	1	PIN P1.B Event Status
. . .	. . .	. . .	. . .
400288	RO	1	PIN P8.A Event Status
400289	RO	1	PIN P8.B Event Status
400290	RO	1	Global Status
400291	RO	1	Power Status
400292	RO	1	Watchdog State

Ethernet Configuration Registers

Description

The following registers contain the Ethernet configuration:

Modbus Register Address	Access	Length (words)	Value	Description
400513	R/W	1	!0 = to save the configuration	save Ethernet modification
400514	R/W	1	0 = static address 1 = DHCP 2 = BOOTP 3 = FACTORY	IP address source
400515	R/W	1	2 lower octets (0-255)	IP address low byte[1]
400516	R/W	1	2 higher octets (0-255)	IP address high byte[1]
400517	R/W	1	2 lower octets (0-255)	maximum subnet address low byte[1]
400518	R/W	1	2 higher octets (0-255)	maximum subnet address high byte[1]
400519	RO	3	read from device	MAC address
400522	RO	2	read from device	serial number
400524	RO	1	read from device	current TCP connection
400525	RO	1	read from device	total TCP connections
400526	RO	1	read from device	timeout number
400527	R/W	1	2 lower octets (0-255)	gateway IP address low byte[1]
400528	R/W	1	2 higher octets (0-255)	gateway IP address high byte[1]
400529	R/W	5	use with DHCP server	DHCP client Identifier
400534	R/W	1	2 lower octets (0-255)	Master controller IP address low byte[1]
400535	R/W	1	2 higher octets (0-255)	Master controller IP address high byte[1]

1. For example, the IP address 172.16.27.172 would be represented as:
- low byte = 0x1BAC (27.172); where 0x1B = 27 and 0xAC = 172
- high byte = 0xAC10 (172.16); where 0xAC =172 and 0x10 = 16

NOTE: It is recommended practice to use the module web pages to set the Ethernet parameters. Only the master controller IP address, set in registers 400534 and 400535, should be set using the PLC.

Registers 400536...400768 are not used.

Module Status Registers

Description

These registers indicate module status. They only use the first bit in each word like in the input process image. Use RW access registers to write to and reset the event status using MBP_MSTR function blocks.

NOTE: The RO access registers are for reference, as they duplicate the information provided in the input process image.

Modbus Register Address	Access	Length (words)	Values[1]	Description
400769	RO	1	0 or 1	point 1.A Current Status
400770	RO	1	0 or 1	point 1.B Current Status
. . .	. . .	. . .	. . .	. . .
400783	RO	1	0 or 1	point 8.A Current Status
400784	RO	1	0 or 1	point 8.B Current Status
400785	RW	1	0 or 1	point 1.A Event Status[2]
400786	RW	1	0 or 1	point 1.B Event Status[2]
. . .	. . .	. . .	. . .	. . .[2]
400799	RW	1	0 or 1	point 8.A Event Status[2]
400800	RW	1	0 or 1	point 8.B Event Status[2]
400801	RO	1	0 or 1	Global Status
400802	RO	1	0 or 1	Output Power Status

1. The values indicate:
- 0 = OK
- 1 = short circuit or overload

2. Event Status references the occurrence (1), or non-occurrence (0) of an event since the last power cycle.

Registers 400803...401024 are not used.

Module Information Registers

Description

This range of registers contains information on the I/O process image and shows information about firmware and version.

Modbus Register Address	Access	Length (words)	Description
401025	RO	1	firmware version - minor
401026	RO	1	firmware version - major
. . .	. . .	. . .	. . .
401030	RO	4	firmware name
401034	RO	1	editable I/O configuration
401035	RO	8	model number

Registers 401036...402048 are not used.

I/O and Watchdog Configuration Registers

Description

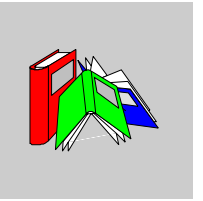
To save a new I/O module configuration, simply write a 1 to the save client configuration register (402049), and then write a 0 to the same register.

Modbus Register Address	Access	Length (words)	Values	Description
402049	R/W	1	!0 to save the configuration	save client configuration
402050	R/W	1	!0 = * 100ms 0 = not active	watchdog value **Note**: This value is multiplied by a factor of 100 to produce the watchdog timeout setting. Applied to points with fallback set to ON.
402051	R/W	1	0 = not active 1 = active	watchdog state
402052	R/W	1	0 = apply output fallback 1 = hold output	watchdog behavior
. . .	. . .	. . .	. . .	. . .
402054	R/W	1	0 = OK 1 = PB on Firmware	firmware state
402055	R/W	1	used when I/O pin is an output 0 = OFF !0 = ON	fallback for point 1.A
402056	R/W	1	used when I/O pin is an output 0 = OFF !0 = ON	fallback for point 1.B
. . .	. . .	. . .	. . .	. . .
402069	R/W	1	used when I/O pin is an output 0 = OFF !0 = ON	fallback for point 8.A
402070	R/W	1	used when I/O pin is an output 0 = OFF !0 = ON	fallback for point 8.B
402071	RO or RW	1	0 = input pin 1 = output pin 2 = universal I/O other = universal I/O	I/O configuration for point 1.A
402072	RO or RW	1	0 = input pin 1 = output pin 2 = universal I/O other = universal I/O	I/O configuration for point 1.B

Modbus Register Address	Access	Length (words)	Values	Description
. . .	. . .	. . .	. . .	. . .
402085	RO or RW	1	0 = input pin 1 = output pin 2 = universal I/O other = universal I/O	I/O configuration for point 8.A
402086	RO or RW	1	0 = input pin 1 = output pin 2 = universal I/O other = universal I/O	I/O configuration for point 8.B
402087	RO or RW	1	0 = PNP 1= PNP	PNP-NPN input type
402088	RO or RW	1	0 = 0 ms 1 = 0.5 ms 2 = 1 ms 3 = 1.5 ms 4 = 2 ms 5 = 2.5 ms 6 = 5 ms	input filter delay

Registers 402089...403072 are not used.

Glossary



A

auto-negotiation/auto-sensing

The ability of a device (at the MAC sub-layer) to identify the speed (10 or 100 Mb/s) and the duplex or half mode of a connection and to adjust it, according to clause 28 of the IEEE 802.3u standard.

B

bit/s

Bits per second, unit of transmission speed.

BootP

(*bootstrap protocol*) A TCP/IP network protocol that offers network nodes request configuration information from a BOOTP server node.

D

default

A value automatically assigned by the computer in a software program. Usually, this value can be changed.

DHCP

(*dynamic host configuration protocol*) Communications protocol that assigns IP addresses to devices on the network, based on BootP.

E

embedded web pages

Embedded Web pages (accessed by an installed HTTP server) provide Ethernet communications modules with easy access to devices anywhere in the world from standard browsers such as Internet Explorer or Netscape Navigator.

ETB

Ethernet Terminal Block

Ethernet

A LAN cabling and signaling specification used to connect devices within a defined area, e.g., a building. Ethernet uses topology such as bus or star to connect different nodes on a network.

F

fallback state

A stable state to which an Advantys I/O module can return in the event that its communication connection is disrupted.

fallback value

The value that a device assumes during fallback. Typically, the fallback value is either configurable or the last stored value for the device.

G

gateway

A combination of hardware and software that interconnects otherwise incompatible networks or networking devices. Gateways include packet assembler/disassembler (pads) and protocol converters.

H

HMI

(*human-machine interface*) The screen of a device, the design of which makes its use intuitive to the user.

I

I/O

(*input/output*) The transfer of data to and from a computer.

I/O module

In a programmable controller system, an I/O module interfaces directly to the sensors and actuators of the machine/process. This module is the component that mounts in an I/O base and provides electrical connections between the controller and the field devices. Normal I/O module capacities are offered in a variety of signal levels and capacities.

IEC

(*International Electrotechnical Commission Carrier*) Founded in 1884 to focus on advancing the theory and practice of electrical, electronics, and computer engineering, as well as computer science. IEC 1131 is the specification that deals with industrial automation equipment.

Internet

A series of interconnected local, regional, national and international networks, linked using TCP/IP. Internet links may be government, university and research sites. It provides E-mail, remote login and file transfer services.

IP

(*Internet protocol*). That part of the TCP/IP protocol family that tracks the Internet addresses of nodes, routes outgoing messages, and recognizes incoming messages.

IP address

The 32-bit address associated with a workstation in connection with TCP/IP Internet.

L

LED

Light emitting diode. An indicator that lights up when electricity passes through it. It indicates the operation status of a communications module.

link

Physical connection between two nodes in a network. It can consist of a data communication circuit or a direct channel (cable) connection.

M

MAC address

The *media access control* address of a device, which is burned into a DNI card and is added near the beginning of the packet.

Modbus

Modbus is an application layer messaging protocol. Modbus provides client and server communications between devices connected on different types of buses or networks. Modbus TCP is the Modbus type that transmits data over Ethernet.

N

network

An interconnected system of computers that can communicate with each other and share files, data and resources.

NPN inputs

The field sensor sink or pull current from input circuitry of the module to 0 VDC.

NPN outputs

NPN outputs are sinking type outputs also referred to as True Low. When energized, the outputs pull current through the load to turn on the field device.

P

ping

(*packet Internet groper*) To test the network by trying to reach a destination with an ICMP echo request and waiting for a reply, type *ping.exe* at the command line.

PLC

(*programmable logic controller*) An industrial control computer, also known simply as a controller.

PNP inputs

The sensor sources or push current from the field sensor to the input circuit of the module, typically a 24 VDC signal.

PNP outputs

PNP outputs are source type output also referred to as True High. When energized the output pushes current through the load to turn the output device on.

port

The physical connector on a device enabling the connection to be made.

process image

Serves as a real-time data area for the data exchange process. The process image includes an input buffer that contains current data and status information from the module and an output buffer that contains the current outputs for the module.

protocol

Any standard method of communicating over a network.

S

server

A computer that provides resources to be shared on the network, such as files (file server) or terminals (terminal server).

subnet

A part of a network that shares a network address with the other parts of a network. A subnet may be physically and/or logically independent of the rest of the network. A part of an internet address called a subnet mask, which is ignored in IP routing, distinguishes the subnet.

switch

A multiport Ethernet device designed to increase network performance by allowing only essential traffic on the attached individual Ethernet segments. Packets are filtered or forwarded based upon their source and destination addresses.

T

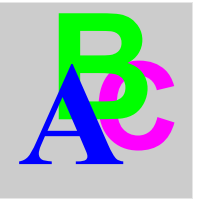
timeout

If communication stops, the program waits the specified number of seconds before trying to communicate again.

topology

The arrangement of the nodes and connecting hardware that comprises the network. Types include ring, bus, star and tree.

Index



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