1732E EtherNet/IP ArmorBlock Supporting Sequence of Events

Allen-Bradley

Catalog Number 1732E-IB16M12SOEDR
User Manual




Allen-Bradley • Rockwell Software

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://literature.rockwellautomation.com) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc., is prohibited.

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to: personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
SHOCK HAZARD	Labels may be on or inside the equipment, such as a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be on or inside the equipment, such as a drive or motor, to alert people that surfaces may reach dangerous temperatures.

Chapter 5

Configure the Module for Your EtherNet/IP Network

Chapter 6

Configure the Module Using RSLogix 5000

Chapter 7

Module Features

Read this preface to familiarize yourself with the rest of the manual. It provides information concerning:

- who should use this manual
- the purpose of this manual
- related documentation
- conventions used in this manual

Who Should Use this Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use 1732 ArmorBlock EtherNet/IP with Diagnostics and CIPSync modules.

You should have a basic understanding of electrical circuitry and familiarity with relay logic. If you do not, obtain the proper training before using this product.

Purpose of this Manual

This manual is a reference guide for the 1732E-IB16M12SOEDR module. It describes the procedures you use to install, wire, and troubleshoot your module. This manual:

- explains how to install and wire your module
- gives you an overview of the ArmorBlock EtherNet/IP system

Related Documentation

The following documents contain additional information concerning Rockwell Automation products. To obtain a copy, contact your local Rockwell Automation office or distributor.

Resource	Description
1732 Ethernet/IP 16 Point ArmorBlock I/O Wiring Diagram, publication 1732E-WD001	Information on wiring the ArmorBlock EtherNet/IP module.
1732E ArmorBlock 2 Port Ethernet Module Installation Instructions, publication 1732E-IN004	Information on installing the ArmorBlock EtherNet/IP module.
1732E ArmorBlock 2 Port Ethernet Module Release Notes, publication 1732E-RN001	Release notes to supplement the existing documentation supplied with the ArmorBlock EtherNet/IP module.
ControlLogix Sequence of Events Module User Manual, publication 1756-UM528	A manual on how to install, configure and troubleshoot the ControlLogix Sequence of Events module in your ControlLogix application.
EtherNet/IP Embedded Switch Technology Application Guide, publication ENET-AP005	A manual on how to install, configure and maintain linear and Device-level Ring (DLR) networks using Rockwell Automation EtherNet/IP devices with embedded switch technology.
EtherNet/IP Modules in Logix5000 Control Systems User Manual, publication ENET-UM001	A manual on how to use EtherNet/IP modules with Logix5000 controllers and communicate with various devices on the Ethernet network.
Integrated Architecture and CIP Sync Configuration Application Techniques, publication IA-AT003	A manual on how to configure CIP Sync with Intergrated Architecture products. and applications.
Getting Results with RSLogix 5000, publication 9399-RLD300GR	Information on how to install and navigate RSLogix 5000. The guide includes troubleshooting information and tips on how to use RSLogix 5000 effectively.
M116 On-Machine Connectivity Catalog, M116-CA001A	An article on wire sizes and types for grounding electrical equipment.
Allen-Bradley Industrial Automation Glossary, AG-7.1	A glossary of industrial automation terms and abbreviations.

Common Techniques Used in this Manual

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.

About 1732E ArmorBlock Modules

Overview

This chapter is an overview of the 1732E ArmorBlock family of modules. You will need to understand the concepts discussed in this chapter to configure your module and use it in an EtherNet/IP control system. The following table lists where to find specific information in this chapter.

Module Features

The module features include:

- use of EtherNet/IP messages encapsulated within standard TCP/UDP/IP protocol
- common application layer with ControlNet and DeviceNet
- interfacing via Category 5 rated twisted pair cable
- half/full duplex 10 Mbit or 100 Mbit operation
- mounting on a wall or panel
- communication supported by RSLinx software
- IP address assigned via standard DHCP tools
- I/O configuration via RSLogix 5000 software
- no network scheduling required
- no routing tables required
- supports connections from multiple controllers simultaneously

Hardware/Software Compatibility

The module and the applications described in this manual are compatible with the following firmware versions and software releases.

Contact Rockwell Automation if you need software or firmware upgrades to use this equipment.

Product	Firmware Version / Software Release
1732E-IB16M12SOEDR	Firmware rev. 1.6 or later
1756-EN2T or 1756-EN2TR module	2.3 (or later version of major revision 2) when using RSLogix 5000 v17 3.x version when using RSLogix 5000 v18 or later
RSLogix 5000 software	17 or later
RSLinx software	2.56 or later

For a complete ControlLogix compatibility matrix, see publication IA-AT003.

Use of the Common Industrial Protocol (CIP)

The 1732E-IB16M12SOEDR uses the Common Industrial Protocol (CIP). CIP is the application layer protocol specified for EtherNet/IP, the Ethernet Industrial Protocol, as well as for ControlNet and DeviceNet. It is a message-based protocol that implements a relative path to send a message from the "producing" device in a system to the "consuming" devices.

The producing device contains the path information that steers the message along the proper route to reach its consumers. Because the producing device holds this information, other devices along the path simply pass this information; they do not need to store it.

This has two significant benefits:

- You do not need to configure routing tables in the bridging modules, which greatly simplifies maintenance and module replacement.
- You maintain full control over the route taken by each message, which enables you to select alternative paths for the same end device.

Understand the Producer/Consumer Model

The CIP "producer/consumer" networking model replaces the old source/destination ("master/slave") model. The producer/consumer model reduces network traffic and increases speed of transmission. In traditional I/O systems, controllers poll input modules to obtain their input status. In the CIP system, input modules are not polled by a controller. Instead, they produce their data either upon a change of state (COS) or periodically. The frequency of update depends upon the options chosen during configuration and where on the network the input module resides. The input module, therefore, is a producer of input data and the controller is a consumer of the data.

The controller can also produce data for other controllers to consume. The produced and consumed data is accessible by multiple controllers and other devices over the EtherNet/IP network. This data exchange conforms to the producer/consumer model.

Specify the Requested Packet Interval (RPI)

The Requested Packet Interval (RPI) is the update rate specified for a particular piece of data on the network. This value specifies how often to produce the data for that device. For example, if you specify an RPI of 50 ms, it means that every 50 ms the device sends its data to the controller or the controller sends its data to the device.

RPIs are only used for devices that exchange data. For example, a ControlLogix EtherNet/IP bridge module in the same chassis as the controller does not require an RPI because it is not a data-producing member of the system; it is used only as a bridge to remote modules.

Chapter Summary and What's Next

In this chapter you were given an overview of the 1732E ArmorBlock family of modules. The next chapter is an overview of the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events module.

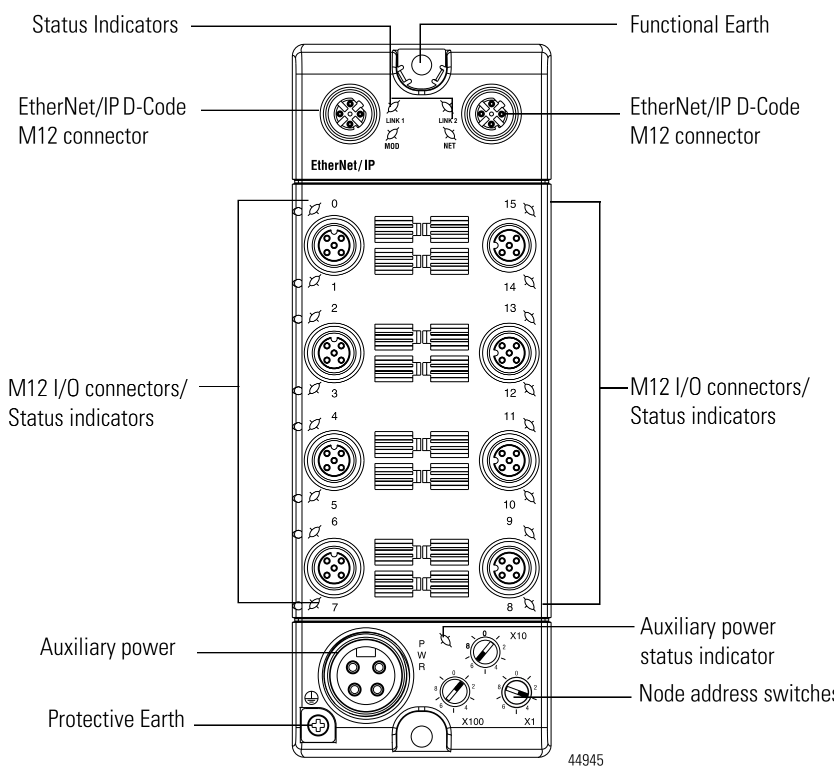
Notes:

Module Overview

Overview

This chapter provides an overview of the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events module. The module uses CIP Sync functionality to provide time stamping when an input event occurs.

EtherNet/IP Network Overview



The module incorporates embedded switch technology. The module supports Star, Tree, Daisy Chain or Linear, and Ring network topologies.

- Star or Tree topologies can connect to either Port 1 or Port 2.
- Daisy Chain/Linear topologies will pass communications from Port 1 to 2, or Port 2 to 1.
- Ring topology will pass communications from Port 1 to 2, or Port 2 to 1.

The 1732E-IB16M12SOEDR supports the management of network traffic to ensure timely delivery of critical data, Quality of Service (QoS) and Internet Group Management Protocol (IGMP) protocols are supported.

If the ring topology is used, the*Ring Master* (not the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events) must be designated in the system, and it will determine the beacon rate and the timeout period. For more information on topologies, refer to publication ENET-AP005. The 1732E-IB16M12SOEDR module is a CIP Sync slave only device. There must be another module on the network that will function as a master clock.

Each input connector's Sensor Source Voltage (SSV) is protected from short circuits to ground as well as open wire conditions due to missing sensor or cable disconnection. These conditions are indicated in the modules input tags and by its input LEDs flashing red for open wire or being solid red for short circuit.

Introduction to CIP Sync

CIP is the Common Industrial Protocol that we use to let all Rockwell products communicate with each other whether it be on a DeviceNet, ControlNet, and/or an EtherNet network. Since it is an ODVA standard, other industrial product manufactures develop products to communicate via the CIP protocol.

CIP Sync is a CIP implementation of the IEEE 1588 PTP (Precision Time Protocol) in which devices can bridge the PTP time across backplanes and on to other networks via EtherNet/IP ports.

What is IEEE 1588 PTP (Precision Time Protocol)?

The IEEE 1588 standard specifies a protocol to synchronize independent clocks running on separate nodes of a distributed measurement and control system to a high degree of accuracy and precision. The clocks communicate with each other over a communication network. In its basic form, the protocol is intended to be administration free. The protocol generates a master slave relationship among the clocks in the system. Within a given subnet of a network there will be a single master clock. All clocks ultimately derive their time from a clock known as the grandmaster clock. This is called Precision Time Protocol (PTP).

The PTP is a time-transfer protocol defined in the IEEE 1588-2008 standard that allows precise synchronization of networks, for example, Ethernet. Accuracy within the nanosecond range can be achieved with this protocol when using hardware generated synchronization.

IEEE 1588 is designed for local systems requiring very high accuracies beyond those attainable using Network Time Protocol (NTP). NTP is used to synchronize the time of a computer client or server to another server or reference time source, such as a GPS.

CIP Sync Support

CIP Sync supports the IEEE 1588-2008 synchronization standard. In this architecture, a grandmaster clock provides a master time reference for the system time. The 1732E-IB16M12SOEDR module is a CIP Sync slave only device. There must be another module on the network that will function as a master clock. The grandmaster could be:

- a 1756 ControlLogix L6 or L7controller when using RSLogix 5000 software V18 or later.
- an Ethernet switch that supports IEEE 1588 V2, or
- a Symmetricom Grand Master GPS or equivalent.

What is CIP Sync?

CIP Sync is a CIP implementation of the IEE 1588 PTP (Precision Time Protocol). CIP Sync provides accurate real-time (Real-World Time) or Universal Coordinated Time (UTC) synchronization of controllers and devices connected over CIP networks. This technology supports highly distributed applications that require time stamping, sequence of events recording, distributed motion control, and increased control coordination.

What is Time Stamping?

Each input has its own individual timestamp recorded for both ON and OFF transitions. The offset from the timestamp to the local clock is also recorded so that steps in time can be detected and resolved. Diagnostic events such as short circuit, open wire and open load are not time stamped.

Time stamping uses the 64-bit System Time whose time base is determined by the modules master clock resolved in microseconds. Each timestamp is updated as soon as an input transition is detected, before input filtering occurs. When filtering is enabled, the transition is only recorded if the transition passes the filter.

The module starts time stamping as soon as it powers up, even if it is not synchronized to a master clock. If it is synchronized to a master clock and then becomes unsynchronized it will continue to time stamp. All time stamps and offsets have a value of zero at power-up.

For more information on how to use CIP Sync technology, see the Integrated Architecture and CIP Sync Configuration Application Technique publication IA-AT003.

Introduction to Sequence of Events modules

The 1732E-IB16M12SOEDR is an input module that offers sub-millisecond timestamping on a per point basis in addition to providing the basic ON/OFF detection.

All input point event times are recorded and returned in a single buffer. The module returns two 64-bit timestamps for each input point, thus allowing:

- ON and OFF events for each point to be displayed simultaneously in the input data.
- ladder logic not being explicitly required to see events, although needed to archive events.
- events to be kept in the controller memory during remote power loss thus eliminating data loss.

Filtering allows all inputs on the module to be filtered for both ON to OFF and OFF to ON transitions. The timestamp for a filtered input will be the time of the initial transition to the new state and not the time that the filter validates the event as real.

Selective Event Capturing allows particular events to be disabled per input and per transition, ON to OFF or OFF to ON.

Event latching ensures that events are not overwritten. A single transition in each direction is recorded per point. Any new event, which occurs after the point has captured a time stamp, is dropped until the stored events have been acknowledged.

If latching is not enabled, new events overwrite old events immediately. Thus, if inputs are changing rapidly it may be possible that events will be lost either in the module or the controller prior to an event being operated on by ladder logic.

When events are lost, either old ones being overwritten or new ones being ignored due to latching, an EventOverflow bit will be set for each point that loses an event. The EventOverflow bit will clear when the blocking events for that point are acknowledged.

Timestamping is a feature that registers a time reference to a change in input data. For the 1732E-IB16M12SOEDR, the time mechanism used for timestamping is (PTP) system time. The 1732E-IB16M12SOEDR module is a PTP slave only device. There must be another module module on the network that will function as a master clock.

High Performance Sequence of Events Applications in the Logix Architecture

Sequence of Events (SOE) applications span a wide range of industry applications. Typically any event that needs to be compared against a second event can be classified as SOE.

- Used on discrete machines to identify failure points
- Used in Power Substations or power plants to indicate first fault conditions
- Used in SCADA applications to indicate pump failures or other discrete events
- Used in motion control applications to increase control coordination.
- Used in high speed applications
- Used in Global Position Registration

In today's environment, specifications for SOE applications typically require 1 ms or better resolution on time stamps. There are two types of SOE applications.

First Fault

First Fault measures the time between events with no correlation to events outside of that system.

Real Time

Real Time captures the time of an event occurrence as it relates to some master clock. Typically this is a GPS, NTP server or some other very accurate clock source. This method allows distributed systems to capture events and build a history of these events. These events are almost always digital, however some are analog for which lower performance requirements can be configured.

First Fault Detection

An example of first fault detection would be intermittent failure from a sensor on a safety system faults a machine and halts production cascading a flood of other interrelated machine faults. Traditional fault detection or alarms may not appear in the correct timed order of actual failure making root cause of the down time difficult or impossible.

Time Stamped I/O

High precision time stamps on I/O allows very accurate first fault detection making it easy to identify the initial fault that caused machine down time.

Common Time base for Alarming System logs user interaction as well as alarm events using common time reference.

The power industry requires sub 1 ms accuracy on first fault across geographically dispersed architecture.

High Speed Applications

Packaging machines or sorters that have fast part cycles are often bottlenecked by controller scan times. By switching to a time based solution, you can remove many scan time critical components of the system. This programming technique allows you to do predictive events and schedule outputs to run things like diverters without having a scan time to match the part cycle time.

Motion Control

CIP Sync also provides a common time reference for distributed VFD drives, servo's, and controllers throughout the system. This allows controllers to request axes reach a pre-defined position at a known time reference or run at a set speed using the same reference. Since all drives and controllers in the system have the same reference to time, the controller can issue simple requests for axes to reach target positions in a synchronized fashion.

Global Position Registration

Registration refers to a function usually performed by the drive where a physical input is triggered causing the drive to precisely capture the actual axis position when the input event occurred. Rather than wiring inputs to the registration input on all of the drives, this time based system lets you wire an input to only one time based SOE input module. The time stamp returned for that input, can be used by the motion planner to calculate the actual axis position at the time the input triggered. This simplifies system installation, reduces wiring costs, and provides a global machine registration for all the axes in the system thru one SOE input.

Chapter Summary and What's Next

In this chapter, you were given an overview of the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events module. The next chapter describes how the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events module operates in an ArmorBlock system.

Use the Module in an ArmorBlock System

Introduction

This chapter describes how the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events module operates in an ArmorBlock system.

Differences Between Module and Standard I/O

In many aspects, the module behaves the same as other ArmorBlock digital input modules. However, the module offers several significant differences from other EtherNet/IP ArmorBlock digital input modules, including those described in the following table.

Difference	Description
Additional data produced for controller	The module produces significantly more data for its owner-controller than standard ArmorBlock digital input modules. While other input modules only produce ON/OFF and fault status, the module produces data such as ON/OFF and fault status, timestamp data, indication of whether new data was produced for specific input points or if transitions were not timestamped.
CIP Sync	This module has an internal clock that is synchronized with a master clock using CIP Sync. This clock is used for time stamping inputs.
Only one owner-controller per module	While multiple controllers can simultaneously own other digital input modules, the module only supports a single owner-controller.
No listen-only connections	Controllers cannot make listen-only connections to the module. All connections between the module and its owner-controller are direct connections.

Similar Functionality to Standard ArmorBlock

With respect to general module operation in an ArmorBlock I/O system, the module operates similarly to other ArmorBlock, single and dual port EtherNet/IP I/O modules in many ways. This chapter focuses on how the module's behavior differs from that of other ArmorBlock I/O modules. However, you should be aware of aspects in which the module is similar to standard EtherNet/IP ArmorBlock I/O modules. In addition to the common features described in Chapter 1, the following table describes the similarities.

Concept	Description
Ownership	Every module in the ArmorBlock system must be owned by a Logix5000 controller. This owner-controller: • stores configuration data for every module that it owns. • sends the module configuration data to define the module's behavior and begin operation with the control system. **This module does not support multiple owner-controllers**.
Using RSLogix 5000 software	The I/O configuration portion of RSLogix 5000 software, v17 or greater, generates the configuration data for each module. Configuration data is transferred to the controller during the program download and subsequently transferred to the appropriate modules. Modules are ready to run as soon as the configuration data has been downloaded. Configure all modules for a given controller using RSLogix 5000 software and download that information to the controller.

Chapter Summary and What's Next

In this chapter, you learned about the differences between this module and other EtherNet/IP ArmorBlock modules. The next chapter describes how to install and wire your module.

Install Your Module

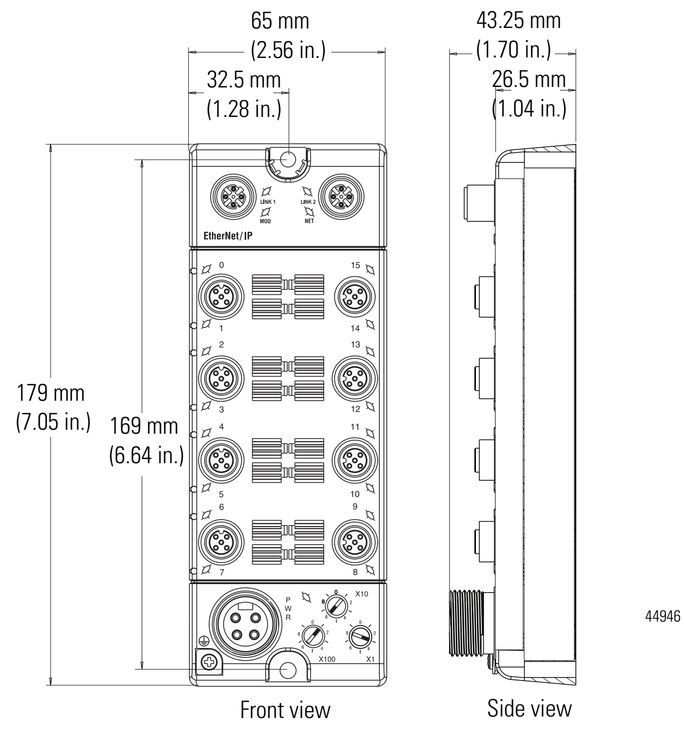
Overview

This chapter shows you how to install and wire the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events. The only tools you require are a flat or Phillips head screwdriver and drill.

Mount the Module

To mount the module on a wall or panel, use the screw holes provided in the module.

Refer to the drilling dimensions illustration to guide you in mounting the module.



Install the mounting base as follows:

1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) pan head screws.
3. Mount the module using #8 (M4) screws.

Wire the Module

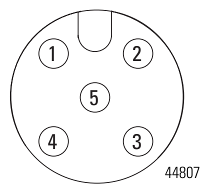
The ArmorBlock EtherNet/IP family has 5-pin micro-style I/O connectors.

We provide caps to cover the unused connectors on your module. Connect the quick-disconnect cord sets you selected for your module to the appropriate ports.

I/O Connectors

Refer to the pinout diagrams for the I/O connectors.

Micro-style 5-Pin Input Female Connector

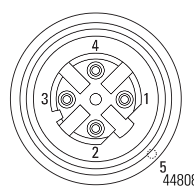


(View into connector)
Pin 1 Sensor Source Voltage
Pin 2 Input B
Pin 3 Return
Pin 4 Input A
Pin 5 PE

Ethernet/IP Connectors

Refer to the pinout diagrams for the network connectors.

D-Code M12 Network Female Connector



(View into connector)
Pin 1 M12_Tx+
Pin 2 M12_Rx+
Pin 3 M12_Tx-
Pin 4 M12_Rx-
Pin 5 Connector shell shield FE

IMPORTANT Use the 1585D–M4DC–H: Polyamide small body unshielded or the 1585D–M4DC–SH: Zinc die-cast large body shielded mating connectors for the D-Code M12 female network connector.

IMPORTANT Use two twisted pair CAT5E UTP or STP cable.

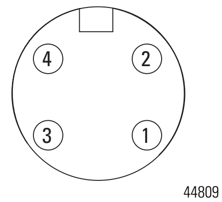
D-Code M12 Pin	Wire Color	Signal	8-way Modular RJ45 Pin
1	White-Orange	TX+	1
2	White-Green	RX+	3
3	Orange	TX-	2
4	Green	RX-	6

ATTENTION Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP enclosure type requirements.

Auxiliary Power Cable

Attach the mini-style 4-pin connector to the mini-style 4-pin receptacle as shown below.

Mini-style 4-Pin Male Receptacle



(View into receptacle)
Pin 1 NC
Pin 2 Sensor/MDL power+
Pin 3 Sensor/MDL power-
Pin 4 NC

Auxiliary Power is based on a 4-pin connector system and is used to provide 24V DC power to I/O modules and other devices. Pins 3 and 4 are connected inside the module.

ATTENTION

To comply with the CE Low Voltage Directive (LVD), this equipment and all connected I/O must be powered from a source compliant with the following:

Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

Chapter Summary and What's Next

In this chapter, you learned how to install and wire your module. The following chapter describes how to configure your module to communicate on the EtherNet/IP network by providing an IP address, gateway address, and Subnet mask.

Notes:

Configure the Module for Your EtherNet/IP Network

Introduction

Before using the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events in an EtherNet/IP network, configure it with an IP address, subnet mask, and optional Gateway address. This chapter describes these configuration requirements and the procedures for providing them. Here are the ways you can do this:

- Use the Rockwell BootP/DHCP utility, version 2.3 or greater, that ships with RSLogix 5000 or RSLinx software. You can also use this utility to reconfigure a device whose IP address must be changed.
- Use a third party DHCP (Dynamic Host Configuration Protocol) server.
- Use the Network Address switches.
- Have your network administrator configure the module via the network server.

See the table for a list of where to find specific information in this chapter.

Configuration Requirements

Before you can use your module, you must configure its IP address, its subnet mask, and optionally, gateway address. You have the option to use the Rockwell BootP/DHCP utility, version 2.3 or greater, to perform the configuration. You also have the option to use a DHCP server or the network address switches to configure these parameters.

If the module needs to be reset to factory defaults, set the switches on the module to the value 888 and then cycle power to the module.

IMPORTANT

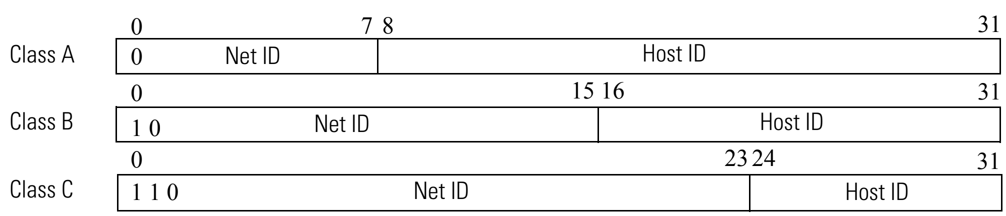
If using the BootP/DHCP utility, you will need to know the Ethernet hardware address of your module. Rockwell assigns each module a unique 48-bit hardware address at the factory. The address is printed on a label on the side of your module. It consists of six hexadecimal digits separated by colons. This address is fixed by the hardware and cannot be changed.

If you change or replace the module, you must enter the new Ethernet hardware address of the module when you configure the new module.

IP Address

The IP address identifies each node on the IP network (or system of connected networks). Each TCP/IP node on a network (including your module) must have a unique IP address.

The IP address is 32 bits long and has a net ID part and a Host ID part. Networks are classified A, B, C, (or other). The class of the network determines how an IP address is formatted.



You can distinguish the class of the IP address from the first integer in its dotted-decimal IP address as follows:

Classes of IP Addresses

Range of first integer	Class	Range of first integer	Class
0…127	A	192…223	C
128...191	B	224…255	other

Each node on the same logical network must have an IP address of the same class and must have the same net ID. Each node on the same network must have a different Host ID thus giving it a unique IP address.

IP addresses are written as four decimal integers (0...255) separated by periods where each integer gives the value of one byte of the IP address.

EXAMPLE

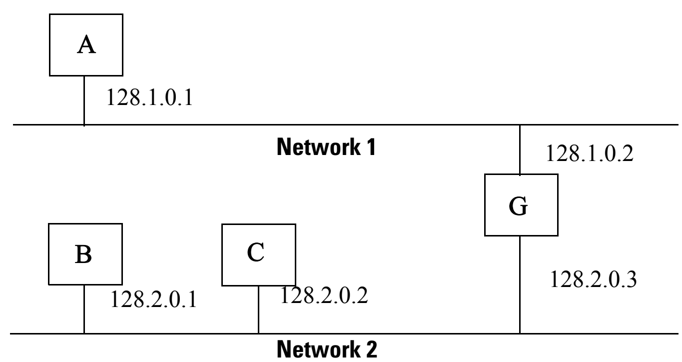
For example, the 32-bit IP address:

10000000 00000001 00000000 00000001 is written as 128.1.0.1.

Gateway Address

This section applies to multi-network systems. If you have a single network system, skip to the next section.

The gateway address is the default address of a network. It provides a single domain name and point of entry to the site. Gateways connect individual networks into a system of networks. When a node needs to communicate with a node on another network, a gateway transfers the data between the two networks. The following figure shows gateway G connecting Network 1 with Network 2.



When host B with IP address 128.2.0.1 communicates with host C, it knows from C's IP address that C is on the same network. In an Ethernet environment, B then resolves C's IP address into a hardware address (MAC address) and communicates with C directly.

When host B communicates with host A, it knows from A's IP address that A is on another network (the net IDs are different). In order to send data to A, B must have the IP address of the gateway connecting the two networks. In this example, the gateway's IP address on Network 2 is 128.2.0.3.

The gateway has two IP addresses (128.1.0.2 and 128.2.0.3). The first must be used by hosts on Network 1 and the second must be used by hosts on Network 2. To be usable, a host's gateway must be addressed using a net ID matching its own.

Subnet Mask

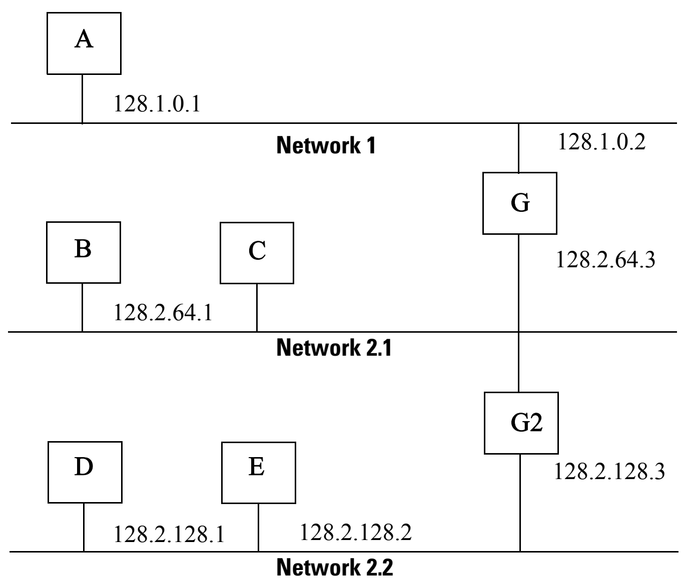
The subnet mask is used for splitting IP networks into a series of subgroups, or subnets. The mask is a binary pattern that is matched up with the IP address to turn part of the Host ID address field into a field for subnets.

EXAMPLE Take Network 2 (a Class B network) in the previous example and add another network. Selecting the following subnet mask would add two additional net ID bits, allowing for four logical networks:

$$11111111\ 11111111\ \underbrace{11}_{\text{These two bits of the host ID used to extend the net ID}}000000\ 00000001 = 255.255.192.0$$

Two bits of the Class B host ID have been used to extend the net ID. Each unique combination of bits in the part of the Host ID where subnet mask bits are 1 specifies a different logical network.

The new configuration is:



A second network with Hosts D and E was added. Gateway G2 connects Network 2.1 with Network 2.2.
Hosts D and E use Gateway G2 to communicate with hosts not on Network 2.2.
Hosts B and C use Gateway G to communicate with hosts not on Network 2.1.
When B is communicating with D, G (the configured gateway for B) routes the data from B to D through G2.

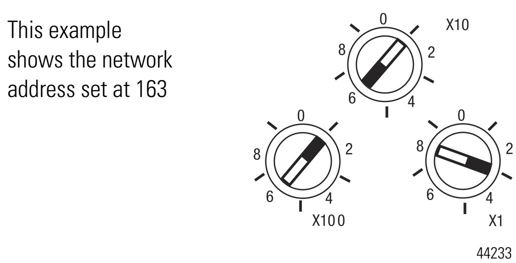
Set the Network Address

The I/O block ships with the rotary switches set to 999 and DHCP enabled. To change the network address, you can do one of the following:

1. Adjust the switches on the front of the module.
2. Use a Dynamic Host Configuration Protocol (DHCP) server, such as Rockwell Automation BootP/DHCP.
3. Retrieve the IP address from nonvolatile memory.

The I/O block reads the switches first to determine if the switches are set to a valid number. Set the network address by adjusting the 3 switches on the front of the module. Use a small blade screwdriver to rotate the switches. Line up the small notch on the switch with the number setting you wish to use. Valid settings range from 001…254.

Network Address Example



When the switches are set to a valid number, the I/O block's IP address is 192.168.1.xxx (where xxx represents the number set on the switches). The I/O block's subnet mask is 255.255.255.0 and the gateway address is set to 0.0.0.0. When the I/O block uses the network address set on the switches, the I/O block does not have a host name assigned to it or use any Domain Name Server.

If the switches are set to an invalid number (for example, 000 or a value greater than 254, excluding 888), the I/O block checks to see if DHCP is enabled. If DHCP is enabled, the I/O block asks for an address from a DHCP server. The DHCP server also assigns other Transport Control Protocol (TCP) parameters.

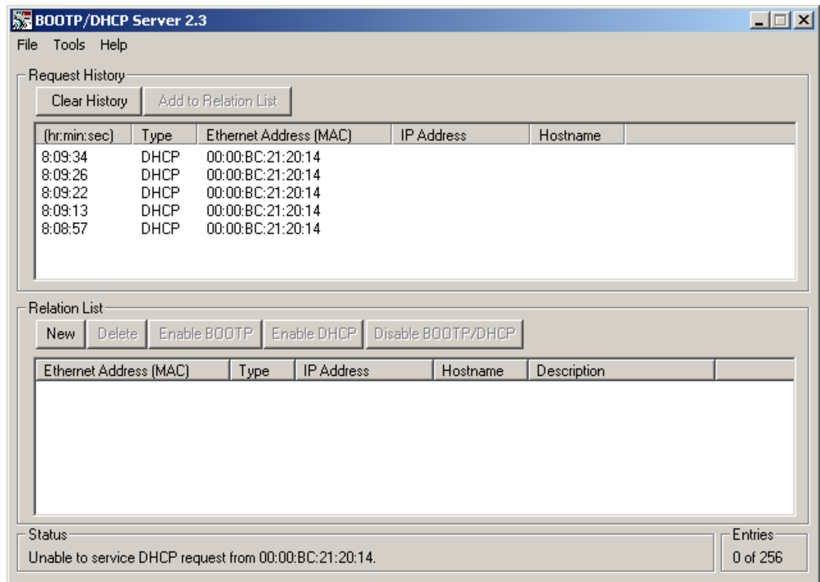
If DHCP is not enabled, and the switches are set to an invalid number, the I/O block uses the IP address (along with other TCP configurable parameters) stored in nonvolatile memory.

Use the Rockwell BootP/DHCP Utility

The Rockwell BootP/DHCP utility is a stand alone program that incorporates the functionality of standard BootP/DHCP software with a user-friendly graphical interface. It is located in the Utils directory on the RSLogix 5000 installation CD. The module must have DHCP enabled (factory default and the network address switches set to an illegal value) to use the utility.

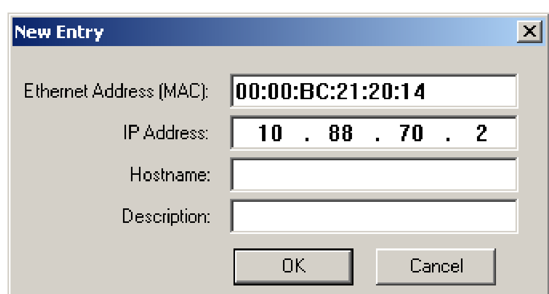
To configure your module using the BootP/DHCP utility, perform the following steps:

1. Run the BootP/DHCP software.
   The BOOTP/DHCP Request History dialog appears showing the hardware addresses of devices issuing BootP/DHCP requests.



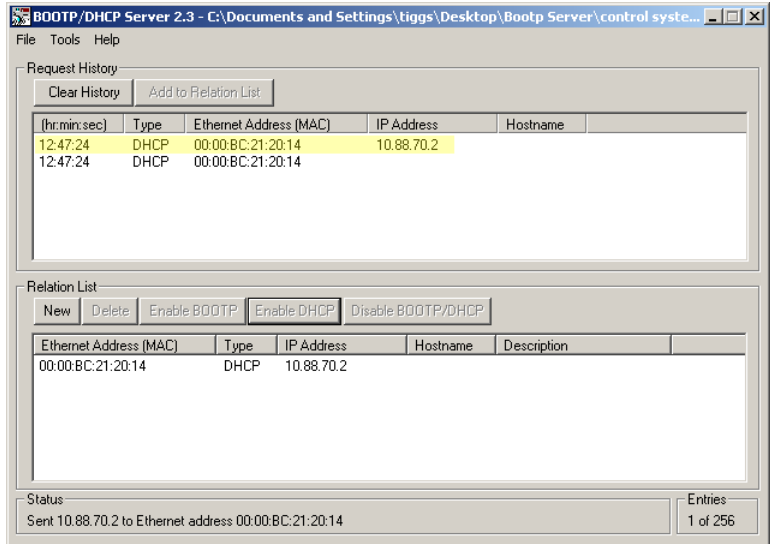
2. Double-click the hardware address of the device you want to configure.

   The New Entry dialog appears showing the device's Ethernet Address (MAC).



3. Enter the IP Address you want to assign to the device and click OK.

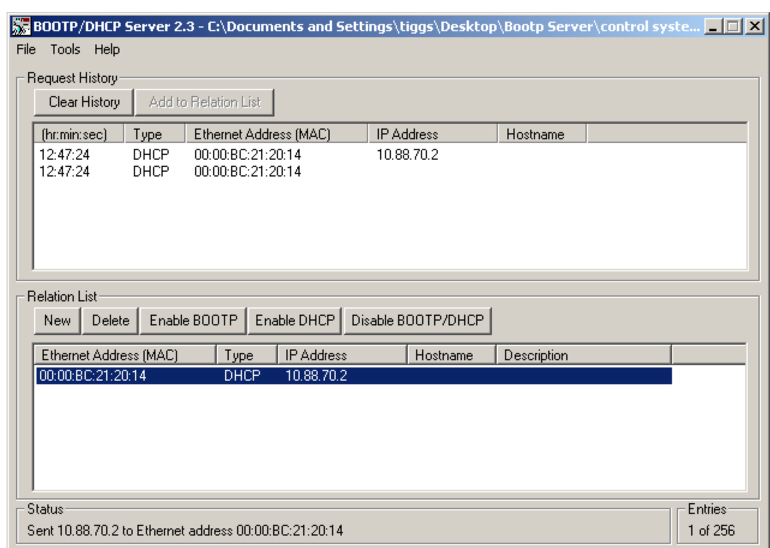
The device is added to the Relation List, displaying the Ethernet Address (MAC) and corresponding IP Address, Hostname and Description (if applicable).



When the IP address assignment is made, the address displays in the IP Address column in the Request History section.

4. To assign this configuration to the device, highlight the device in the Relation List panel and click Disable BOOTP/DHCP. When power is cycled to the device, it uses the configuration you assigned and not does not issue a DHCP request.

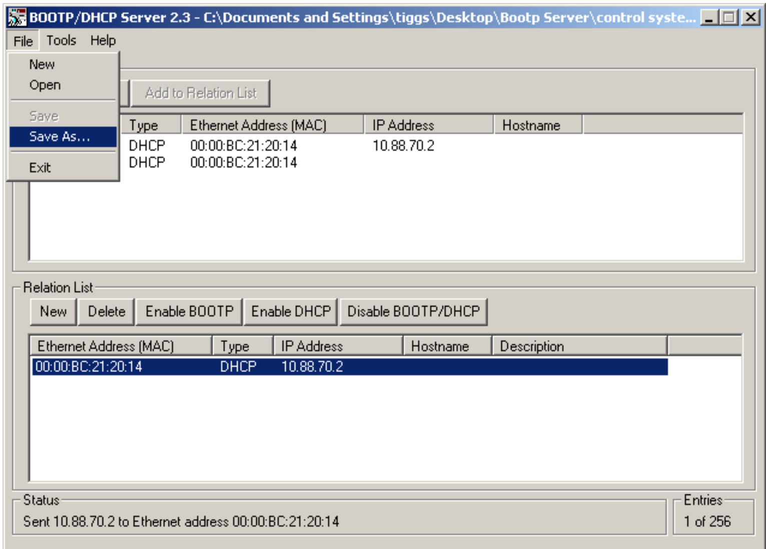
TIP To enable DHCP for a device that has had DHCP disabled, highlight the device in the Relation List and click Enable DHCP. You must have an entry for the device in the Relation List panel to re-enable DHCP.



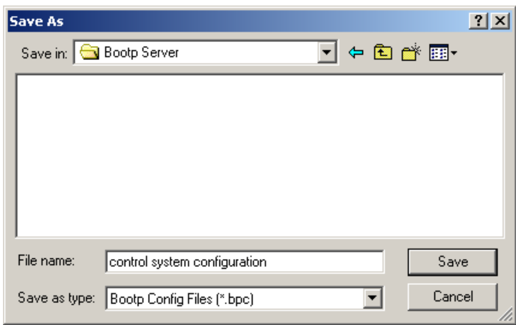
Save the Relation List

You can save the Relation List to use later. To save the Relation List do the following:

1. Select Save As... from the File menu.



The Save As dialog box appears.



2. Select the folder you want to save the list to.

3. Enter a file name for the Relation List (for example, control system configuration) and click Save.

   If you want to see your saved file names in the Open dialog box, save your files using the default file type (*.bpc).

Use DHCP Software to Configure Your Module

Dynamic Host Configuration Protocol (DHCP) software automatically assigns IP addresses to client stations logging onto a TCP/IP network. DHCP is based on BootP and maintains some backward compatibility. The main difference is that BootP was designed for manual configuration, while DHCP allows for dynamic allocation of network addresses and configurations to newly attached devices.

Be aware that a DHCP server typically assigns a finite lease time to the offered IP address. When 50 percent of the leased time has expired, the module will attempt to renew its IP address with the DHCP server. The module could be assigned a different IP address, which would cause communicating with the ControlLogix controller to cease.

ATTENTION

To avoid unintentional control, the module must be assigned a fixed IP address. The IP address of this module should not be dynamically provided. If a DHCP server is used, it must be configured to assign a fixed IP address for your module.

Failure to observe this precaution may result in unintended machine motion or loss of process control.

Chapter Summary and What's Next

In this chapter, you learned how to configure the module to communicate on your EtherNet/IP network by providing an IP address, gateway address, and Subnet mask. The next chapter describes an example application in which you configure discrete I/O.

Notes:

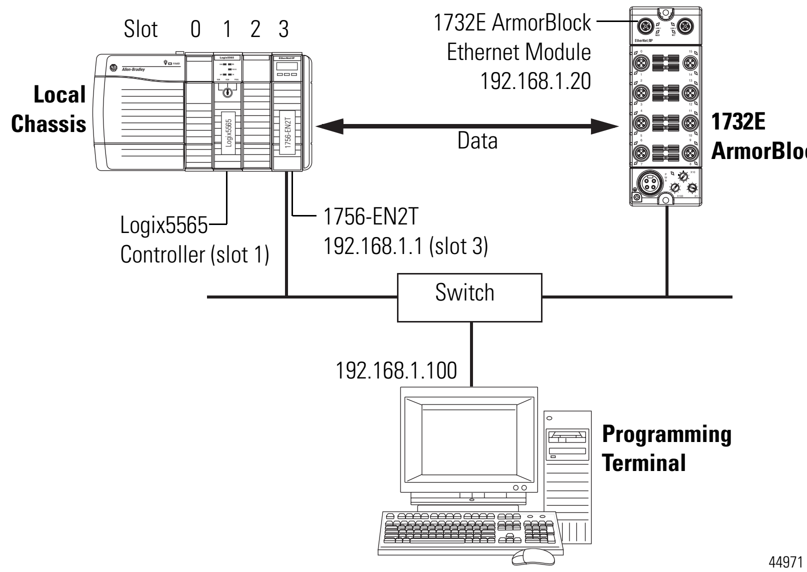
Configure the Module Using RSLogix 5000

Introduction

This chapter guides you through the steps required to configure your 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events using RSLogix 5000 software. Note that the modules presented in this chapter are configured using RSLogix 5000 software, version 17 or later. The chapter contains the following main sections:

Set Up the Hardware

In this example, a ControlLogix chassis contains the Logix 5565 processor in slot 1 and a 1756-EN2T bridge module in slot 3. The 1732E ArmorBlock module is mounted remotely.



To work along with this example set up your system as shown.

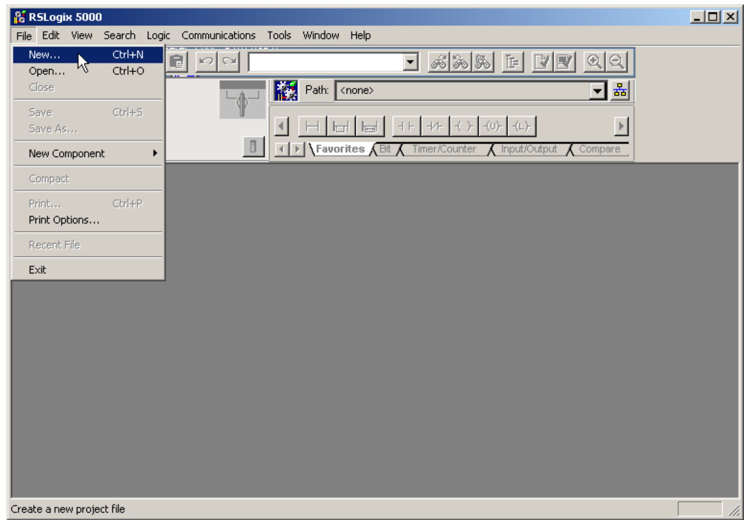
- Note that in the example application, the Logix5565 controller and 1756-EN2T module (firmware version 2.3 or higher) are assumed to be in the slots shown.
- Verify the IP addresses for your programming terminal, 1756-EN2T module and 1732E ArmorBlock Ethernet module.
- Verify that you connected all wiring and cabling properly.
- Be sure you configured your communication driver (for example, AB_ETH-1 or AB-ETHIP-1) in RSLinx software.

Create the Example Application

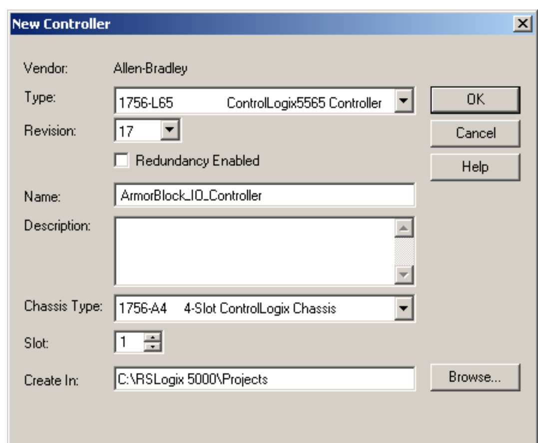
Perform the following steps to create the example application:

1. Perform the following steps to create the example application:

2. From the File menu, select New.



The New Controller dialog opens.



3. Enter an appropriate name for the Controller, for example, ArmorBlock_IO_Controller.

4. Select the correct version, chassis type, and slot number of the Logix5565 controller, and the folder where you want to save the RSLogix 5000 software file (Create In). The Description is optional.

   To use redundancy in your system, select the Redundancy Enabled checkbox.

5. Click OK.

Configure Your I/O Module

You must configure your module upon installation. The module will not work until it has been configured with at least the default configuration.

RSLogix 5000 Configuration Software

You must use **RSLogix 5000, version 17 or later** to set configuration for your module. You have the option of accepting default configuration for your module or writing point level configuration specific to your application.

Both options are explained in detail, including views of software screens, in this chapter.

Overview of the Configuration Process

When you use the RSLogix 5000 software to configure a module, you must perform the following steps:

1. Add the Local EtherNet/IP Bridge (1756-EN2T or 1756-EN2TR) to your project's I/O Configuration.
2. Add the 1732E-IB16M12SOEDR as a child of the 1756-EN2T module.
3. Accept the default configuration or change it to specific configuration for the module.
4. Edit configuration for a module when changes are needed.

Add a New Bridge and Module to Your RSLogix 5000 Project

After you have started RSLogix 5000 and created a controller, you must add a new bridge and a new module to your project. The bridge allows your module to communicate with the controller.

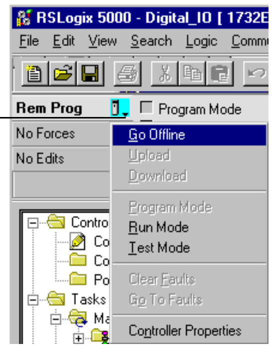
The wizard allows you to create a new module and write configuration. You can use default configuration or write specific configuration for your application.

IMPORTANT	Click Help on the configuration dialogs shown in this section if you need assistance in selecting and setting the parameters.

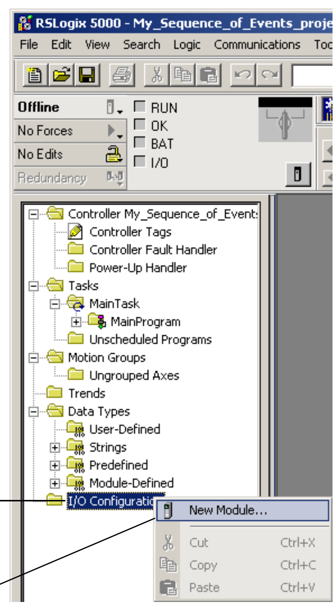
Add the Local EtherNet/IP Bridge to the I/O Configuration

1. If necessary, go offline.

If you are not offline, use this pull-down menu to go offline



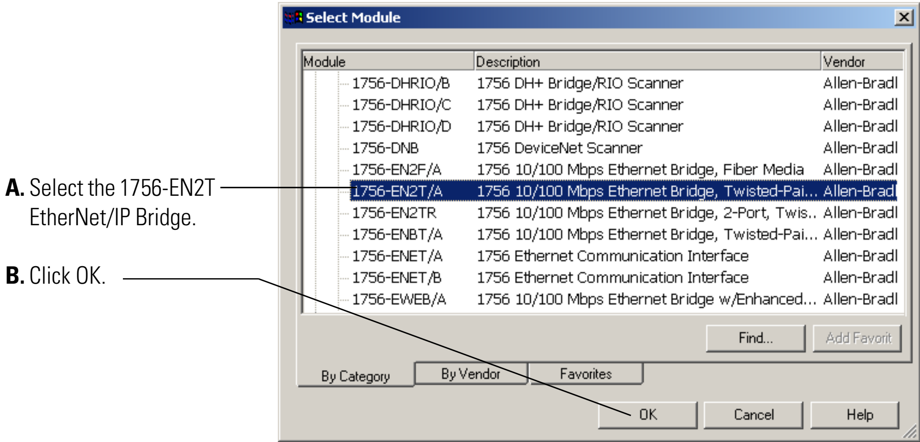
2. Add the EtherNet/IP Bridge to your RSLogix 5000 project.



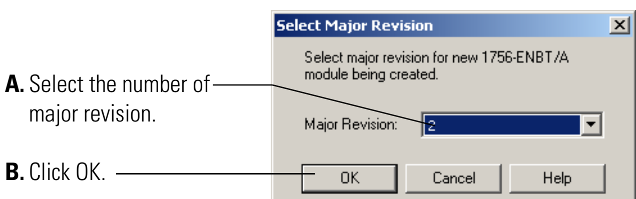
A. Right-click on I/O Configuration.

B. Select New Module

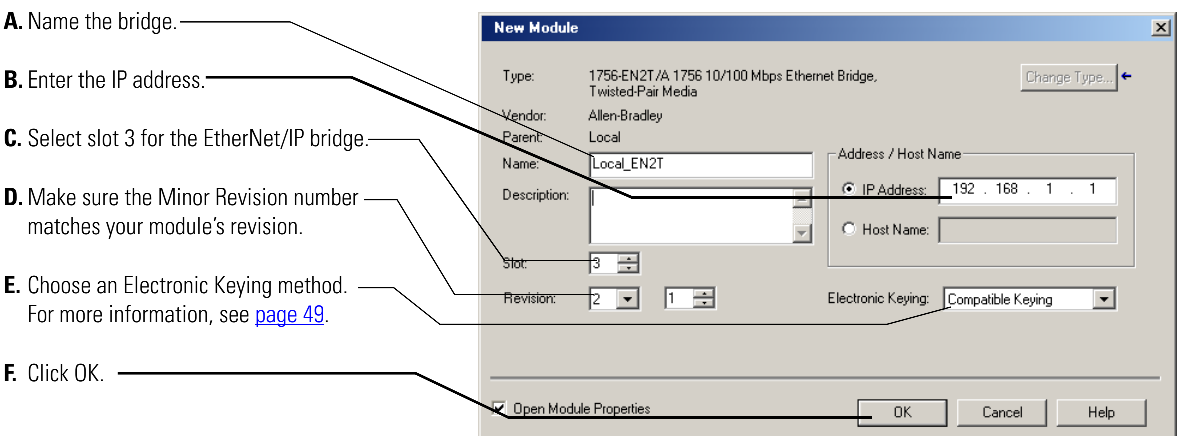
3. When the Select Module dialog appears, expand Communications and select the new module. Select the 1756-EN2T EtherNet/IP Bridge.



4. The Select Major Revision dialog opens.
Select Major Revision 2 or later.



5. Configure the bridge. The first screen of the configuration wizard opens.

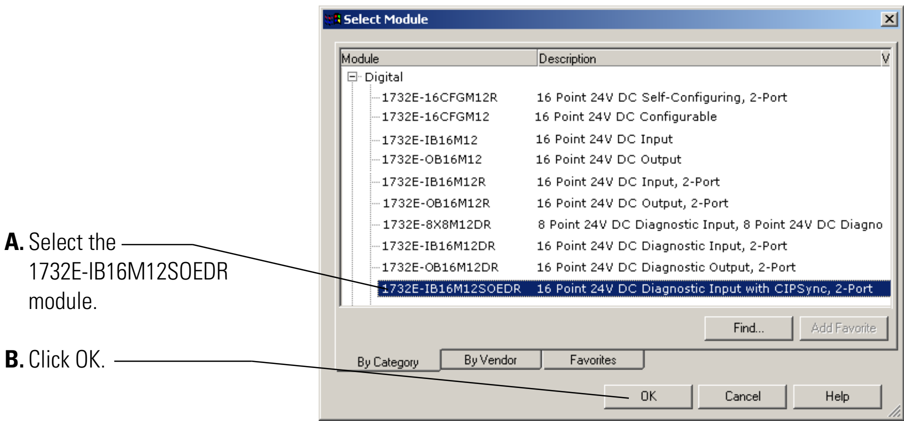


The local 1756-EN2T communication module will communicate with the 1732E ArmorBlock module on EtherNet. Before you can communicate with your module, you need to add it as a *slave* of the 1756-EN2T communication module. For more information about using 1756 controller and EtherNet/IP products, see publication ENET-UM001.

Add the 1732E-IB16M12SOEDR as a child of the 1756-EN2T module

1. Right click the Ethernet folder that appears below the 1756-EN2T bridge you added to the I/O Configuration tree and select New Module.

2. When the Select Module dialog appears expand Digital. Select the 1732E-IB16M12SOEDR module.



TIP If the 1732E-IB16M12SOEDR module is not listed in the digital section of the Select Module dialog you may need to download the Add-On Profile (AOP) for the 1732E- ArmorBlock R 2-Port and install it as an add-on to RSLogix 5000. The AOP file can be downloaded from:
support.rockwellautomation.com/controlflash/LogixProfiler.asp

3. The Create Module wizard appears.
Fill in the Module Properties information as shown, and then click OK.

Module Definition Dialog Values

Field Name	Value
Name	My2PortIB16SOEDR_20
IP address	192.168.1.20
Electronic keying	Compatible Module
Connection	Data
Revision	1.1

You can either accept or change the default configuration as shown...

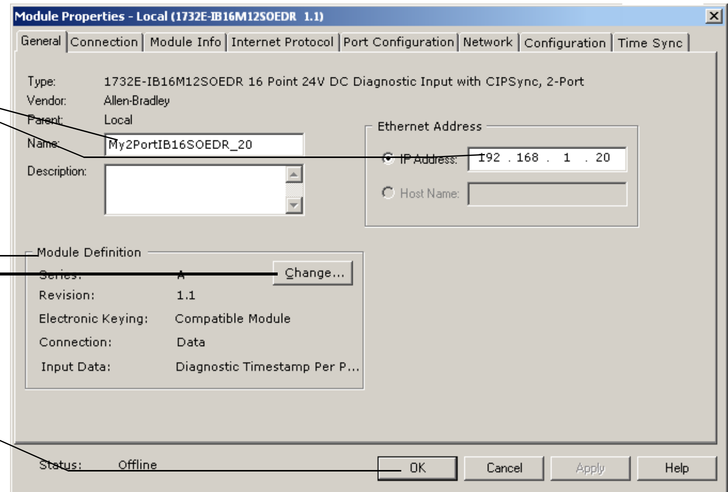
A. Name the module.

B. Enter the module's IP address as shown.

C. Make sure the Module Definition information matches this example.

D. Click Change... to edit the Module Definition for your module before downloading the program to the controller.

E. Click OK to accept the default configuration.



Use the Default Configuration

If you use the default configuration and click on OK, you are done. You can skip to Download Your Configuration on page 37 for instructions on downloading your default configuration to the controller.

Change the Default Configuration

If you click Change... in step D on page 34, you can change the Module Definition information. Select tabs on the Module Properties dialog to edit specific configuration for your module in RSLogix 5000, for example the Configuration tab.

Some of the screens that appear during this initial module configuration process are blank and are not shown here. However, those screens can be important during online monitoring. To see these screens in use, see Chapter 10, Troubleshoot the Module on page 71.

On this dialog, you can:

A. Select the module series.

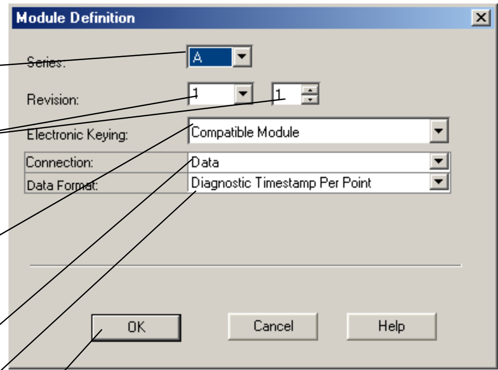
B. Make sure the Major and Minor Revision numbers match your module's revision.

C. Choose and Electronic Keying method. For more information, see page 49.

D. Select the Connection type.

E. Select the Data Format.

F. Click OK to return to theGeneral tab of the Module Properties dialog.



From the Connection tab, you can:

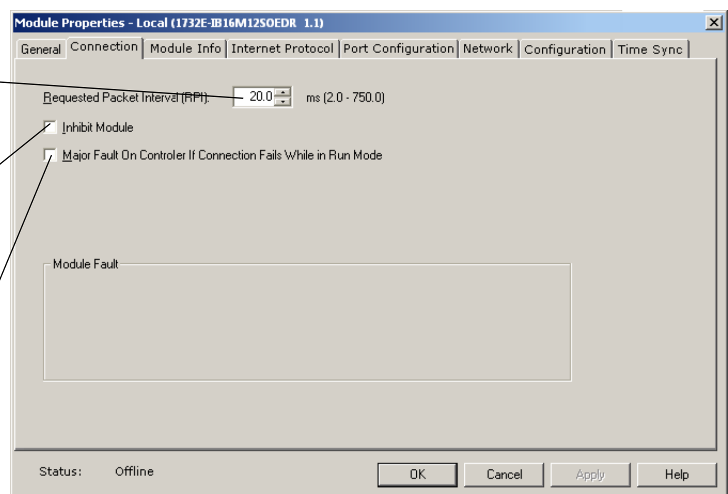
A. Change the RPI. For more information on the RPI, see page 3.

B. Inhibit the module. For more information on Module Inhibiting, see page 51.

C. Make sure a Major Fault occurs on the module's owner-controller if there is a connection failure between the module and the controller.

D. Click the Port Configuration tab to see the next screen.

E. Click OK to close the Module Properties dialog and download your configuration.



This screen is grayed out unless you are online with the controller and module. On this screen, you can:

A. Enable or disable external ports.

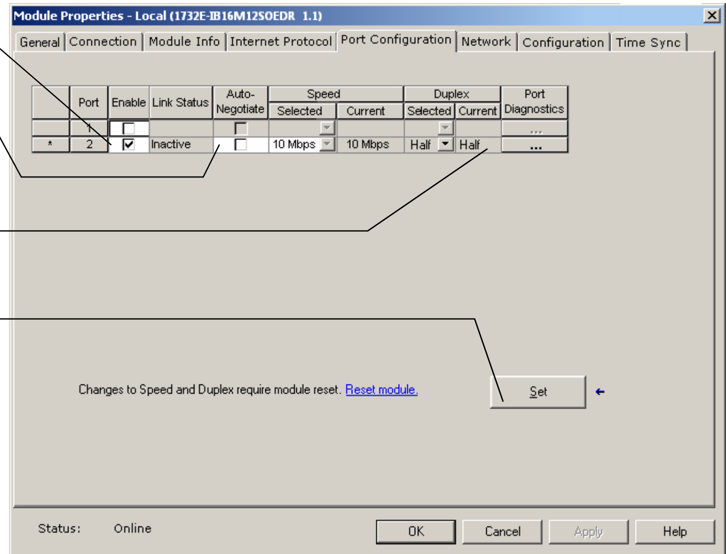
B. Select Auto-negotiate on enabled ports. If Auto-negotiate is disabled then select the correct speed and duplex.

C. Click Port Diagnostics to display the Port Diagnostics dialog.

D. If you make changes in Step A or Step B then click Set. Changes will not take effect until you reset the module or cycle the power to the module.

E. Click the Configuration tab to see the next screen.

F. Click OK to close the Module Properties dialog and download your configuration.



On this screen, you can:

A. Set the Input Filter Times. For more information on Input Filters, see page 46.

B. Enable Timestamp Capture for all input points or for specific points. For more information on Timestamp Capture, see page 43.

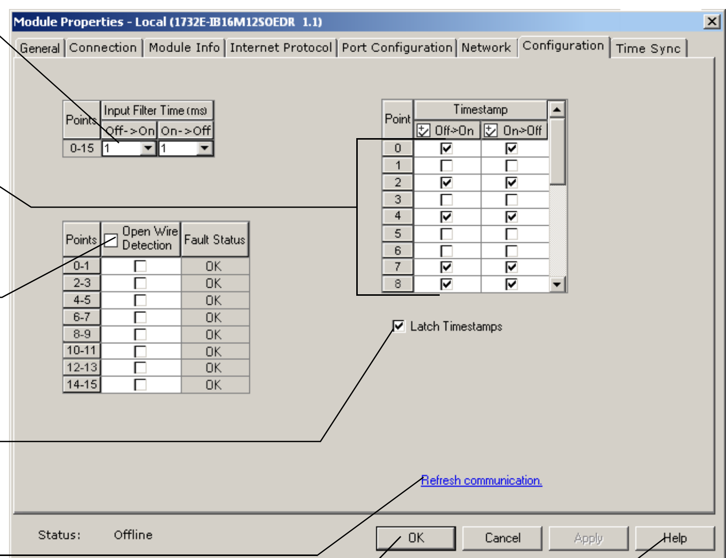
C. Enable Open Wire Detection for all points or for specific points. For more information on Open Wire Detection, see page 45.

D. Click on the box to enable Timestamp Latching. For more information on Timestamp Latching, see page 44.

E. Click Refresh communication to update the content.

F. Click OK to close the Module Properties dialog and download your configuration.

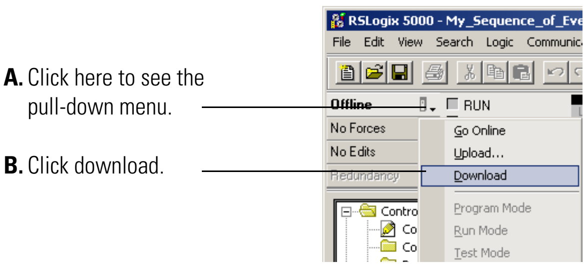
G. Click Help to access the RSLogix 5000 Add-On Profile help for descriptions of tabs that are not required for setting up your module.



Download Your Configuration

After you write configuration for your module, the module does not use this configuration until you download it to the owner-controller. The download transfers the entire program to the controller, overwriting any existing program.

Download module configuration as shown below.:



Depending on your application, a variety of RSLogix 5000 software screens may appear to choose a path to your ControlLogix controller and to verify the download. Navigate those screens as best fits your application.

This completes the download process.

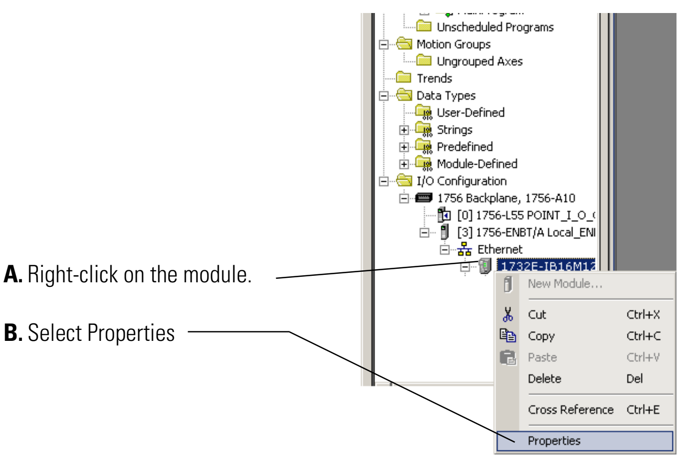
Edit Your Configuration

After you have set configuration for a module, you can review and change your choices. You can change configuration data and download it to the controller while online. This is called **dynamic reconfiguration**.

Your freedom to change some configurable features, though, depends on whether the controller is in Remote Run Mode or Program Mode.

IMPORTANT Although you can change configuration while online, you must go offline to add or delete modules from the project.

The editing process begins on the main page of RSLogix 5000



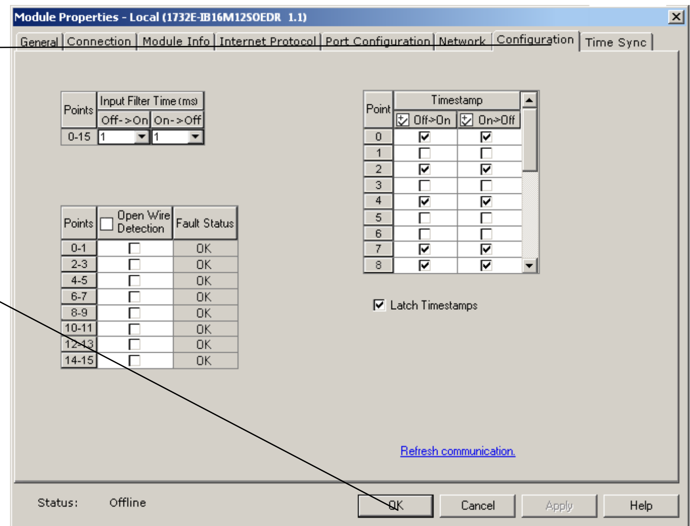
The General tab of the Module Properties dialog appears.

Click on the tab of the page that you want to view or reconfigure and make any appropriate changes, as shown in the example.

A. Click the tab where you need to reconfigure the module.

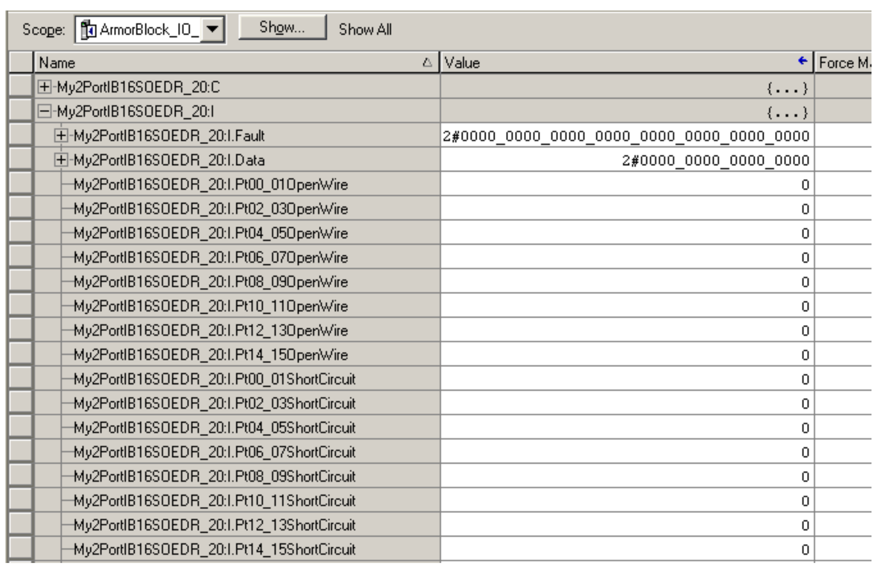
In this example, Timestamp Capture was disabled for several input points.

B. When the module is reconfigured, click OK.



Access Module Data in RSLogix 5000

Use the following information to use the 1732E-IB16M12SOEDR data in the ladder logic program.



Scope: ArmorBlock_IO_ Show... Show All

Name	Value	Force M.
My2PortIB16SOEDR_20:C	{...}	
My2PortIB16SOEDR_20:I	{...}	
My2PortIB16SOEDR_20:I.Fault	2#0000_0000_0000_0000_0000_0000_0000_0000	
My2PortIB16SOEDR_20:I.Data	2#0000_0000_0000_0000	
My2PortIB16SOEDR_20:I.Pt00_01OpenWire	0	
My2PortIB16SOEDR_20:I.Pt02_03OpenWire	0	
My2PortIB16SOEDR_20:I.Pt04_05OpenWire	0	
My2PortIB16SOEDR_20:I.Pt06_07OpenWire	0	
My2PortIB16SOEDR_20:I.Pt08_09OpenWire	0	
My2PortIB16SOEDR_20:I.Pt10_11OpenWire	0	
My2PortIB16SOEDR_20:I.Pt12_13OpenWire	0	
My2PortIB16SOEDR_20:I.Pt14_15OpenWire	0	
My2PortIB16SOEDR_20:I.Pt00_01ShortCircuit	0	
My2PortIB16SOEDR_20:I.Pt02_03ShortCircuit	0	
My2PortIB16SOEDR_20:I.Pt04_05ShortCircuit	0	
My2PortIB16SOEDR_20:I.Pt06_07ShortCircuit	0	
My2PortIB16SOEDR_20:I.Pt08_09ShortCircuit	0	
My2PortIB16SOEDR_20:I.Pt10_11ShortCircuit	0	
My2PortIB16SOEDR_20:I.Pt12_13ShortCircuit	0	
My2PortIB16SOEDR_20:I.Pt14_15ShortCircuit	0	

Use the controller tags in your ladder program to read input data or write output data.

- For RSLogix 5000 programming instructions, refer to RSLogix 5000 Getting Results, publication no. 9399-RLD300GR.
- For ControlLogix controller information, refer to ControlLogix System User Manual, publication no. 1756-UM001.

Configure RSLogix 5000 and the 1756-EN2T Communication Module for CIP Sync

If you are using RSLogix 5000 version 17, follow these steps to configure the 1756-EN2T communication module to be the PTP (CIP Sync) master clock.

1. In your web browser, go to the Rockwell Automation Sample Code Library at http://samplecode.rockwellautomation.com/idc/groups/public/documents/webassets/sc_home_page.hcst.
   The Search Our Sample Code Library page appears.

2. In the Filename/ID field enter **MMS_048132**.

3. Click Search.
   The 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events module synchronizes to the grandmaster clock as a slave module as described in the document.

If you are using RSLogix 5000 version 18 or greater, refer to publication IA-AT003 for instructions on configuring the 1756-EN2T communication module and the ContolLogix processor so that the processor can function as the PTP (CIP Sync) master clock.

Chapter Summary and What's Next

In this chapter, you read about configuring your module in RSLogix 5000. The next chapter describes the module Features.

Notes:

Module Features

Introduction

This chapter describes the features available on 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events. The chapter contains the following main sections:.

Determine Module Compatibility

Primarily, this module is used to interface to sensing devices and detect whether they are ON or OFF and to timestamp ON and OFF transitions. The module converts ON/OFF signals from user devices to appropriate logic level for use in the processor. Typical input devices include:

- auxiliary contacts
- limit switches

When designing a system using these modules, you must consider:

- the voltage necessary for your application
- whether you need a solid state device
- current leakage
- if your application should use sinking or sourcing wiring.

For more information on compatibility of other Rockwell Automation products to modules, see the I/O Systems Overview, publication CIG-SO001.

There are two types of features available on the module:

- Module Features That Can Be Configured - Features that can be adjusted to make sure the module operates as efficiently as possible in your application (for example., input filter times)
- Other Inherent Module Features - Features that cannot be changed but are still crucial to module functionality (for example, producer/consumer model).

Module Features That Can Be Configured

The following features on the module can be configured

This feature	is described on
Timestamp Capture	43
Timestamp Latching	44
Input Diagnostics	45
Software Configurable Input Filters	46

Operational Mode

The module operates only in Per Point Mode:

Per Point Mode

The module produces timestamps for up to 2 input transitions per input, one for OFF to ON transitions and another for ON to OFF transitions; these timestamps can occur simultaneously on separate inputs.

Timestamp Capture

Timestamp Capture instructs the module to timestamp specific input point transitions. You can use this feature to instruct the module to capture the timestamp when the inputs transition from:

- OFF to ON only
- ON to OFF only or
- both OFF to ON and ON to OFF

When Timestamp Capture is enabled for specific points and transitions occur for those points, the module not only captures the timestamp at the transition occurrence but also sends input data to the controller.

IMPORTANT

All points on the module have Enable Timestamp Capture enabled by default for both ON to OFF and OFF to ON transitions.

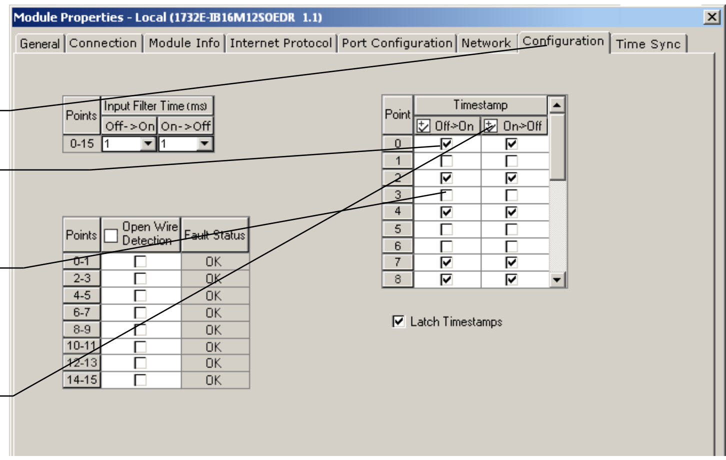
Additionally, you must specify an RPI regardless of whether you use Timestamp Capture on any input points. If a change does not occur within the RPI timeframes, the module will still produce data at the rate specified by the RPI.

Use the Configuration tab in RSLogix 5000 to set Timestamp Capture, as shown in the example.

Click the Configuration tab.

- Click on the individual boxes for each input point to Timestamp Capture for that point.
- Clear the individual boxes for each input point to disable Timestamp Capture for that point.

You can also use these boxes to enable or disable all points simultaneously.



Timestamp Latching

Timestamp Latching can be used to prevent the module from overwriting input data once it is timestamped.

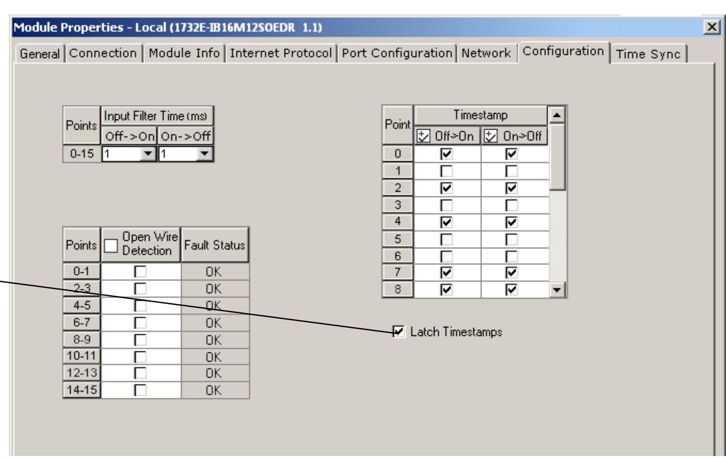
- If Timestamp Latching is **enabled**, the module timestamps an input in a given direction and ignores future input transitions in that direction until the controller acknowledges the timestamp data already received.
- If Timestamp Latching is **disabled**, the module timestamps every input transition and may overwrite previously recorded timestamp data if the controller does not acknowledge the data quickly enough.

This feature is set on a modulewide basis and is enabled by default.

Use the Configuration tab in RSLogix 5000 to enable Timestamp Latching, as shown in the example.

Select this box to enable the Timestamp Latching feature.

Unselect the box to disable the feature.



Input Diagnostics

As with other modules with diagnostics, the input connector's Sensor Source Voltage (SSV), on Pin 1 of the input connectors, is protected from short circuits to ground as well as open wire conditions due to a missing sensor or to a cable disconnection.

Short Circuit Protection

Each connector with inputs is protected against short circuits to ground. The circuit automatically resets each connector individually and the SSV energizes once the short circuit is removed.

When a short circuit condition is detected, the module issues a diagnostic for a short circuit in the module's input tag and solid red input LEDs are illuminated for the inputs associated with that connector. For more information on interpreting Status Indicators, see page 69.

Short circuit detection cannot be disabled.

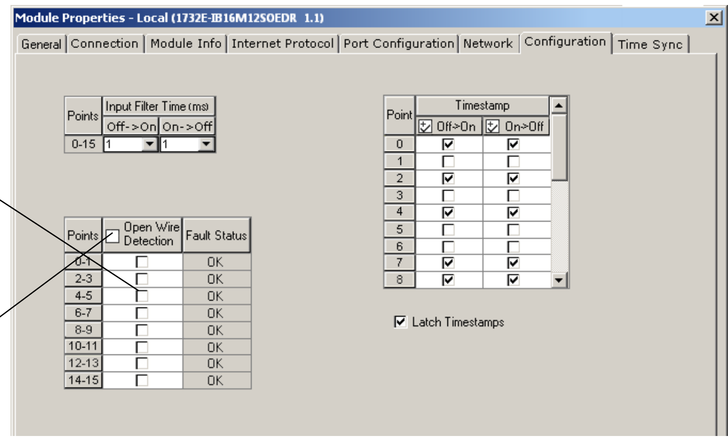
Open Wire Detection

Open Wire Detection can be used to monitor each input connector for cable disconnection conditions.

- If Open Wire Detection is enabled, the module monitors the enabled input connectors for cable disconnections. If an open wire condition is detected, the module issues a diagnostic for an open wire in the module's input tag and blinks the red diagnostic LEDs for the inputs associated with that connector. For more information on interpreting Status Indicators indicators, see page 69.
- If Open Wire Detection is disabled, the module will not signal a fault for the disabled input connectors.

Disabling Open Wire Detection on unused inputs prevents the module from signaling a fault even though nothing is connected to it. This feature is set on an input connector basis and is disabled for all inputs by default.

Use the Configuration tab in RSLogix 5000 to enable Open Wire Detection, as shown in the example.



- Click on the individual boxes for each input point to enable Open Wire Detection for that point.
- Clear the individual boxes for each input point to disable Open Wire Detection for that point.

You can also select this box to enable or disable all points simultaneously.

Software Configurable Input Filters

To account for hard contact "bounce", you can configure ON to OFF and OFF to ON input filter times in RSLogix 5000 for your module. These filters define how long an input transition must remain in the new state before the module considers the transition valid.

IMPORTANT	Input filters are applied to all inputs on the module. You cannot apply input filters to individual inputs on the module.

When an input transition occurs, the module timestamps the transition on the initial edge of the transition and stores data for the transition on-board; the module then scans the input where the transition occurred every millisecond for the length of the filter time setting to verify that the input remains in the new state (remained OFF or ON).

- If the input remains in the new state for a time period equal to the filter time setting, the module sends data for the transition to the controller.

  When an input transition is detected the module counts the number of 1 ms intervals the input is in the new state until the count reaches the filter value.

- If the input changes state again (returns to the original state) before the length of time of the filter setting has elapsed, the module starts decrementing the number of 1 ms intervals counted until it reaches zero. At this point the module stops filtering the input and discards the timestamp. During this continued scan period, one of the following events occurs:

– At some point while still filtering the input, the input returns to the transitioned state and remains there until the module counts the number of 1 ms intervals equal to the filter setting. In this case, the module sends data from the transition to the controller.
– The input does not remain in the transitioned state for a time period equal to the filter setting and the 1 ms counter decrements to zero. In this case, the module does not consider the original transition valid and drops the timestamp.

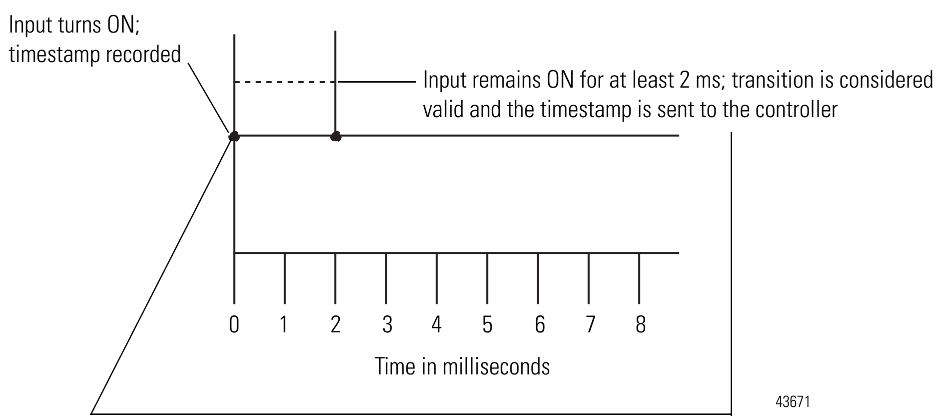
The following example illustrates how the module's input filters operate.

In the example, a module:

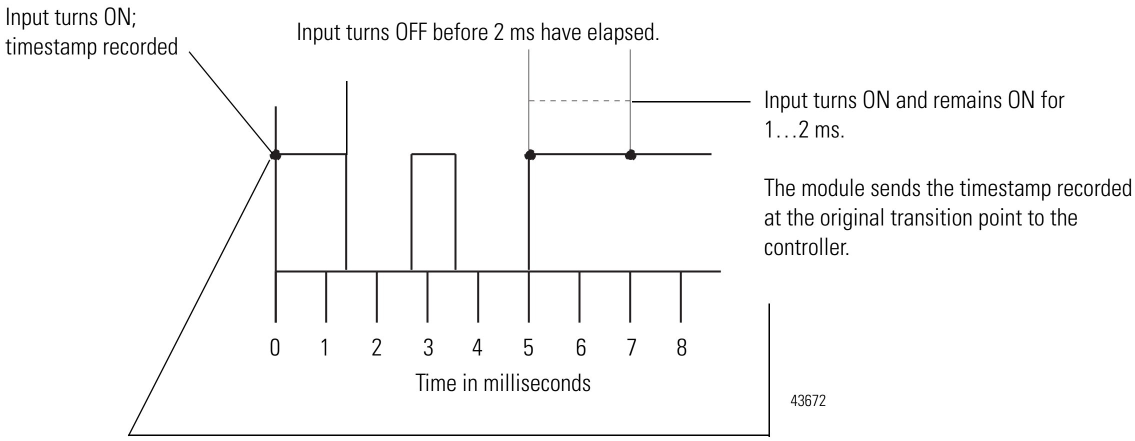
- is Timestamp Capture-enabled for all of its points
- uses a 2 ms input filter setting for OFF to ON transitions

Three possible scenarios can result after an input transitioning from OFF to ON in the given circumstances.

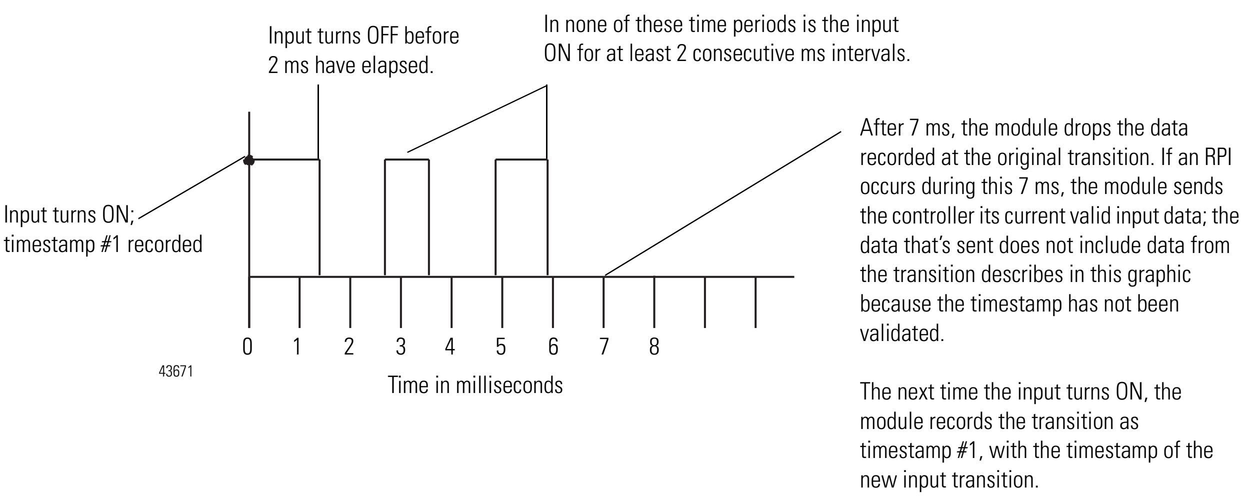
- Scenario #1 (no bounce) – The input turns ON and remains for the full 2 ms. In this case, the module considers the transition valid and sends the data recorded at the transition to the controller.
  Note the input was sampled as being on three different times: 0 ms, 1 ms and 2 ms.



- Scenario #2 – The input turns ON but turns OFF before 2 ms (length of the input filter setting) elapses. In this case, the module continues to scan the input every millisecond. At some point, less than 2 ms later, the input turns ON again and remains for 1 to 2 ms, the third ON sampled 1 ms interval (in this case at 6 ms). In this case, the module considers the transition valid and sends the data timestamped at the original transition to the controller.



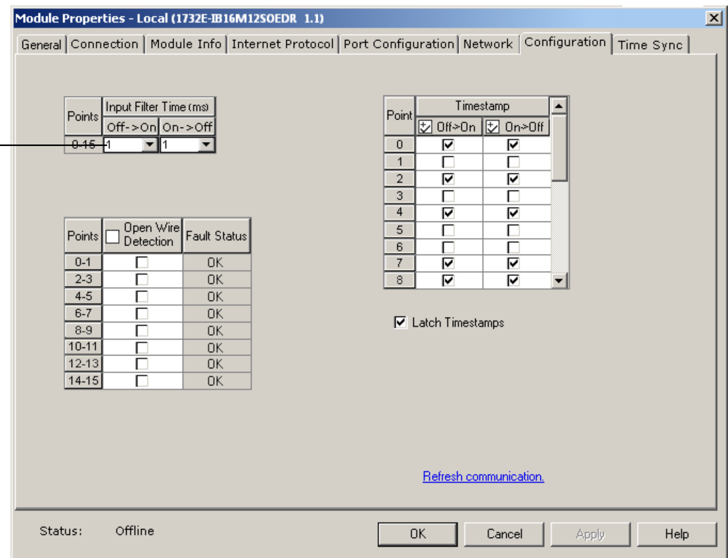
- Scenario #3 – The input turns ON but turns OFF before 2 ms (length of the input filter setting) elapses. In this case, the module continues to scan the input every millisecond until the 1 ms counter decrements to zero. The input never remains ON for at least 2 consecutive ms intervals, the third ON sampled 1 ms interval. In this case, the module considers the transition invalid and drops the data timestamped at the original transition.



Use the Configuration tab in RSLogix 5000 software to configure Input Filters, as shown in the example below.

Type the filter times or use the drop down menu to select the Input Filter Time.

The Input Filter Time range is 0, 1, 2, 4, 8 or 16 ms.



Communications Format

The communications format determines what operational mode your module uses and, consequently, what tags RSLogix 5000 generates when configuration is complete. Once a module is created, you cannot change the communications format unless you delete and recreate the module.

The 1732E-IB16M12SOEDR module can only use Per Point mode as the communication format.

Electronic Keying

Electronic keying allows the ControlLogix system to control what modules belong in the configured system.

During module configuration, you must choose one of the following keying options for your module:

- Exact Match
- Compatible Module
- Disable Keying

When the controller attempts to connect to and configure a module (for example, after program download), the module compares the following parameters before allowing the connection and configuration to be accepted:

- Vendor
- Product Type
- Product Code
- Major Revision - Change that affects the module's function or RSLogix 5000 interface
- Minor Revision - Change that does not affect the module's intended function or RSLogix 5000 interface

The comparison is made between the keying information present in the module and the keying information in the controller's program, preventing the inadvertent operation of a system with the wrong module. For example, if you select Exact Match and a module with revision 1.2 is placed in a location configured for a module with revision 1.4, the controller does not make a connection to the new module because of the mismatched revisions.

The following table describes the keying options available with your module.

Keying option:	Definition:	
Exact Match	All of the parameters listed above must match or the inserted module will reject a connection to the controller.	
Compatible Module	The Compatible Module mode allows the module to determine whether it can emulate the module defined in the configuration sent from the controller. Some modules can emulate older revisions. The module will accept the configuration if the configuration's major.minor revision is less than or equal to the physical module's revision. For example, if the configuration contains a major.minor revision of 1.7, the module must have a firmware revision of 1.7 or higher for a connection to be made. When a module is inserted with a major.minor revision that is less than the revision configured (that is., the module has a revision of 1.6 and the slot is configured for a module with revision 1.8), no connection is made between the controller and the I/O module.	
	TIP	We recommend using Compatible Module whenever possible. Remember, though, with major revision changes, the module only works to the level of the configuration. At the time of this printing, the module uses a major.minor revision of 1.6[1] However, if a new major revision for the module is released, consider this example. If a module is configured for major.minor revision of 1.7 and you insert a module with a major.minor revision of 2.3, the module works at the 1.7 level, with respect to module functions that are related to RSLogix 5000 software such as interface changes. Anomaly updates that are affected by the module's firmware, though, would work at the 2.3 revision level. If possible, we recommend that you make sure configuration is updated to match the revision levels of all I/O modules, including your module. Failure to do so may not prevent the application from working but may defeat the purpose of upgrading your modules' revision levels.

Keying option:	Definition:
Disable Keying	The inserted module attempts to accept a connection to the controller regardless of its type.
	ATTENTION Be extremely cautious when using the disable keying option; if used incorrectly, this option can lead to personal injury or death, property damage or economic loss.
	If keying is disabled, a controller makes a connection with most modules of the same type as that used in the configuration. A controller will NOT establish a connection if any of the following conditions exist, even if keying is disabled: • The module is configured for one module type (for example, input module) and a module of another type (for example, output module) is used. • The module cannot accept some portion of the configuration. For example, if a non-diagnostic input module is configured for a diagnostic input module, the controller cannot make a connection because the module will not accept/process the diagnostic configuration.

(1) Minor revisions are incremented by single counts such that minor level 10 (major.minor revision level = 1.10) follows minor revision level 9 (1.9).

Module Inhibiting

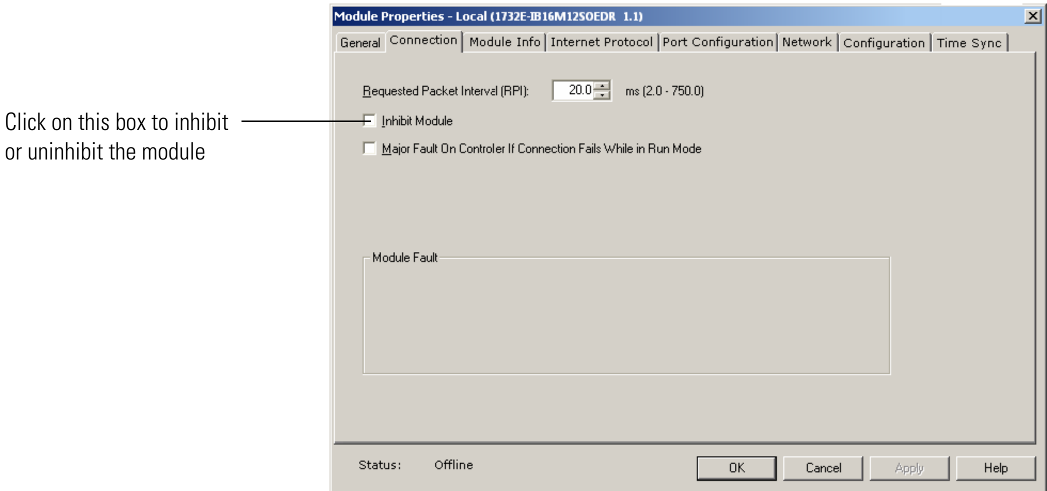
With module inhibiting, you can indefinitely suspend a connection between an owner-controller and a module. This process can occur in the following way:

- You write configuration for a module but inhibit the module to prevent it from communicating with the owner-controller. In this case, the owner-controller does not establish a connection and configuration is not sent to the module until the connection is uninhibited.

The following examples are instances where you may need to use module inhibiting:

- You want to FLASH upgrade your module. We recommend you:
  a. Inhibit the module.
  b. Perform the upgrade.
  c. Uninhibit the module.
- You are using a program that includes a module that you do not physically possess yet, but you do not want the controller to continually look for a module that does not exist yet. In this case, you can inhibit the module in your program until it physically resides on the network.

You can inhibit your module on the Connection tab in RSLogix 5000, as shown in the example.



The following table lists features on the module that cannot be configured.

This feature:	is described on:
Module Fault Reporting	52
Fully Software Configurable	52
Producer/Consumer Model	53
Status Indicator Information	53

Module Fault Reporting

Your module provides both a hardware and software indication when a module fault occurs. The module's status indicators and RSLogix 5000 display each fault and include a fault message describing the nature of the fault.

This feature allows you to determine how the fault affects your module and what action you should take to resume normal operation. For more information on how to use hardware and software indicators when a module fault occurs, see Interpret Status Indicators on page 69 and Troubleshoot the Module on page 69.

Fully Software Configurable

RSLogix 5000 uses a custom, easily understood interface to write configuration. All module features are enabled or disabled through the I/O configuration portion of the software.

You can also use the software to interrogate your module to retrieve:

- serial number
- revision information
- product code
- vendor identification
- error/fault information
- diagnostic counters.

By eliminating such tasks as setting hardware switches and jumpers, the software makes module configuration easier and more reliable.

Producer/Consumer Model

By using the Producer/Consumer model, modules can produce data without having been polled by a controller first. The module produces the data and the owner-controller device consumes it.

Status Indicator Information

Each module has Status Indicators on the front of the module that allows you to check the module health and operational status.

For more information on how to use the module's status indicators, and RSLogix 5000, when troubleshooting your application, see Interpret Status Indicators on page 69 and Troubleshoot the Module on page 71.

Agency Certifications

The module is marked for any agency certifications (for example, c-UL-us, CE, C-Tick and EtherNet/IP) it has obtained. See the module's label for all agency certifications. For more information on full certification specifications, see Appendix A on page 73.

Chapter Summary and What's Next

In this chapter, you read about the module's features. The next chapter describes using the module.

Notes:

Using the Module

Introduction

This chapter describes how to use the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events module. The chapter contains the following main sections:.

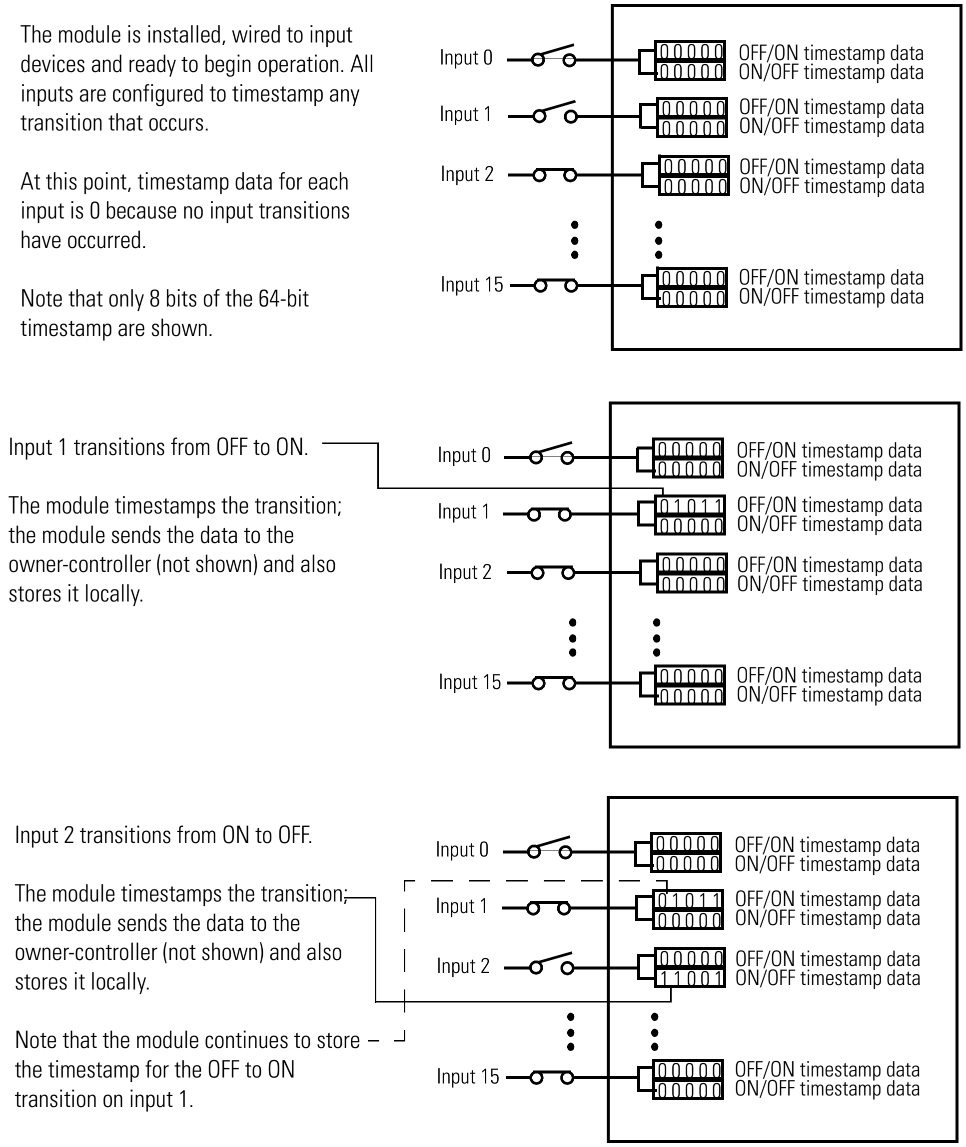
Overview

The module can be configured to timestamp two transitions per input, one in each direction (OFF to ON and ON to OFF).

When specific points that are Timestamp Capture-enabled transition (for example., input 1 is configured so that Timestamp Capture is enabled for OFF to ON transitions and the input turns ON), the module timestamps the transition with the current system time value on the network. The module produces data for the owner-controller the RPI after the input filter criteria have been met and at subsequent RPIs.

How Does the Module Store Timestamp Data?

With each timestamped transition, the module stores data for that point. An overview of how the module stores timestamp data is shown in the following figure.



Generally the following occurs:

1. The module timestamps each transition for inputs that are Timestamp Capture-enabled. The module can timestamp each transition with a unique system time.

2. The module sends all of its input data, including the new data from the most recent transition, to the controller the RPI after timestamping the transition and passing the input filter to make sure the transition was valid.

3. You copy new data from the controller tags to a separate data structure for later sorting.

4. Acknowledge the timestamp, using output tags, so that the module can capture another timestamp on that input without losing any data.

5. Once the data is copied to a separate data structure, you may sort the data in the controller to determine the order of events.

Some of these typical events are described in greater detail in the rest of this chapter. For typical applications for Sequence of Events modules, refer to High Performance Sequence of Events Applications in the Logix Architecture on page 9.

Using Timestamp Latching

When enabled, Timestamp Latching prevents the module from overwriting recorded timestamp data once a transition occurs. This feature is set on a modulewide basis and is enabled by default. The following table describes how Timestamp Latching affects the module.

If Timestamp Latching is:	the following occurs[1]
Enabled	The module timestamps two transitions for each input–one for OFF to ON and one for ON to OFF. If similar transitions occur on inputs where a transition has already been timestamped and the data was not yet acknowledged (for more information on Acknowledge Timestamp Latching Timestamp Data, see page 64), the module does not timestamp the new transition. When transitions occur that the module does not timestamp, the module sets the I.EventOverflow tag for that point to inform the controller that an input transitioned but a timestamp was not produced for the transition. **By default, Timestamp Latching is enabled**.
Disabled	The module timestamps each transition for each input as it occurs. In this case, when multiple transitions occur in the same direction on the same input, the module records the new timestamp data, overwriting any previously-recorded data which had yet to be acknowledged (for more information on Acknowledge Timestamp Latching Timestamp Data, see page 64). When the module overwrites data, it sets the I.EventOverflow tag for that point to inform the controller that events have been overwritten.

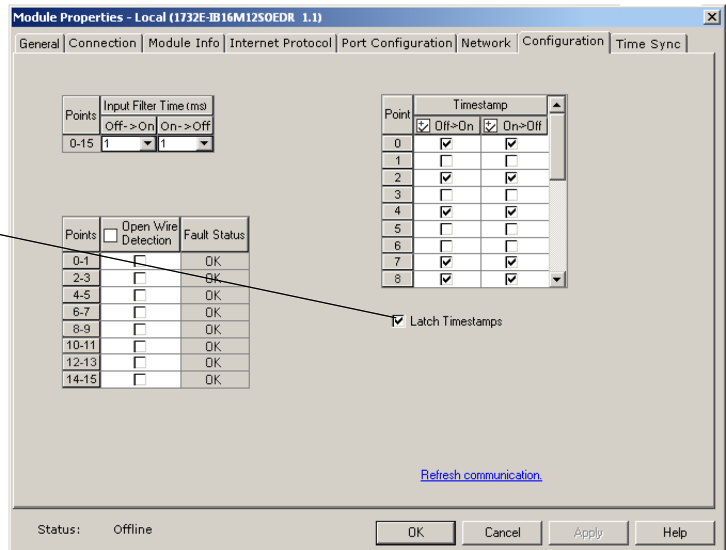
(1) This table assumes the transition occurs on inputs that have Timestamp Capture enabled. If Timestamp Capture is disabled, the module does not timestamp transitions on that input and, therefore, Timestamp Latching does not affect module behavior.

IMPORTANT We suggest you monitor the I.EventOverflow bits to make sure you are aware of when transitions were either not timestamped or when timestamp data was overwritten.

Use the Configuration tab in RSLogix 5000 to enable Timestamp Latching, as shown in the example.

Select this box to enable the Timestamp Latching feature.

Deselect the box to disable the feature.



Using Timestamp Capture

Timestamp Capture causes the module to timestamp specific input transitions (Off to On and On to Off). However, keep the following in mind when using this feature:

Typically, Timestamp Latching is enabled. The configuration of this feature (described on page 57) determines whether the module timestamps only the first transition on an input until the timestamp is acknowledged, or every transition on an input while overwriting timestamps that have not yet been acknowledged.

If Timestamp Capture is enabled, the module timestamps only the enabled transitions (OFF to ON and ON to OFF) for each input.

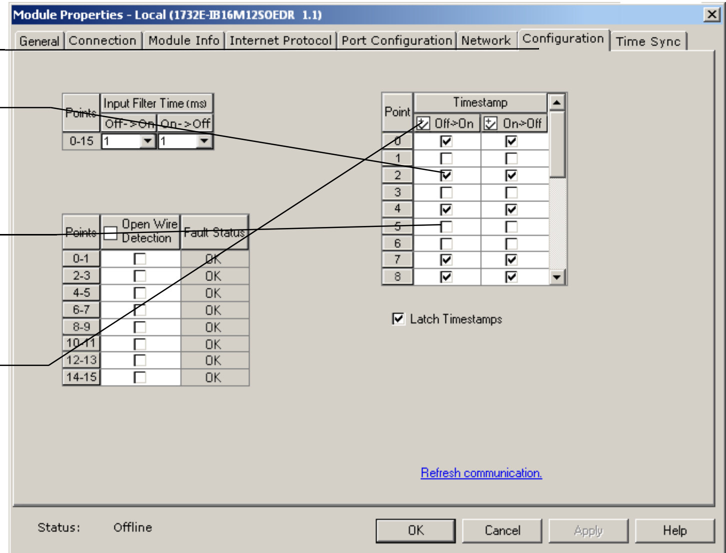
Whenever an input transition is timestamped as a valid transition, the module sends updated input data for all inputs to the controller at the next RPI and at every subsequent RPI.

Use the Configuration tab in RSLogix 5000 to set Timestamp Capture, as shown in the example below.

Click the Configuration tab.

- Select the individual boxes for each input point to enable Timestamp Capture for that point.
- Unselect the individual boxes for each input point to disable Timestamp Capture for that point.

You can also use these boxes to enable or disable all points simultaneously.



Manage the Data

The module sends all of its input data to the controller the next RPI after an input transition has been timestamped and at each subsequent RPI. You must manage the data coming from the module.

The following occurs in the process of the managing data coming from the module:

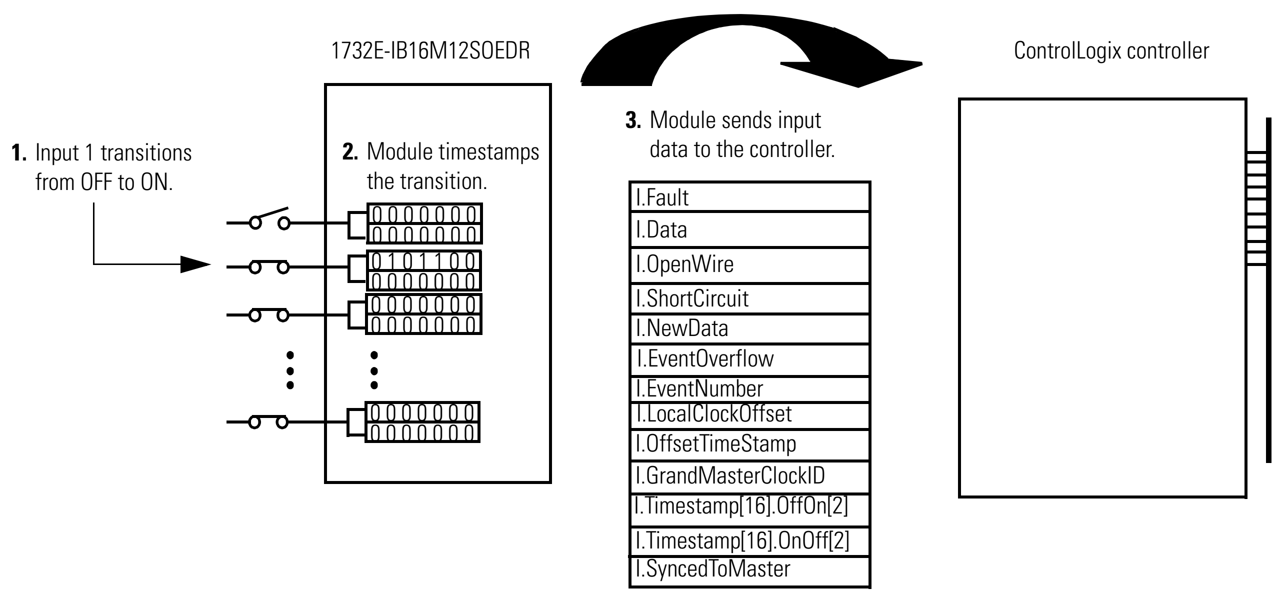
1. The module sends data to the controller.
2. The controller copies the relevant portions of the input data to separate array.
3. At the user's discretion, the controller clears latched timestamp data from the module via the O.EventAck and O.NewData tags, preparing the module to timestamp the next transition.

This process is described in the rest of this section.

Module Sends Data to the Controller

The following figure shows an example of the module sending data to the controller. In the example, the following occurs:

1. Input 1 transitions from OFF to ON. (The input has Timestamp Capture enabled).
2. The module timestamps the transition.
3. The module sends its input data, including the transition timestamp from input 1, to the controller.



The following table describes the data that is sent for each input. These tags are sent to the controller the next RPI after the module timestamps a transition on any input as well as all other RPIs. For detailed descriptions of the tags, refer to Appendix B.

Tag Name	Set on a Per Point or Modulewide Basis	Description
I.Fault	Modulewide	Indicates if a communication fault has occurred. 0 = no fault 1 = fault – Communication fault - The controller sets this tag to 1 for all 32 bits if a communication fault occurs on the module. This tag clears when the fault that causes the condition no longer exists.
I.Data	Per point	Status of the input point. This data is filtered if the Input Filter feature is used on the module. Thus, an input change must pass through the filter before it is seen in this tag. 0 = input is OFF 1 = input is ON For example, if input 3 is ON, *I.Data.3* = 1.
I.OpenWire	Per input connector	0 = no fault 1 = Open Wire For more information on Open Wire Detection, see page 45.
I.ShortCircuit	Per input connector	0 = no fault 1 = Short Circuit For more information on Short Circuit Protection, see page 45.
I.NewData	Per point	Flag indicating if new timestamp data was detected on the input. 0 = no new timestamp data on the input 1 = new timestamp data on the input (since last acknowledged) Because input data for all inputs is sent the RPI after each timestamped transition and at each subsequent RPI, this tag is useful to quickly determine on which input the transition occurred. For example, if the module sends new input data to the owner-controller and *I.NewData.5* = 1, you know that at least one of the timestamps for input 5 (*I.Timestamp[5].OffOn* or *I.Timestamp[5].OnOff*) has new data. This tag only clears when the controller acknowledges the new data or all events on the module are reset. For more information on clearing timestamp data, see page 67.

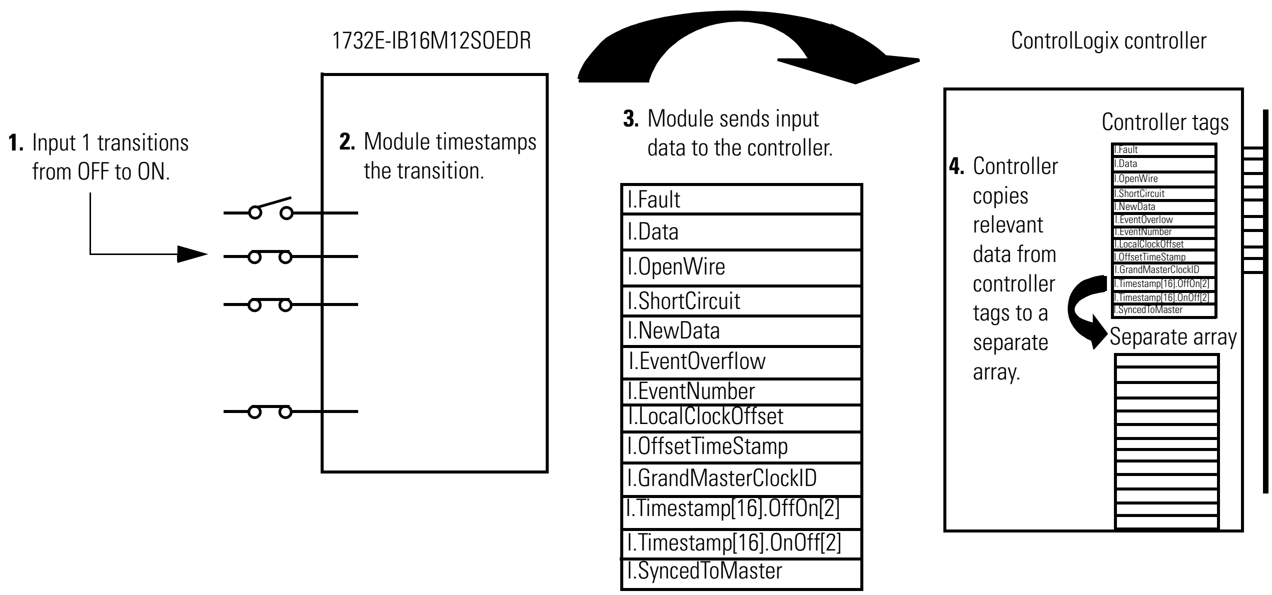
Tag Name	Set on a Per Point or Modulewide Basis	Description
I.EventOverflow	Per point	Set for an input when the module either: • Does not timestamp a transition on the input – The module has Timestamp Latching enabled and a similar transition has already been timestamped on this input but has not been cleared via the O.EventAck and O.NewDataAck output tags (see page 82). or • Overwrites previously-recorded timestamp data for the input – The module has Timestamp Latching disabled and multiple transitions occur on the input. In this case, timestamp data from new transitions are recorded before previously-recorded transitions were cleared from the input via the O.EventAck and O.NewDataAck output tags (see page 82). This tag only clears when the controller acknowledges the new data or all events on the module are reset. For more information on clearing timestamp data, see page 64.
I.EventNumber.x	Modulewide	Running count of the timestamped transitions; this tag increments by one with each new transition that the module timestamps. This value is cleared if the power is cycled and rolls over 1 instead of 0.
I.LocalClockOffset	Modulewide	The offset from the local clock to the system time. This value is useful for detecting steps in time. This value updates when a PTP update is received.
I.OffsetTimeStamp	Modulewide	The time when the PTP message was received to cause the Local Clock Offset to update. This value is initially zero. The first timestamp occurs when the module synchronizes with the Grandmaster clock.
I.GrandMasterClockID	Modulewide	The I.D. number of the Grandmaster clock that the module is synchronized to.
I.Timestamp[16].OffOn[2]	Per point	Timestamp value for an input's OFF to ON transition. This tag is a 16 x 2 32-bit array. There is a 64-bit timestamp per point. This value is cleared after the data has been acknowledged via the *O.EventAck* and *O.NewData* tags. For more information on clearing timestamp data, see page 64.
I.Timestamp[16].OnOff[2]	Per point	Timestamp value for an input's ON to OFF transition. This tag is a 16 x 2 32-bit array. There is a 64-bit timestamp per point. This value is cleared after the data has been acknowledged via the *O.EventAck* and *O.NewData* tags. For more information on clearing timestamp data, see page 64.
I.SyncedToMaster	Modulewide	Indicates if the module is synchronized with a master clock. 1 = Synchronized 0 = Not synchronized

Copy Relevant Input Data to a Separate Data Structure

When the module sends input data to the controller, the data is stored in the controller tags. We recommend you use a COP or CPS instruction to programmatically copy new timestamp data from the controller tags to a separate array in the controller's memory. Later, you can combine timestamp data from multiple modules and use a Sort routine to determine the order of events, with relative time reference, that occurred in a specific time period.

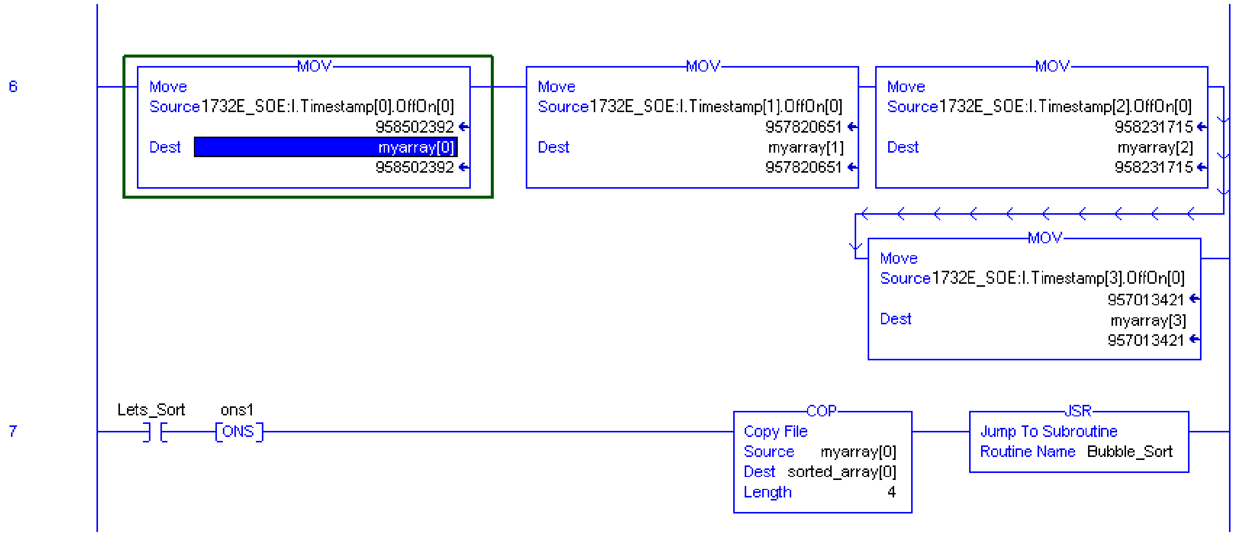
IMPORTANT When you copy relevant timestamp data from the controller tags to a separate data structure, make sure you copy enough information for each timestamp that you can differentiate between timestamps for different inputs.

The following figure shows when to use the COP instruction. In this example, the module timestamped a transition on input 1 and is sending input data to the controller at each RPI. The controller copies input data from the controller tags to a separate data structure.



Your application determines what input data should be copied from the controller tags to a separate data structure. Although you can copy all the input data to another array, typically, only the data from specific tags is copied.

The following figure shows an example of ladder logic in which the controller only moves OFF to ON timestamp data for inputs 0…3 from the controller tags to a separate data structure named myarray. The data in the myarray structure is then moved to another array used to sort the data. In this example, 32 bits of each 64-bit timestamp are moved to the new array.



Acknowledge Timestamp Latching Timestamp Data

In most cases, Timestamp Latching is enabled. This means that once the module timestamps an input transition, the module will not timestamp another transition in the same direction on the same input until you acknowledge the data from the first timestamped transition; when you **acknowledge data**, you **clear it from the module**.

To clear data from the module, you must acknowledge them via the module's output tags. You can clear data in the following ways:

- Clear latched timestamp data for specific inputs – As data is acknowledged, it is cleared from the module, and the module will once again timestamp the first new transition for the input in the cleared direction(s).

  To clear timestamp data for specific inputs, you must complete the following steps:

  a. Write to the EventAck output tag (*O.EventAck*). This tag determines which edge you will clear (acknowledge).

  - 0 = clear only the falling edge timestamp (I.Timestamp[x].OnOff)
  - 1 = clear only the rising edge timestamp (I.Timestamp[x].OffOn)
  - 2 = clear both the falling and rising edge timestamps

b. Change the NewDataAck output tag (*O.NewDataAck.x*) to a rising edge (set the tag =1). This tag determines which inputs will be cleared (acknowledged). There are 16 bits (x = 0…15) that can be transitioned; each corresponding to an input. More than one bit can be transitioned at the same time.

- If the bit = 0, change the bit to 1.
- If the bit = 1, change the bit to 0, wait for at least one RPI, and change the bit to 1.

The corresponding I.EventOverflow and I.NewData tags are also cleared.

- **Clear all latched data for the module** – This transition erases all timestamp data from the module, clearing data from all inputs simultaneously. Once the data is cleared, the module timestamps the first transition in each direction for each input and sends the data to the controller (assuming those inputs are configured with Timestamp Capture enabled in each direction).

  To clear all data for the module, transition the O.ResetEvents tag to 1.

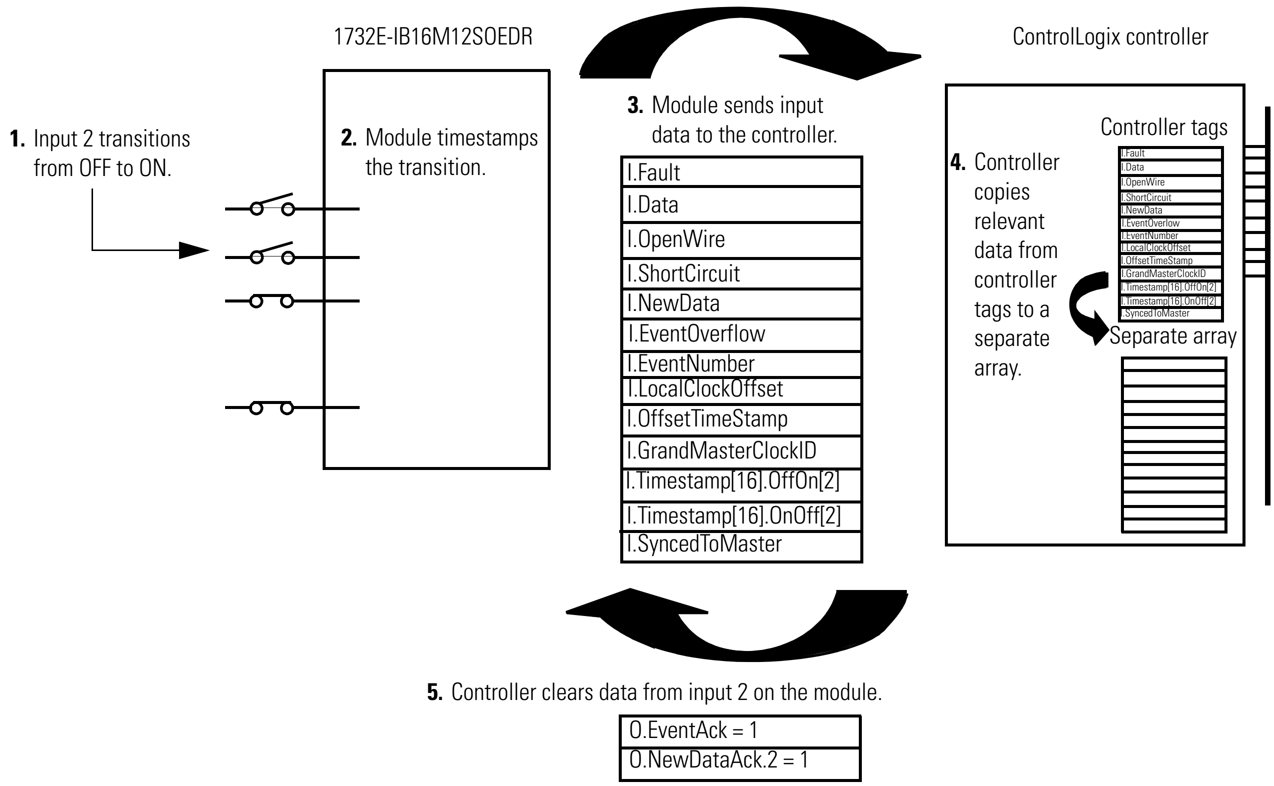
  – If the bit = 0, change the bit to 1.
  – If the bit = 1, change the bit to 0, wait for at least one RPI, and change the bit to 1.

The following figure shows when to clear data from the module. In this example, the module sent input data to the controller, and the controller copied the relevant input data to a separate structure. Now, the controller must clear the data from the module.

In this example, to clear data from the module, the controller writes the following to the Sequence of Events output word:

- O.EventAck = 1

- O.NewDataAck.2 = 1



If **Timestamp Latch is disabled**, the module sends new data, from subsequent transitions, to the controller as soon as they occur. The controller overwrites timestamp data from the last transition, regardless of whether it saved the data or not.

If the controller does not acknowledge the timestamp data then the NewData bits in the input tags remains set and the EventOverflow bit is set as well.

Sort the Data

If you need to determine the order of events that occurred in a cascade, you must use a Sort routine to determine the order of events. Rockwell Automation offers a sample sort routine that you can use to determine the order of events in an event cascade.

Visit the Rockwell Automation Sample Code Library at http://samplecode.rockwellautomation.com/idc/groups/public/documents/webassets/sc_home_page.hcst.

Clear All Data From the Module's Buffer At Once

If necessary, you can reset the events in the module, in effect clearing all data from previously timestamped transitions. In other words, when all data is cleared from the module's buffers, all of the module's input tags return to 0.

To reset events in the module's buffer, transition the O.ResetEvents tag to 1 as described below:

- If the bit = 0, change the bit to 1.
- If the bit = 1, change the bit to 0, wait for at least one RPI, and change the bit to 1.

Once the data is cleared, the module begins timestamping input transitions again and storing them in its on-board buffer.

Propagate a Signal From Input Pin to EtherNet

The module receives a signal at its input pin and processes it internally before sending the input and time stamp data to the controller at the Requested Packet Interval (RPI) via EtherNet.

When you operate the module, you must account for signal propagation delays that exist during internal processing. Some of these delays are inherent to the module and others are controlled by temperature and input voltage.

During processing, the following delays exist:

- hardware delay – The time it takes an input signal to propagate from the module's input pin to its microprocessor. This time varies according to input transition type (OFF to ON/ON to OFF), input voltage and temperature.
- firmware delay time – The time is takes the module to acquire a time stamp once its microprocessor receives the input signal.
- input filter delay – user-configurable number from 0…16 ms. The input filter does not affect when the timestamp is acquired. It is acquired the "firmware delay time" after the input changes state at the module's microprocessor. The input filter simply delay's the amount of time the input must be in a certain state before input is considered valid and the timestamp data will be sent to the controller.
- RPI – Once the timestamp is acquired by the microprocessor and the input is filtered, the input and timestamp data is sent to the controller at the next RPI.

Timestamp Accuracy = +/- 40 μs.[1]

Module Input Pin OFF->ON to Timestamp (Hardware + Firmware) Delay (μs)

Ambient Temp ºC Voltage	-20	25	60
10V DC	23	24	25
24V DC	18	19	19
30V DC	18	19	19

Module Input Pin ON->OFF to Timestamp (Hardware + Firmware) Delay (μs)

Ambient Temp ºC Voltage	-20	25	60
10V DC	59	75	84
24V DC	70	84	93
30V DC	71	85	94

Maximum input frequency (for each input) = 250 Hz 50% duty cycle. The module can provide unique timestamps for input transitions on separate inputs as long as they occur 25 μs apart. An input that changes state less than 25 μs after another input may receive the timestamp of the first input.

EXAMPLE

For example, if you are **turning ON** a 1732E-IB16M12SOEDR module's input at 24V DC in 25 ºC conditions, the signal propagation delay is 19 μs. If you want to calculate the actual time the signal reaches the module's input pin, subtract 19 μs from the timestamp.

If you are **turning OFF** an input at 30V DC in 60 ºC conditions, the signal propagation delay is 94 μs. If you want to calculate the actual time the signal reaches the module's input pin, subtract 94 μs from the timestamp.

The timestamps acquired are accurate to +/- 40 μs as noted earlier.

The Timestamp data being produced on EtherNet is also delayed by the input filter setting and the RPI setting.

Chapter Summary and What's Next

In this chapter, you learned how to use the module. The next chapter describes interpreting the Status Indicators.

(1) The timestamp accuracy of +/- 40 μs does not included errors introduced by the module's clock being tuned using CIP Sync. This error can be less than one microsecond on a properly configured network.

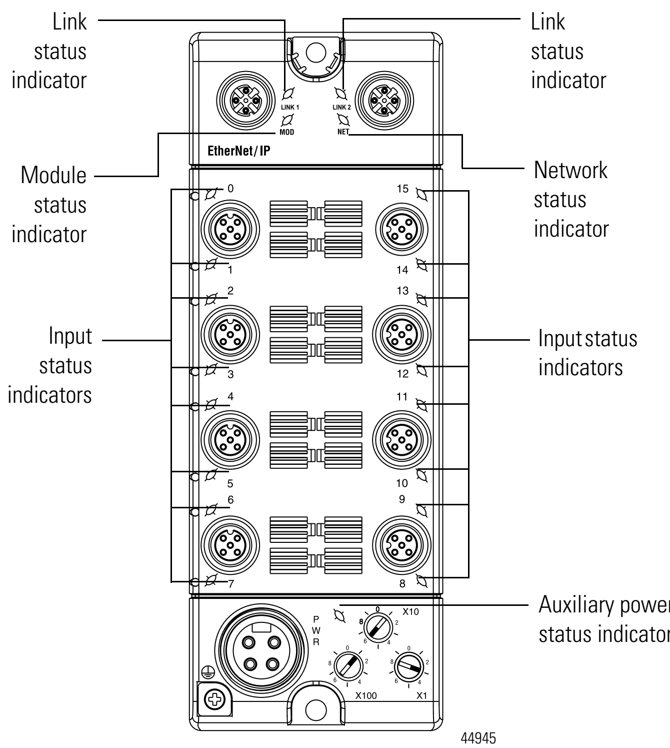
Interpret Status Indicators

Introduction

This chapter contains information about status indicators.

This module has the following indicators:

- Network, Module, and Link status indicators for EtherNet/IP
- Auxiliary Power indicator
- Individual I/O status indicators for inputs.



Indicator Status for Module

	Status	Description
Module status	Off	No power applied to device.
	Flashing red/green	Device is in self-test.
	Flashing green	Device not synchronized to master clock.
	Green	Device operating normally.
	Flashing red	Recoverable fault.
	Red	Unrecoverable fault – may require device replacement.

Indicator Status for Module

	Status	Description
Network status	Off	The device is not initialized or the module does not have an IP address.
	Flashing green	The device has an IP address, but no CIP connections are established.
	Green	The device is online, has an IP address, and CIP connections are established.
	Flashing red	One or more connections have timed out.
	Red	The module has detected that its IP address is already in use.
Network link status	Off	No link established.
	Green	Link established on indicated port at 100 Mbps.
	Flashing green	Link activity present on indicated port at 100 Mbps.
	Yellow	Link established on indicated port at 10 Mbps.
	Flashing yellow	Link activity present on indicated port at 10 Mbps.
Auxiliary status	Off	No power to device or input not valid.
	Green	Power applied to device.
Digital input status	Off	No valid input.
	Yellow	Valid input.
	Red	Sensor source voltage shorted.
	Flashing red	Sensor source open wire.

IMPORTANT The Module Status Indicator will flash red and green for a maximum of 30 seconds while the module completes its POST (Power-On Self Test).

Chapter Summary and What's Next

In this chapter, you read how to interpret the Status Indicators on the module. The next chapter describes how to troubleshoot the module using RSLogix 5000.

Troubleshoot the Module

Introduction

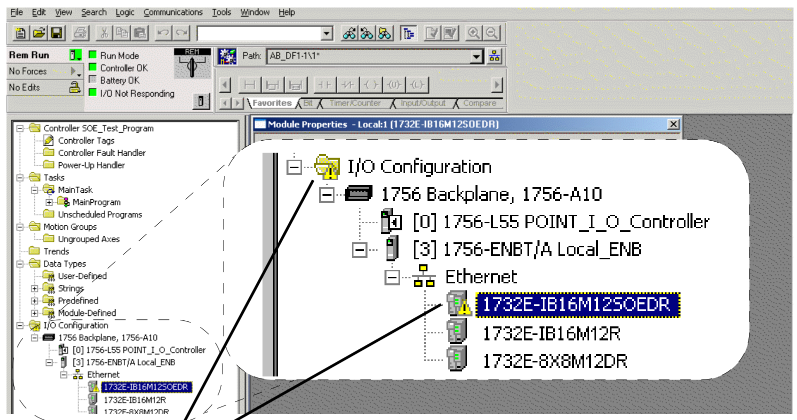
This chapter describes how to troubleshoot the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events using RSLogix 5000.

Troubleshoot the Module

In addition to the Status Indicators on the module, RSLogix 5000 alerts you to fault and other conditions in one of three ways:

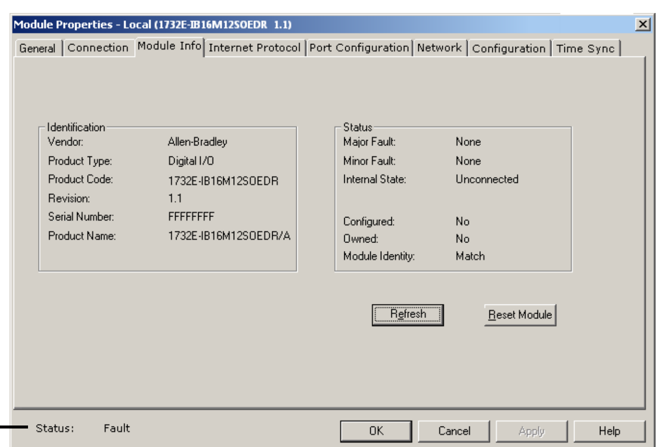
- Warning signal on the main screen next to the module – This occurs when the connection to the module is broken.

Warning icon appears when a communications fault occurs or if the module is inhibited



Warning signal - The module has a communications fault

- Message in a screen's status line.

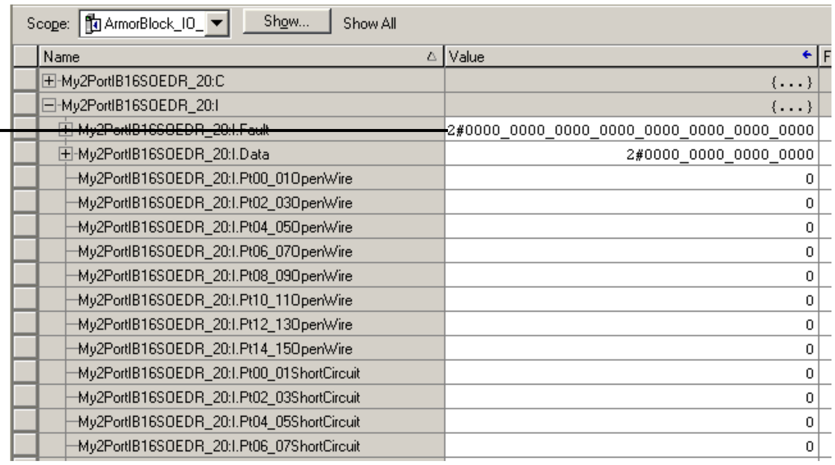


Status line provides information on the module's fault and on the connection to the module

- Notification in the Tag Monitor - General module faults are also reported in the Tag Monitor. Communication faults are reported in the input tags. OpenWire, ShortCircuit and EventOverflow faults are also reported in the input tag.

RSLogix 5000 software generates 1s in response to a module communication fault.

In this example, a communication fault occurred between the controller and the module, so the controller automatically writes 1s for all bits in the word.

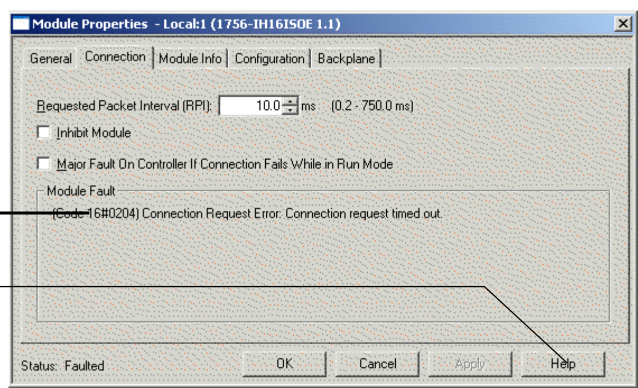


Determining Fault Type

When you are monitoring a module's configuration properties in RSLogix 5000 and receive a Communications fault message, the Connection page lists the type of fault.

The fault type is listed here

Click Help for a detailed listing of the possible faults, their causes and suggested solutions.



For a detailed listing of the possible faults, their causes and suggested solutions, see Module Faults in the RSLogix 5000 online help.

Refer to the RSLogix 5000 AOP help to troubleshoot using the Module Info tab, Internet Protocol tab, Port Diagnostics dialog, Time Sync tab, or Network tab. Access the AOP help by clicking Help on any of these tabs.

ArmorBlock 2 Port Ethernet Module Specifications

Specifications

ArmorBlock 2 Port Ethernet Module Input Specifications – 1732E-IB16M12SOEDR

Attributes	Value
Number of inputs	16
Input type	Sink, 24V DC
Voltage, off-state input, max	5V DC
Voltage, on-state input, max	30V DC
Voltage, on-state input, nom	24V DC
Voltage, on-state input, min	11V DC
Current, off-state input, max	1.5 mA @ 5V DC
Current, on-state input, max	5 mA @ 30V DC
Voltage, sensor source, max	30V DC
Voltage, sensor source, min	10V DC
Input delay time ON to OFF OFF to ON	0…16000 µs
Isolation voltage	50V (continuous), Basic Insulation Type, Inputs and Sensor Power to Network No isolation between individual Inputs or between Network channels Type tested at 707V DC for 60s
Voltage, auxiliary power, max	30V DC
Voltage, auxiliary power, min	12V DC
Current, Ethernet system power, max (pins 2, 3 sensor source/module power)	1.2 A
Current, sensor source, per input, max	50 mA
Current, sensor source, per connector, max	100 mA
Timestamp accuracy	100 µs Refer to the module input delay tables on page 68.
Communication rate	EtherNet/IP 10/100 Mbps Full or half-duplex 100 meter per segment

ArmorBlock 2 Port Ethernet Module Input Specifications – 1732E-IB16M12SOEDR

Attributes	Value
CIP Sync (PTP) clock	Transparent clock, and slave only ordinary clock
Status indicators	Module Status - red/green Network Status - red/green Link Status - green/yellow Auxiliary Power - green I/O Status - yellow/red
Dimensions (HxWxD), approx.	179 x 65 x 43.25 mm (7.05 x 2.56 x 1.70 in.)
Weight, approx.	0.34 kg (0.75 lb)
Enclosure type rating	Meets IP65/66/67/69K (when marked)
Wiring category[1]	1 - on signal ports 1 - on power ports 1 - on communications ports

(1) Use this Conductor Category information for planning conductor routing. Refer to publication 1770-4.1, Industrial Automation Wiring and Grounding Guidelines.

Environmental Specifications

Attribute	Value
Temperature, operating	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20…60 °C (-4…140 °F)
Temperature, storage	IEC 60068-2-1 (Test Ab, Unpackaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Non-operating Thermal Shock): -40…85 °C (-40…185 °F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Damp Heat): 5…95% non-condensing
Vibration	IEC60068-2-6 (Test Fc, Operating): 5 g @ 10…500 Hz
Shock, operating	IEC60068-2-27 (Test Ea, Unpackaged Shock): 30 g
Shock, non-operating	IEC60068-2-27 (Test Ea, Unpackaged Shock): 50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity	IEC 61000-4-2: 6 kV contact discharges 8 kV air discharges
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 Mhz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 Mhz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz

Environmental Specifications

Attribute	Value
EFT/B immunity	IEC 61000-4-4: ±4 kV @ 5 kHz on power ports ±3 kV @ 5 kHz on signal ports ±3 kV @ 5 kHz on communications ports
Surge transient immunity	IEC 61000-4-5: ±1 kV line-line(DM) and ±2 kV line-earth(CM) on power ports ±1 kV line-line(DM) and ±2 kV line-earth(CM) on signal ports ±2 kV line-earth(CM) on communications ports
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz

Certifications

Certification (when product is marked)[1]	Value
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E322657.
CE	European Union 2004/108/EC EMC Directive, compliant with: EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
EtherNet/IP	ODVA conformance tested to Ethernet/IP specifications.

(1) See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Notes:

Module Tags

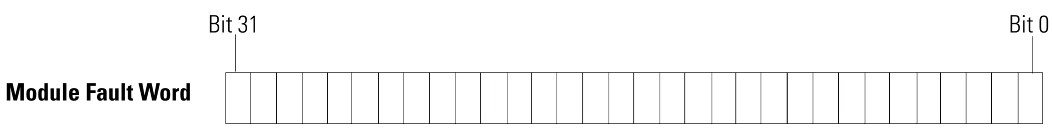
Fault and Status Reporting Between the Module and Controllers

The 1732E-IB16M12SOEDR sends fault/status data to the owner-controller. The module maintains a Module Fault Word, the highest level of fault reporting.

The following table describes the tag that can be examined in ladder logic to indicate when a fault has occurred for your module:

Tag	Description
Module Fault Word	This word provides fault summary reporting. It's tag name is Fault.

- If a communication fault occurs on the module, all 32 bits in the Module Fault Word are set to 1.



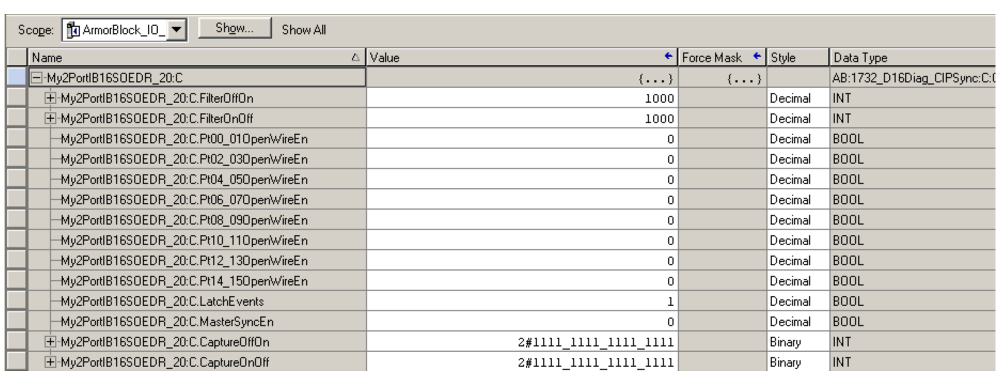
A communications fault sets **all bits** in the Module Fault Word.

42676

Module Tag Names and Definitions

The 1732E-IB16M12SOEDR has three sets of tags:

- Configuration
- Input
- Output



Scope: ArmorBlock_IO_ Show... Show All

Name	Value	Force Mask	Style	Data Type
My2PortIB16SOEDR_20:C	{...}	{...}		AB:1732_D16Diag_CIPSync:C:(
My2PortIB16SOEDR_20:C.FilterOffOn	1000		Decimal	INT
My2PortIB16SOEDR_20:C.FilterOnOff	1000		Decimal	INT
My2PortIB16SOEDR_20:C.Pt00_01OpenWireEn	0		Decimal	BOOL
My2PortIB16SOEDR_20:C.Pt02_03OpenWireEn	0		Decimal	BOOL
My2PortIB16SOEDR_20:C.Pt04_05OpenWireEn	0		Decimal	BOOL
My2PortIB16SOEDR_20:C.Pt06_07OpenWireEn	0		Decimal	BOOL
My2PortIB16SOEDR_20:C.Pt08_09OpenWireEn	0		Decimal	BOOL
My2PortIB16SOEDR_20:C.Pt10_11OpenWireEn	0		Decimal	BOOL
My2PortIB16SOEDR_20:C.Pt12_13OpenWireEn	0		Decimal	BOOL
My2PortIB16SOEDR_20:C.Pt14_15OpenWireEn	0		Decimal	BOOL
My2PortIB16SOEDR_20:C.LatchEvents	1		Decimal	BOOL
My2PortIB16SOEDR_20:C.MasterSyncEn	0		Decimal	BOOL
My2PortIB16SOEDR_20:C.CaptureOffOn	2#1111_1111_1111_1111		Binary	INT
My2PortIB16SOEDR_20:C.CaptureOnOff	2#1111_1111_1111_1111		Binary	INT

Tags Used

Configuration Tags

The following table describes the configuration tags generated in RSLogix 5000 when you use your module.

Configuration Tags

Tag Name	Type	Description
C.FilterOffOn	INT	Sets the OFF to ON filter time for all 16 inputs. Times are set in µs increments of 0, 1000 (default), 2000, 4000, 8000 and 16000 µs. 0 = no filtering For more information on Software Configurable Input Filters, see page 46.
C.FilterOnOff	INT	Sets the ON to OFF filter time for all 16 inputs. Times are set in µs increments of 0, 1000 (default), 2000, 4000, 8000 and 16000 µs. 0 = no filtering For more information on Software Configurable Input Filters, see page 46.
C.PointXX_YYOpenWireEn	BOOL	XX = even numbered input 0…14 YY = odd numbered input 1…15 OpenWire is enabled or disabled per I/O connector. For example, 00_01 or 14_15 0 = Off (default) 1 = Enable Open Wire
C.LatchEvents	BOOL	Latches events so that an event will not be overwritten until acknowledged. 0 = SOE not latched 1 = SOE latched (default) Latched means that a sequence of events of LO to HI and HI to LO then LO to HI will cause the first LO to HI transition to be recorded and the final LO to HI to be ignored. All subsequent transitions on that point will be ignored until acknowledged/reset. If the bit is not set, the new LO to HI will overwrite the first LO to HI event immediately, even if the controller has yet to extract that data.
C.MasterSyncEn	BOOL	PTP enabled bit indicates if the module is expected to sync to a master clock. 0 = Synchronization indication disabled (default) 1 = Synchronization indication enabled If not enabled (0) then the Module Status Indicators will not flash green if we are not sync'd to a master clock. Disabling the bit does not prevent the module from synchronizing to a master clock.

Configuration Tags

Tag Name	Type	Description
C.CaptureOffOn.x	INT	Enables capturing OFF to ON events on a per point basis. If disabled (0), that point will not record timestamp data for OFF to ON input transitions. 0 = Capture disabled for OFF to ON input transitions 1 = Capture enabled (default) for OFF to ON input transitions This option is useful if you want to avoid reporting data on the module for events in which you have no interest.
C.CaptureOnOff.x	INT	Enables capturing ON to OFF events on a per point basis. If disabled (0), that point will not record timestamp data for ON to OFF input transitions. 0 = Capture disabled for ON to OFF input transitions 1 = Capture enabled (default) for ON to OFF input transitions This option is useful if you want to avoid reporting data on the module for events in which you have no interest.

Input Tags

The following table describes the input tags generated in RSLogix 5000.

Input Tags

Tag Name	Type	Set on Per Point or Modulewide basis	Description
I.Fault	DINT	Modulewide	Communication fault - The controller sets this tag to 1 for all 32 bits if a communication fault occurs on the module otherwise all bits are zero.
I.Data	INT	Per point	Status of the input point. This data is filtered if the Input Filter feature is used on the module. Thus, an input change must pass through the filter before it is seen in this tag. 0 = input is OFF 1 = input is ON For example, if input 3 is ON, *I.Data.3* = 1.
I.PtXX_YYOpenWire	BOOL	Per point	XX = even numbered input 0…14 YY = odd numbered input 1…15 An OpenWire condition exists per I/O connector. For example, 00_01 or 14_15 0 = no fault 1 = Open Wire For more information on Open Wire Detection, see page 45.

Input Tags

Tag Name	Type	Set on Per Point or Modulewide basis	Description
I.PtXX_YYShortCircuit	BOOL	Per point	XX = even numbered input 0…14 YY = odd numbered input 1…15 A Short Circuit condition exists per I/O connector. For example, 00_01 or 14_15 0 = no fault 1 = short circuit For more information on Short Circuit Protection, see page 45.
I.NewData	INT	Per point[1]	Flag indicating if new timestamp data was detected on the input. 0 = no new timestamp data on the input 1 = new timestamp data on the input (since last acknowledged) Because input data for all inputs is sent the next RPI after each timestamped transition, this tag is useful to quickly determine on which input the transition occurred. For example, if the module sends new input data to the owner-controller and *I.NewData.5* = 1, you know that at least one of the timestamps for input 5 (*I.Timestamp[5].OffOn* or *I.Timestamp[5].OnOff*) has new data. This tag only clears when the controller acknowledges the new data or all events on the module are reset. For more information, see page 64.
I.EventOverflow	INT	Per point	Set for an input when the module either: • Does not timestamp a transition on the input – The module has Timestamp Latch enabled and a similar transition has already been timestamped on this input but has not been cleared via the O.EventAck and O.NewDataAck output tags (see page 64). or • Overwrites previously-recorded timestamp data for the input – The module has Timestamp Latch disabled and multiple transitions occur on the input. In this case, timestamp data from new transitions are recorded before previously-recorded transitions were cleared from the input via the O.EventAck and O.NewDataAck output tags (see page 64). This value is cleared if the module is reset.
I.EventNumber.x	DINT	Modulewide	Running count of the timestamped transitions; this tag increments by one with each new transition that the module timestamps and rolls over to 1, not 0. This value is cleared if the module is reset.
I.LocalClockOffset	DINT[2]	Modulewide	The offset from the local clock to the system time. This value is useful for detecting steps in time. This value updates when a PTP update is received.

Input Tags

Tag Name	Type	Set on Per Point or Modulewide basis	Description
I.OffsetTimeStamp	DINT[2]	Modulewide	The time when the PTP message was received to cause the Local Clock Offset to update. This value is initially zero. The first timestamp occurs when the module synchronizes with the Grandmaster clock.
I.GrandMasterClockID	DINT[2]	Modulewide	The I.D. number of the Grandmaster clock that the module is synchronized to.
I.Timestamp[16].OffOn[2]	DINT[2]	Per point	Timestamp value with an input's OFF to ON transition. This tag is a 16 x 2 32-bit array. This value is cleared after the data has been acknowledged via the *O.EventAck* and *O.NewData* tags. For more information on clearing timestamp data, see see page 64.
I.Timestamp[16].OnOff[2]	DINT[2]	Per point	Timestamp value with an input's ON to OFF transition. This tag is a 16 x 2 32-bit array. This value is cleared after the data has been acknowledged via the *O.EventAck* and *O.NewData* tags. For more information on clearing timestamp data, see page 64.
I.SyncedToMaster	BOOL	Modulewide	Indicates if the module is synchronized with a master clock. 1 = Synchronized 0 = Not synchronized

(1) With the Per point tags, there is one bit per input. For example, bit 0 represents input 0, bit 7 represents input 7 and so on.

Output Tags

The following table describes the output tags generated in RSLogix 5000.

Output Tags

Tag Name	Type	Description
O.EventAck	DINT	For the bits selected in the O.NewDataAck tag, this tag selects which edge to acknowledge, On to Off, Off to On or both. 0 = acknowledging an ON to OFF event 1 = acknowledging an OFF to ON event 2 = acknowledging both ON to OFF and OFF to ON events The O.NewDataAck tag must also be used to acknowledge the event(s).
O.NewDataAck.x	INT	Allows I.NewData bits and I.Timestamp data updates in the Input tag to function as intended. I.NewData bits are set and I.Timestamp data updates when a transition occurs and clear only after they are acknowledged via the O.NewDataAck bit. Typically, the following events occur: • An event occurs on an input. • The module sets the I.NewData bit and I.Timestamp data for the input where the event occurred. • The controller records the new data. • The controller acknowledges the new data by causing a 0 to 1 transition on the corresponding O.NewDataAck bit. • The I.NewData bit and I.Timestamp data clears. • When another event occurs on the input, the sequence begins at the top bullet in this list. The controller must cause a 0 to 1 transition in this bit to acknowledge new data for an input; in other words, if the NewDataAck bit is 0 when new data is received, the controller must change this bit to 1 to acknowledge the data. If NewDataAck bit is 1 when new data is received, the controller must change this bit to 0 and then at least one RPI later to 1 to acknowledge the new data.
O.PointToRetrieve	SINT	Not used in this mode.
O.ResetEvents	BOOL	Erases all recorded events when transitioned from 0 to 1.
O.RetrieveByPoint	BOOL	Not used in this mode.

1732E EtherNet/IP ArmorBlock Supporting Sequence of Events Data Tables

Communicate with Your Module

Read this section for information about how to communicate with your module.

I/O messages are sent to (consumed) and received from (produced) the ArmorBlock I/O modules. These messages are mapped into the processor's or scanner's memory. The following table lists the assembly instances and connection points for the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events.

Produced Assembly Instance 118

16 Point Input / Status / CIP Sync								
Produced Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Reserved (Must be 0)							
1	Reserved (Must be 0)							
2	Reserved (Must be 0)							
3	Reserved (Must be 0)							
4	IN 7	IN 6	IN 5	IN 4	IN 3	IN 2	IN 1	IN 0
5	IN 15	IN 14	IN 13	IN 12	IN 11	IN 10	IN 9	IN 8
6	INOW 7	INOW 6	INOW 5	INOW 4	INOW 3	INOW 2	INOW 1	INOW 0
7	INSC 7	INSC 6	INSC 5	INSC 4	INSC 3	INSC 2	INSC 1	INSC 0
8	NewData 7	NewData 6	NewData 5	NewData 4	NewData 3	NewData 2	NewData 1	NewData 0
9	NewData 15	NewData 14	NewData 13	NewData 12	NewData 11	NewData 10	NewData 9	NewData 8
10	EventOV 7	EventOV 6	EventOV 5	EventOV 4	EventOV 3	EventOV 2	EventOV 1	EventOV 0
11	EventOV 15	EventOV 14	EventOV 13	EventOV 12	EventOV 11	EventOV 10	EventOV 9	EventOV 8
12-15	Event Number (32 bit)							
16-23	Local clock Offset (64 bit)							
24-31	Offset Time Stamp (64 bit)							
32-39	Grandmaster Clock ID (64 bit) 8 byte SINT array							
40-47	IN 0 Off-On Time Stamp (64 bit)							
48-55	IN 0 On-Off Time Stamp (64 bit)							
56-63	IN 1 Off-On Time Stamp (64 bit)							
64-71	IN 1 On-Off Time Stamp (64 bit)							
72-79	IN 2 Off-On Time Stamp (64 bit)							
80-87	IN 2 On-Off Time Stamp (64 bit)							

Produced Assembly Instance 118

88-95	IN 3 Off-On Time Stamp (64 bit)
96-103	IN 3 On-Off Time Stamp (64 bit)
104-111	IN 4 Off-On Time Stamp (64 bit)
112-119	IN 4 On-Off Time Stamp (64 bit)
120-127	IN 5 Off-On Time Stamp (64 bit)
128-135	IN 5 On-Off Time Stamp (64 bit)
136-143	IN 6 Off-On Time Stamp (64 bit)
144-151	IN 6 On-Off Time Stamp (64 bit)
152-159	IN 7 Off-On Time Stamp (64 bit)
160-167	IN 7 On-Off Time Stamp (64 bit)
168-175	IN 8 Off-On Time Stamp (64 bit)
176-183	IN 8 On-Off Time Stamp (64 bit)
184-191	IN 9 Off-On Time Stamp (64 bit)
192-199	IN 9 On-Off Time Stamp (64 bit)
200-207	IN 10 Off-On Time Stamp (64 bit)
208-215	IN 10 On-Off Time Stamp (64 bit)
216-223	IN 11 Off-On Time Stamp (64 bit)
224-231	IN 11 On-Off Time Stamp (64 bit)
232-239	IN 12 Off-On Time Stamp (64 bit)
240-247	IN 12 On-Off Time Stamp (64 bit)
248-255	IN 13 Off-On Time Stamp (64 bit)
256-263	IN 13 On-Off Time Stamp (64 bit)
264-271	IN 14 Off-On Time Stamp (64 bit)

Produced Assembly Instance 118

272-279	IN 14 On-Off Time Stamp (64 bit)	
280-287	IN 15 Off-On Time Stamp (64 bit)	
288-295	IN 15 On-Off Time Stamp (64 bit)	
296	Reserved	Synced to Master

Where: INOW = Input Open Wire

INSC = Input Short Circuit

NewData = New data, has been detected upon that input and an unread event is queued for that point.

EventOV = Set whenever the module begins to lose events for that input pint. Events may be lost when new events are either ignored or overwriting existing events which have yet to be acknowledged.

EventNumber = Running count of events which increments by one each new event. Allows the controller to check for a new event easily by comparing this number to the last retrieved event. If the EventNumber reaches its maximum value and rolls over it rolls over to 1, not 0.

Inx Off-On Time Stamp = Timestamp corresponding to when an event was recorded at one of the module's inputs when the input transitioned from Off to On.

Inx On-Off Time Stamp = Timestamp corresponding to when an event was recorded at one of the module's inputs when the input transitioned from On to Off.

Local Clock Offset = The offset from the local clock to the system time. This value is useful for detecting steps in time. This value will update when a PTP update is received.

Offset Time Stamp = The time when the PTP message was received that caused the Local Clock Offset to update. This value is initially zero and the first timestamp occurs when the module synchronizes with the master clock.

Grandmaster Clock ID = The I. D. number of the Grandmaster clock the module is synchronized to.

Synced to Master = 1 indicates the module is synchronized with a master clock. 0 indicates it is not.

In order to acknowledge receipt of an event the user must transition the corresponding NewDataAck bit from 0 to 1 and set the EventAck to indicate whether to acknowledge the Off-On or On-Off transition for the input. the NewDataAck bits and EventAck are in consumed assembly 139.

Timestamps are zero at power-up and after a timestamp is acknowledged. The time base and epoch of the timestamps are determined by the grandmaster clock of the system.

All data listed in this assembly is in Little Endian format, LSB first, in increasing byte order to MSByte last.

Consumed Assembly Instance 139

CIP Sync								
Consumed Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0-3	Event Ack (32 bit)							
4	NewData Ack 7	NewData Ack 6	NewData Ack 5	NewData Ack 4	NewData Ack 3	NewData Ack 2	NewData Ack 1	NewData Ack 0
5	NewData Ack 15	NewData Ack 14	NewData Ack 13	NewData Ack 12	NewData Ack 11	NewData Ack 10	NewData Ack 9	NewData Ack 8
6	Point To Retrieve							
7	Reserved						Retrieve By Point	Reset Events

Where: EventAck

- Is a 0 or 1 to indicate acknowledging an OnOff or OffOn event respectively, or a 2 to acknowledge both.

NewDataAck

- When transitioned from 0 to 1, acknowledges the corresponding input's timestamp and clears its NewData and EventOV bits in produced instance 118. EventAck determines which OffOn and/or OnOff timestamps are acknowledged by the NewDataAck bits.

PointToRetrieve: Not used

RetrieveByPoint: Not used

Reset Events: When transitioned from 0 to 1, erases all recorded time stamped events.

Configuration Assembly Instance 110

16 Input / Status / CIP Sync								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Reserved							CRN
1	Reserved							
2	Reserved							
3	Reserved							
4	Group 0 Input OFF_ON Delay Filter (Low Byte)							
5	Group 0 Input OFF_ON Delay Filter (High Byte)							
6	Group 0 Input ON_OFF Delay Filter (Low Byte)							
7	Group 0 Input ON_OFF Delay Filter (High Byte)							
8	Enable IN OW 7	Enable IN OW 6	Enable IN OW 5	Enable IN OW 4	Enable IN OW 3	Enable IN OW 2	Enable IN OW 1	Enable IN OW 0
9							Master Sync Enable	Latch Events
10	Capture OffOn 7	Capture OffOn 6	Capture OffOn 5	Capture OffOn 4	Capture OffOn 3	Capture OffOn 2	Capture OffOn 1	Capture OffOn 0
11	Capture OffOn 15	Capture OffOn 14	Capture OffOn 13	Capture OffOn 12	Capture OffOn 11	Capture OffOn 10	Capture OffOn 9	Capture OffOn 8
12	Capture OnOff 7	Capture OnOff 6	Capture OnOff 5	Capture OnOff 4	Capture OnOff 3	Capture OnOff 2	Capture OnOff 1	Capture OnOff 0
13	Capture OnOff 15	Capture OnOff 14	Capture OnOff 13	Capture OnOff 12	Capture OnOff 11	Capture OnOff 10	Capture OnOff 9	Capture OnOff 8

Where

CRN = Configuration Revision Number, Value is 0 after power-on reset and after completely closing the connection. Value is 1 when the module is configured. Once a module is configured, the only way to change its configuration is to close the connections to it or use the override value of 0.

Enable IN OW x = Enable Input Open Wire x
1 = Enable; 0 = Off

LatchEvents: When set, latches events which means that an event will not be overwritten until acknowledged. For example, this means that an input's sequence of events of Off, On, Off, On will cause the first Off to On transition to be recorded, and the final Off to On transition to be ignored. All subsequent transitions on that point will be ignored until acknowledged/reset. If the bit is not set, the new Off to On transition will overwrite the first Off to On transition event immediately, even if the controller has yet to extract that data.

MasterSyncEnable: This is a PTP enable bit which will indicate if the module is expected to sync to a master clock. If not enabled (0), then the module Status Indicator does not flash green if it is not synchronized to a master clock. Disabling the bit does not prevent the module from synchronizing to a master clock.

CaptureOffOn: Enables capturing Off to On events on a per point basis. If cleared, that point will not record Off to On events. This is useful for not reporting events that are not necessary.

CaptureOnOff: Enables capturing On to Off events on a per point basis. If cleared, that point will not record On to Off events. This is useful for not reporting events that are not necessary.

Input Filter values = 0, 1000, 2000, 4000, 8000 or 16000 μs.

Notes:

Connect to Networks via Ethernet Interface

This appendix:

- describes ArmorBlock module and Ethernet communication.
- describes Ethernet network connections and media.
- explains how to establish connections with the ArmorBlock module.
- lists Ethernet configuration parameters and procedures.
- describes configuration for subnet masks and gateways.

ArmorBlock Module and Ethernet Communication

Ethernet is a local area network that provides communication between various devices at 10 or 100 Mbps. The physical communication media options for the ArmorBlock module are:

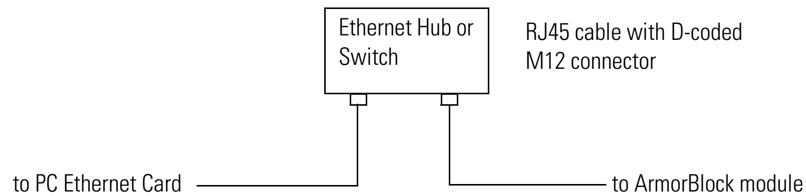
- built-in
  - twisted-pair (10/100Base-T)
- with media converters or hubs
  - fiber optic
  - broadband
  - thick-wire coaxial cable (10Base-5)
  - thin-wire coaxial cable (10Base-2)

See the following page for more information on Ethernet physical media.

ArmorBlock module and PC Connections to the Ethernet Network

The ArmorBlock module utilizes 10 Base-T or 100 Base-TX media. Connections are made directly from the ArmorBlock module to an Ethernet hub or switch. Since the ArmorBlock module incorporates embedded switch technology, it can also be connected to other modules in a Star, Tree, Daisy Chain or Linear, and Ring network topologies. The network setup is simple and cost effective. Typical network topology is pictured below.

Ethernet Network Topology



IMPORTANT The ArmorBlock module contains two 10/100Base-T, M12-D (4-pin) Ethernet connectors which connect to standard Ethernet hubs or switches via RJ-45 (8-pin) twisted-pair straight-through cable. It can also connect to another ArmorBlock module via a four wire twisted pair straight-through or cross-over cable. To access other Ethernet mediums, use 10/100Base-T media converters or Ethernet hubs or switches that can be connected together via fiber, thin-wire, or thick-wire coaxial cables, or any other physical media commercially available with Ethernet hubs or switches.

Connecting to an Ethernet Network

The ArmorBlock module supports the following Ethernet settings:

- 10 Mbps half duplex or full duplex
- 100 Mbps half duplex or full duplex

Mode selection can be automatic, based on the IEEE 802.3 auto negotiation protocol. In most cases, using the auto negotiation function results in proper operation between a switch port and the ArmorBlock module.

With RSLogix5000 programming software version 17 or later, you can manually set the communication rate and duplex mode of an Ethernet port you have connected to the switch port. The settings of the Ethernet port and the switch port must match.

Cables

Shielded and non-shielded twisted-pair 10/100Base-T cables with D-coded M12 connectors are supported. The maximum cable length (without repeaters or fiber) is 100 m (323 ft). However, in an industrial application, cable length should be kept to a minimum.

Ethernet Connections

TCP/IP is the mechanism used to transport Ethernet messages. On top of TCP, the Ethernet/IP protocol is required to establish sessions and to send MSG commands. Connections can be initiated by either a client program (RSLinx application) or a processor.

The client program or processor must first establish a connection to the ArmorBlock module to enable the ArmorBlock module to receive solicited messages from a client program or processor.

In order to exchange I/O data with another device on Ethernet, that device must first originate a connection with the ArmorBlock via TCP/IP. Once an IO connection is established via TCP/IP the IO data is exchanged via UDP/IP.

Duplicate IP address Detection

The ArmorBlock module firmware supports duplicate IP address detection.

When you change the IP address or connect one of the modules to an EtherNet/IP network, the module checks to make sure that the IP address assigned to this device does not match the address of any other network device. The module will periodically check for a duplicate IP address on the network. If the module determines that there is a conflict (another device on the network with a matching IP address), the Network Status Indicator becomes solid red.

To correct this conflict, the IP address of one of the modules will need to changed. If you decide to change the IP address of the ArmorBlock then, assign a unique IP address to the module then cycle power to the module.

If you decide to change the IP address of the other module, remove the device with the incorrect IP address or correct its conflict. To get the ArmorBlock out of conflict mode, cycle power to the module or disconnect its Ethernet cables and reconnect the cables. If you choose to disconnect the Ethernet cables to correct this conflict you will need to disconnect both Ethernet cables from two port Ethernet modules at the same time.

Configure Ethernet Communications on the ArmorBlock module

There are five ways to configure ArmorBlock module Ethernet communications.

- via a DHCP request at module powerup
- manually setting the configuration parameters using RSLogix 5000 software
- manually setting the configuration parameters using RSLinx software
- manually configuring the network settings using the embedded web server

- set the IP address of the module using the modules network address switches. See Connecting to an Ethernet Network on page 90.

The configuration parameters are shown in the Configuration Parameters table, and the configuration procedures follow.

Configuration Parameters

Parameter	Description	Default	Status
Hardware Address	The ArmorBlock module Ethernet hardware address.	Ethernet hardware address	read only
IP Address	The ArmorBlock module internet address (in network byte order). The internet address must be specified to connect to the TCP/IP network.	0 (undefined)	read/write
Subnet Mask	The ArmorBlock module subnet mask (in network byte order). The Subnet Mask is used to interpret IP addresses when the internet is divided into subnets. A Subnet Mask of all zeros indicates that no subnet mask has been configured. In this case, the controller assumes a Subnet Mask of 255.255.255.0.	0 (undefined)	read/write
Gateway Address	The address of a gateway (in network byte order) that provides connection to another IP network. A Gateway Address of all zeros indicates that no gateway has been configured.	0 (undefined)	read/write
Host name	The Host Name is a unique name that identifies a device on a network. It must start with a letter, end with a letter or digit, and have as interior characters only letters, digits or hyphens. Maximum length is 64 characters. It must have an even number of characters.	NULL (undefined)	read/write
Default Domain Name	The default domain name can have the following formats: 'a.b.c', 'a.b' or 'a', where a, b, c must start with a letter, end with a letter or digit, and have as interior characters only letters, digits or hyphens. Maximum length is 48 characters.	NULL (undefined)	read/write
Primary Name Server	This is the IP address of the computer acting as the local Ethernet network Primary Domain Name System (DNS) server.	0 (undefined)	read/write
Secondary Name Server	This is the IP address of the computer acting as the local Ethernet network Secondary Domain Name System (DNS) server.	0 (undefined)	read/write
DHCP Enable	When DHCP is enabled, a DHCP server automatically assigns network related parameters to the ArmorBlock module when it logs into a TCP/IP network. There must be a DHCP server on the network capable of allocating network addresses and configuring parameters to newly attached device. When DHCP is disabled, the ArmorBlock module uses the locally configured network related parameters (IP Address, Subnet Mask, Gateway Address, etc.).	1 (enabled)	read/write
Auto Negotiate and Port Setting	When Auto Negotiate is disabled (unchecked), the Ethernet speed/duplex is forced to either 10 Mbps/Half-duplex, 10 Mbps/Full-duplex, 100 Mbps/Half-duplex, or 100 Mbps/Full-duplex, as selected in the Port Setting field. When Auto Negotiate is enabled (checked), the ArmorBlock module will automatically negotiate the link speed and duplex with the module it is connected to.	Auto Negotiate enabled	read/write

Configure Using RSLogix 5000 Software

Refer to the online documentation provided with your programming software or see Configure the Module for Your EtherNet/IP Network on page 17 and Configure the Module Using RSLogix 5000 on page 27.

Configure Using Web Server

The 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events module includes an embedded web server which allows viewing of module information, TCP/IP configuration, and diagnostic information.

For more information on ArmorBlock module embedded web server capability, refer to Appendix E on page 95.

Notes:

1732E ArmorBlock I/O Embedded Web Server

Introduction

Rockwell Automation offers enhanced 1732E ArmorBlock I/O for your EtherNet/IP control systems so you can monitor data remotely via web pages.

This chapter shows how you can use the 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events module's web server.

Typical Applications

The module provides access to internal and network diagnostics. This access opens up different, remote access applications to control systems. Use the ArmorBlock I/O web browser to remotely access module data. Use a web browser to monitor live module data and access diagnostic information.

Browser Requirements

You can access the 1732E ArmorBlock I/O web pages only with Internet Explorer 6.0 or higher. To access data view pages, the browser requires Javascript support.

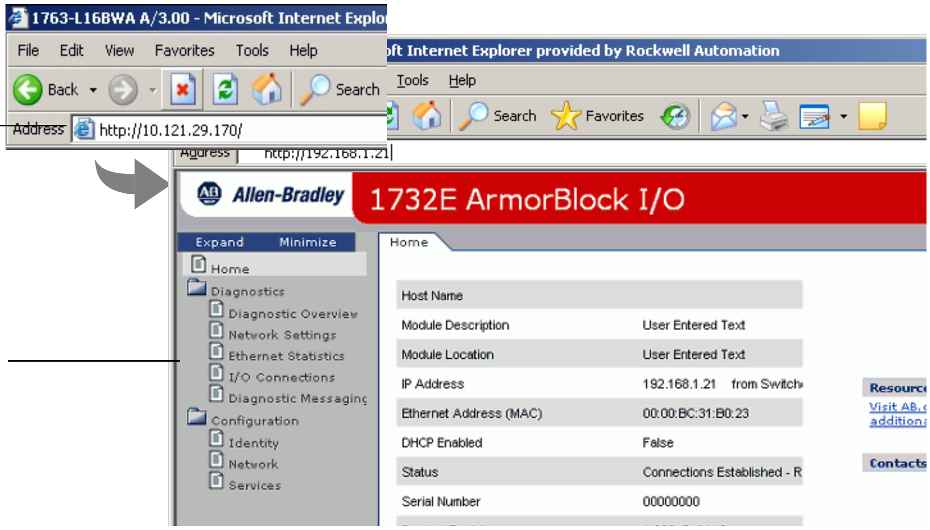
The supported display size is 640 x 480 or greater. Smaller display sizes work but might require extensive scrolling to view the information.

Access the Home Page of the Web Server

From your web browser, enter the IP address of the 1732E ArmorBlock I/O module. The module displays its Home page.

Specify the IP address of the module in the Address window of your web browser.

This is the module's Home page.



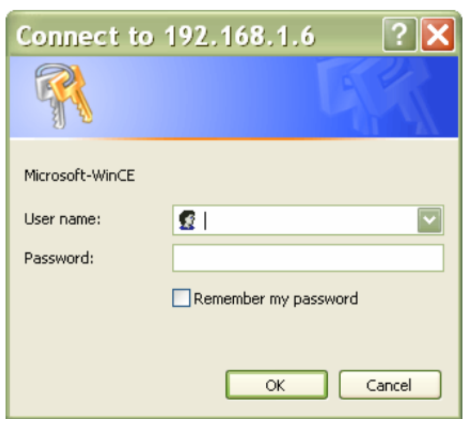
Log Into the Web Server

Many of the features of the 1732E ArmorBlock I/O require you to log in with appropriate access. If you select a feature, such as Configuration, the 1732E ArmorBlock I/O prompts you to enter your user name and password. The user name is Administrator. The default password is blank. Both are case sensitive.

Default Access

User Name: Administrator

Password:



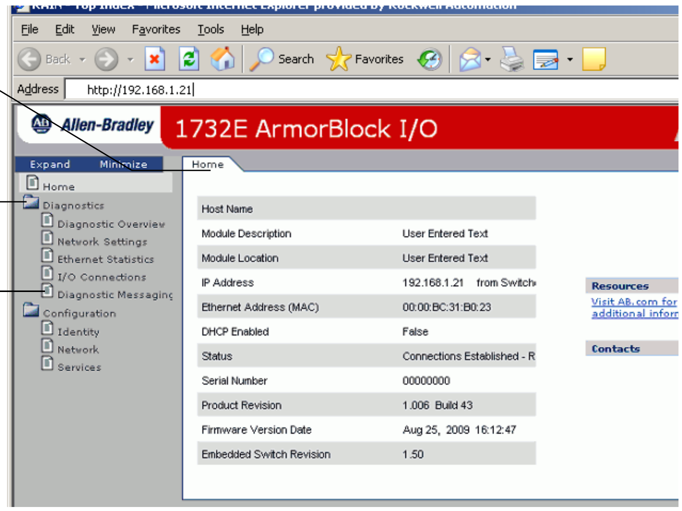
Navigate the 1732E ArmorBlock I/O

You navigate the web server's web pages by using the navigation panel on the left of the screen. There are also tabs across the top you can use to navigate the sections within folders

Tabs across the top match the documents within a folder, as shown in the left navigation panel.

Click folders to open and close additional levels of information.

Click a document to display a web page showing specific information.

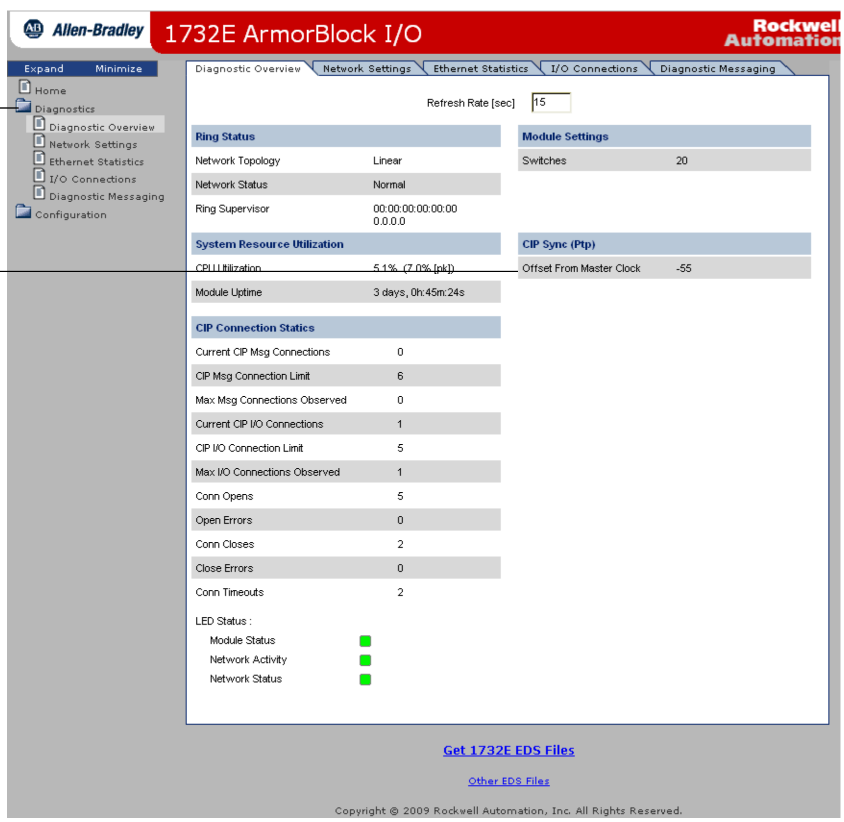


Access Diagnostic Information

You can view 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events specific diagnostic information, such as Offset From Master Clock by clicking Diagnostic Overview on the navigational panel on the left.

Click the Diagnostic folder to expand the navigation, then click the Diagnostic Overview page.

View the amount of deviation between the local clock and its master clock in nanoseconds.



Notes:

The following terms are used throughout this manual. Refer to the *Allen-Bradley Industrial Automation Glossary*, publication AG-7.1, for a complete guide to Allen-Bradley technical terms.

1588

IEEE1588-2008 is a protocol to synchronize independent clocks running on separate nodes of a distributed measurement and control system to a high degree of accuracy and precision. Provides accurate real-time (Real-World Time) or Universal Coordinated Time (UTC) synchronization.

address

A character string that uniquely identifies a memory location. For example, I:1/0 is the memory address for the data located in the Input file location word1, bit 0.

application

1) A machine or process monitored and controlled by a controller.
2) The use of computer- or processor-based routines for specific purposes.

baud rate

The speed of communication between devices. All devices must communicate at the same baud rate on a network.

bit

The smallest storage location in memory that contains either a 1 (ON) or a 0 (OFF).

block diagrams

A schematic drawing.

Boolean operators

Logical operators such as AND, OR, NAND, NOR, NOT, and Exclusive-OR that can be used singularly or in combination to form logic statements or circuits. Can have an output response of T or F.

branch

A parallel logic path within a rung of a ladder program.

CIP

Common Industrial Protocol. The application layer protocol specified for EtherNet/IP, the Ethernet Industrial Protocol, as well as for ControlNet and DeviceNet. It is a message-based protocol that implements a relative path to send a message from the "producing" device in a system to the "consuming" devices.

CIP Sync

CIP Sync is a CIP implementation of the IEEE 1588 PTP protocol in which devices can bridge the PTP time across backplanes and on to other networks via EtherNet/IP ports.

CIP Sync provides accurate real-time (Real-World Time) or Universal Coordinated Time (UTC) synchronization of controllers and devices connected over CIP networks.

communication scan

A part of the controller's operating cycle. Communication with other devices, such as software running on a personal computer, takes place.

controller

A device, such as a programmable controller, used to monitor input devices and control output devices.

controller overhead

An internal portion of the operating cycle used for housekeeping and set-up purposes.

control profile

The means by which a controller determines which outputs turn on under what conditions.

counter

1) An electro-mechanical relay-type device that counts the occurrence of some event. May be pulses developed from operations such as switch closures or interruptions of light beams.
2) In controllers, a software counter eliminates the need for hardware counters. The software counter can be given a preset count value to count up or down whenever the counted event occurs.

CPU

Central Processing Unit. The decision-making and data storage section of a programmable controller.

data table

The part of processor memory that contains I/O values and files where data is monitored, manipulated, and changed for control purposes.

download

Data is transferred from a programming or storage device to another device.

DNS

Domain Name System. A system for converting host names and domain names into IP addresses on the Internet or on local networks that use the TCP/IP protocol.

DTE

Data Terminal Equipment. Equipment that is attached to a network to send or receive data, or both.

EMI

Electromagnetic interference.

encoder

1) A rotary device that transmits position information.
2) A device that transmits a fixed number of pulses for each revolution.

executing mode

Any run or test mode.

false

The status of an instruction that does not provide a continuous logical path on a ladder rung.

FIFO

First-In-First-Out. The order that data is entered into and retrieved from a file.

file

A collection of information organized into one group.

full-duplex

A bidirectional mode of communication where data may be transmitted and received simultaneously (contrast with half-duplex).

Gateway address

The default address of a network or website. It provides a single domain name and point of entry to the site.

half-duplex

A communication link in which data transmission is limited to one direction at a time.

hard disk

A storage area in a personal computer that may be used to save processor files and reports for future use.

high byte

Bits 8...15 of a word.

IANA

Internet Assigned Numbers Authority. An division of the Internet Corporation for Assigned Names and Numbers (ICANN) that maintains top-level domain, IP address and protocol number databases.

input device

A device, such as a push button or a switch, that supplies signals to the input circuits of the controller.

inrush current

The temporary surge current produced when a device or circuit is initially energized.

instruction

A mnemonic and data address defining an operation to be performed by the processor. A rung in a program consists of a set of input and output instructions. The input instructions are evaluated by the controller as being true or false. In turn, the controller sets the output instructions to true or false.

instruction set

The set of general purpose instructions available with a given controller.

IP address

An Internet Protocol address is the logical network address of a network module. This IP address uniquely identifies devices on a TCP/IP network.

I/O

Inputs and Outputs. Consists of input and output devices that provide and/or receive data from the controller.

jump

Change in normal sequence of program execution, by executing an instruction that alters the program counter (sometimes called a branch). In ladder programs a JUMP (JMP) instruction causes execution to jump to a labeled rung.

ladder logic

A program written in a format resembling a ladder-like diagram. The program is used by a programmable controller to control devices.

LSB

Least significant bit. The digit (or bit) in a binary word (code) that carries the smallest value of weight.

LED

Light Emitting Diode. Used as status indicator for processor functions and inputs and outputs.

LIFO

Last-In-Last-Out. The order that data is entered into and retrieved from a file.

low byte

Bits 0...7 of a word.

logic

A process of solving complex problems through the repeated use of simple functions that can be either true or false. General term for digital circuits and programmed instructions to perform required decision making and computational functions.

M12

Metric size 12 mm circular sealed connector, also called Micro connector.

MCR

Master Control Relay. A mandatory hard-wired relay that can be de-energized by any series-connected emergency stop switch. Whenever the MCR is de-energized, its contacts open to de-energize all application I/O devices.

MCU

Microcontroller. Microcontroller, an embedded microcomputer which handles most module functionality.

Mini

A family of sealed 7/8 inch connectors. Larger than the Micro style connector, the contacts are rated for 7...12 A and 600V.

mnemonic

A simple and easy to remember term that is used to represent a complex or lengthy set of information.

modem

Modulator/demodulator. Equipment that connects data terminal equipment to a communication line.

modes

Selected methods of operation. Example: run, test, or program.

module tags

Information about the I/O module. Tags may consist of several items, each defining some aspect of the module.

negative logic

The use of binary logic in such a way that “0” represents the voltage level normally associated with logic 1 (for example, 0 = +5V, 1 = 0V). Positive is more conventional (for example, 1 = +5V, 0 = 0V).

network

A series of stations (nodes) connected by some type of communication medium. A network may be made up of a single link or multiple links.

nominal input current

The current at nominal input voltage.

normally closed

Contacts on a relay or switch that are closed when the relay is de-energized or the switch is deactivated; they are open when the relay is energized or the switch is activated. In ladder programming, a symbol that allows logic continuity (flow) if the referenced input is logic “0” when evaluated.

normally open

Contacts on a relay or switch that are open when the relay is de-energized or the switch is deactivated. (They are closed when the relay is energized or the switch is activated.) In ladder programming, a symbol that allows logic continuity (flow) if the referenced input is logic “1” when evaluated.

off-delay time

The OFF delay time is a measure of the time required for the controller logic to recognize that a signal has been removed from the input terminal of the controller. The time is determined by circuit component delays and by any filter adjustment applied.

offline

Describes devices not under direct communication.

offset

The steady-state deviation of a controlled variable from a fixed point.

off-state leakage current

When an ideal mechanical switch is opened (off-state) no current flows through the switch. Practical semiconductor switches, and the transient suppression components which are sometimes used to protect switches, allow a small current to flow when the switch is in the off state. This current is referred to as the off-state leakage current. To ensure reliable operation, the off-state leakage current rating of a switch should be less than the minimum operating current rating of the load that is connected to the switch.

on-delay time

The ON delay time is a measure of the time required for the controller logic to recognize that a signal has been presented at the input terminal of the controller.

one-shot

A programming technique that sets a bit for only one program scan.

online

Describes devices under direct communication. For example, when RSLogix 5000 is monitoring the program file in a controller.

operating voltage

For inputs, the voltage range needed for the input to be in the On state. For outputs, the allowable range of user-supplied voltage.

output device

A device, such as a pilot light or a motor starter coil, that is controlled by the controller.

PTP

Precision Time Protocol. A IEEE-1588 protocol to synchronize independent clocks running on separate nodes of a distributed measurement and control system to a high degree of accuracy and precision.

processor

A Central Processing Unit. See CPU.

processor file

The set of program and data files used by the controller to control output devices. Only one processor file may be stored in the controller at a time.

program file

The area within a processor file that contains the ladder logic program.

program mode

When the controller is not executing the processor file and all outputs are de-energized.

program scan

A part of the controller's operating cycle. During the scan the ladder program is executed and the output data file is updated based on the program and the input data file.

programming device

Executable programming package used to develop ladder diagrams.

protocol

The packaging of information that is transmitted across a network.

read

To acquire data from a storage place. For example, the processor READs information from the input data file to solve the ladder program.

relay

An electrically operated device that mechanically switches electrical circuits.

relay logic

A representation of the program or other logic in a form normally used for relays.

RPI

Requested Packet Interval. The update rate specified for a particular piece of data on the network. This value specifies how often to produce the data for that device.

restore

To download (transfer) a program from a personal computer to a controller.

reserved bit

A status file location that the user should not read or write to.

RoHS

Restriction of Hazardous Substances in Electrical and Electronic Equipment. European Community (EC) Directive on Restriction of Hazardous Substances in Electrical and Electronic Equipment. Complementary to the WEEE Directive, this seeks to reduce environmental impact by restricting the use of hazardous substances (lead, mercury, cadmium, hexavalent chromium and brominated flame retardants PBB and PBDE).

retentive data

Information associated with data files (timers, counters, inputs, and outputs) in a program that is preserved through power cycles.

run mode

This is an executing mode during which the controller scans or executes the ladder program, monitors input devices, energizes output devices, and acts on enabled I/O forces.

rung

Ladder logic is comprised of a set of rungs. A rung contains input and output instructions. During Run mode, the inputs on a rung are evaluated to be true or false. If a path of true logic exists, the outputs are made true. If all paths are false, the outputs are made false.

save

To upload (transfer) a program stored in memory from a controller to a personal computer; OR to save a program to a computer hard disk.

scan time

The time required for the controller to execute the instructions in the program. The scan time may vary depending on the instructions and each instruction's status during the scan.

Sealed

Protected from the environment; IEC and NEMA publications define the degree of protection. International Protection (IP) ratings are two digits the first of which define protection against solids. These products will be rated "6" which is totally protected against dust. The second digit defines protection against liquids. These products will be rated "5", "6" and "7" which is protection against water spray and immersion up to 1 meter. NEMA ratings concern environmental conditions such as corrosion, rust, oil and coolants. These products will be rated NEMA "4X Indoor".

SSV

Sensor source voltage. The voltage output on I/O connectors in order to power attached sensors. SSV in this document should not be confused with the Logix SSV instruction, used to Set System Value.

SOE

Sequence of Events. Any event that needs to be compared against a second event.

sinking

A term used to describe current flow between an I/O device and controller I/O circuit — typically, a sinking device or circuit provides a path to ground, low, or negative side of power supply.

sourcing

A term used to describe current flow between an I/O device and controller I/O circuit — typically, a sourcing device or circuit provides a path to the source, high, or positive side of power supply.

status

The condition of a circuit or system, represented as logic 0 (OFF) or 1 (ON).

Subnet Mask

The method for splitting Internet protocol (IP) networks into a series of subgroups, or subnets.

terminal

A point on an I/O module that external I/O devices, such as a push button or pilot light, are wired to.

timestamping

Timestamping is a feature that registers a time reference to a change in input state.

throughput

The time between when an input turns on and the corresponding output turns on.

true

The status of an instruction that provides a continuous logical path on a ladder rung.

upload

Data is transferred to a programming or storage device from another device.

WEEE

Waste Electrical and Electronic Equipment. European Community (EC) Directive on Waste Electrical and Electronic Equipment. The purpose of the Directive is to reduce waste arising from electronic equipment, improve recycling and minimize impact on the environment. Manufacturers will be responsible for taking back and recycling equipment.

watchdog timer

A timer that monitors a cyclical process and is cleared at the conclusion of each cycle. If the watchdog runs past its programmed time period, it causes a fault.

workspace

The main storage available for programs and data and allocated for working storage.

write

To copy data to a storage device. For example, the processor WRITEs the information from the output data file to the output modules.

D

N

S

T

U

Notes:

How Are We Doing?

Your comments on our technical publications will help us serve you better in the future.
Thank you for taking the time to provide us feedback.

You can complete this form and mail (or fax) it back to us or email us at
RADocumentComments@ra.rockwell.com.

Pub. Title/Type 1732E EtherNet/IP ArmorBlock Supporting Sequence of Events

Cat. No. *1732E-IB16M12SOEDR* Pub. No. 1732E-UM002A-EN-P Pub. Date March 2010 Part No.

Please complete the sections below. Where applicable, rank the feature (1=needs improvement, 2=satisfactory, and 3=outstanding).

Overall Usefulness	1 2 3	How can we make this publication more useful for you?
Completeness (all necessary information is provided)	1 2 3	Can we add more information to help you? procedure/step illustration feature example guideline other explanation definition
Technical Accuracy (all provided information is correct)	1 2 3	Can we be more accurate? text illustration
Clarity (all provided information is easy to understand)	1 2 3	How can we make things clearer?
Other Comments		You can add additional comments on the back of this form.

Your Name

Your Title/Function

Location/Phone

Would you like us to contact you regarding your comments?

___No, there is no need to contact me

___Yes, please call me

___Yes, please email me at ____________________

___Yes, please contact me via ____________________

Return this form to: Rockwell Automation Technical Communications, 1 Allen-Bradley Dr., Mayfield Hts., OH 44124-9705

Fax: 440-646-3525 Email: RADocumentComments@ra.rockwell.com

PLEASE FASTEN HERE (DO NOT STAPLE)

Other Comments

PLEASE FOLD HERE

PLEASE REMOVE

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 18235 CLEVELAND OH

POSTAGE WILL BE PAID BY THE ADDRESSEE

Rockwell Automation

1 ALLEN-BRADLEY DR
MAYFIELD HEIGHTS OH 44124-9705

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running.

United States	1.440.646.3434 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning, it may need to be returned.

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication 1732E-UM002A-EN-P - March 2010