PointMax Digital I/O Modules

5034-IB16, 5034-IB16XT, 5034-IB8, 5034-IB8XT, 5034-OB16, 5034-OB16XT, 5034-OB8, 5034-OB8XT, 5034-OW4I, 5034-OW4IXT, 5034-IB8S, 5034-IB8SXT, 5034-OB8S, 5034-OB8SXT

Allen-Bradley
by ROCKWELL AUTOMATION

User Manual

Original Instructions

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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.

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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.

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.

IMPORTANT: Identifies information that is critical for successful application and understanding of the product.

These labels may also be on or inside the equipment to provide specific precautions.

SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

The following icon may appear in the text of this document.

Identifies information that is useful and can help to make a process easier to do or easier to understand.

Rockwell Automation recognizes that some of the terms that are currently used in our industry and in this publication are not in alignment with the movement toward inclusive language in technology. We are proactively collaborating with industry peers to find alternatives to such terms and making changes to our products and content. Please excuse the use of such terms in our content while we implement these changes.

Preface

About This Publication

This manual describes how to use PointMax™ digital standard and safety I/O modules in Logix 5000® control systems.

Make sure that you are familiar with the following:

- Use of a controller in a Logix 5000 control system
- Use of an EtherNet/IP™ network
- Use of safety systems
- Studio 5000 Logix Designer® environment

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at rok.auto/literature.

Table 1. Additional Resources

Resources	Description
PointMax I/O System Specifications Technical Data, publication 5034-TD001	Provides PointMax I/O system specifications.
PointMax I/O System Installation Instructions, publication 5034-IN001	Provides instructions on installing a complete PointMax I/O system.
PointMax EtherNet/IP Adapter User Manual, publication 5034-UM001	Provides information on how to configure and operate PointMax EtherNet/IP adapters.
PointMax Analog I/O Modules User Manual, publication 5034-UM003	Provides information on how to configure and operate PointMax analog I/O modules.
PointMax IO-Link Master Module User Manual, publication 5034-UM004	Provides information on how to configure and operate PointMax IO-Link master modules.
EtherNet/IP Network Devices User Manual, publication ENET-UM006	Describes how to configure and use EtherNet/IP devices to communicate on the EtherNet/IP network.
Ethernet Reference Manual, publication ENET-RM002	Describes basic Ethernet concepts, infrastructure components, and infrastructure features.
System Security Design Guidelines Reference Manual, publication SECURE-RM001	Provides guidance on how to conduct security assessments, implement Rockwell Automation® products in a secure system, harden the control system, manage user access, and dispose of equipment.
Safety Guidelines for the Application, Installation, and Maintenance of Solid-state Control, publication SGI-1.1	Designed to harmonize with NEMA Standards Publication No. ICS 1.1-1987 and provides general guidelines for the application, installation, and maintenance of solid-state control in the form of individual devices or packaged assemblies incorporating solid-state components.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Selection and Configuration tools website, rok.auto/systemtools	Helps configure complete, valid catalog numbers and build complete quotes based on detailed product information.
Product Certifications website, rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

Download Firmware, AOP, EDS, and Other Files

You can download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center at rok.auto/pcdc.

Terminology

This table defines the terms that are used in this publication.

Table 2. Terminology

Acronym	Full Term	Definition
BP	Backplane Power	Power that is generated from module power by the adapter and expansion power, and supplied to the I/O system through the backplane.
CIP™	Common Industrial Protocol	An industrial communication protocol that is used by Logix 5000 based automation systems on EtherNet/IP, ControlNet®, and DeviceNet® communication networks.
CIP Sync™	Common Industrial Protocol Synchronization	CIP Sync provides the increased control coordination needed for control applications where absolute time synchronization is vital to achieve real-time synchronization between distributed intelligent devices and systems.
MB	Mounting Base	A device that provides data and power connections from the backplane to the installed module.
MP	Module Power	Power that is supplied to the adapter and expansion power.
ODVA	Open DeviceNet Vendor Association	A nonprofit association of vendors that are established for the promotion of CIP networks.
PL	Performance Level	ISO 13849-1 safety rating
RPI	Requested Packet Interval	Time interval (usually in milliseconds) that users are requesting their data be exchanged at
RTB	Removable Terminal Block	A component that is used for wiring field devices to.
SA	Sensor Actuator	A term that is used to describe field-side devices.
SELV	Safety Extra Low Voltage	An electrical system where the voltage level is considered safe under normal or fault conditions, as defined in the EN and IEC standards.
SIL	Safety Integrity Level	A relative level of risk reduction that is provided by a safety function, or to specify a target level of risk reduction.
SRT	Safety Reaction Time	The input reaction time is the time from when the signal changes on an input terminal to when safety data is sent to the safety controller. The output reaction time is the time from when safety data is received from the safety controller to when the output terminal changes state.
XT	Harsh Environment	These modules have additional conformal coating and design considerations that add a greater degree of protection when exposed to harsh, corrosive environments.

Digital I/O Modules

This chapter describes the digital I/O module types and features that are common between input and output modules, and how to construct a PointMax I/O system.

I/O Type	Catalog Number	Description
Standard input modules	5034-IB16, 5034-IB16XT	16-point sinking standard input module
	5034-IB8, 5034-IB8XT	8-point sinking standard input module
Standard output modules	5034-OB16, 5034-OB16XT	16-point sourcing standard output module
	5034-OB8, 5034-OB8XT	8-point sourcing standard output module
	5034-OW4I, 5034-OW4IXT	4-point relay isolated high current standard output module
Safety input module	5034-IB8S, 5034-IB8SXT	8-point sinking safety input module
Safety output module	5034-OB8S, 5034-OB8SXT	8-point sourcing safety output module

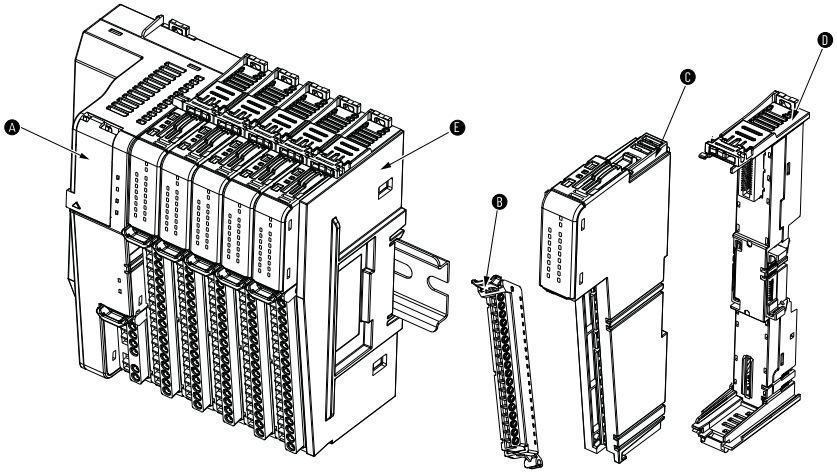
All digital I/O modules support removal and insertion under power (RIUP). You must remove the RTB first and then the I/O modules.

For technical and environmental specifications details, see PointMax I/O System Specifications Technical Data, publication 5034-TD001.

Construct a PointMax I/O System

The PointMax I/O system contains the components pictured below.

Figure 1. PointMax I/O System



Item	Component Name	Description
A	Adapter	The adapter transfers data between the I/O module and the controller.
B	Removable Terminal Block (RTB)	The RTB contain terminals to terminate wiring for field devices. Also it has interfaces to establish the connection between the RTB and the I/O module.
C	I/O module	The I/O module contains the SA or field power interface and circuitry needed to perform specific functions related to your application.

Item	Component Name	Description
D	Mounting Base (MB)	The MB contains mechanical and electrical interfaces to establish the connection between I/O module and the backplane.
E	End cap	It is a dust protection cap for the last module in a rack.

For PointMax I/O system power requirements, see PointMax I/O System Installation Instructions, publication 5034-IN001.

IMPORTANT: Confirm that SA power is connected for proper operation of safety I/O modules.

Secure Access to the System

To secure access to the device by authorized users only, consider these options:

- Use passwords to help protect the source and execution of the control program.
- Remove the key from the controller.
- Implement physical barriers, such as locked cabinets.

To secure access to the system, consider these options:

- Follow industry best practices to harden your personal computers and servers, including anti-virus/anti-malware and application allow-list solutions.

  The recommendations are published at the Rockwell Automation technical support center in Knowledgebase Technote Rockwell Automation Customer Hardening Guidelines.
- Develop and deploy backup and disaster recovery policies and procedures. Test backups on a regular schedule.
- Minimize network exposure for all control system devices and systems, and confirm that they are not accessible from the Internet.
- Locate control system networks and devices behind firewalls and isolate them from the business network.
- Subscribe to the Knowledgebase Technote Security Advisory Index, so you have access to information about security matters that affect Rockwell Automation products.

Follow recommended network practices for products with network interfaces, such as communication ports or web servers. These practices help minimize risk or exposure by unauthorized activity or users. For more information, see:

- Converged Plantwide Ethernet (CPwE) Design and Implementation Guide, publication ENET-TD001
- Ethernet/IP Network Devices User Manual, publication ENET-UM006
- Configure System Security Features User Manual, publication SECURE-UM001

PointMax I/O in a Logix 5000 Control System

IMPORTANT: Throughout this publication, the term Logix 5000 controller refers to the controllers with which you can use PointMax I/O modules in a given capacity. You can use PointMax I/O modules with Logix 5000 controllers as remote I/O modules only. You cannot use PointMax I/O modules with all Logix 5000 controllers. For example, you can use PointMax I/O modules with CompactLogix® 5380 and ControlLogix® 5580 controllers but not with CompactLogix 5370 and ControlLogix 5570 controllers.

Logix 5000 controllers use I/O modules to control devices in a control system. The controllers access the modules over an EtherNet/IP network.

See Connections for Standard I/O Modules on page 22 and Connections for Safety I/O Modules on page 25 for the communication model between controller and I/O modules.

Controller and Software Compatibility

Controller and programming software compatibility requirements apply when you use PointMax digital I/O modules. A module type and how it is used affect which requirements apply.

You must use Studio 5000 Logix Designer application version 36 or later. For more information, see the Product Compatibility and Download Center at rok.auto/pcdc.

If you use GuardLogix® controllers and need to use up to chassis slot 32, you must use Studio 5000 Logix Designer application version 37 or later.

Module Firmware Updates

I/O modules are manufactured with module firmware installed. If updated module firmware revisions are available in the future, you can update the firmware.

Firmware information for I/O modules is available at the Rockwell Automation Product Compatibility and Download Center (PCDC). The PCDC is available at: rok.auto/pcdc. At the PCDC, you can use the module catalog number to check for firmware updates. If the catalog number is not available, then no updates exist.

IMPORTANT: Only download firmware and access product release notes from the Rockwell Automation PCDC. Do not download firmware from non-Rockwell Automation sites.

Verify that the firmware revision of the I/O modules that you use is correct before commissioning the system. For more information on how to update your module firmware, see the ControlFLASH Plus Quick Start Guide, publication CFP-QS001.

When the firmware update is in progress, you cannot peform the following operations:

- Another firmware update request
- Module connection request
- Module reset request

WARNING: When you update the PointMax EtherNet/IP adapter, the I/O modules in its chassis may reset and be unable to maintain their Program Mode or Inhibit states. Verify that all equipment controlled by the modules in this chassis are in a stopped state and that all safety critical functions are not affected.

Input Modules

Digital input modules interface to sensing devices and detect whether they are On or Off.

Digital input modules convert DC On/Off signals from user devices to appropriate logic level for use within the processor. Typical input devices include the following:

- Proximity switches
- Limit switches
- Selector switches
- Float switches
- Push button switches

When you design systems with digital input modules, consider these factors:

- Voltage necessary for your application
- Current leakage
- Whether your application uses sinking or sourcing wiring

Feature Comparison

Table 3. Input Module Feature Comparison

Feature	5034-IB16, 5034-IB16XT, 5034-IB8, 5034-IB8XT	5034-IB8S, 5034-IB8SXT
Requested Packet Interval	✓	✓
Module Inhibiting	✓	✓
Electronic Keying	✓	✓
Protected Operations	✓	✓
Module Data Quality Reporting	✓	✓
Software Configurable Input Filters or Delays	✓	✓
Simple Counter Mode	✓	
Input Timestamping	✓	
Test Output with Safety Inputs		✓
Muting Lamp Operation		✓
Field Power Loss Detection	✓	✓
Overload Protection		✓

Output Modules

Digital output modules can be used to drive various output devices. Typical output devices compatible with digital output modules include these items:

- Motor starters
- Solenoids
- Indicators

When designing a system, make sure that the digital output modules can supply the necessary surge and continuous current for proper operation.

When you size output loads, see the documentation supplied with the output device for the surge and continuous current necessary to operate the device.

Feature Comparison

Table 4. Output Module Feature Comparison

Feature	5034-OB16, 5034-OB16XT, 5034-OB8, 5034-OB8XT	5034-OW4I, 5034-OW4IXT	5034-OB8S, 5034-OB8SXT
Requested Packet Interval	✓	✓	✓
Module Inhibiting	✓	✓	✓
Electronic Keying	✓	✓	✓
Protected Operations	✓	✓	✓
Module Data Quality Reporting	✓	✓	✓
Connection Fault Handling	✓	✓	✓

Table 4. Output Module Feature Comparison (continued)

Feature	5034-OB16, 5034-OB16XT, 5034-OB8, 5034-OB8XT	5034-OW4I, 5034-OW4IXT	5034-OB8S, 5034-OB8SXT
Data Echo	✓	✓	
Data Readback			✓
Time-scheduled Output Control	✓		
Safety and Safety Pulse Test Mode			✓
Field Power Loss Detection	✓	✓	✓
No Load Detection	✓		✓
Short Circuit Detection	✓		
Overload Protection			✓
Isolated Relay Output		✓	

Ownership

Every I/O module in a Logix 5000 control system must be owned by a controller, also known as the owner-controller. When the PointMax I/O modules are used in a Logix 5000 control system, the owner-controller performs the following:

- Stores configuration data for every module that it owns.
- Sends the I/O module configuration data to define module behavior and begin operation in the control system.

Each PointMax I/O module must continuously maintain communication with its owner-controller during normal operation.

When the owner-controller establishes I/O connection to the module, it sends the configuration data of the module. Two possible results are:

- If the configuration is appropriate to the module, a connection is established and operation begins.
- If the configuration is not appropriate to the module, the data is rejected and the Connection view in the Module Properties indicates that an error occurred. The configuration can be inappropriate for many reasons. For example, a mismatch in electronic keying that helps prevent operation on incompatible module.

Multiple Owners of Digital Input Modules

This section applies to standard digital input modules only.

While typically only one owner-controller is connected to an input module, multiple Logix 5000 controllers can own digital input modules as owner-controllers. In this case, the following conditions must exist:

- The controllers maintain the same configuration.
- The configuration in each controller uses a Data connection to the input module without output data.
- The first controller to make a connection to the input module is the only controller that can change the configuration. Therefore, it 'owns' the module configuration.

IMPORTANT: If the controller that owns the module configuration changes the configuration, the other controllers are not notified of any changes. See Configuration Changes in an Input Module with Multiple Owners on page 16 for more information.

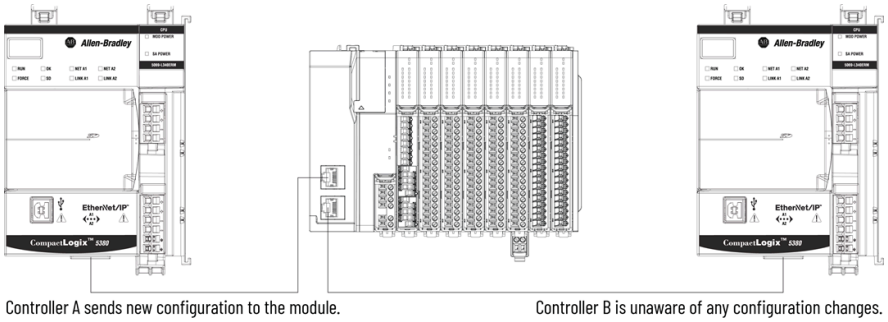
- The controllers that do maintain but do not 'own' the module configuration are similar to Listen-only controllers. The difference between the controllers is that the controllers that maintain but do not own the module configuration can use a Multicast or Unicast connection over the EtherNet/IP network.

Configuration Changes in an Input Module with Multiple Owners

This section applies to standard digital input modules only.

You must be careful when changing the configuration data of an input module in a multiple owner scenario. If the configuration data is changed in owner A and sent to the module, that configuration data is accepted as the new configuration for the module. Owner B continues to listen unaware that any changes have been made in the behavior of the input module, as illustrated.

Figure 2. Module Configuration Changes with Multiple Owners



IMPORTANT: A message in Studio 5000 Logix Designer alerts you to the possibility of a multiple owner-controller situation and lets you inhibit the connection before changing the module configuration. When changing the configuration for a module with multiple owners, you should inhibit the connection.

To prevent other owner-controllers from receiving potentially erroneous data, use these steps when changing the configuration of a module in a multiple owner scenario while online.

1. For each owner-controller, inhibit the connection to the module either in the software on the Connection tab or the message dialog box warning you of the multiple owner condition.
2. Make the appropriate configuration data changes in the software.
3. Repeat step 1 and step 2 for all owner-controllers, making the exact same changes in each.
4. Clear the Inhibit checkbox in each owner-controller configuration.

Requested Packet Interval

Requested Packet Interval (RPI) is a configurable parameter that defines a specific rate at which data is exchanged between the controller and the module.

You set the RPI value during initial module configuration and can adjust it as necessary after module operation has begun.

IMPORTANT: If you change the RPI while the project is online, the connection to the module is closed and reopened in one of the following ways:

- You inhibit the connection to the module, change the RPI value, and uninhibit the connection.
- You change the RPI value. In this case, the connection is closed and reopened immediately after you apply the change to the module configuration.

Connection Optimization

PointMax I/O system supports automatic optimization for I/O connections.

The following conditions must be met for connections to be included in the optimization:

- I/O modules on the rack have the same RPI
- Unicast
- Sum of data sizes are within the packet limit

This is similar to how I/O systems such as POINT I/O™ support rack optimization or enhanced rack optimization. Functional safety modules, HART modules, and IO-Link master modules are excluded from the optimization.

Listen Only Mode

This section applies to standard digital I/O modules only.

Any controller in the system can listen to the data from an I/O module. An owner-controller, as described in Ownership on page 15 exchanges data with I/O modules. Other controllers can use a Listen Only connection with the I/O module. In this case, the 'listening' controller can only listen to the data produced by the module. The listening controller does not own the module configuration or exchange other data with the module.

During the I/O configuration process, you can specify a Listen Only connection.

IMPORTANT:

Remember the following:

- If a controller uses a Listen Only connection, the connection must use the Multicast option. In this case, all other connections to the module, for example, the connection of the owner-controller, must also use the Multicast option. The Listen Only connection RPI value must be the same as owner connection RPI value.
- If a controller attempts to use a Listen Only connection to a module but the owner-controller connection uses the Unicast option, the attempt at a Listen Only connection fails. The Listen Only controller receives data from the module as long as a connection between an owner-controller and module is maintained.
- If the connection between an owner-controller and the module is broken, the module stops sending data and connections to all 'listening controllers' are also broken.
- Due to Multicast, adding a Listen Only connection does not increase network bandwidth.
- Only one controller can own the I/O module. The PointMax I/O modules do not support multiple owners of the same module. Other controllers must use a Listen Only connection to the module.

Module Inhibiting

Module inhibiting lets you indefinitely suspend a connection, including Listen Only connections, between a controller and a module without removing the module from the configuration. This process lets you temporarily stop the connection between the controller and the module.

IMPORTANT: Whenever you inhibit a module with outputs, all outputs change to the state that is configured for Program Mode (Standard modules only).

IMPORTANT: You cannot inhibit a connection when the safety controller is safety-locked or a safety signature exists for the controller.

You can use module inhibiting in the following ways:

- You want to perform maintenance on the module.
- You want to update a module, for example, update the module firmware revision.
- You use a program that includes a module that you do not physically possess yet. You do not want the controller to look for a module that does not yet exist. In this case, you can inhibit the module in your program until it physically resides in the system.

Use the following procedure to inhibit and uninhibit the module:

1. Inhibit the module – Go to Connection view in the Module Properties dialog, select Inhibit Module and then select Apply or OK.
2. Perform the necessary update.
3. Uninhibit the module – Go to Connection view in the Module Properties dialog, clear Inhibit Module and then select Apply or OK.

Electronic Keying

Electronic Keying reduces the possibility that you use the wrong device in a control system. It compares the device that is defined in your project to the installed device. If keying fails, a fault occurs. These attributes are compared.

Attribute	Description
Vendor	The device manufacturer.
Device Type	The general type of the product, for example, an I/O module.
Product Code	The specific type of the product. The Product Code maps to a catalog number.
Major Revision	A number that represents the functional capabilities of a device.
Minor Revision	A number that represents behavior changes in the device.

Table 5. Electronic Keying Options

Keying Option	Description
Compatible Module	Lets the installed device accept the key of the device that is defined in the project when the installed device can emulate the defined device. With Compatible Module, you can typically replace a device with another device that has the following characteristics: • Same or compatible catalog number • Same or higher Major Revision • Minor Revision as follows: ◦ If the Major Revision is the same, the Minor Revision must be the same or higher. ◦ If the Major Revision is higher, the Minor Revision can be any number. • You can use an XT version of the module in place of a non-XT module or non-XT version of the module in place of XT module.

Table 5. Electronic Keying Options (continued)

Keying Option	Description
Disable Keying	Indicates that the keying attributes are not considered when attempting to communicate with a device. With Disable Keying, communication can occur with a device other than the type specified in the project. **ATTENTION:** Be cautious when using Disable Keying; if used incorrectly, this option can lead to personal injury or death, property damage, or economic loss. We strongly suggest that you do not use Disable Keying. If you use Disable Keying, you must take full responsibility for understanding whether the device being used can fulfill the functional requirements of the application.
Exact Match	Indicates that all keying attributes must match to establish communication. If any attribute does not match precisely, communication with the device does not occur. When XT module is configured in Studio 5000 Logix Designer application project, only XT Module residing on XT MB is considered as Exact Match. When non-XT module is configured, only non-XT module (with any MB) is considered as exact match.

Carefully consider the implications of each keying option when selecting one.

IMPORTANT: Changing Electronic Keying parameters online interrupts connections to the device and any devices that are connected through the device. Connections from other controllers can also be broken. If an I/O connection to a device is interrupted, the result can be a loss of data.

For more detailed information on Electronic Keying, see Electronic Keying in Logix 5000 Control Systems Application Technique, publication LOGIX-AT001.

Protected Operations

To maintain the secure operation of your I/O module, operations that can disrupt module operation are restricted based on the module operating mode.

In Protection Mode, the device deactivates services that could disrupt the operation of the device, but the device continues to function. For example, configuration operations or firmware updates are disabled to not impact the operation of the device.

The module enters Implicit Protection Mode as soon as an I/O connection is established to the module. The module exits Implicit Protection Mode as soon as all I/O connections to the module are stopped.

When the device is in Implicit Protection Mode, the mode prevents the following actions:

- Firmware update request
- Module reset request
- Connection or data format change

The following operations can be applied in Studio 5000 Logix Designer application when the modules are in Protection Mode, but as a consequence, the I/O connections are closed and reopened:

- Change Electronic Keying
- Change RPI
- Change Unicast/Multicast

The following operations are allowed when the modules are in Protection Mode:

- Listen-only connection requests from other controllers
- I/O channel configuration change. To apply configuration change without interrupting the I/O connections, there are two methods:
  - Change configurations and apply the changes in the Module Properties dialog.
  - Change configuration tag values and send a Reconfigure Module MSG to the module to apply the changes.

Unicast or Multicast Connection

During module configuration, you must configure the Connection over EtherNet/IP parameter. The configuration choice dictates how input data is broadcast over the network.

The PointMax I/O modules use one of the following methods to broadcast data:

- Multicast - Multicast connections deliver information from one sender to multiple receivers simultaneously. Copies of one transmission are passed to a selected subset of possible destinations.
- Unicast - Unicast connections are point-to-point transmissions between a source node and destination node on the network. A transmission is sent to one destination controller.

IMPORTANT: Unicast is the default setting. Use Unicast because it reduces network bandwidth usage. However, if you are using a ControlLogix 5580 controller in a high availability system, you must use Multicast.

CIP Sync Time

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

These modules are CIP Sync slave-only devices. There must be another module on the network that functions as a master clock. For more information on how to use CIP Sync technology, see the Integrated Architecture and CIP Sync Configuration Application Technique, publication IA-AT003.

I/O modules can be used to capture timestamps. The advantage is that CIP Sync is system-wide, so timestamp values are consistent across all modules in the system.

IMPORTANT: *I.CIPSyncValid* = 1 is not sufficient for an application to confirm that the module is ready for application requiring a system time synchronization to start operation. See Grandmaster Clock Verification on page 20 for extra verification needed.

Grandmaster Clock Verification

The application must verify that the module is synchronized with the same Grandmaster Clock as the owner-controller.

- If Status connection is selected in the PointMax EtherNet/IP adapter Device Definition, verify that all of the following are true:
  - I/O module's *I.CipSyncValid* is 1
  - Adapter's *S.CipSyncValid* is 1
  - Adapter's *S.GrandmasterClockID* is the same as the controller's *GrandMasterClockID*

- If Status connection is not selected in the PointMax EtherNet/IP adapter Device Definition, verify that all of the followings are true:
  - I/O module's *I.CipSyncValid* is 1
  - I/O module's *GrandmasterClockID* in GrandMasterClockInfo attribute of TimeSync object is the same as the controller's *GrandmasterClockID*
- Class: 0x43
- Instance: 0x01
- Attribute: 0x08
- Response: GrandMasterClockInfo (see structure below)

GrandMasterClockInfo	**STRUCT of**
ClockIdentity	USINT[8]
ClockClass	UINT
TimeAccuracy	UINT
OffsetScaledLogVariance	UINT
CurrentUtcOffset	UINT
TimePropertyFlags	WORD
TimeSource	UINT
Priority1	UINT
Priority2	UINT

To get controller's GrandMasterClockID, access the TIMESYNCHRONE object through the GSV instruction. See Access the TimeSynchronize object.

Standard Input Modules

Connections for Standard I/O Modules

A connection is a real-time data transfer link between the owner-controller and the module that occupies the slot that the configuration references.

During the module configuration, the connection type determines what data is exchanged between the controller and the module. When you uninhibit a module in online mode, or download the project with modules that are uninhibited to the controller, the controller attempts to establish a connection to each module.

The owner-controller monitors its connection with a module. Any break in the connection, for example, the loss of power to the PointMax I/O system, causes a fault. The Studio 5000 Logix Designer application can monitor the fault status tags to indicate when a fault occurs on a module.

Producer/Consumer Communication

PointMax I/O modules use the Producer/Consumer communication model to produce data without a controller polling them first. The modules produce the data and controllers consume it. That is, the owner-controller and controllers with a Listen Only connection to the module can consume it.

When an input module produces data, the controllers can consume the data simultaneously. Simultaneous data consumption eliminates the need for one controller to send the data to other controllers.

Module Data Quality Reporting

The I/O modules indicate the quality of point data that is returned to the owner-controller. Levels of data quality are reported via module input tags.

The following inputs indicate the level of data quality.

IMPORTANT: Once the condition that causes the Fault or Uncertain tag to change to 1 is removed, the tag automatically resets to 0. The Studio 5000 Logix Designer application controls the tags. You cannot change the status of the tags. Keep in mind that in some system configurations, the tag is not reset immediately after the condition is removed. The tag typically resets after a small delay.

- *I.Ptxx.Fault* – When the fault bit is set, this tag indicates that the reported point data is inaccurate and cannot be trusted for use in your application. Do not use the reported point data for control.

  If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy.

  Example causes of inaccurate data include the following:
  - Point fault
  - Field Power Loss condition

  You should troubleshoot the module for the typical causes first.

- *I.Ptxx.Uncertain* – This tag indicates that the reported point data can be inaccurate but the degree of inaccuracy is unknown. We recommend that you do not use the reported point data for control.

  If the tag is set to 1, you know that the data can be inaccurate. You must troubleshoot the module to discover what degree of inaccuracy exists.

An example cause of uncertain data is the counter input signal frequency is outside its designed operating range.

You should monitor the tags in your program to make sure that the application is operating as expected with accurate point input data.

Software Configurable Input Filters or Delays

You can adjust On to Off and Off to On filter timing through the Studio 5000 Logix Designer application for all digital input modules. These filters improve noise immunity within a signal.

A larger filter value affects the length of delay time for signals from these modules. The filter values are adjustable in the Points view of the Module Properties dialog.

Simple Counter Mode

Simple Counter mode is used to count input pulses. The module provides count up functionality, and counter done and counter rollover indication.

Input Timestamping

Timestamping registers a time reference to a change in input data. CIP Sync is used for timestamping when you set the Input Data parameter to Timestamp Data in the Device Definition dialog.

Pulse Latching

Pulse Latching is supported via the Timestamping feature and Timestamp Latching. You can use Pulse Latching to detect or latch short-duration pulses.

To use Pulse Latching, you must set the Input Data parameter to Timestamp Data in the Device Definition dialog.

Location in Studio 5000 Logix Designer Application Project	Action
Module Properties → Points → Ptxx	Check the input transition type where you must latch short-duration pulses. For example, for short-duration pulses that are latched for Off to On transitions, select Off → On input transition.
Module tags	One or both of these actions. • Change the *C.Ptxx.CaptureOffOnEn* tag to 1. • Change the *C.Ptxx.CaptureOnOffEn* tag to 1.

When the module detects a short-duration pulse at an input point, the changes that are described in this table occur.

Input Transition Type Where Pulse Is Captured	Change in Studio 5000 Logix Designer Application Project
Off to On	• The *I.Ptxx.TimestampOffOnNumber* tag increments. • The timestamp is recorded in the *I.Ptxx.TimestampOffOn* tag.
On to Off	• The *I.Ptxx.TimestampOnOffNumber* tag increments. • The time stamp is recorded in the *I.Ptxx.TimestampOnOff* tag.

When subsequent short-duration pulses are detected at the same input point, the Latching configuration dictates what changes, if any, occur in the Studio 5000 Logix Designer application project.

Latching Configuration	Input Transition Type Where Pulse Is Captured	Change in Studio 5000 Logix Designer Application Project
Disabled (default) These conditions disable Timestamp Latching. • The Enable Timestamp Latching checkbox on the Ptxx view is cleared. • The *C.Ptxx.TimestampLatchEn* tag = 0	Off to On	The *I.Ptxx.TimestampOffOnNumber* tag increments. The new time stamp is recorded in the *I.Ptxx.TimestampOffOn* tag, which overwrites the previous time stamp.
	On to Off	The *I.Ptxx.TimestampOnOffNumber* tag increments. The new time stamp is recorded in the *I.Ptxx.TimestampOnOff* tag, which overwrites the previous time stamp.
Enabled These conditions enable Timestamp Latching. • The Enable Timestamp Latching checkbox on the Ptxx view is selected. • The *C.Ptxx.TimestampLatchEn* tag = 1	Off to On	The *I.Ptxx.TimestampOffOnNumber* and *I.Ptxx.TimestampOffOn* tags remain latched until the last captured pulse is acknowledged. In other words, the tag values remain the same until the last captured pulse is acknowledged.
	On to Off	The *I.Ptxx.TimestampOnOffNumber* and *I.Ptxx.TimestampOnOff* tags remain latched until the last captured pulse is acknowledged. In other words, the tag values remain the same until the last captured pulse is acknowledged.

To acknowledge the last captured pulse, set the output tag of the last input pulse as follows:

- Off to On transition - Set the *O.Ptxx.TimestampOffOnNumberAck* tag = *I.Ptxx.TimestampOffOnNumber* tag.
- On to Off transition - Set the *O.Ptxx.TimestampOnOffNumberAck* tag = *I.Ptxx.TimestampOnOffNumber* tag.

Once a pulse latch is acknowledged for an input point, the next pulse at that point increments the corresponding *I.Ptxx.TimestampOffOnNumber* and records the time stamp in *I.Ptxx.TimestampOffOn*.

You can change tag values in program logic while normal module operation continues or through the Studio 5000 Logix Designer application tag editor.

Chatter Detection

Chatter Detection is a feature that is directly related to Timestamping. You use the feature to detect when a device that is connected to the module input causes chatter.

Chatter occurs when the device causes the inputs to transition falsely many times in a relatively short period. As a result, the module time stamps invalid input transitions.

You can configure the following:

- Chatter Count – Determines the number of acceptable input transitions that can occur in a given time period before considering the input to be chatter.
- Chatter Time – Determines the amount of time within which the number of input transitions are counted.

Field Power (SA Power) Loss Detection

The Field Power Loss Detection feature monitors for the loss of field-side power on the SA power bus.

In the diagnostic assembly, the FieldPowerOff bit is set at the module and point level structure. The Fault bit is set at the point level.

Safety Input Modules

Connections for Safety I/O Modules

During module configuration, you must define the module. Among the Module Definition parameters with safety I/O modules, you must choose how module is configured.

The choice depends on whether the project is downloaded to the controller that owns the module configuration, that is, the owner-controller, or to a controller that is listening to modules in a project, that is an external means controller.

A real-time data transfer link is established between the controller and the module that occupies the slot that the configuration references.

When you download module configuration to a controller, the controller attempts to establish connections to each module in the configuration. An owner-controller establishes two connections (safety input and safety output). A controller that is listening to the module establishes one safety input connection.

Because part of module configuration includes a slot number in the remote I/O system, the owner-controller checks for the presence of a module there. If a module is detected, the owner-controller sends the configuration. One of the following occurs:

- If the configuration is appropriate to the module detected, a connection is made and operation begins.
- If the configuration is not appropriate to the module detected, the connection request is rejected and the Studio 5000 Logix Designer application indicates that an error occurred.

  The configuration can be inappropriate for many reasons. For example, a mismatch in electronic keying that helps prevents normal operation.

The owner-controller and external means controller monitors its connection with a module. Any break in the connection, for example, the loss of power to a remote I/O system, causes a fault. The Studio 5000 Logix Designer application monitors the fault status tags to indicate when a fault occurs on a module.

Producer/Consumer Communication

PointMax I/O modules use the Producer/Consumer communication model to produce data without a controller polling them first. The modules produce the data and controllers consume it. If the connection is a multicast input connection, then mulitple controllers can consume the input data, including the owner-controller and external means controller.

Connection Reaction Time Limit With Safety Modules

Setting the RPI on safety modules is not as straightforward as setting it on standard modules. With safety modules, the Connection Reaction Time Limit configuration affects the RPI that is used for a module.

The Connection Reaction Time Limit defines the predicted period of safety packets on the associated connection. If the Max Network Delay exceeds the Connection Reaction Time Limit, a connection fault occurs.

By default, the Connection Reaction Time Limit is four times the RPI.

Use the default values for Timeout Multiplier (2) and Network Delay Multiplier (200). The Network Delay Multiplier value is in terms of percentage. Thus, 200 means 200%.

IMPORTANT: To determine what is appropriate, analyze each safety point. The default Timeout Multiplier of 2 and Network Delay Multiplier of 200 creates a worst-case input connection reaction time limit of 4 times the RPI, and an output connection reaction time limit of 3 times the RPI. Changes to these parameters must be approved only after a thorough review by a safety administrator.

For more information on specifying RPI rates, see the Logix 5000 Controllers Design Considerations Reference Manual, publication 1756-RM094.

Module Data Quality Reporting

The safety I/O modules indicate the quality of point data that is returned to the owner-controller. Levels of data quality are reported via module input tags.

The following inputs indicate the level of data quality.

IMPORTANT: Some faults are not recoverable, that is, the fault bit is not cleared, and some faults are reset according to the *Ptxx.ResetFault* tag. The Studio 5000 Logix Designer application controls the tags. You cannot change the status of the tags. Keep in mind that in some system configurations, the tag is not reset immediately after the condition is removed. The tag typically resets after a small delay.

- *I.Ptxx.Fault* – When the fault bit is set, this tag indicates that the reported point data is inaccurate and cannot be trusted for use in your application. Do not use the reported point data for control.

  If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy.

  Example causes of inaccurate data include the following:
  - Point not used
  - Point fault
  - Field Power Loss condition

  You should troubleshoot the module for the typical causes first.

- *I.Ptxx.Uncertain* – This tag indicates that the reported point data can be inaccurate but the degree of inaccuracy is unknown. We recommend that you do not use the reported point data for control.

  If the tag is set to 1, you know that the data can be inaccurate. You must troubleshoot the module to discover what degree of inaccuracy exists.

  An example cause of uncertain data is the module is operating outside its designed operating range.

  You should monitor the tags in your program to make sure that the application is operating as expected with accurate point input data.

Software Configurable Input Filters or Delays

You can adjust On to Off and Off to On filter timing through the Studio 5000 Logix Designer application for all digital input modules. These filters improve noise immunity within a signal.

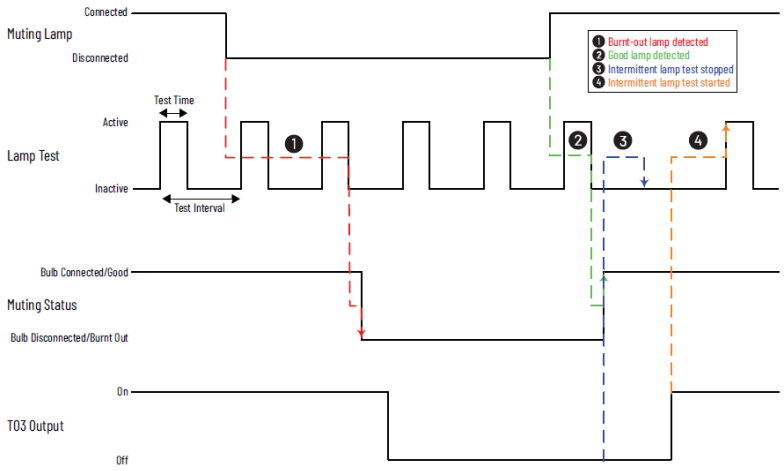
A larger filter value affects the length of delay time for signals from these modules. The filter values are adjustable in the Points view of the Module Properties dialog.

Muting Lamp Operation

To use test outputs for muting lamp operation, select Muting Lamp for the Test Output Point Mode in the Module Properties dialog.

Your controller program controls test outputs 0...3 (T00...T03) to illuminate a muting lamp. Muting lamp status is monitored with a test that runs periodically during every test interval to detect a burned-out lamp. The test runs repeatedly when the test output is commanded On or commanded Off and a fault is detected.

Figure 3. Monitor Muting Lamp Operation, Status, and Fault Detection



The lamp test interval is 2 seconds. Two consecutive failed lamp tests are required to declare a burned-out lamp condition. The lamp test does not always run immediately after the test output is energized. It starts at the next 2-second interval. To allow time for two consecutive test intervals, program a minimum Test Output On Time of 4 seconds.

Table 6. Expected Behavior of Muting Status for Test Outputs

Test Output Commanded State	Lamp Condition	Muting Status Bit	Required Action
ON	Bad (open circuit)	0	Repair the lamp.
ON	Good	1	None, normal condition, the lamp is operating properly.
OFF	Bad (open circuit)	0	If the lamp remains OFF after the test output is cycled, repair the lamp.
OFF	Good	1	None, normal condition

- When power is applied to the safety input module and the test output remains commanded Off, the muting status bit defaults to 1.
  This bit operation is designed to help prevent erroneous muting instruction faults from the owner-controller.
  This bit status is not always the true indication of a burned-out lamp.

  IMPORTANT: Before you check the state of the corresponding muting status, be sure that the test output is commanded On. Once the test output is commanded On, a maximum time of 4 seconds is required for the module to detect a burned-out lamp.

- If a muting lamp circuit is open when power is applied to the module, the condition is detected when the test output is commanded On.
- When a lamp burns out and is replaced, the fault (muting status bit) returns to the good condition, independent of the state of the test output.

Field Power (SA Power) Loss Detection

The Field Power Loss Detection feature monitors for the loss of field-side power on the SA power bus.

The Field Power Loss condition causes safety connections to fault.

In the diagnostic assembly, the FieldPowerOff bit is set at the module and point level structure. The Fault bit is set at the point level.

Overload Protection

Overload Protection helps prevent damage to a Test Output on the safety input module that can result when more current is present at the output than it can handle.

There is an Overload tag in the Diagnostic assembly.

When an overload or short circuit to ground condition is detected, the Test Output turns off and the *I.Testxx.Fault* tag is set to 1.

When an overload or short circuit to ground condition is removed, the Test Output restarts in its commanded state and the *I.Testxx.Fault* tag is reset to 0.

For more information on the maximum current that you can apply to a Test Output, see the PointMax I/O System Specifications Technical Data, publication 5034-TD001.

Table 7. Test Output Recovery After Overload Condition

Cause of Fault	Correction	Recover Time
Overload condition	Remove the load from the Test Output point.	After the Overload or short circuit to ground condition occurs, the Test Output point holds fault indications for 10 seconds until it checks if the fieldfault is removed.
Short circuit to ground condition	Correct the cause of the short circuit condition	

Standard Output Modules

Connections for Standard I/O Modules

A connection is a real-time data transfer link between the owner-controller and the module that occupies the slot that the configuration references.

During the module configuration, the connection type determines what data is exchanged between the controller and the module. When you uninhibit a module in online mode, or download the project with modules that are uninhibited to the controller, the controller attempts to establish a connection to each module.

The owner-controller monitors its connection with a module. Any break in the connection, for example, the loss of power to the PointMax I/O system, causes a fault. The Studio 5000 Logix Designer application can monitor the fault status tags to indicate when a fault occurs on a module.

Producer/Consumer Communication

PointMax I/O modules use the Producer/Consumer communication model to produce data without a controller polling them first. The modules produce the data and controllers consume it. That is, the owner-controller and controllers with a Listen Only connection to the module can consume it.

When an input module produces data, the controllers can consume the data simultaneously. Simultaneous data consumption eliminates the need for one controller to send the data to other controllers.

Standard Output Module Operation

The controller sends data to the output module at one of the following:

- RPI
- After an Immediate Output (IOT) instruction is executed

IMPORTANT: An IOT instruction sends data to the module immediately, and resets the RPI timer.

Output Delay Change Time

For the output delay change time, see the PointMax I/O System Specifications Technical Data, publication 5034-TD001.

Configure Output State When Module is in Program Mode or Inhibited

You can configure individual output points to specific states when the module is in Program Mode or when the module is inhibited.

When the controller switches from Run mode to Program Mode or Inhibited, the output can behave in the following ways, depending on how you configure the Output State in Program Mode parameter:

- Turn off - Default
- Turn on
- Hold its last state

When the module is inhibited, the output behavior follows the Output State in Program Mode configuration.

Configure Output State in Communication Fault Mode

You can configure individual output points to specific states when a connection fault occurs, that is, the connection between the controller and the module breaks.

Output Behavior Immediately After a Connection Fault

When the connection between a controller and module breaks, the output can behave in the following ways, depending on how the Communication Fault Mode State parameter is configured:

- Turn off – Default
- Turn on
- Hold its last state

The output remains at that state value until the following occurs:

- The connection to the controller is re-established.
- The duration expired, which is based on the value that is defined in the Communication Fault Mode State Duration.

Communication Fault State Duration After Connection Fault

For output behavior after a connection fault, you must define how long the output remains at the specified value before it transitions to a Final Communication Fault Mode State.

You can configure the output to remain at the specific value for the following times:

- Forever
- 1 second
- 2 seconds
- 5 seconds
- 10 seconds

After the Communication Fault Mode State Duration time expires, the output transitions to the user-defined Final Communication Fault Mode State.

Final Communication Fault State

The Final Communication Fault State defines the state to which the output goes after the Communication Fault Mode State Duration time expires.

Once the connection between the controller and module is re-established, the output resumes normal operation.

When Communication Fails in Program Mode

When communication fails in Program Mode, the output can behave in the following ways, depending on how you configure the When Communication Fails in Program Mode parameter:

- Leave Outputs in Program Mode State – It causes the output to behave as defined by the Output State in Program Mode selection.
- Change Outputs to Communication Fault Mode State – It causes the output to behave as defined by the Output State in Communication Fault Mode selection.

Data Echo

Data Echo automatically sends point data values that match the digital value that was sent to the module's screw terminals.

At the RPI, the output module sends fault and status data, and returns a value that was sent to it by the owner-controller. The echoed value is indicated in *I.Ptxx.Data*.

Time-scheduled Output Control

You can schedule times for module outputs to turn On or Off. The time schedules use units in nanoseconds.

IMPORTANT:

These output modules are the only ones to support the Time-scheduled Output Control feature:

- 5034-OB16, 5034-OB16XT
- 5034-OB8, 5034-OB8XT

For the timing of scheduled outputs for the modules, see the PointMax I/O System Specifications Technical Data, publication 5034-TD001.

The module must be time synced or schedules are not applied.

Time-scheduled output control is used with the Motion Arm Output Cam (MAOC) instruction. The MAOC instruction enables position-based output control in these ways:

- Uses the position of any motion axis in a Logix 5000 control system as the position reference.
- Updates the outputs based on the motion axis position at the motion group coarse update rate, typically 1...32 ms.

The instruction can update standard digital output modules at the coarse update rate. However, some high-speed applications require a higher degree of accuracy.

The scheduled output modules improve the accuracy of the MAOC instruction by supporting the ability to schedule output On and Off times. All scheduling configuration for the On and Off times of an output is completed through the MAOC instruction. The instruction then updates values in the outputs of the module that define the scheduled output behavior.

Table 8. Output Module Schedule Parameters

Feature	5034-OB16, 5034-OB16XT	5034-OB8, 5034-OB8XT
Number of schedules	32	
Output points available for scheduling	16 (points 0...15)	8 (points 0...7)
Remote operation	N/A	
Minimum schedule interval	200 µs	

The MAOC limits the minimum schedule interval (minimum pulse width) to 1/16 of the coarse update period.

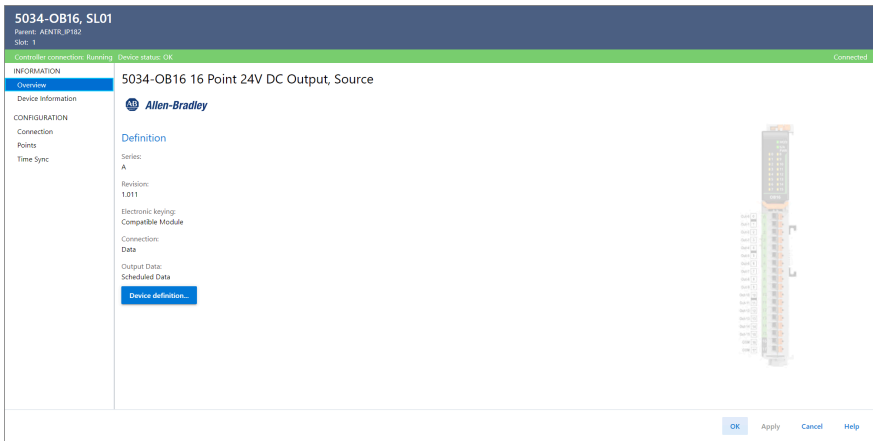
Use MAOC Instructions with Scheduled Outputs

To use a MAOC instruction with schedule outputs, complete the following steps:

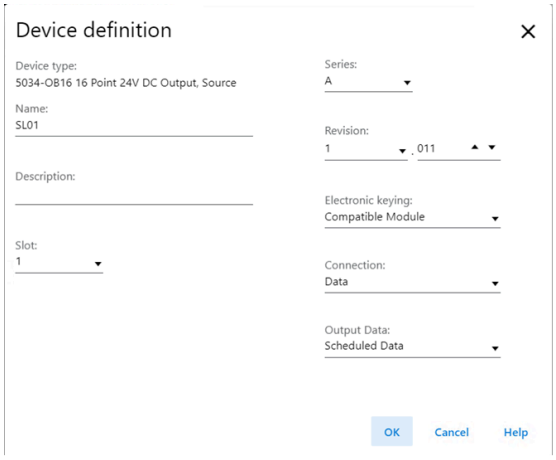
IMPORTANT:

- Before you complete the steps, confirm that Time Synchronization is enabled in the controller and, if applicable, the Ethernet module, to use scheduled outputs.
- You must verify in your logic that the grandmaster clock ID in both the controller and I/O module is identical. For more information, see Grandmaster Clock Verification on page 20.

1. If necessary, add an output module to your Studio 5000 Logix Designer application project.
2. From the Overview in the Module Properties dialog, select Device definition to access the Device Definition parameters.

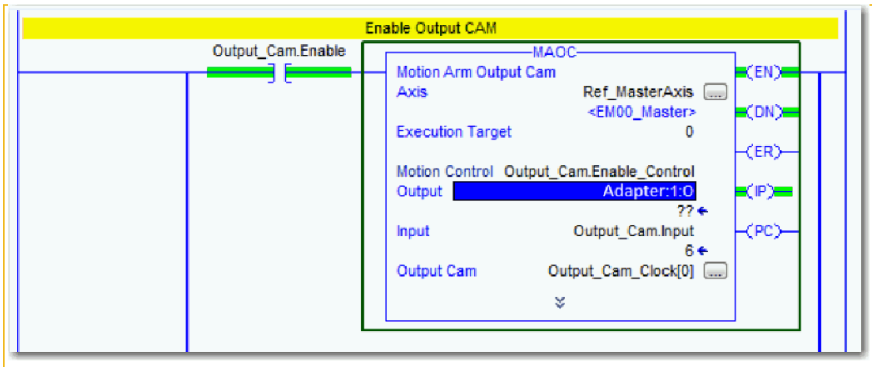


3. In the Device Definition dialog, choose Scheduled Data for the Output Data and select OK.



4. Select OK to close the Device Definition dialog.
5. Add an MAOC instruction to your logic.
6. In the MAOC instruction, use the module output tag in the Output operand, for example, Adapter:1:O for the output module.

The tag value displays as ??. This value is correct.



For more information on how to use an MAOC instruction in general, see the following:

- Logix 5000 Controllers Motion Instructions Reference Manual, publication MOTION-RM002
- Position-based Output Control with the MAOC Instruction Application Technique, publication 1756-AT017

Field Power (SA Power) Loss Detection

The Field Power Loss Detection feature monitors for the loss of field-side power on the SA power bus.

In the diagnostic assembly, the FieldPowerOff bit is set at the module and point level structure. The Fault bit is set at the point level.

No Load Detection

No Load Detection detects when a wire is disconnected from the output or a missing load for each output point. No Load Detection occurs only when the output point is in the Off state.

The No Load Detection feature is disabled by default. You must enable the feature in your Studio 5000 Logix Designer application project.

The *I.Ptxx.NoLoad* tag indicates the presence of a No Load condition when it is set to 1. You can monitor a module tag in your program that corresponds to the No Load Detection to check for a fault.

For the minimum load current that is supported by the module, see the PointMax I/O Systems Specifications Technical Data, publication 5034-TD001.

Short Circuit Detection

Short Circuit Detection helps prevent damage to the output that can result when more current is present at the output than it can handle.

A short circuit condition can cause an increase in temperature and trigger a thermal shutoff to prevent damage to the output.

When a short circuit condition is detected, the following occurs:

- The output turns off.
- The I/O status indicator for the output flashes red.
- The *I.Ptxx.ShortCircuit* tag is set to 1.

When the short-circuit condition is removed, the following occurs:

- The output restarts in its commanded state.
- The I/O status indicator for the output follows the commanded state (off or steady yellow).
- The *I.Ptxx.ShortCircuit* tag is reset to 0.

For more information on the maximum current that you can apply to an output, see the PointMax I/O System Specifications Technical Data, publication 5034-TD001.

Isolated Relay Output

These digital output modules provide point-to-point wiring isolation:

- 5034-OW4I
- 5034-OW4IXT

Safety Output Modules

Connections for Safety I/O Modules

During module configuration, you must define the module. Among the Module Definition parameters with safety I/O modules, you must choose how module is configured.

The choice depends on whether the project is downloaded to the controller that owns the module configuration, that is, the owner-controller, or to a controller that is listening to modules in a project, that is an external means controller.

A real-time data transfer link is established between the controller and the module that occupies the slot that the configuration references.

When you download module configuration to a controller, the controller attempts to establish connections to each module in the configuration. An owner-controller establishes two connections (safety input and safety output). A controller that is listening to the module establishes one safety input connection.

Because part of module configuration includes a slot number in the remote I/O system, the owner-controller checks for the presence of a module there. If a module is detected, the owner-controller sends the configuration. One of the following occurs:

- If the configuration is appropriate to the module detected, a connection is made and operation begins.
- If the configuration is not appropriate to the module detected, the connection request is rejected and the Studio 5000 Logix Designer application indicates that an error occurred.

  The configuration can be inappropriate for many reasons. For example, a mismatch in electronic keying that helps prevents normal operation.

The owner-controller and external means controller monitors its connection with a module. Any break in the connection, for example, the loss of power to a remote I/O system, causes a fault. The Studio 5000 Logix Designer application monitors the fault status tags to indicate when a fault occurs on a module.

Producer/Consumer Communication

PointMax I/O modules use the Producer/Consumer communication model to produce data without a controller polling them first. The modules produce the data and controllers consume it. If the connection is a multicast input connection, then mulitple controllers can consume the input data, including the owner-controller and external means controller.

Connection Reaction Time Limit With Safety Modules

Setting the RPI on safety modules is not as straightforward as setting it on standard modules. With safety modules, the Connection Reaction Time Limit configuration affects the RPI that is used for a module.

The Connection Reaction Time Limit defines the predicted period of safety packets on the associated connection. If the Max Network Delay exceeds the Connection Reaction Time Limit, a connection fault occurs.

By default, the Connection Reaction Time Limit is four times the RPI.

Use the default values for Timeout Multiplier (2) and Network Delay Multiplier (200). The Network Delay Multiplier value is in terms of percentage. Thus, 200 means 200%.

IMPORTANT: To determine what is appropriate, analyze each safety point. The default Timeout Multiplier of 2 and Network Delay Multiplier of 200 creates a worst-case input connection reaction time limit of 4 times the RPI, and an output connection reaction time limit of 3 times the RPI. Changes to these parameters must be approved only after a thorough review by a safety administrator.

For more information on specifying RPI rates, see the Logix 5000 Controllers Design Considerations Reference Manual, publication 1756-RM094.

Safety Output Module Operation

Only the owner-controller makes an output connection with the safety module and sends output data to the safety module.

IMPORTANT: Immediate Output instruction is not supported in safety applications.

The controller sends data to an output module at the output RPI, and the output module sends data to the controller at the input RPI. For example, the output module sends an indication of the point data quality.

IMPORTANT: The RPI for an output safety module is the Safety Task period. Safety output data is sent at the completion of the Safety Task scan.

The output modules reside in an I/O system that is accessible to a Logix 5000 controller over an EtherNet/IP network.

An EtherNet/IP adapter is the first component in an I/O system and connects the system to the EtherNet/IP network. Output modules receive output data from a controller. The output module also sends data to the controller.

Controller to Output Module Data Transmission

The output RPI is the same as the controller safety task period.

These events occur when the controller sends data to an output module.

1. Data is sent in one of the following ways:
   - If the controller is directly connected to the EtherNet/IP network, it sends data to the network.

     In this case, skip to step 3.
   - If the controller is connected to the EtherNet/IP network via a communication module, the controller transmits the data to the backplane.

     In this case, proceed to step 2.
2. The EtherNet/IP communication module transmits the data to the EtherNet/IP network.
3. The PointMax EtherNet/IP adapter in the PointMax I/O system receives the data from the network and transmits it to the backplane.
4. The digital output module receives the data from the backplane and behaves as dictated by its configuration.

Output Module to Controller Data Transmission

The output module sends readback data and status to the controller at input RPI.

The following events occur when an output module sends data to the controller at input RPI.

1. The module sends the data to the backplane.
2. The PointMax EtherNet/IP adapter in the PointMax I/O system sends the data over the EtherNet/IP network.
3. One of the following occurs:
   - If the controller is directly connected to the EtherNet/IP network, it receives the input data from the network without need for a communication module.
   - If the controller is connected to the EtherNet/IP network through another communication module, the module transmits the data to its backplane and the controller receives it.

Connection Fault Handling

You cannot configure the safety output module behavior when a connection fault occurs, that is, the connection between the owner-controller and the output module breaks. All outputs are put in a Safe state.

The output remains in a Safe state until the connection to the owner-controller is re-established. The output returns to normal operation as defined in the module configuration.

Once the connection between the owner-controller and output module is re-established, the output resumes normal operation.

Data Readback

Data Readback automatically sends point data values that read back the output at the screw, regardless if it matches the digital value that was sent to the screw terminals of the module then.

The read back value is either On or Off.

Fault and status data are also sent. This data is sent at input RPI.

Field Power (SA Power) Loss Detection

The Field Power Loss Detection feature monitors for the loss of field-side power on the SA power bus.

The Field Power Loss condition causes safety connections to fault. The module does not send anything to the controller until the controller queries the diagnostic assembly.

In the diagnostic assembly, the FieldPowerOff bit is set at the module and point level structure. The Fault bit is set at the point level.

No Load Detection

No Load Detection detects when a wire is disconnected from the output or a missing load for each output point. No Load Detection occurs only when the output point is in the Off state.

The No Load Detection feature is disabled by default. You must enable the feature in your Studio 5000 Logix Designer application project.

Use the diagnostic assembly to monitor the presence of a No Load condition.

Overload Protection

Overload Protection helps prevent damage to the output that can result when more current is present at the output than it can handle.

An Overload or short circuit to ground condition can cause an increase in point temperature and trigger a thermal shutoff to prevent damage to the output.

There is an Overload tag in the Diagnostic assembly.

Table 9. Output Recovery After Overload Condition

Cause of Fault	Correction	Recover Time
Overload condition	Remove the load from the output point.	After the Overload or short circuit to ground condition occurs, the output point holds fault indications for 10 seconds until it checks if the fieldfault is removed.
Short circuit to ground condition	Correct the cause of the short circuit condition	

Standard Module Applications

This chapter describes how to configure your standard digital I/O modules in a Studio 5000 Logix Designer application project. You can use the default module configuration or edit the module configuration.

This chapter does not explain the user-configurable module features that you can edit on different screens in your Studio 5000 Logix Designer application project.

Add a New Module to a Studio 5000 Logix Designer Application Project

You must complete the following tasks before you configure the module:

1. Create a Studio 5000 Logix Designer application project.
2. Add a Logix 5000 controller to the project.
3. Add a PointMax EtherNet/IP adapter to the project.

   For more information on how to add a PointMax EtherNet/IP adapter to the Studio 5000 Logix Designer application project, see the PointMax EtherNet/IP Adapter User Manual, publication 5034-UM001.

After completing above steps, add your I/O module to the project by following one of the methods:

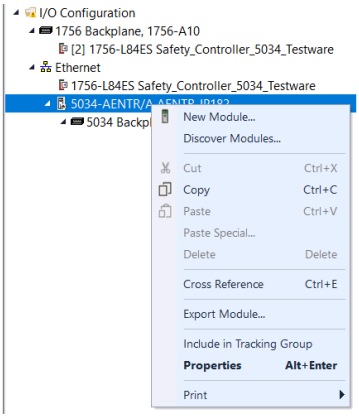
- Discover Modules
- New Module

Discover Modules

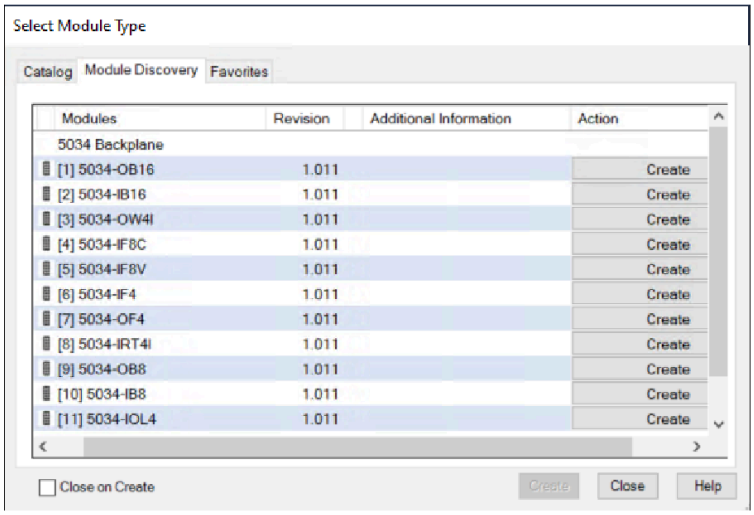
To use the Discover Modules method with PointMax I/O modules, complete these steps:

1. Go online with your Studio 5000 Logix Designer application.

   The project must include a PointMax EtherNet/IP adapter.
2. Right-click the PointMax EtherNet/IP adapter and select Discover Modules.

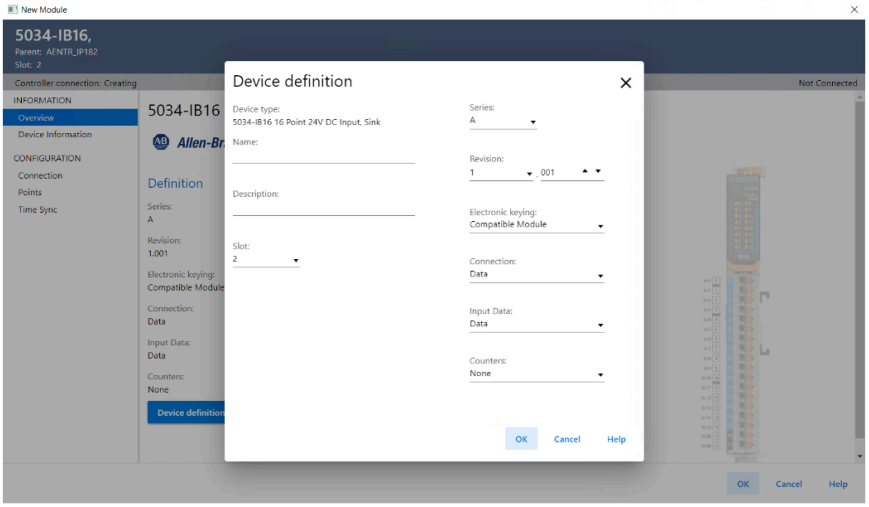


   The Studio 5000 Logix Designer application automatically detects available modules that are connected to the backplane. The Select Module Type dialog appears with a list of modules detected.
3. In the Select Module Type window, select Create for the module that you want to add.

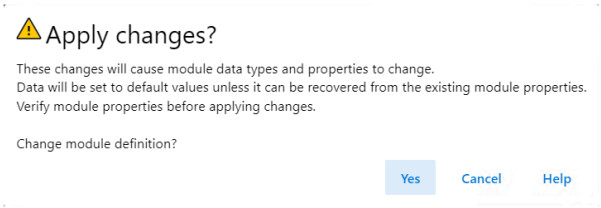


The New Module window with Device definition dialog appears.

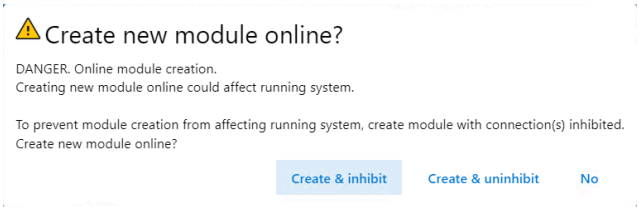
4. In the Device definition dialog, configure the module properties and select OK.



5. If Apply changes warning dialog appears, select Yes.



6. At the Create new module online warning dialog, select Create & inhibit.



7. After adding as many as module you need, close the Select Module Type dialog.

To add additional I/O modules with this method, complete one of the following:

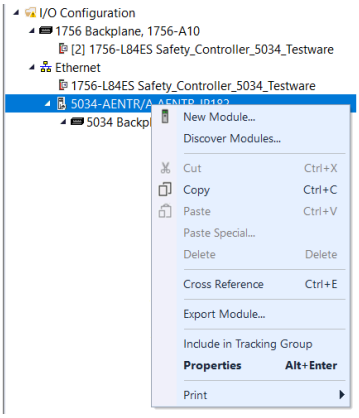
- If you selected the Close on Create checkbox when you created the first I/O module, repeat steps 2...7.
- If you did not select the Close on Create checkbox when you created the first I/O module, repeat steps 3...7.

Add a New Module

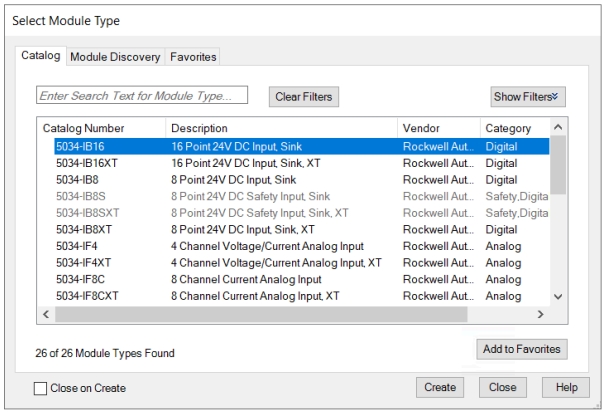
To use the New Module method with PointMax I/O modules, complete these steps:

This example shows how to add a module when the Studio 5000 Logix Designer application project is offline. You can add new modules when the project is online, if desired. In this case, the steps are similar to the steps described in Discover Modules. One exception is that, in step 1, you choose New Module instead of Discover Modules.

1. Right-click the PointMax EtherNet/IP adapter and select New Module.

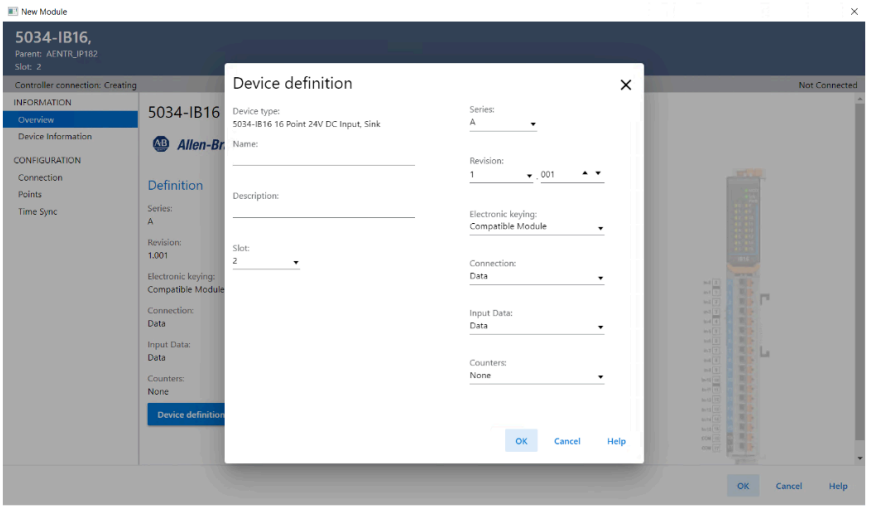


2. In the Select Module Type dialog, choose the module that you want to add and select Create.



The New Module window with Device definition dialog appears.

3. You can select OK to use the default configuration as shown or edit the module configuration.



4. After adding as many as module you need, close the Select Module Type dialog.

   To add additional I/O modules with this method, complete one of the following:

   - If you selected the Close on Create checkbox when you created the first I/O module, repeat steps 1...3.
   - If you did not select the Close on Create checkbox when you created the first I/O module, repeat steps 2...3.

I/O Tag Name Conventions

The module tag names use defined naming conventions. The conventions are as follows:

Example tag name = *Adapter1:I.Pt00.Data*

- Adapter = Name of the EtherNet/IP adapter in the system
- 1 = Slot number
- I = Tag type

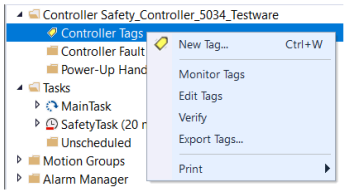
  The possible tag types are C (configuration), I (input), and O (output)
- Pt00 = Module point number
- Data = Tag function

  In this case, Data represents the input data that is returned to the owner-controller.

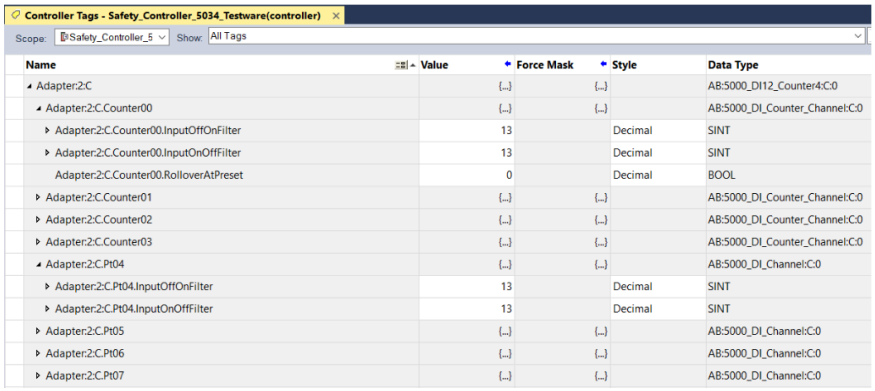
Access I/O Tags

To access the I/O tags in the Studio 5000 Logix Designer application, proceed as follows:

1. Open your Studio 5000 Logix Designer application project.
2. Right-click Controller Tags and select Monitor Tags.



3. Open the tags as necessary to view specific tags.



Troubleshoot Your Module

You can use one of the following methods to troubleshoot your module:

- Use Module Status Indicators

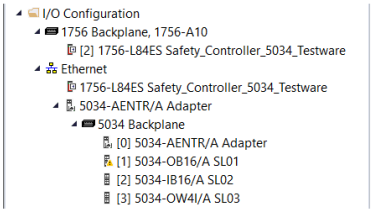
  See the respective module-specific sections for information on status indicators.

- Use Studio 5000 Logix Designer application.

Use Studio 5000 Logix Designer Application

Check the Controller Organizer to see if there is a warning icon on the module.

Figure 4. Warning Icon in Controller Organizer

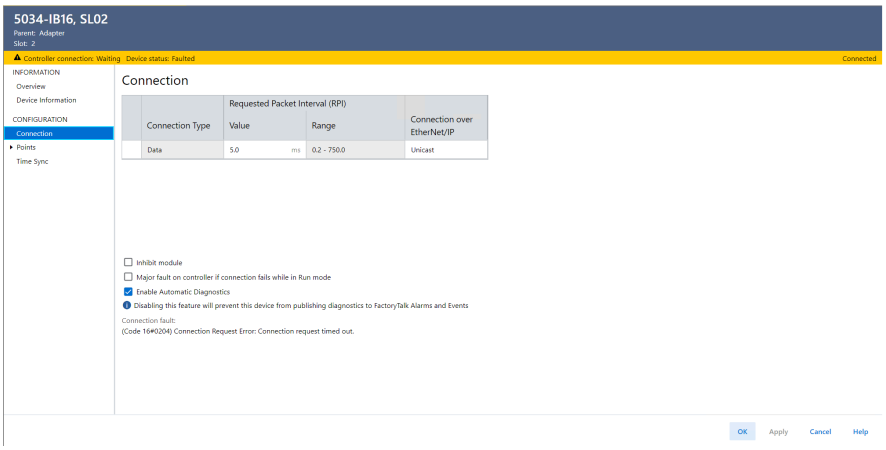


If a warning icon is present, open the module properties and check the status bar to identify the type of fault.

Figure 5. Fault Message in Status Bar

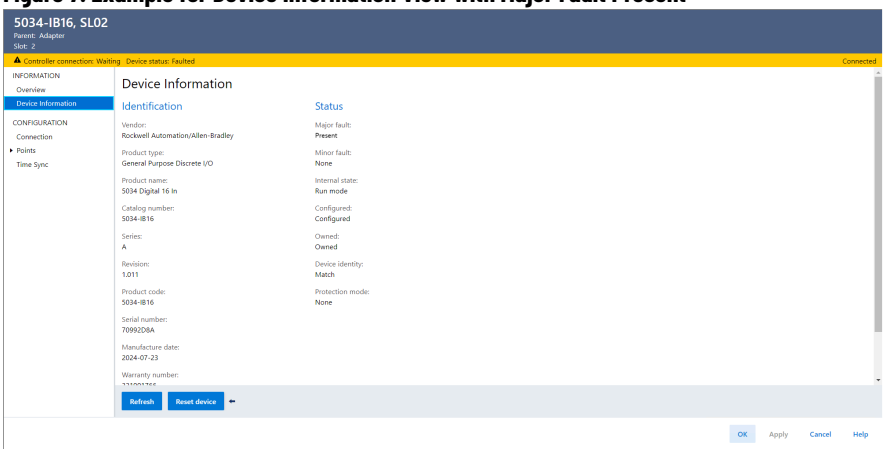
If connection is faulted, go to the Connection view and check the error code in the Connection Fault area.

Figure 6. Connection Fault Description with Error Code



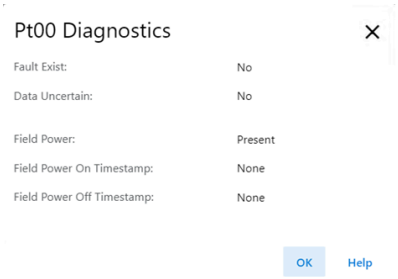
Error Code	Action
0x204	1. Open the adapter module properties. 2. Go to Chassis Information view and check the base status. If there is a fault, check the base details to identifiy the fault.
Keying Error	Go to Device Information view to confirm that the physical module is compliant or matches the configured identity. For more information, see Electronic Keying in Logix 5000 Control Systems Application Technique, publication LOGIX-AT001.
0x10	Go to Device Information view and check the firmware revision and major fault status. • If firmware update is required, update the firmware. • If the major fault is recoverable, reset the module. • If the major fault is unrecoverable, replace the module.

Figure 7. Example for Device Information View with Major Fault Present



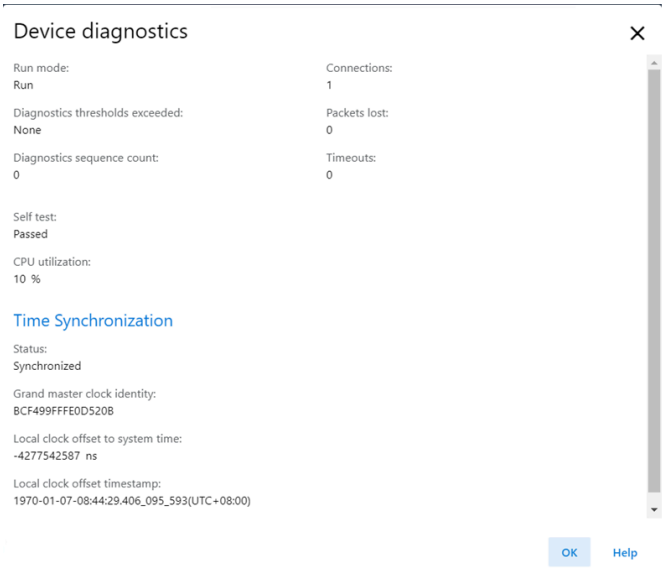
If a point is faulted, go to the Points view and check the Diagnostics for the point to see the diagnostic condition.

Figure 8. Point Diagnostics



If a Time Sync fault is present, go to the Device Diagnostics dialog to check the Time Synchronization status and Grandmaster clock identity.

Figure 9. Device Diagnostics



The Grandmaster clock identity must match with the network Grandmaster clock identity. Also, check the Time Synchronization status of the adapter in the adapter Device Diagnostics dialog.

Safety Module Applications

Safety digital I/O modules have additional items to be aware of. Type approval, certification, and suitability for use in safety applications vary by catalog number.

These modules can be used with GuardLogix 5580 and Compact GuardLogix 5380 safety controllers in applications up to SIL 3, PLe, Cat. 4 in single-channel and dual-channel configurations. The Studio 5000 Logix Designer application, version 36 or later, is the configuration and programming tool for these modules.

IMPORTANT: TÜV Rheinland has approved GuardLogix 5580 and Compact GuardLogix 5380 controller systems for use in safety-related applications where the de-energized state is always considered to be the safe state. You must confirm that the configuration of each channel of the safety I/O module is set to "Off" to consider those output points as part of the safety function of any equipment.

IMPORTANT: Functional safety certification and performance of PointMax I/O safety modules requires that the modules operate in conditions at or below the ambient operating temperature specification. The Probability of Failure on Demand (PFD) and average frequency of a dangerous failure per hour (PFH) calculations for these modules are based on the module operating conditions adhering to the ambient operating temperature specification. For more information on the ambient operating temperature specification for PointMax I/O safety modules, see the PointMax I/O System Specifications Technical Data, publication 5034-TD001.

These restrictions apply to the modules:

- Type-approved and certified for use in safety applications up to and including SIL 3 per IEC 61508 – PointMax safety digital I/O modules are in the process of obtaining TÜV certification.
- Suitable for use in safety applications up to and including Performance Level e (PLe), category 4 per ISO 13849-1 – PointMax safety digital I/O modules are in the process of obtaining TÜV certification.

IMPORTANT: Requirements are based on the ISO standards that are current at the time of certification. For more information on safety application suitability levels with the PointMax safety I/O modules, see the respective module details.

Single-channel or Dual-channel Mode

You can use safety I/O modules in single-channel mode or dual-channel configuration. The configuration affects the safety application suitability level for a module.

In single-channel mode, the signal status on one channel is evaluated. Based on that status, safety input data and safety input status can be off or on.

In dual-channel mode, the consistency between the signal status on two channels is evaluated. Based on the status on both channels, safety input data and safety input status can be off or on.

For safety input modules: The module does not support dual-channel mode. You can use instructions with any channels. There is no requirement to use one even and one odd.

For safety output modules: You select the predefined dual-channel pairs in the module properties.

Use with Safety Controllers

You can use only the Compact GuardLogix 5380 or GuardLogix 5580 controllers with the PointMax I/O safety modules.

For more information on which controllers you can use with PointMax safety I/O modules, see the Product Compatibility and Download Center at rok.auto/pcdc.

You must use the Studio 5000 Logix Designer application, version 36 or later, to configure the PointMax safety I/O modules.

Determine Conformity

ATTENTION: Use only appropriate components or devices that comply with the relevant safety standards and meet the required safety integrity level or performance level and safety category.

- Conformity to the requirements of the relevant safety standards must be determined for the entire system by conducting a risk assessment.
- Use devices properly according to the installation environment, performance rating, and functions of the machine.
- Use devices within their specified ratings.
- We recommend that you consult a certification body regarding assessment of conformity to the required safety integrity level or performance level.

You are responsible for confirming compliance with the applicable standards for the entire system. You must read, understand, and fulfill the functional safety requirements of the standard applicable to your safety application.

Safety Precautions

ATTENTION: Personnel responsible for the application of safety-related programmable electronic systems (PES) shall be aware of the safety requirements in the application of the system and shall be trained in the use of the system.

Observe these precautions for the proper use of safety I/O modules.

ATTENTION:

As serious injury can occur due to loss of required safety function, follow these safety precautions.

- Never use test outputs as safety outputs. Test outputs are not safety outputs.
- Do not use standard I/O data or explicit message data as safety data.
- Do not use light-emitting diode (LED) status indicators on the I/O modules for safety operations.
- Do not connect loads beyond the rated value to the safety outputs.
- Apply properly specified voltages to the module. Applying inappropriate voltages can cause the module to fail to perform its specified function, which could lead to loss of safety functions or damage to the module.
- Wire the safety I/O modules as shown in the PointMax I/O Systems Specifications Technical Data, publication 5034-TD001.
- Set unique network node addresses before connecting devices to the network.
- Perform testing to confirm that device wiring, configuration, and operation is correct before starting system operation.

ATTENTION: Do not disassemble, repair, or modify the module. This can result in loss of safety functions.

For more information about safety precautions, see Secure Access to the System on page 12.

Install and Replace Modules

ATTENTION:

- Clear previous configuration data before connecting devices to the network or connecting input or output power to the device.
- Configure the replacement device properly and confirm that it operates correctly.
- After installation of the module, a safety administrator must confirm the installation and conduct trial operation and maintenance.

Safety Application Requirements

Safety application requirements include evaluating the following:

- Probability of failure rates (PFD and PFH)
- System reaction time
- Functional verification tests that fulfill appropriate safety-level criteria

Creating, recording, and verifying the safety signature is also a required part of the safety application development process. The safety controller creates the safety signatures. The safety signature consists of an identification number, date, and time that uniquely identifies the safety portion of a project. This number includes all safety logic, data, and safety I/O configuration.

For safety system requirements, including information on the safety network number (SNN), verifying the safety signature, functional verification test intervals, system reaction time, and PFD/PFH calculations, see the GuardLogix 5580 and Compact GuardLogix 5380 Controller Systems Safety Reference Manual, publication 1756-RM012.

You must read, understand, and fulfill the requirements that are described in this publication before you operate a safety system that uses PointMax I/O safety modules.

Configuration Signature and Ownership

Every safety module in a system has a configuration signature and configuration ownership.

Configuration Signature

Each safety device has a unique configuration signature that defines the module configuration. The configuration signature includes the following:

- ID number
- Date
- Time

The configuration signature is used to verify a module's configuration.

If you choose to configure safety connections with a Safety Configuration Identifier, SCID = 0, you are responsible for ensuring that originators and targets have the correct configurations.

IMPORTANT: The signature can only be considered "verified" (and configuration locked) after user testing.

Configuration Ownership

The connection between the owner-controller and the safety module is based on the following:

- Safety module node number
- Safety module safety network number
- Controller node or slot number

IMPORTANT: If the owner-controller is a Compact GuardLogix 5380 controller, the controller has a node number. If the owner-controller is a GuardLogix 5580 controller, the controller has a slot number.

- Controller safety network number
- Path from the controller to the safety module
- Configuration signature

If any differences are detected, the connection between the owner-controller and the safety module is lost, the yellow yield icon appears in the controller project tree.

Different Configuration Owner

When a controller owns the I/O module configuration, other controllers can listen to the input. In this case, the module configuration signature in the Logix Designer project for any listening controller must match the one in the owner-controller project.

If the safety module is configured for inputs only, you can copy and paste the configuration signature from one project to the other. If the safety module has safety outputs, the configuration signature parameter is disabled.

Safety Input Modules in CIP Safety Systems

The following apply to the safety inputs:

- You can connect safety devices, such as Emergency Stop Push Button, gate switches, and safety light curtains.
- An external wiring short-circuit check is possible when inputs are wired in combination with test outputs. The module must be wired in combination with test outputs when this function is used.
- Independently adjustable on and off delays are available per channel.
- If you configure inputs as Safety Pulse Test, you must choose a test source.
- Diagnostics. See Point Diagnostics.
- Safety input points are configured as the following:
  - Not Used
  - Safety Pulse Test
  - Safety

The following apply to the test outputs:

- Test outputs can be configured as the following:
  - Not Used
  - Standard Output
  - Pulse Test
  - Power Supply
  - Muting Lamp
- Separate test outputs are provided for short-circuit detection of a safety input (or inputs).
- Can supply 24V DC power to devices, such as safety sensors.

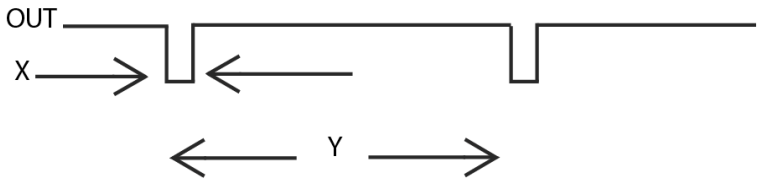
Use Test Output with a Safety Input

A test output can be used in combination with a safety input for short circuit and cross-channel fault detection.

Configure the test output as a pulse test source and associate it to a specific safety input. The associated safety input must use a Point Mode = Safety Pulse Test.

One test output can be assigned to a maximum of four safety inputs.

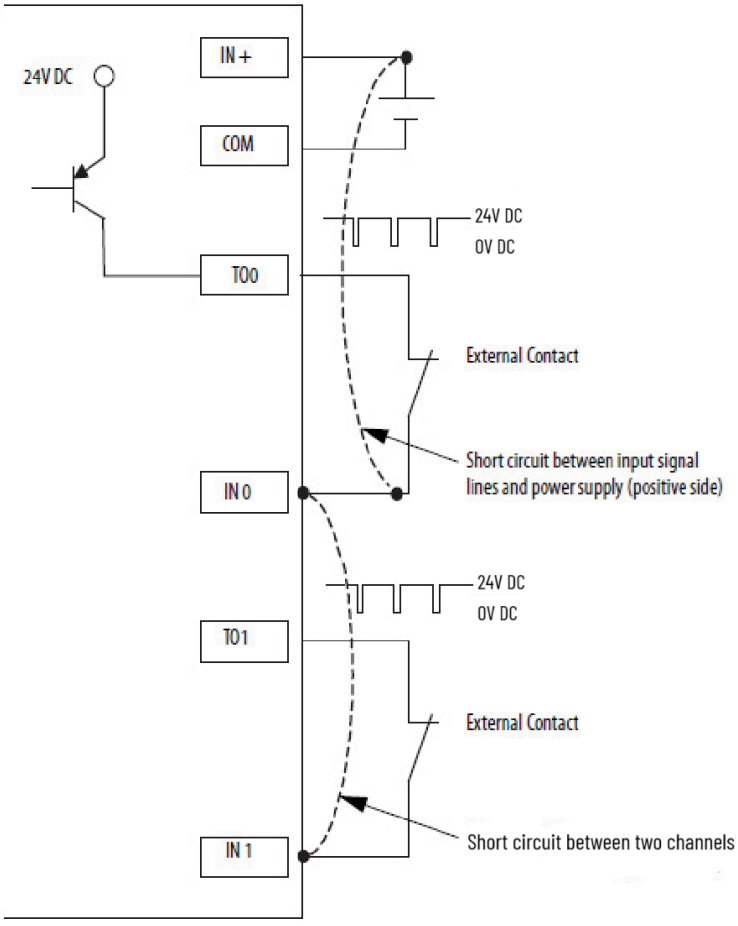
Figure 10. Test Pulse in a Cycle



On the safety input modules, the pulse width (X) is less than 700 µs; the pulse period (Y) is less than 524 ms.

When an external contact is closed, a test pulse is output from the test output terminal to diagnose the field wiring and input circuitry. By using this function, short circuits between inputs and power supply (positive), and between input signal lines can be detected. However, a short circuit between two input channels cannot be detected if these two channels correspond to the same Test Output. For example, you associate Test Output 0 to Safety Input 0 and 7. If these two channels short circuit, it cannot be detected.

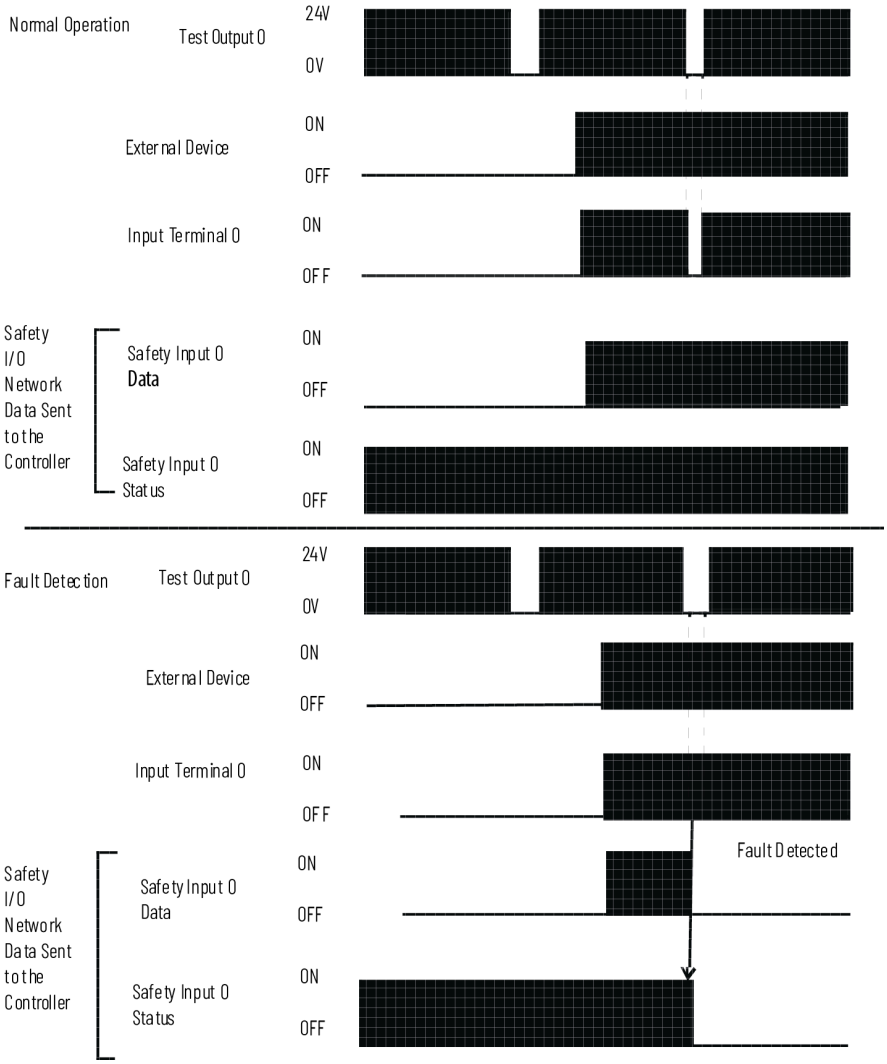
Figure 11. Short Circuit Between Input Signal Lines



Single-channel Mode

If an error is detected on the input channel, Safety Input Data and Safety Input Status change to the off state.

Figure 12. Normal Operation and Fault Detection (Not to Scale)



Safety Input Fault Reset

The I/O channel supports a module-level user-configurable 'Latch Fault until Reset via Output Tag' mode and recovers from a Safety Input Short Circuit fault.

Other types of Safety Input faults are non-recoverable. You must cycle power to the module.

Latch Fault until Reset via Output Tag mode is Enabled

When Latch Fault mode is Enabled, the I/O channel holds safety input fault indications until it checks that the fault is removed. If the fault is removed, the channel clears the fault status only upon detecting that the ResetFault in its consume assembly channel sees a transition from 0 to 1.

Latch Fault until Reset via Output Tag mode is Disabled

When Latch Fault mode is Disabled (default), the I/O channel holds safety input fault indications for 1 second until it checks if the fault is removed. If the fault is removed, the channel clears the fault status only upon detecting the safety input is low on the screw. If not, the channel continues to check if the fault is removed.

Safety Input Delay Time

You can increase the time that it takes for an input point to transition from On to Off and Off to On. The increase in time is a delay of the signal from the module to the controller.

The delay time is added to the RPI. For example, if you set the RPI at 10 ms and use an input delay time of 2 ms, the signal from the module to the controller is 12 ms.

When chattering or low frequency noise coupling is present on the input signal, an increase in the time it takes to transition from one state to another improves noise immunity within a signal.

Table 10. Off to On Delay Time

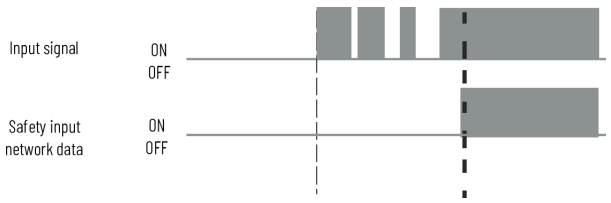
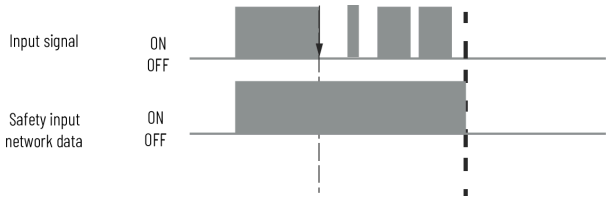
Description	Transition Delay Times	Diagram
An input signal is treated as Logic 0 during the Off to On delay time after the rising edge of the input contact. The input turns on only if the input contact remains on after the Off to On delay time has elapsed. This setting help prevent rapid changes of the input data due to contact bounce.	• 0 ms • 2 ms • 5 ms • 10 ms • 20 ms • 50 ms	

Table 11. On to Off Delay Time

Description	Transition Delay Times	Diagram
An input signal is treated as Logic 1 during the On to Off delay time after the falling edge of the input contact. The input turns off only if the input contact remains off after the On to Off delay time has elapsed. This setting helps to prevent rapid changes of the input data due to contact bounce.	• 0 ms • 2 ms • 5 ms • 10 ms • 20 ms • 50 ms	

Safety Output Modules in CIP Safety Systems

The following apply to the safety outputs:

- You can connect safety devices, such as safety relays, safety contactors.
- An external wiring short-circuit check between channels or supply is possible when the safety output is configured as Safety Pulse Test mode. The detection of external wiring fault is ≤ 1024 msec.
- Diagnostics. See Status and Fault Information in Module Properties.
- Safety output points are configured as the following:
  - Not Used
  - Safety
  - Safety Pulse Test

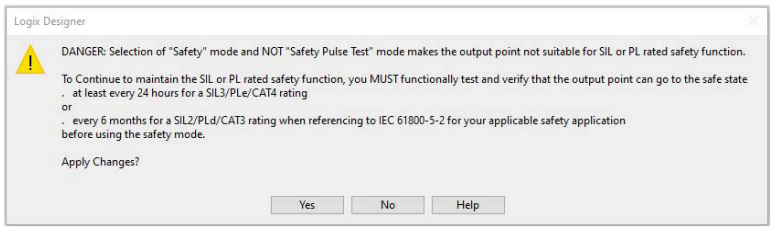
Safety and Safety Pulse Test Mode

The Safety Output can be configured to two types of point modes:

- Safety Mode
- Safety Pulse Test Mode

Safety Mode

When the safety output is configured to Safety Mode, a warning message prompt occurs.



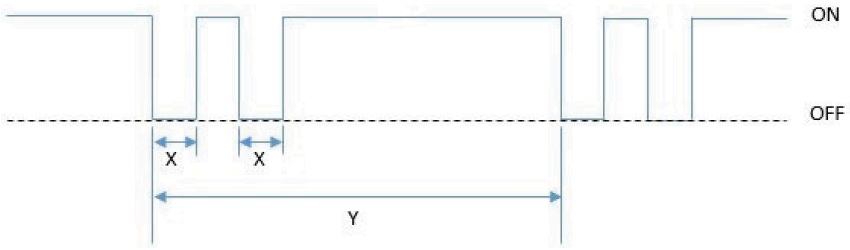
You are responsible to command the Safety Output to Safe State at the stated interval in order to achieve the desired safety level.

Safety Pulse Test Mode

When the safety output is configured to Safety Pulse Test Mode, the safety output channel continuously test the ability of the safety output to remove power from the output terminals of the module. The safety output turn off momentarily during the pulse test duration.

If an error is detected, the safety output data and individual safety output status turn off.

Figure 13. Safety Output Voltage Variation During Pulse Test When Safety Pulse Test Mode is Configured



On the safety output modules, the pulse width (X) is less than 700 µs, and the pulse period (Y) is less than 524 ms.

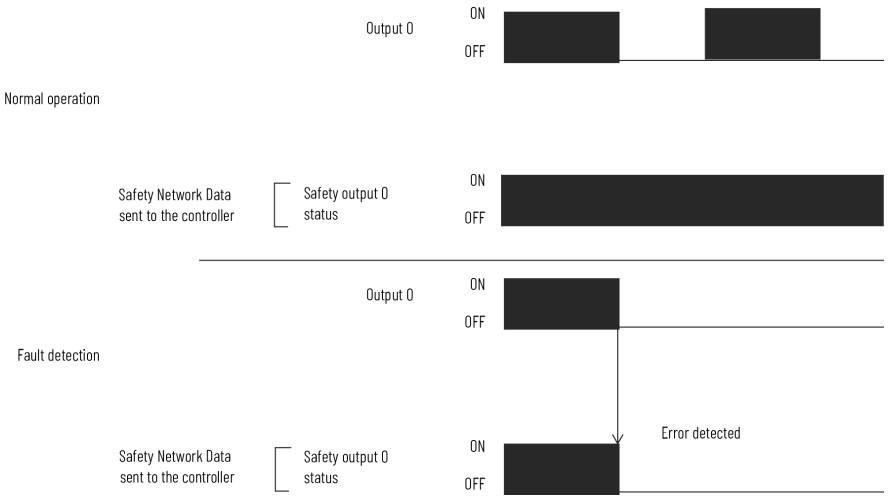
To help prevent the test pulse from causing the connected device to malfunction, pay careful attention to the input response time of the output device.

See Wiring Diagrams for Safety Mode and Safety Pulse Mode on page 222 for more details about applying Safety Mode and Safety Pulse Test Mode in your application.

Single-channel Mode

When the output channel is in the On state and without any faults, the safety outputs turned on. The status is normal. If a fault is detected on the output channel, the safety output is de-energized and individual safety output status turn off.

Figure 14. Single-channel Normal Operation and Fault Detection (Not to Scale)



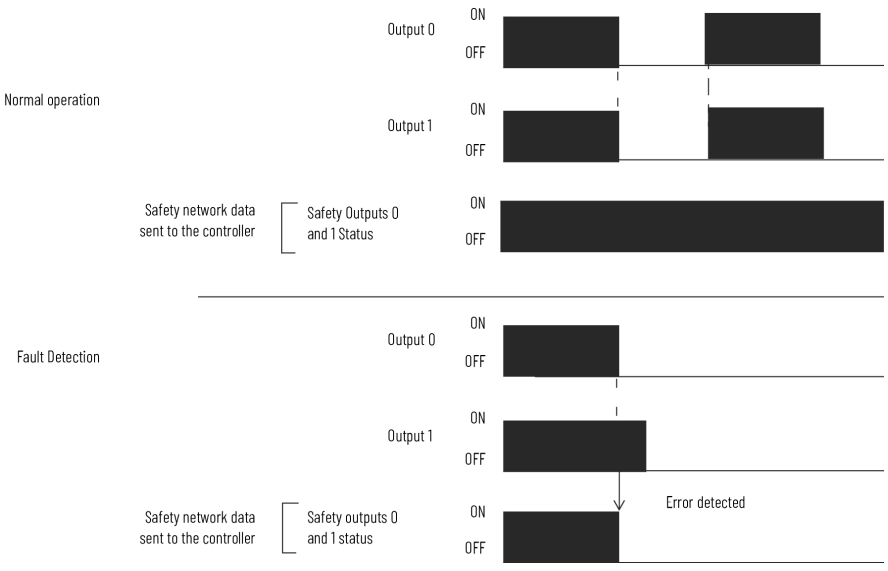
Dual-channel Mode

When dual-channel mode is used, output channels function as connection pairs. Connection pairs are as follows:

- Channels 0 and 1
- Channels 2 and 3
- Channels 4 and 5
- Channels 6 and 7

When both output channels in a connection pair are in the On state and without any faults, the safety outputs are turned on.

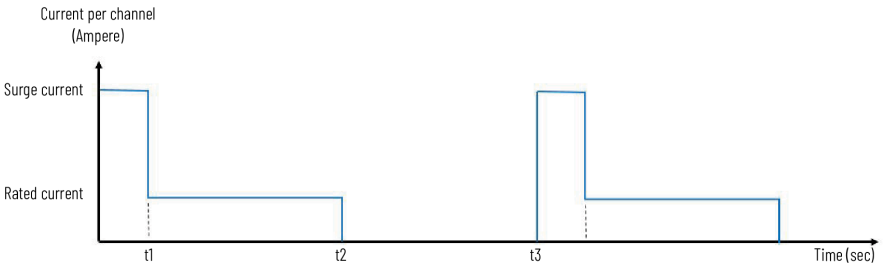
Figure 15. Dual-channel Normal Operation and Fault Detection (Not to Scale)



Surge Capability of Safety Output

The safety output supports temporary surge of current when transitioning from OFF to ON.

Figure 16. Surge Capability



Safety Output Fault Reset

The I/O channel supports a module-level user-configurable 'Latch Fault until reset via output tag' mode and recovers from only these field faults:

- Safety Output Overload
- Safety Output NoLoad

Other types of Safety Output faults are non-recoverable. You must cycle power to the module.

Latch Fault until Reset via Output Tag mode is Enabled

When Latch Fault mode is Enabled, the I/O channel holds safety output fault indications until it checks that the field fault is removed. If the field fault is removed, the channel clears the fault status only upon detecting that the ResetFault in its consume assembly channel sees a rising edge.

Latch Fault until Reset via Output Tag mode is Disabled

When Latch Fault mode is Disabled (default), the I/O channel holds safety output fault indications for 1 second until it checks if the field fault is removed. If the field fault is removed, the channel clears the fault status only upon detecting the consume data bit is low. The fault status can also be cleared by a module reset or power cycle.

After the channel clears the fault, the I/O indicator (red) turns off. The output data can now be controlled.

IMPORTANT: If the module outputs experience persistent high faults, consider cycling power to the module to clear the error.

Replace a Safety I/O Module

Replacing a safety module that sits on a CIP Safety network requires more effort than replacing standard devices because of the safety network number (SNN).

Safety devices require this more complex identifier to make sure that module numbers that are duplicated on separate subnets across all of the networks in the application do not compromise communication between the correct safety devices.

The SNN is a unique identifier that is automatically assigned to each subnet in a safety application. The same SNN is assigned to also devices on the subnet.

However, each safety I/O modules require a unique identifier within the same subnet. A DeviceID is used to uniquely identify each safety module. The SNN and module slot number make up the DeviceID of the safety module.

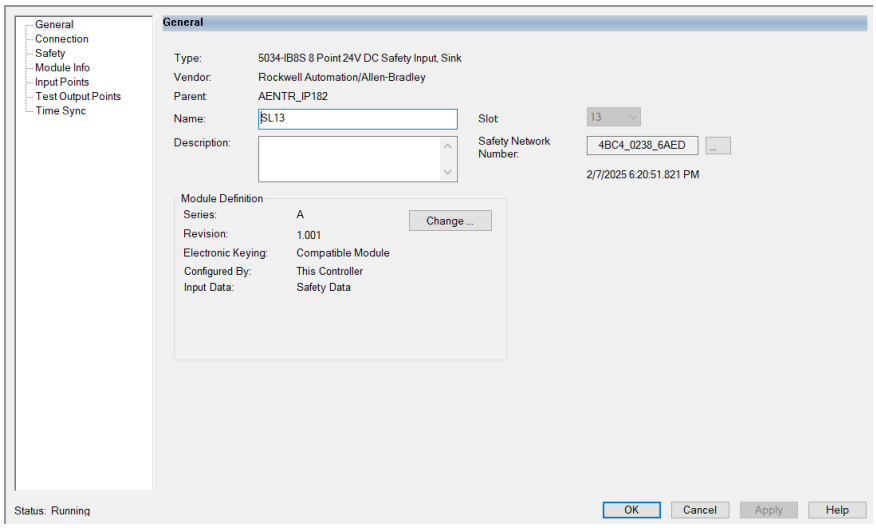
Set the SNN Manually

The SNN is used to provide integrity on the initial download to a safety module.

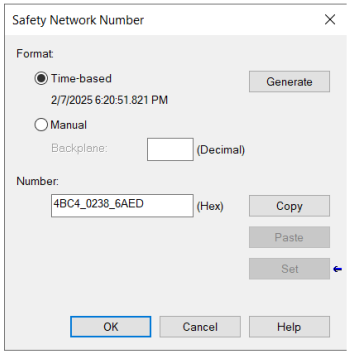
If a safety signature exists, the safety module must have DeviceID that matches the module in the safety controller project, before it can receive its configuration.

To maintain integrity, the module SNN must be set manually.

1. On the General category of the Module Properties dialog, select the ellipsis next to the Safety Network Number.



2. On the Safety Network Number dialog, select Manual.



3. Type the SNN in the Number field and select OK.
4. On the Module Properties dialog, select OK.

Reset to Out-of-Box Configuration

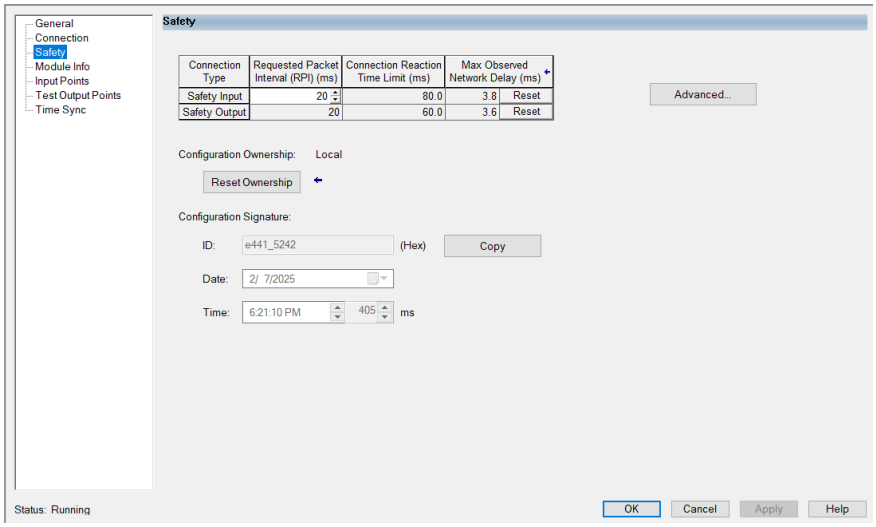
When the Studio 5000 Logix Designer application is online, the Safety tab of the Module Properties dialog box displays the current configuration ownership. When the opened project owns the configuration, Local is displayed.

When a second device owns the configuration, Remote is displayed, along with the SNN, and node address or slot number of the configuration owner. Communication error is displayed if the module read fails.

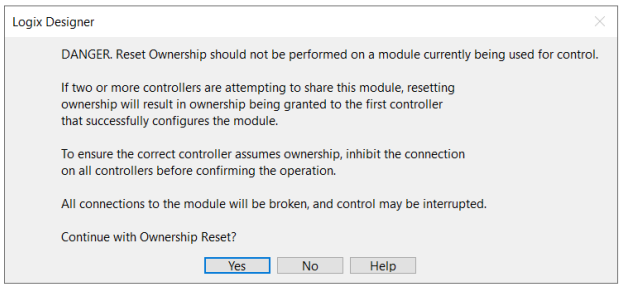
If the connection is Local, you must inhibit the module connection before you reset ownership.

Follow these steps to reset the module to its out-of-box configuration when online.

1. Right-click the module and choose Properties.
2. On the Safety tab, select Reset Ownership.



3. When a dialog box appears asking if you want to continue with the reset, read it and select Yes.



Replace a Safety Module in a Logix 5000 System

Consider the following conditions before you replace a safety I/O module in a Logix 5000 system:

- If you rely on a portion of the CIP Safety system to maintain SIL 3 behavior during module replacement and functional testing, you must use the Configure Only When No Safety Signature Exists feature.
- If you rely on the entire routable CIP Safety control system to maintain SIL 3/PL (d or e) during the replacement and functional testing of a module, you can use the Configure Always feature.

Replacement with 'Configure Only When No Safety Signature Exists' Enabled

When a module is replaced, the configuration is downloaded from the safety controller if the DeviceID of the new module matches the original. The DeviceID is updated whenever the SNN is set.

If the project is configured with Configure Only When No Safety Signature Exists enabled, follow the appropriate instructions in the table to replace a safety I/O module.

After you complete the steps in a scenario correctly, the DeviceID matches the original. This match enables the safety controller to download the proper module configuration, and re-establish the safety connection.

Table 12. Replace a Safety I/O Module

Controller Safety Signature Exists	Replacement Module Condition	Action Required
No	No SNN (Out-of-box)	None. The module is ready for use.
Yes or No	Same SNN as original safety task configuration	None. The module is ready for use.
Yes	No SNN (Out-of-box)	Complete the steps in Set the SNN Manually on page 54.
Yes	Different SNN from original safety task configuration	1. Reset to Out-of-Box Configuration on page 55. 2. Set the SNN Manually on page 54.
No		1. Reset to Out-of-Box Configuration on page 55. 2. Follow your company-prescribed procedures to functionally test the replaced I/O device and system and to authorize the system for use.

Replacement with 'Configured Always' Enabled

ATTENTION: Enable the 'Configure Always' feature only if the entire CIP Safety Control System is not being relied on to maintain SIL 3 behavior during the replacement and functional testing of a module. Do not place modules that are in the out-of-box condition on a CIP Safety network when the Configure Always feature is enabled, except while following this replacement procedure.

When the 'Configure Always' feature is enabled, the controller automatically checks for and connects to a replacement module that meets all the following requirements:

- The controller has configuration data for a compatible module at that network address.
- The module is in out-of-box condition or has an SNN that matches the configuration.

If the project is configured for 'Configure Always', follow the appropriate steps to replace a safety I/O module.

1. Remove the old I/O module and install the new module.

If	Then
The module is in out-of-box condition	Go to step 6. No action is needed for the controller to take ownership of the module.
An SNN mismatch error occurs	Go to the next step to reset the module to out-of-box condition.

2. Right-click your I/O module and choose Properties.
3. Select the Safety tab.
4. Select Reset Ownership.
5. Select OK.
6. Follow your company-prescribed procedures to functionally test the replaced I/O module and system and to authorize the system for use.

5034-IB16 and 5034-IB16XT Details

Module Configuration

Before you start configuring your I/O module, you must create a Studio 5000 Logix Designer application project for the Logix 5000 controller that owns the I/O module. The project includes configuration data for the module.

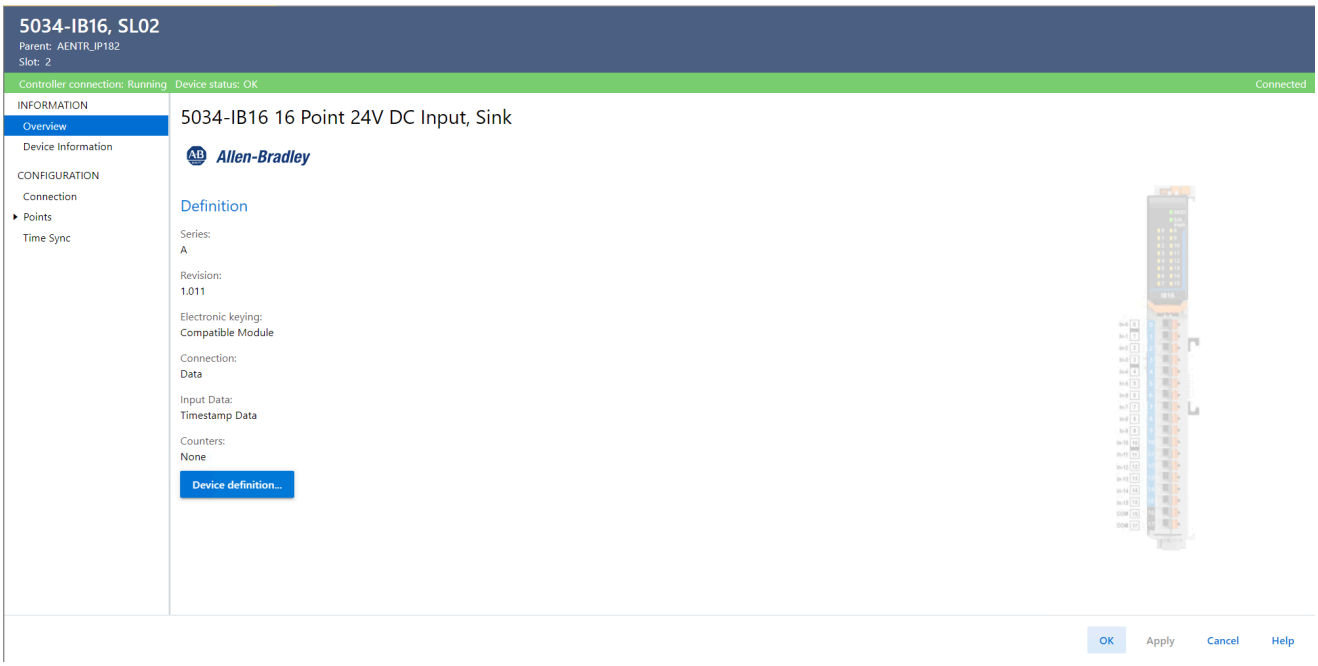
The Studio 5000 Logix Designer application transfers the project to the owner-controller during the program download. Data is then transferred to the I/O modules over the EtherNet/IP network.

The I/O modules can operate immediately after receiving and applying the configuration data.

Overview View

Use Overview to view the definition of a device, including the device type, revision, electronic keying, connection, and other device-specific values.

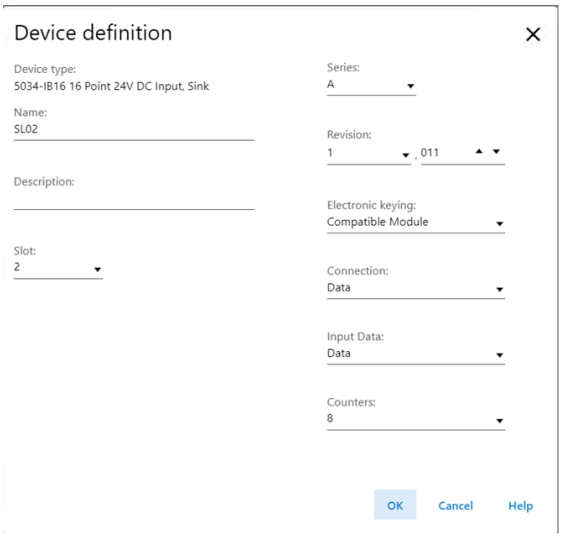
Figure 17. Overview View Example



Device Definition

To change the definition of a device, select Device definition in the Overview view.

Figure 18. Device Definition Example



Device Definition includes these parameters:

Table 13. Device Definition Parameters

Parameter	Definition	Available Choices
Device Type	Displays the device catalog number and type.	Device-specific
Name	Enter an IEC 61131 compliant device name. If an invalid character is entered in this field, or if the name exceeds 40 characters, the software ignores the character.	All valid values
Description	Enter the description of the device.	All valid values
Slot	Specify the slot number where the device resides. Only slots between 1 and the maximum number of I/O devices are valid depending on the platform. When the device is created, the slot number defaults to the first available slot position. When the controller is changed to one supporting a smaller maximum I/O count, the current slot value may no longer be valid.	1...32
Series	Specifies the series of the device.	Device-specific

Table 13. Device Definition Parameters (continued)

Parameter	Definition	Available Choices
Revision	Specifies the major and minor revisions of the device. The valid range for minor revision is from 1...255.	Device-specific
Electronic Keying	Defines the electronic keying used for the device. Electronic keying compares the device defined in the project to the installed device. If keying fails, a fault occurs. For detailed information on Electronic keying, see Electronic Keying in Logix 5000 Control Systems Application Technique, publication LOGIX-AT001.	• Exact Match • Compatible Module • Disable Keying
Connection	Specify the type of data transferred between the device and controller. For the Listen Only Data choice, the controller and device establish communication without the controller sending any configuration or output data to the device. A full input data connection is established but depends on the connection between the owner-controller and the device.	• Data • Listen Only Data
Input Data	Select the input data type for the device.	• Data • Timestamp Data • Packed Data
Counters	Select the counter number for the device.	• None • 4 • 8

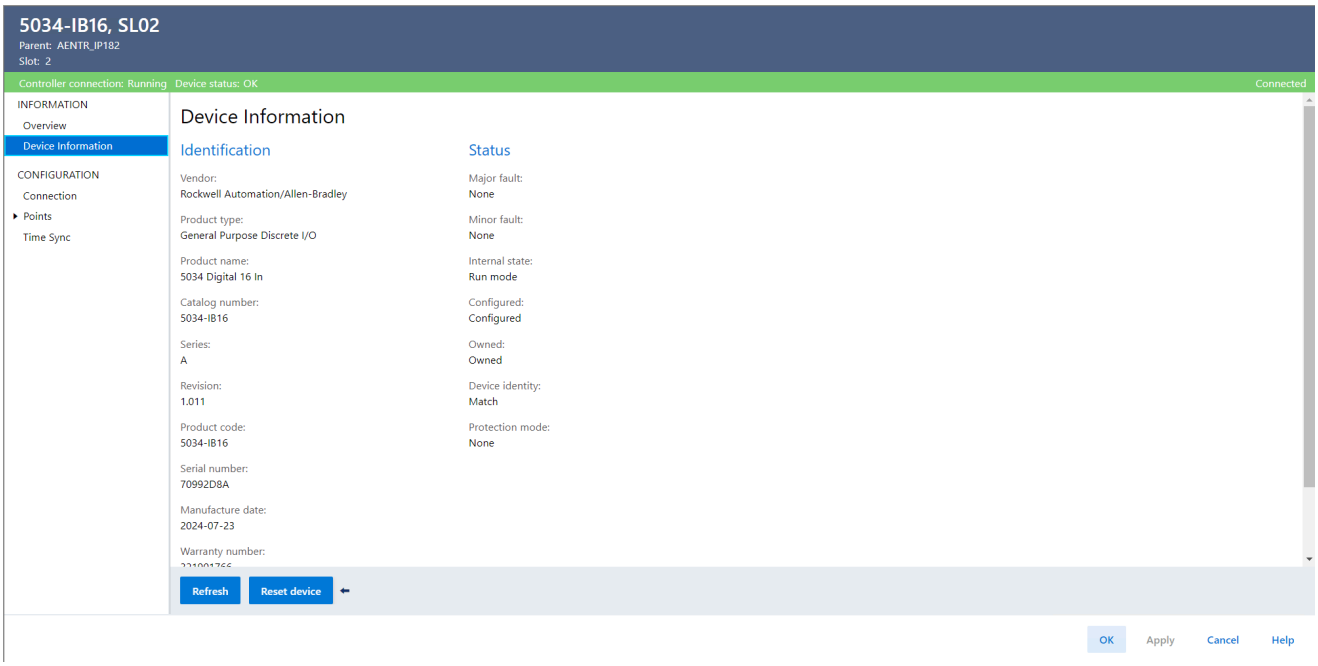
Device Information View

Use Device Information to view device and status information when the device is online.

Use Device Information to:

- Determine the identity of the device.
- View the device's current operational state.
- View whether the device was configured by the owner controller.
- View whether an owner controller is currently connected to the device.
- Retrieve the latest information from the device.
- Reset a device to its power-up state.
- If supported, view the protection mode of the device.

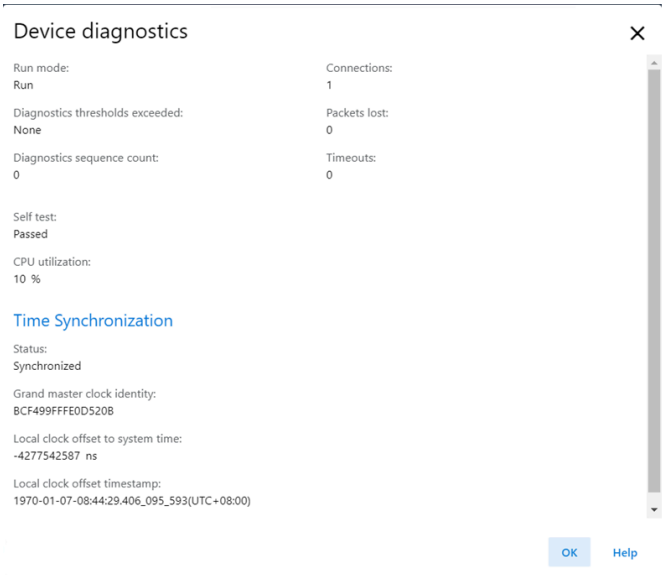
Figure 19. Device Information View Example



Device Diagnostics

To view the device diagnostics, select Diagnostics in the Device Information view.

Figure 20. Device Diagnostics Example



Connection View

Use Connection to define controller-to-device behavior.

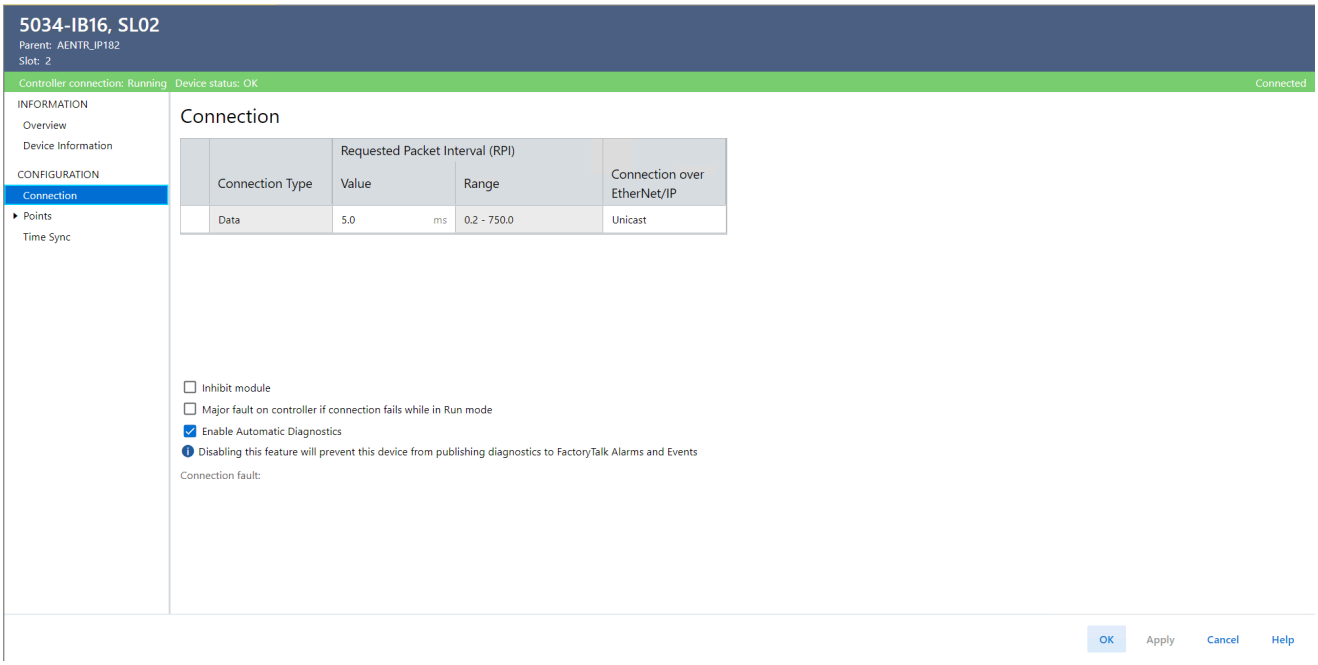
- Set the RPI rate. For more information, see Requested Packet Interval on page .
- Select Unicast or Multicast connection to use on the EtherNet/IP network. For more information, see Unicast or Multicast Connection on page 20.
- View the reason for a connection fault.

If there is a connection fault, the Connection Fault area displays the error code with a description that helps you to troubleshoot the module. For more information, see Troubleshoot Your Module on page 42.

- Inhibit the module. For more information, see Module Inhibiting on page 17.
- Configure whether a connection failure while the controller is in Run mode causes a major or minor fault.
- Enable or disable Automatic Diagnostics.

ATTENTION: If you do not enable Automatic Diagnostics, the device does not publish diagnostics to FatoryTalk Alarms and Events.

Figure 21. Connection View Example

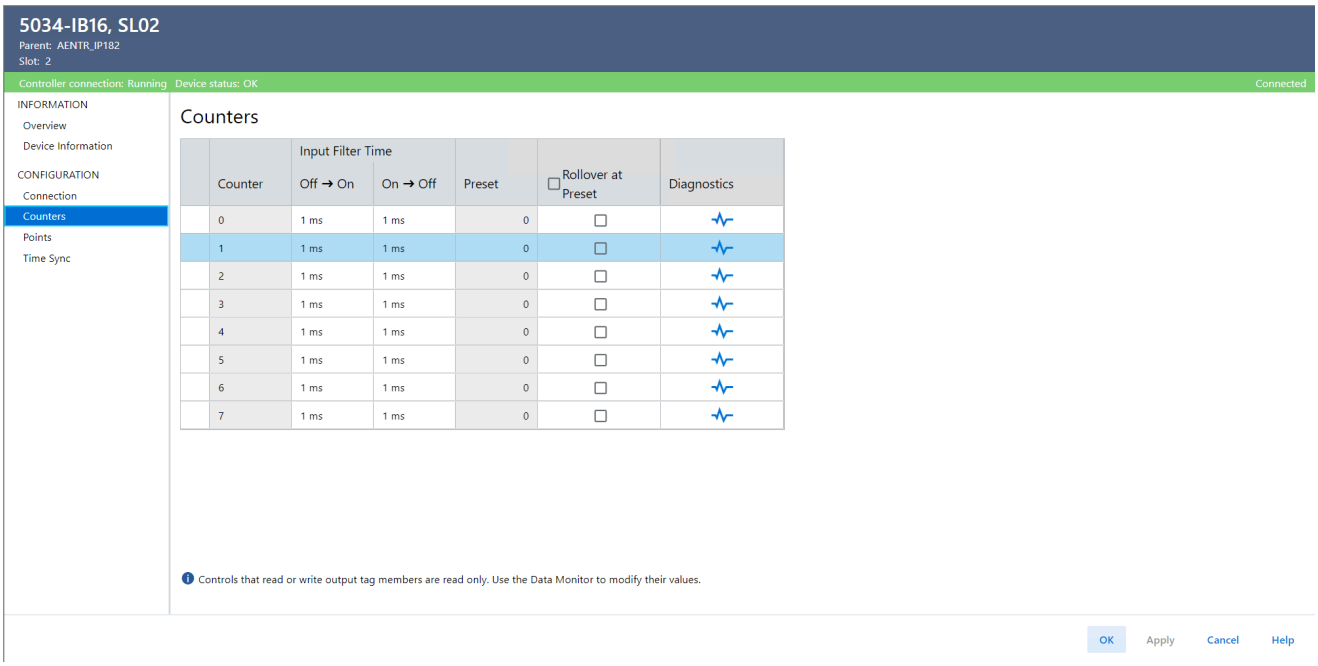


Counters View

Counters is available only if you choose a value for the Counters parameter in the Device Definition dialog.

Counters show the configuration options that are available for each counter. Based on your Input Filter Time selections, the Input Filter Time Off→On and On→Off times change. You can also enable Rollover at Preset. To modify the counter preset value, use *0.Counterxx.Preset* in the controller tags.

Figure 22. Counters View Example

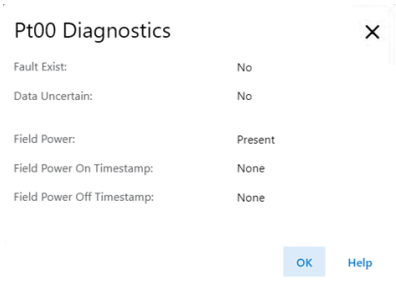


IMPORTANT: The total number of Counters subtracts from the available number of Points. For example, if you configure a 5034-IB16 module to use eight counters, the first eight terminals are not available to use as points. The number of points available on the module in this case is 8. That is, points 8...15.

Ptxx Diagnostics

To view the Ptxx diagnostics, select Diagnostics in the Counters view.

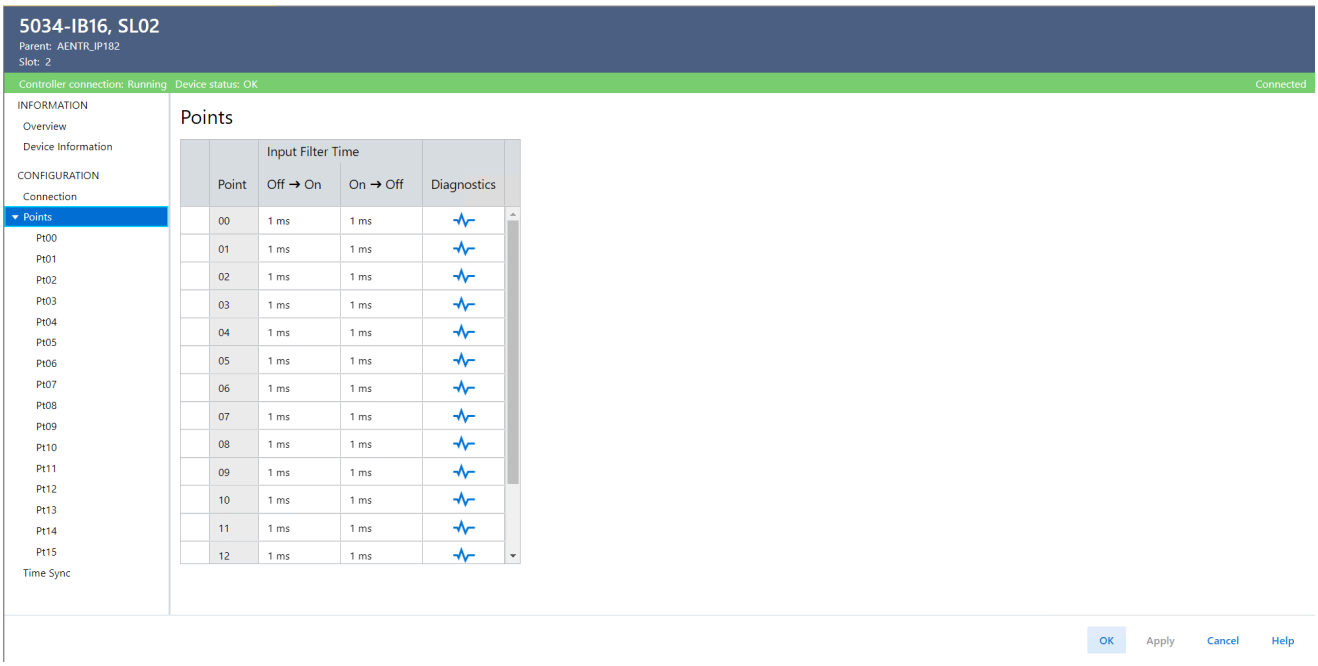
Figure 23. Ptxx Diagnostics Example



Points View

Use Points to view or configure the points for the device.

Figure 24. Points View Example



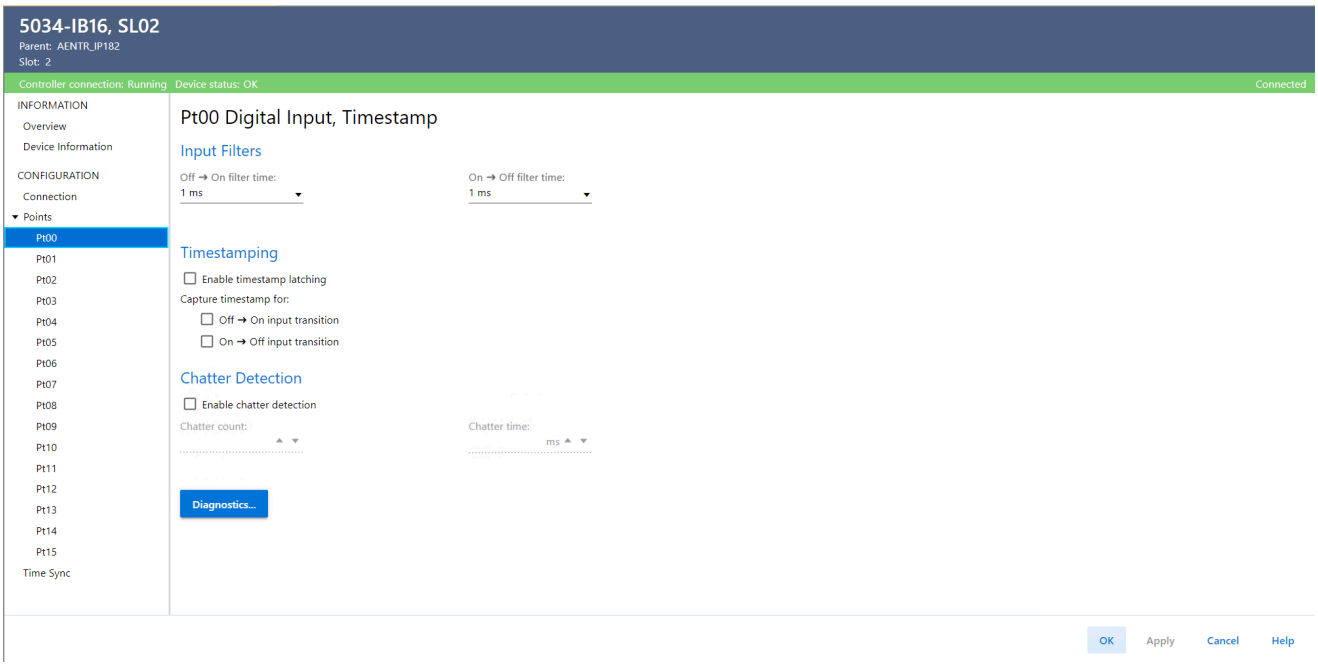
Ptxx View

If you choose Timestamp Data for Input Data in the Device Definition dialog, the Points view expands.

The Ptxx view shows the configuration options available when you use Timestamping on a point.

Select each Ptxx to configure it as necessary for your application.

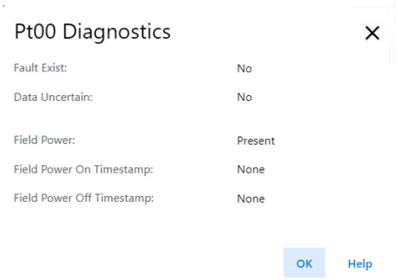
Figure 25. Ptxx View Example



Ptxx Diagnostics

To view the Ptxx diagnostics, select Diagnostics in the Points or Ptxx view.

Figure 26. Ptxx Diagnostics Example

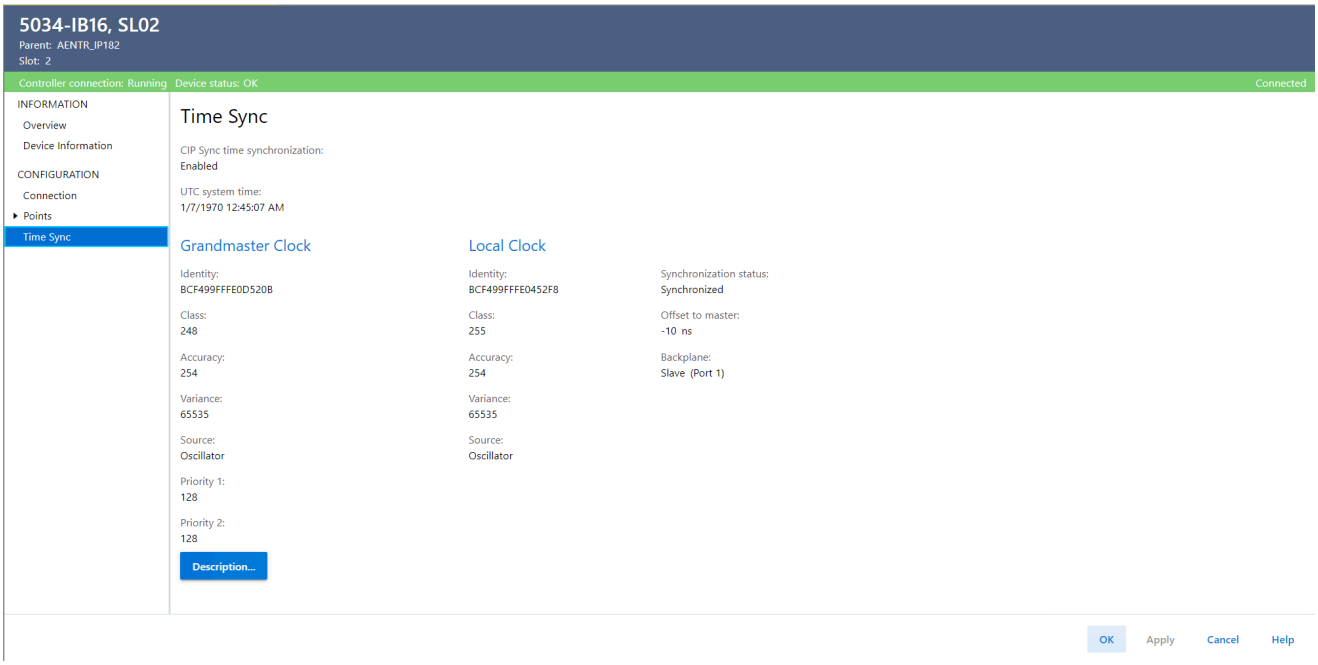


Time Sync View

The Time Sync view is read-only and displays the CIP Sync status information about the module when the project is online. The Time Sync category displays the following information:

- CIP Sync time synchronization status
- UTC system time
- Grandmaster Clock information
- Grandmaster Clock description
- Local Clock information

Figure 27. Time Sync View Example

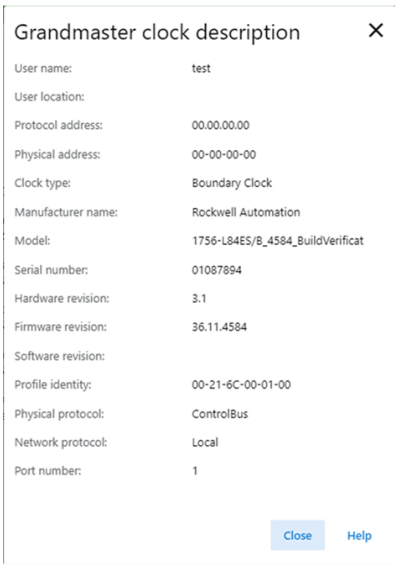


Grandmaster Clock Description

The Grandmaster clock description dialog provides detailed information about the grandmaster clock.

To view the Grandmaster clock description, select Description in the Time Sync view.

Figure 28. Grandmaster Clock Description Example



Use the Status Indicators for Troubleshooting

PointMax I/O modules use the following status indicators:

- SA Power Indicator - This indicator operates the same for all PointMax I/O modules.
- Module Status Indicator - This indicator operates the same for all PointMax I/O modules.
- Channel Status Indicator - This indicator operates differently based on the module type you are using.

SA Power Indicator

Table 14. Interpret SA Power Indicator – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered or outside its designed operating range.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	There is SA power to the module	None
Steady red	There is no SA power to the module or SA power is not in the valid range.	Complete the following actions: 1. Confirm that SA power wiring is properly connected to the adapter, expansion power module, or 5034-MBSA mounting base. 2. Check the following: ◦ Check that the SA voltage is in the correct range. ◦ If an external power supply is used, confirm that the power supply is turned on. ◦ Confirm that there is sufficient voltage supplied to the module. ◦ Make sure that the mounting base to mounting base connection is properly secured. Go to Chassis Information view in the Module Properties of the adapter module to check the Field Power status of mounting bases installed in all slots.

Module Status Indicator

Table 15. Interpret Module Status Indicator – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	The module has a connection to the owner-controller and is operating normally.	None
Flashing green	One of the following conditions exist: • The module has powered up successfully. • The module is OK, but it does not have a connection. No connection can result from missing, incomplete, or incorrect module configuration.	Complete the following actions: • Troubleshoot your Studio 5000 Logix Designer application to determine what is preventing a connection from the module to the controller and correct the issue. • Confirm that the system conditions require the controller to be in Remote Run mode or Run mode, transition the controller to one of those modes.
Steady red	The module experienced a nonrecoverable fault.	Complete the following actions: 1. Cycle power to the module. 2. If the status indicator remains in the steady red state, replace the module.
Flashing red	One of the following conditions exist: • A module firmware update is in progress. • A module firmware update attempt failed. • The device has experienced a recoverable fault. • A connection to the module has timed out.	Complete one of the following: • Let the firmware update progress complete. • Reattempt a firmware update after one fails. • Use the Studio 5000 Logix Designer application to determine whether a module recoverable fault is occurred. It is shown in Device Information view. To clear a recoverable fault, complete one of the following: ◦ Cycle module power. ◦ Select Reset device in the Studio 5000 Logix Designer project via the Device Information view of the Module Properties dialog. If the fault does not clear after cycling power and module reset, contact Rockwell Automation Technical Support. • Use the Studio 5000 Logix Designer application to determine if a connection has timed out. The Connection view in the Module Properties indicates whether a connection request has timed out. If a connection has timed out, determine the cause and correct it. For example, a cable failure can cause a connection timeout.
Flashing red/green	The module is in a self-test mode.	None

Point Status Indicators

Table 16. Interpret Point Status Indicators – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	One of the following: • The point is Off. • There is no backplane power. • A Field Power Loss condition exists.	One of the following: • Confirm that the point is configured properly. • Confirm that there is backplane power supplied through the EtherNet/IP adapter. • Locate and correct the cause of field power loss condition.
Steady yellow	The point is On.	None

Module Tag Definitions

Module tags are created when you add a module to the Studio 5000 Logix Designer application project.

The set of module tags associated with a module depends on the module type and Module Definition choices made during module configuration.

The tables contained in this section list all of the tags available with a module. Not all tags in the list are used when that module type is added to a project. Tag use varies by module configuration.

Configuration Tag Definitions

Table 17. Configuration Tags

Name	Data Type	Definition	Valid Values
Counterxx.InputOffOnFilter	SINT	The amount of time that a signal must be in the On state before the input data indicates the On state. The amount of time is indicated using an enumeration.	• 5 = 0 µs • 10 = 100 µs • 11 = 200 µs • 12 = 500 µs • 13 = 1 ms • 14 = 2 ms • 15 = 5 ms • 16 = 10 ms • 17 = 20 ms • 18 = 50 ms
Counterxx.InputOnOffFilter	SINT	The amount of time that a signal must be in the Off state before the input data indicates the Off state. The amount of time is indicated using an enumeration.	• 5 = 0 µs • 10 = 100 µs • 11 = 200 µs • 12 = 500 µs • 13 = 1 ms • 14 = 2 ms • 15 = 5 ms • 16 = 10 ms • 17 = 20 ms • 18 = 50 ms
Counterxx.RolloverAtPreset	BOOL	Determines whether the simple counter will rollover to 0 at the Preset value.	• 0 = No rollover at the Preset value When the counter counts to the Preset value, the Done bit is set. When the counter reaches maximum DINT (2,147,483,647) and continues counting, it rolls over to 0 and the Rollover bit is set. • 1 = Rollover at the Preset value When the counter reaches Preset-1 and continues counting, it rolls over to 0 and the Rollover bit is set. The Done bit is always 0.
Ptxx.InputOffOnFilter	SINT	The amount of time that a signal must be in the On state before the input data indicates the On state. The amount of time is indicated using an enumeration.	• 5 = 0 µs • 10 = 100 µs • 11 = 200 µs • 12 = 500 µs • 13 = 1 ms • 14 = 2 ms • 15 = 5 ms • 16 = 10 ms • 17 = 20 ms • 18 = 50 ms
Ptxx.InputOnOffFilter	SINT	The amount of time that a signal must be in the Off state before the input data indicates the Off state. The amount of time is indicated using an enumeration.	• 5 = 0 µs • 10 = 100 µs • 11 = 200 µs • 12 = 500 µs • 13 = 1 ms • 14 = 2 ms • 15 = 5 ms • 16 = 10 ms • 17 = 20 ms • 18 = 50 ms

Table 17. Configuration Tags (continued)

Name	Data Type	Definition	Valid Values
Ptxx.ChatterTime	INT	A value from 1...10,000 ms in whole ms increments.	1...10,000
Ptxx.ChatterCount	SINT	The number of input changes that are considered Chatter.	• 0 = Disabled • 2...127 = Enabled
Ptxx.CaptureOffOnEn	BOOL	Enables capturing Off to On timestamps. If cleared, the point does not record Off to On timestamps.	• 0 = Capture disabled for Off to On input transitions • 1 = Capture enabled for Off to On input transitions
Ptxx.CaptureOnOffEn	BOOL	Enables capturing On to Off timestamps. If cleared, the point does not record On to Off timestamps.	• 0 = Capture disabled for On to Off input transitions • 1 = Capture enabled for On to Off input transitions
Ptxx.TimestampLatchEn	BOOL	Determines whether timestamps latching is enabled.	• 0 = Timestamps are overwritten with each successive transition The new timestamp overwrites the reported timestamp immediately, even if the controller has yet to extract that data. • 1 = Timestamps are latched until acknowledged The reported timestamp is not overwritten until acknowledged. All subsequent transitions on that point are ignored until acknowledged/reset. Timestamp is acknowledged by writing the value from input tag TimestampOffOnNumber/TimestampOnOffNumber to output tag TimestampOffOnNumberAck/TimestampOnOffNumberAck. The acknowledgment also clears TimestampOverflowOffOn/TimestampOverflowOnOff.

Input Tag Definitions

Table 18. Input Tags

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Module is not applying new output tag data because the controller is in Program Mode. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied or there is no output tag data for the connection (For example, all points configured as digital input without timestamp).
ConnectionFaulted	BOOL	Indicates if a connection to the target is running. The module always returns a zero in this member. The controller overwrites the zero with a one when the connection is not up.	• 0 = Connection is running • 1 = Connection is not running
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
Uncertain (Packed data)	BOOL	Indicates that the point data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module.	• 0 = Good data • 1 = Uncertain data
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master was detected on the backplane, but the time master has timed out The module is using its local clock and can be drifting away from the last known master time.

Table 18. Input Tags (continued)

Name	Data Type	Definition	Valid Values
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
Counterxx.Data	BOOL	Indicates the current digital input value.	• 0 = Off • 1 = On
Counterxx.Fault	BOOL	Indicates that counter data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault
Counterxx.Uncertain	BOOL	Indicates that the counter data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
Counterxx.Done	BOOL	If RolloverAtPreset is set, indicates if Count ≥ Preset. If RolloverAtPreset is not set, always 0.	• 0 = Counter has not reached the Preset value • 1 = Counter has reached the Preset value
Counterxx.Rollover	BOOL	The counter counted up to Preset -1 and continued counting from 0. The RolloverAck bit transitioning from 0 to 1 or the Reset bit transitioning from 0 to 1 clears this bit.	• 0 = Counter has not rolled over from Preset -1 to 0 • 1 = Counter counted up to Preset -1 and continued counting from 0
Counterxx.Count	DINT	The number of rising edge of input signal counted by the counter.	All values
Ptxx.Data PtxxData (Packed data)	BOOL	Indicates the current digital input value.	• 0 = Off • 1 = On
Data (Packed data)	INT	Indicates the current values for all points of the module. Each bit represents 1 point. For example, Data.3 represents Pt03.	Data.0...Data.15: • 0 = Off • 1 = On
Ptxx.Fault PtxxFault (Packed data)	BOOL	Indicates that point data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault

Table 18. Input Tags (continued)

Name	Data Type	Definition	Valid Values
Fault (Packed data)	INT	Indicates the fault state for all points of the module. Each bit represents 1 point. For example, Fault.3 represent Pt03. Fault state indicates that point data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	Fault.0...Fault.15: • 0 = Good • 1 = Bad, causing fault
Ptxx.Uncertain	BOOL	Indicates that the point data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
Ptxx.Chatter	BOOL	Indicates if the input is chattering per the ChatterTime and ChatterCount settings.	• 0 = Normal • 1 = Input is chattering
Ptxx.TimestampOverflowOffOn	BOOL	Indicates an Off to On timestamp was lost. A timestamp can be lost when TimestampLatchEn is set but the reported timestamp is not acknowledged in time.	0 or 1
Ptxx.TimestampOverflowOnOff	BOOL	Indicates an On to Off timestamp was lost. A timestamp can be lost when TimestampLatchEn is set but the reported timestamp is not acknowledged in time.	0 or 1
Ptxx.CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
Ptxx.CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master was detected on the backplane, but the time master has timed out The module is using its local clock and can be drifting away from the last known master time.
Ptxx.TimestampOffOnNumber	INT	An Off to On timestamp identifier for the currently produced timestamp.	All values
Ptxx.TimestampOnOffNumber	INT	An On to Off timestamp identifier for the currently produced timestamp.	All values
Ptxx.TimestampOffOn	LINT	64-bit timestamp corresponding to when a change of state Off to On was recorded at the input.	All values
Ptxx.TimestampOnOff	LINT	64-bit timestamp corresponding to when a change of state On to Off was recorded at the input.	All values

Output Tag Definitions

Table 19. Output Tags

Name	Data Type	Definition	Valid Values
Counterxx.Reset	BOOL	When this bit transitions from 0 to 1, Count and Rollover are set to zero.	• 0 = Count and Rollover values are not set to 0 • 1 = Count and Rolloever values are set to 0
Counterxx.RolloverAck	BOOL	Clears the Rollover bit in the input tag when it transitions from 0 to 1.	• 0 = Rollover bit is not cleared • 1 = Rollover bit is cleared
Counterxx.Preset	DINT	• If RolloverAtPreset is set, when the counter reaches Preset-1 and continues counting, it rolls over to 0 and the Rollover bit is set. The Done bit is always 0. • If RolloverAtPreset is not set, when the counter counts to the Preset value, the Done bit is set. When the counter reaches maximum DINT (2,147,483,647) and continues counting, it rolls over to 0 and the Rollover bit is set.	0...2,147,483,647
Ptxx.ResetTimestamps	BOOL	Erases all recorded timestamps for the input point when it transitions from 0 to 1.	• 0 = Timestamps are not erased • 1 = Timestamps are erased
Ptxx.TimestampOffOnNumberAck	INT	An Off to On timestamp identifier that the controller writes to indicate that the identified timestamp has been seen and acted on. When Latching is enabled and the Timestamp Number that is received from the controller matches the most recent timestamp that is produced, the module is then allowed to produce a new timestamp.	All values
Ptxx.TimestampOnOffNumberAck	INT	An On to Off timestamp identifier that the controller writes to indicate that the identified timestamp has been seen and acted on. When Latching is enabled and the Timestamp Number that is received from the controller matches the most recent timestamp that is produced, the module is then allowed to produce a new timestamp.	All values

Diagnostic Assembly

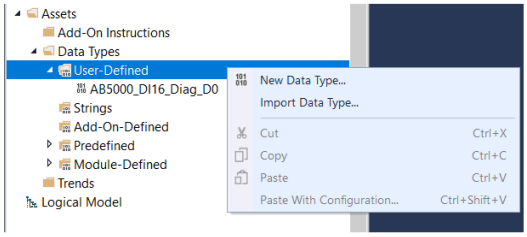
Diagnostic assembly helps you troubleshoot and diagnose the fault in your system.

Create User-defined Diagnostic Assembly Types

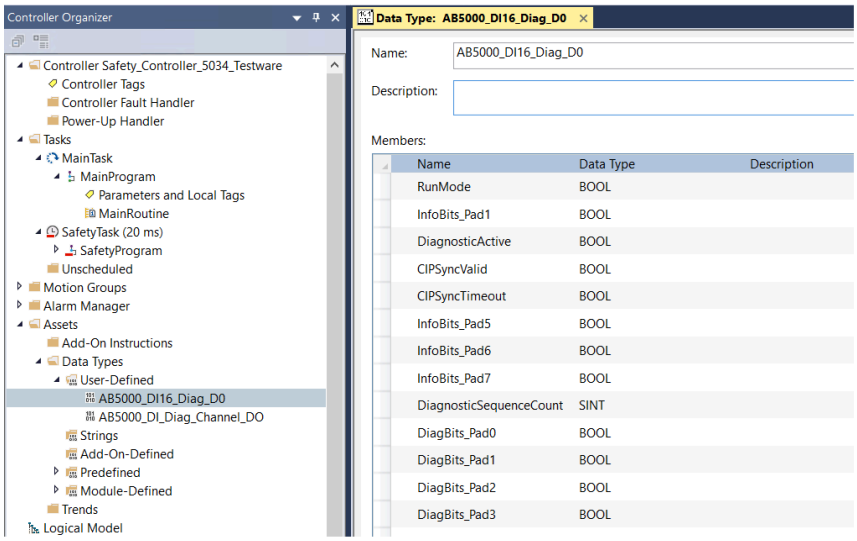
You can use the Studio 5000 Logix Designer application to create user-defined Diagnostic Assembly types.

Create user-defined diagnostic assembly by following the below steps:

1. From the Controller Organizer pane, go to Assets → Data types → User-Defined.
2. Right-click on the User-Defined folder and select New Data Type.



3. Add a Name and Description (optional) for your diagnostic assembly.
4. Under Members area, add the data members based on the diagnostic assembly detailed below.



IMPORTANT: The members indicated in the tables are arranged according to Data Alignment Rules of controllers. Strictly follow the data type and the sequence of the members that are indicated in the tables of this appendix. If the data type and the sequence are not followed, data misalignment may occur after executing Get Attribute Single Message (MSG) instruction.

Diagnostic Assembly

Diagnostic Digital 16 Point with Diagnostics Assembly

- Instance ID = 0x315 (789)
- Size = 416 bytes

Table 20. Diagnostic Assembly Instance – 789

Name	Data Type	Size in Bytes
RunMode	BOOL	1
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
CIPSyncValid	BOOL	
CIPSyncTimeout	BOOL	
InfoBits_Pad5	BOOL	
InfoBits_Pad6	BOOL	
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
DiagBits_Pad0	BOOL	2
DiagBits_Pad1	BOOL	

Table 20. Diagnostic Assembly Instance – 789 (continued)

Name	Data Type	Size in Bytes
DiagBits_Pad2	BOOL	
DiagBits_Pad3	BOOL	
DiagBits_Pad4	BOOL	
DiagBits_Pad5	BOOL	
DiagBits_Pad6	BOOL	
DiagBits_Pad7	BOOL	
DiagBits_Pad8	BOOL	
DiagBits_Pad9	BOOL	
BaseUnsupportedFault	BOOL	
BaseIDFault	BOOL	
FlashUpdateRequired	BOOL	
SelfTestFault	BOOL	
DiagBits_Pad14	BOOL	
DiagBits_Pad15	BOOL	
Pad	INT	4
LocalClockOffset	LINT	8
LocalClockOffsetTimestamp	LINT	8
GrandMasterClockID[8]	SINT	8
Points[0...15]	AB:5000_DI_Diag_Channel:D:0	384

Diagnostic Counters

Diagnostic Counters Assembly for I/O

- Instance ID = 0x301 (769)
- Size = 16 bytes

Table 21. Diagnostic Assembly Instance – 769

Name	Data Type	Size in Bytes
RunMode	BOOL	
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
InfoBits_Pad3	BOOL	1
InfoBits_Pad4	BOOL	
InfoBits_Pad5	BOOL	
InfoBits_Pad6	BOOL	

Table 21. Diagnostic Assembly Instance – 769 (continued)

Name	Data Type	Size in Bytes
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
CIPConnections	INT	2
CIPLostPackets	DINT	4
CIPTimeouts	DINT	4
CPUUtilization	INT	2
Pad	INT	2

Diagnostic Channel

This data type is retrieved as part of the diagnostic assembly instance.
Diagnostic Digital with Diagnostics Channel (Input)

- Data Type = AB:5000_DI_Diag_Channel:D:0
- Size = 24 bytes

Table 22. Structure for Data Type AB:5000_DI_Diag_Channel:D:0

Name	Data Type	Size in Bytes
DataBits_Pad0	BOOL	2
Fault	BOOL	
Uncertain	BOOL	
DataBits_Pad3	BOOL	
DataBits_Pad4	BOOL	
DataBits_Pad5	BOOL	
FieldPowerOff	BOOL	
DataBits_Pad7	BOOL	
DataBits_Pad8	BOOL	
DataBits_Pad9	BOOL	
DataBits_Pad10	BOOL	
DataBits_Pad11	BOOL	
DataBits_Pad12	BOOL	
DataBits_Pad13	BOOL	
DataBits_Pad14	BOOL	
DataBits_Pad15	BOOL	
DiagBits_Pad0...DiagBits_Pad15	INT	2
Pad	DINT	4

Table 22. Structure for Data Type AB:5000_DI_Diag_Channel:D:0 (continued)

Name	Data Type	Size in Bytes
FieldPowerOnTimestamp	LINT	8
FieldPowerOffTimestamp	LINT	8

Definitions for Diagnostic Assembly Types

Table 23. Definition of Members in Diagnostic Assembly Data Types

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state.	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Module is not applying new output tag data because the controller is in Program Mode. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied or there is no output tag data for the connection (For example, all points configured as digital input without timestamp).
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master has timed out The module is using its local clock and can be drifting away from the last known master time.
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
LocalClockOffset	LINT	The offset from the local clock to the system time. This value helps to detect steps in time. This value updates when a PTP update is received.	All values

Table 23. Definition of Members in Diagnostic Assembly Data Types (continued)

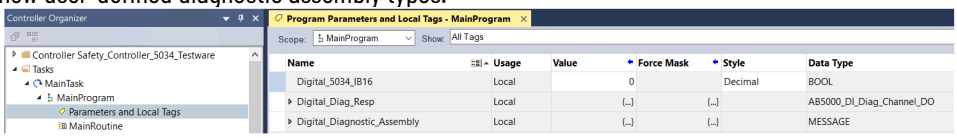
Name	Data Type	Definition	Valid Values
LocalClockOffsetTimestamp	LINT	Indicates the time of the local clock offset.	A valid time or None if there is no recorded event time. Time format is YYYY-MMDD-HH:mm:SS_mmm_uuu_nnn(UTC-00:00). • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds • uuu = microseconds • nnn = nanoseconds • UTC-00:00 = Time zone
GrandMasterClockID	SINT[8]	The EUI-64 Identity of the CIP Sync Grandmaster clock the module is synced to.	All values
Fault	BOOL	Indicates that the data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault
Uncertain	BOOL	Indicates that the data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
FieldPowerOff	BOOL	Indicates that a field power loss condition exists on the channel.	• 0 = Field power off condition does not exist • 1 = Field power off condition exists
FieldPowerOnTimestamp	LINT	Indicates the time of the last field power turned on event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds

Table 23. Definition of Members in Diagnostic Assembly Data Types (continued)

Name	Data Type	Definition	Valid Values
FieldPowerOffTimestamp	LINT	Indicates the time of the last field power turned off event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
CIPConnections	INT	Indicates the number of CIP connections that are currently open.	0...24
CIPLostPackets	DINT	Indicates the running sum of the number of Sequenced Address Item Sequence Numbers that are skipped in Class 0 and Class 1 connections consumed by the adapter and its children.	0...2,147,483,647
CIPTimeouts	DINT	Indicates the running count of the number of connections that time out, both originated and targeted, to and through the adapter.	0...2,147,483,647
CPUUtilization	INT	Indicates the usage of the compute engine.	0...100%

Create Message Type User Tags

Create MESSAGE type user tags for requests and associated response user tags for each of the new user-defined diagnostic assembly types.



From the Controller Organizer pane, expand Tasks → MainTask → MainProgram

1. Create MESSAGE type user tags for each request.
2. Create associated response user tags for each new user-defined diagnostic assembly type.
3. Add the user tags to your ladder program.

4. Expand the message tag to open the message configuration dialog.
5. On the Configuration tab, select:
   - Service type: Get Attribute Single
   - Class: 4
   - Attribute: 3

- Instance:
  - **5034-IB16 and 5034-IB16XT**
    789 (315h) Diagnostic Digital 16 Point with Diagnostics Assembly
    769 (301h) Diagnostic Counters Base I/O Assembly
- Destination element: User-defined data type suitable for the instance entered.

6. On the Communication tab, select the path to the module that you wish to send the messages to.
7. Download the project and set to Run mode.

   You can monitor the user-defined tag values from the Program Parameters and Local Tags window, under the MainProgram task in the Controller Organizer pane.

5034-IB8 and 5034-IB8XT Details

Module Configuration

Before you start configuring your I/O module, you must create a Studio 5000 Logix Designer application project for the Logix 5000 controller that owns the I/O module. The project includes configuration data for the module.

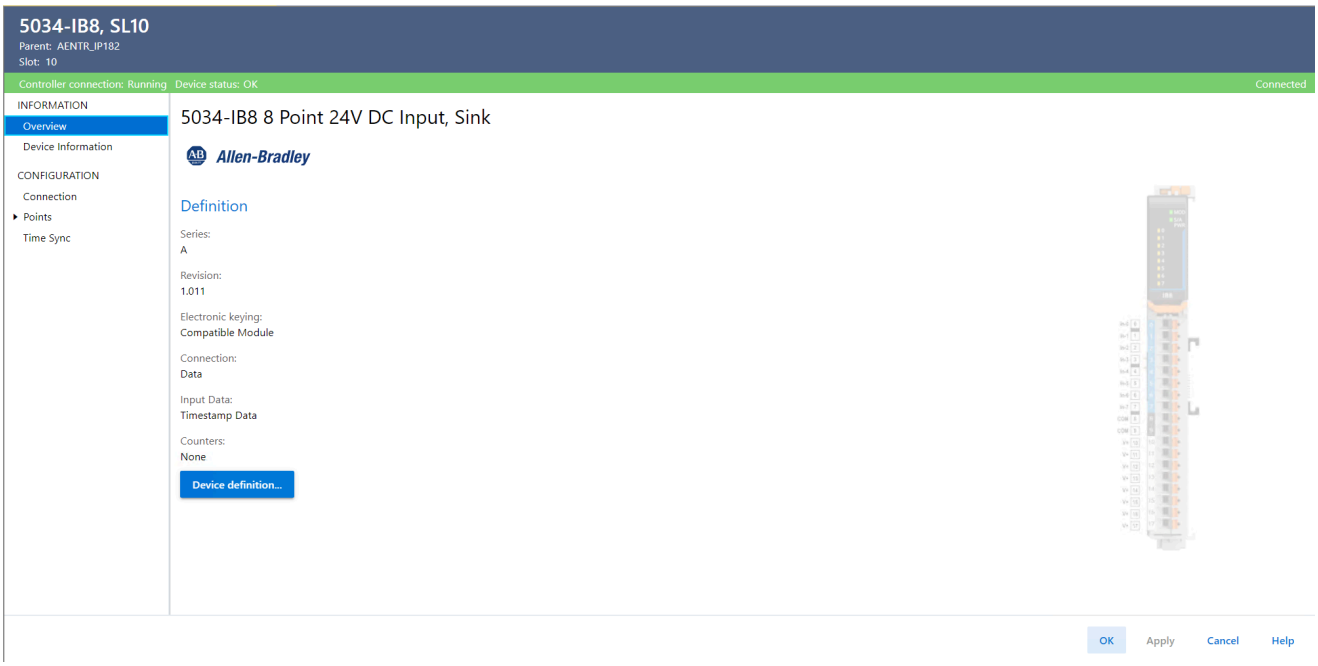
The Studio 5000 Logix Designer application transfers the project to the owner-controller during the program download. Data is then transferred to the I/O modules over the EtherNet/IP network.

The I/O modules can operate immediately after receiving and applying the configuration data.

Overview View

Use Overview to view the definition of a device, including the device type, revision, electronic keying, connection, and other device-specific values.

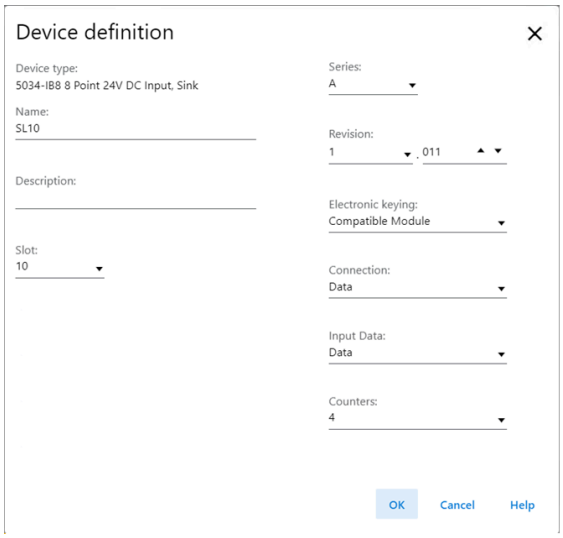
Figure 29. Overview View Example



Device Definition

To change the definition of a device, select Device definition in the Overview view.

Figure 30. Device Definition Example



Device Definition includes these parameters:

Table 24. Device Definition Parameters

Parameter	Definition	Available Choices
Device Type	Displays the device catalog number and type.	Device-specific
Name	Enter an IEC 61131 compliant device name. If an invalid character is entered in this field, or if the name exceeds 40 characters, the software ignores the character.	All valid values
Description	Enter the description of the device.	All valid values
Slot	Specify the slot number where the device resides. Only slots between 1 and the maximum number of I/O devices are valid depending on the platform. When the device is created, the slot number defaults to the first available slot position. When the controller is changed to one supporting a smaller maximum I/O count, the current slot value may no longer be valid.	1...32
Series	Specifies the series of the device.	Device-specific

Table 24. Device Definition Parameters (continued)

Parameter	Definition	Available Choices
Revision	Specifies the major and minor revisions of the device. The valid range for minor revision is from 1...255.	Device-specific
Electronic Keying	Defines the electronic keying used for the device. Electronic keying compares the device defined in the project to the installed device. If keying fails, a fault occurs. For detailed information on Electronic keying, see Electronic Keying in Logix 5000 Control Systems Application Technique, publication LOGIX-AT001.	• Exact Match • Compatible Module • Disable Keying
Connection	Specify the type of data transferred between the device and controller. For the Listen Only Data choice, the controller and device establish communication without the controller sending any configuration or output data to the device. A full input data connection is established but depends on the connection between the owner-controller and the device.	• Data • Listen Only Data
Input Data	Select the input data type for the device.	• Data • Timestamp Data • Packed Data
Counters	Select the counter number for the device.	• None • 4

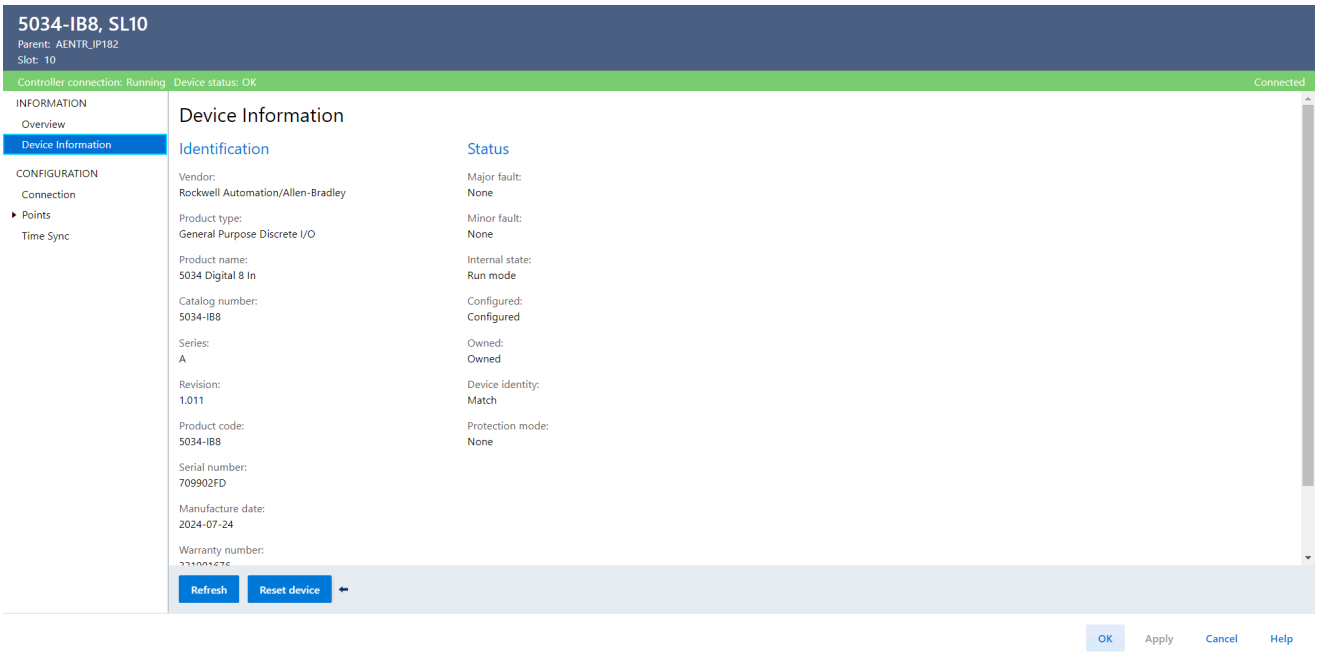
Device Information View

Use Device Information to view device and status information when the device is online.

Use Device Information to:

- Determine the identity of the device.
- View the device's current operational state.
- View whether the device was configured by the owner controller.
- View whether an owner controller is currently connected to the device.
- Retrieve the latest information from the device.
- Reset a device to its power-up state.
- If supported, view the protection mode of the device.

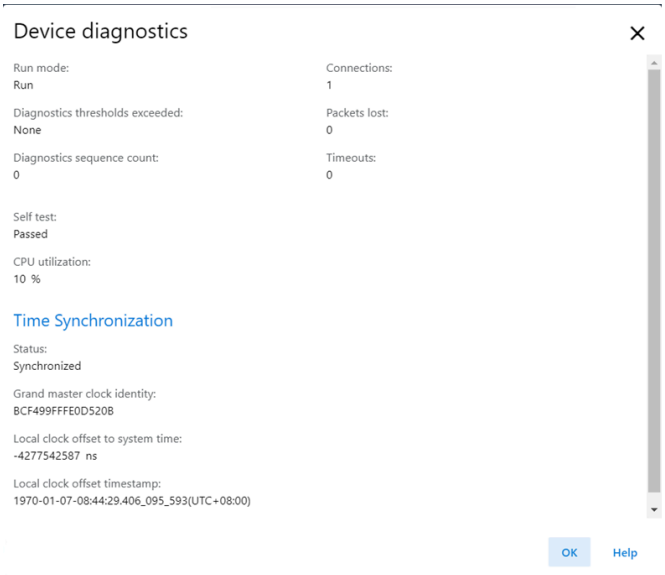
Figure 31. Device Information View Example



Device Diagnostics

To view the device diagnostics, select Diagnostics in the Device Information view.

Figure 32. Device Diagnostics Example



Connection View

Use Connection to define controller-to-device behavior.

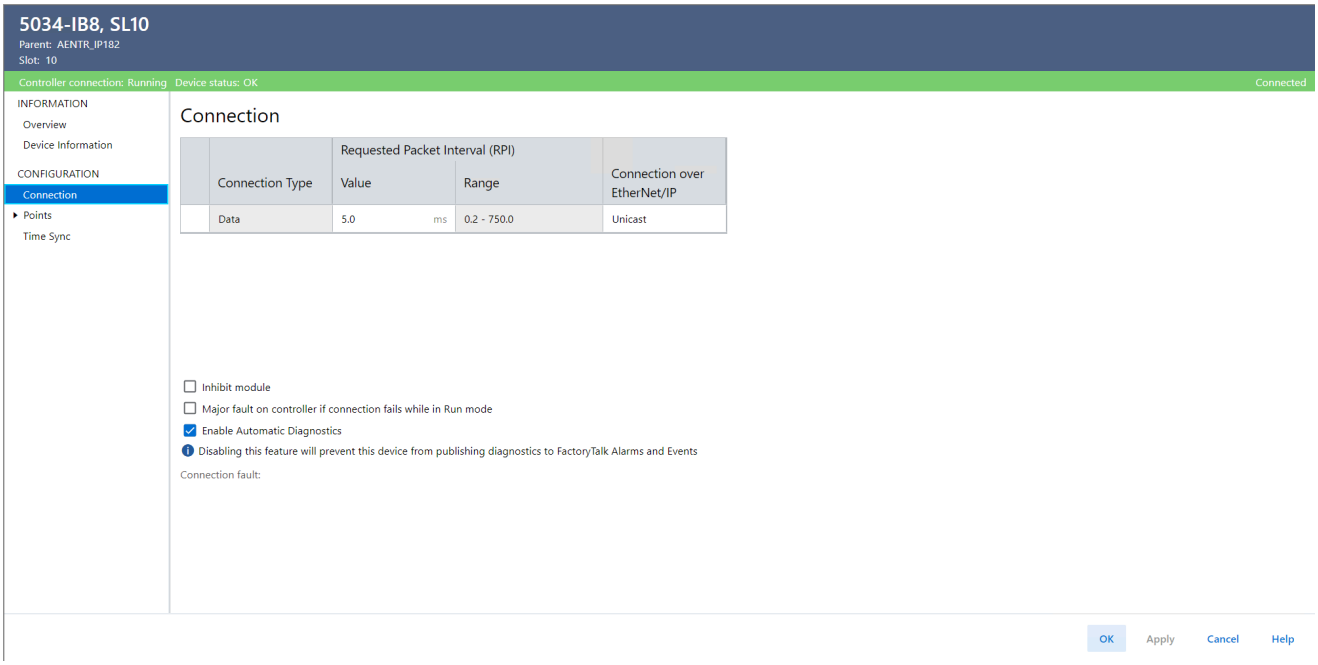
- Set the RPI rate. For more information, see Requested Packet Interval on page .
- Select Unicast or Multicast connection to use on the EtherNet/IP network. For more information, see Unicast or Multicast Connection on page 20.
- View the reason for a connection fault.

If there is a connection fault, the Connection Fault area displays the error code with a description that helps you to troubleshoot the module. For more information, see Troubleshoot Your Module on page 42.

- Inhibit the module. For more information, see Module Inhibiting on page 17.
- Configure whether a connection failure while the controller is in Run mode causes a major or minor fault.
- Enable or disable Automatic Diagnostics.

ATTENTION: If you do not enable Automatic Diagnostics, the device does not publish diagnostics to FatoryTalk Alarms and Events.

Figure 33. Connection View Example

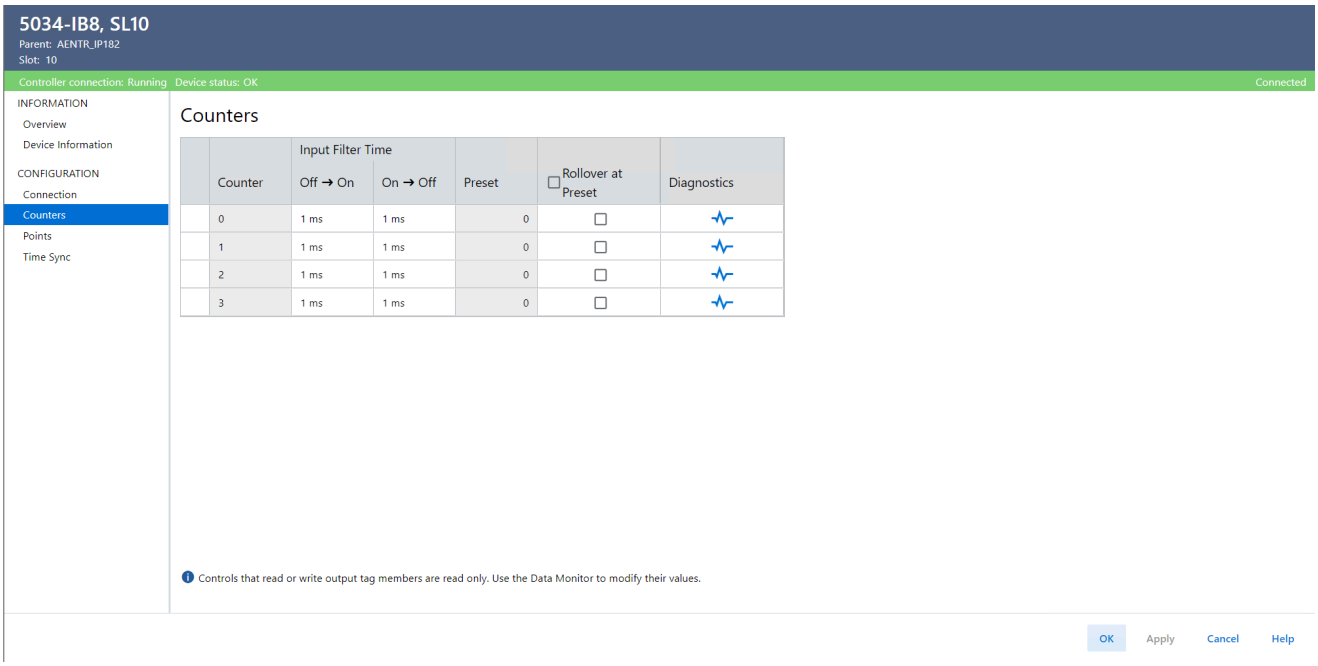


Counters View

Counters is available only if you choose a value for the Counters parameter in the Device Definition dialog.

Counters show the configuration options that are available for each counter. Based on your Input Filter Time selections, the Input Filter Time Off→On and On→Off times change. You can also enable Rollover at Preset. To modify the counter preset value, use *0.Counterxx.Preset* in the controller tags.

Figure 34. Counters View Example

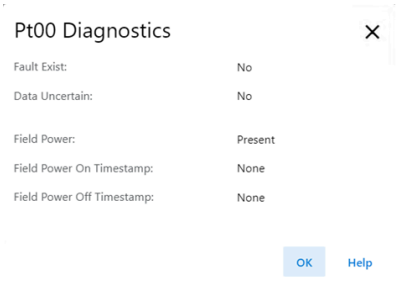


IMPORTANT: The total number of Counters subtracts from the available number of Points. For example, if you configure a 5034-IB8 module to use four counters, the first four terminals are not available to use as points. The number of points available on the module in this case is 4. That is, points 4...7.

Ptxx Diagnostics

To view the Ptxx diagnostics, select Diagnostics in the Counters view.

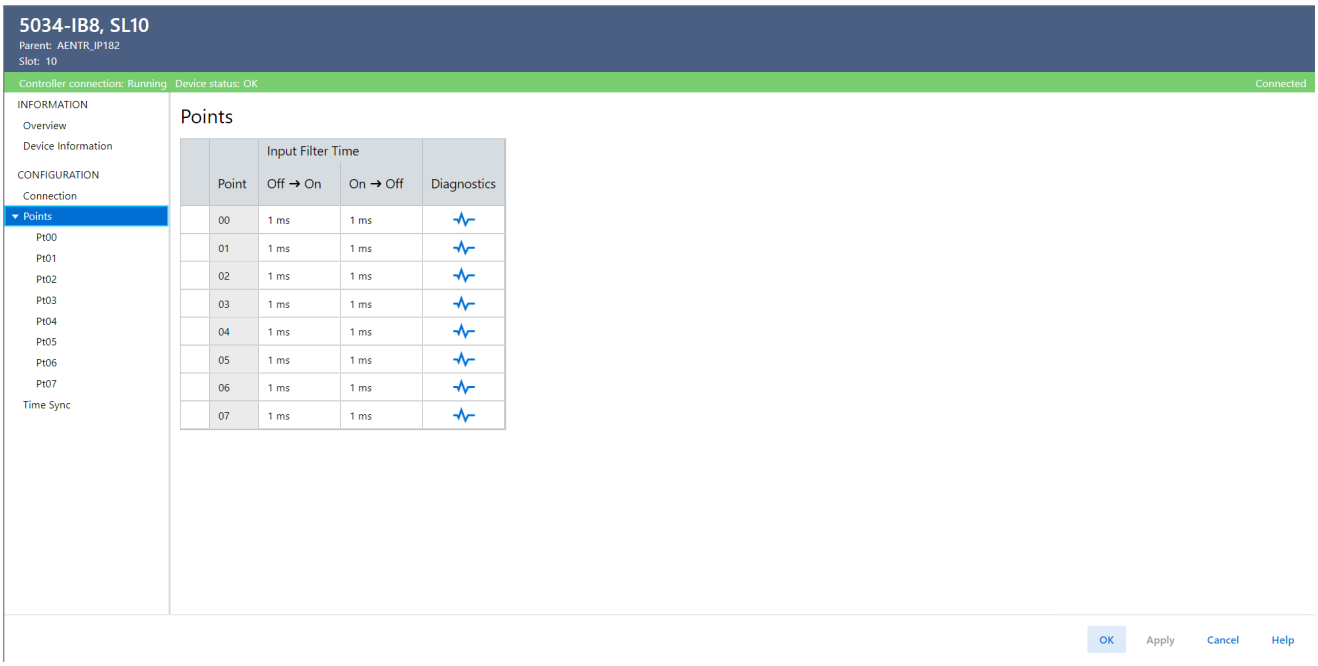
Figure 35. Ptxx Diagnostics Example



Points View

Use Points to view or configure the points for the device.

Figure 36. Points View Example



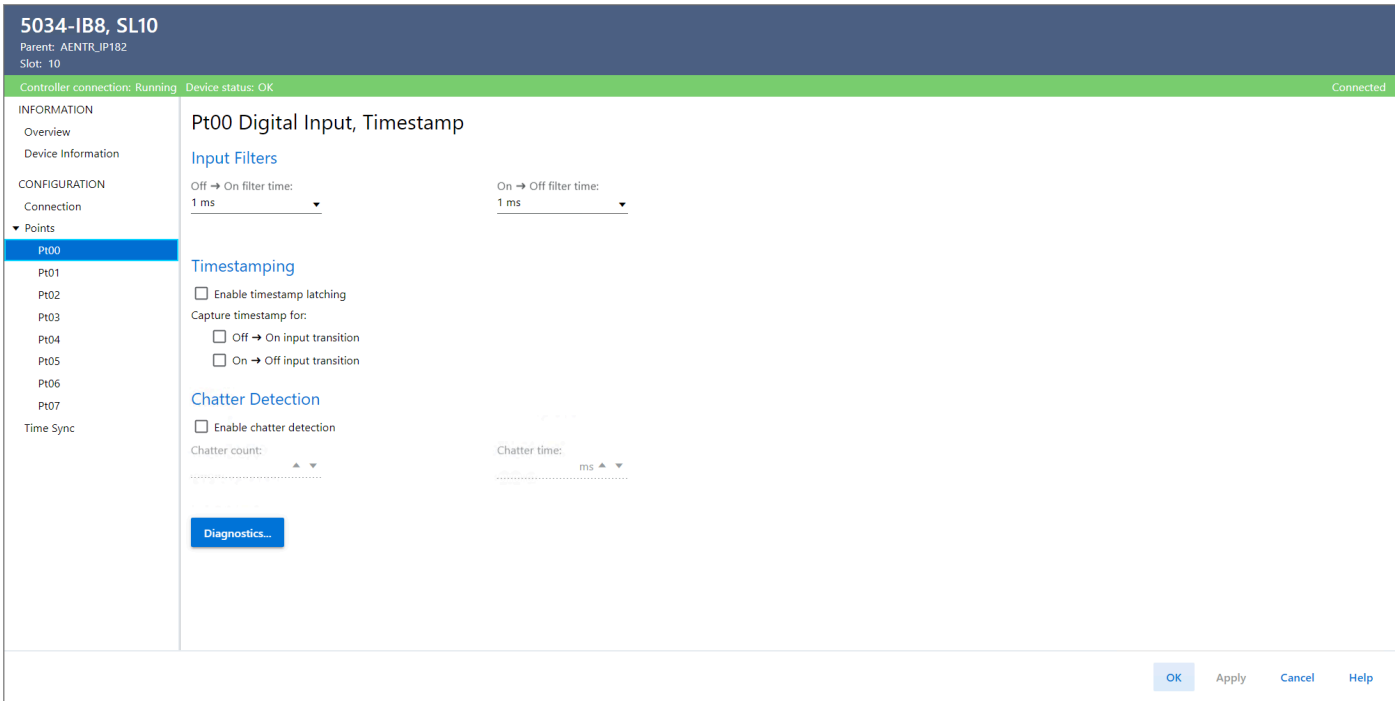
Ptxx View

If you choose Timestamp Data for Input Data in the Device Definition dialog, the Points view expands.

The Ptxx view shows the configuration options available when you use Timestamping on a point.

Select each Ptxx to configure it as necessary for your application.

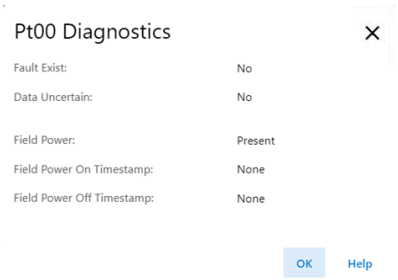
Figure 37. Ptxx View Example



Ptxx Diagnostics

To view the Ptxx diagnostics, select Diagnostics in the Points or Ptxx view.

Figure 38. Ptxx Diagnostics Example

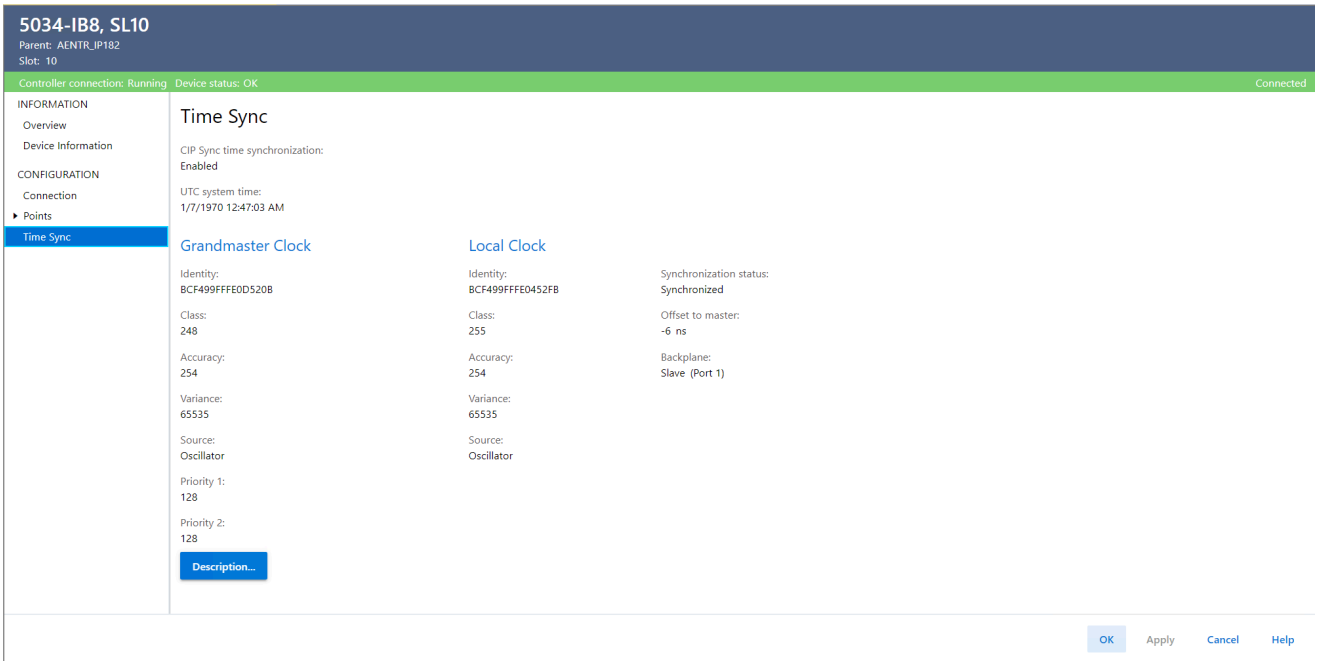


Time Sync View

The Time Sync view is read-only and displays the CIP Sync status information about the module when the project is online. The Time Sync category displays the following information:

- CIP Sync time synchronization status
- UTC system time
- Grandmaster Clock information
- Grandmaster Clock description
- Local Clock information

Figure 39. Time Sync View Example

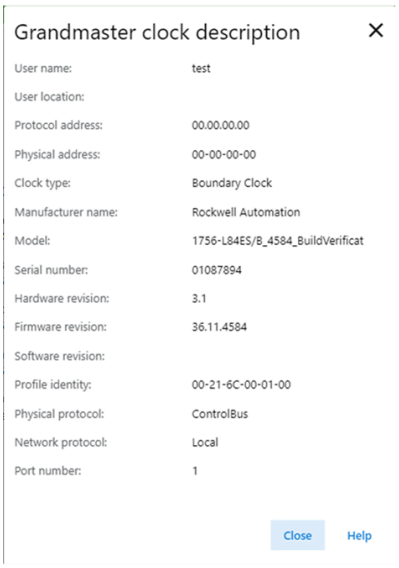


Grandmaster Clock Description

The Grandmaster clock description dialog provides detailed information about the grandmaster clock.

To view the Grandmaster clock description, select Description in the Time Sync view.

Figure 40. Grandmaster Clock Description Example



Use the Status Indicators for Troubleshooting

PointMax I/O modules use the following status indicators:

- SA Power Indicator - This indicator operates the same for all PointMax I/O modules.
- Module Status Indicator - This indicator operates the same for all PointMax I/O modules.
- Channel Status Indicator - This indicator operates differently based on the module type you are using.

SA Power Indicator

Table 25. Interpret SA Power Indicator – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered or outside its designed operating range.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	There is SA power to the module	None
Steady red	There is no SA power to the module or SA power is not in the valid range.	Complete the following actions: 1. Confirm that SA power wiring is properly connected to the adapter, expansion power module, or 5034-MBSA mounting base. 2. Check the following: ◦ Check that the SA voltage is in the correct range. ◦ If an external power supply is used, confirm that the power supply is turned on. ◦ Confirm that there is sufficient voltage supplied to the module. ◦ Make sure that the mounting base to mounting base connection is properly secured. Go to Chassis Information view in the Module Properties of the adapter module to check the Field Power status of mounting bases installed in all slots.

Module Status Indicator

Table 26. Interpret Module Status Indicator – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	The module has a connection to the owner-controller and is operating normally.	None
Flashing green	One of the following conditions exist: • The module has powered up successfully. • The module is OK, but it does not have a connection. No connection can result from missing, incomplete, or incorrect module configuration.	Complete the following actions: • Troubleshoot your Studio 5000 Logix Designer application to determine what is preventing a connection from the module to the controller and correct the issue. • Confirm that the system conditions require the controller to be in Remote Run mode or Run mode, transition the controller to one of those modes.
Steady red	The module experienced a nonrecoverable fault.	Complete the following actions: 1. Cycle power to the module. 2. If the status indicator remains in the steady red state, replace the module.
Flashing red	One of the following conditions exist: • A module firmware update is in progress. • A module firmware update attempt failed. • The device has experienced a recoverable fault. • A connection to the module has timed out.	Complete one of the following: • Let the firmware update progress complete. • Reattempt a firmware update after one fails. • Use the Studio 5000 Logix Designer application to determine whether a module recoverable fault is occurred. It is shown in Device Information view. To clear a recoverable fault, complete one of the following: ◦ Cycle module power. ◦ Select Reset device in the Studio 5000 Logix Designer project via the Device Information view of the Module Properties dialog. If the fault does not clear after cycling power and module reset, contact Rockwell Automation Technical Support. • Use the Studio 5000 Logix Designer application to determine if a connection has timed out. The Connection view in the Module Properties indicates whether a connection request has timed out. If a connection has timed out, determine the cause and correct it. For example, a cable failure can cause a connection timeout.
Flashing red/green	The module is in a self-test mode.	None

Point Status Indicators

Table 27. Interpret Point Status Indicators – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	One of the following: • The point is Off. • There is no backplane power. • A Field Power Loss condition exists.	One of the following: • Confirm that the point is configured properly. • Confirm that there is backplane power supplied through the EtherNet/IP adapter. • Locate and correct the cause of field power loss condition.
Steady yellow	The point is On.	None

Module Tag Definitions

Module tags are created when you add a module to the Studio 5000 Logix Designer application project.

The set of module tags associated with a module depends on the module type and Module Definition choices made during module configuration.

The tables contained in this section list all of the tags available with a module. Not all tags in the list are used when that module type is added to a project. Tag use varies by module configuration.

Configuration Tag Definitions

Table 28. Configuration Tags

Name	Data Type	Definition	Valid Values
Counterxx.InputOffOnFilter	SINT	The amount of time that a signal must be in the On state before the input data indicates the On state. The amount of time is indicated using an enumeration.	• 5 = 0 µs • 10 = 100 µs • 11 = 200 µs • 12 = 500 µs • 13 = 1 ms • 14 = 2 ms • 15 = 5 ms • 16 = 10 ms • 17 = 20 ms • 18 = 50 ms
Counterxx.InputOnOffFilter	SINT	The amount of time that a signal must be in the Off state before the input data indicates the Off state. The amount of time is indicated using an enumeration.	• 5 = 0 µs • 10 = 100 µs • 11 = 200 µs • 12 = 500 µs • 13 = 1 ms • 14 = 2 ms • 15 = 5 ms • 16 = 10 ms • 17 = 20 ms • 18 = 50 ms
Counterxx.RolloverAtPreset	BOOL	Determines whether the simple counter will rollover to 0 at the Preset value.	• 0 = No rollover at the Preset value When the counter counts to the Preset value, the Done bit is set. When the counter reaches maximum DINT (2,147,483,647) and continues counting, it rolls over to 0 and the Rollover bit is set. • 1 = Rollover at the Preset value When the counter reaches Preset-1 and continues counting, it rolls over to 0 and the Rollover bit is set. The Done bit is always 0.
Ptxx.InputOffOnFilter	SINT	The amount of time that a signal must be in the On state before the input data indicates the On state. The amount of time is indicated using an enumeration.	• 5 = 0 µs • 10 = 100 µs • 11 = 200 µs • 12 = 500 µs • 13 = 1 ms • 14 = 2 ms • 15 = 5 ms • 16 = 10 ms • 17 = 20 ms • 18 = 50 ms
Ptxx.InputOnOffFilter	SINT	The amount of time that a signal must be in the Off state before the input data indicates the Off state. The amount of time is indicated using an enumeration.	• 5 = 0 µs • 10 = 100 µs • 11 = 200 µs • 12 = 500 µs • 13 = 1 ms • 14 = 2 ms • 15 = 5 ms • 16 = 10 ms • 17 = 20 ms • 18 = 50 ms

Table 28. Configuration Tags (continued)

Name	Data Type	Definition	Valid Values
Ptxx.ChatterTime	INT	A value from 1...10,000 ms in whole ms increments.	1...10,000
Ptxx.ChatterCount	SINT	The number of input changes that are considered Chatter.	• 0 = Disabled • 2...127 = Enabled
Ptxx.CaptureOffOnEn	BOOL	Enables capturing Off to On timestamps. If cleared, the point does not record Off to On timestamps.	• 0 = Capture disabled for Off to On input transitions • 1 = Capture enabled for Off to On input transitions
Ptxx.CaptureOnOffEn	BOOL	Enables capturing On to Off timestamps. If cleared, the point does not record On to Off timestamps.	• 0 = Capture disabled for On to Off input transitions • 1 = Capture enabled for On to Off input transitions
Ptxx.TimestampLatchEn	BOOL	Determines whether timestamps latching is enabled.	• 0 = Timestamps are overwritten with each successive transition The new timestamp overwrites the reported timestamp immediately, even if the controller has yet to extract that data. • 1 = Timestamps are latched until acknowledged The reported timestamp is not overwritten until acknowledged. All subsequent transitions on that point are ignored until acknowledged/reset. Timestamp is acknowledged by writing the value from input tag TimestampOffOnNumber/TimestampOnOffNumber to output tag TimestampOffOnNumberAck/TimestampOnOffNumberAck. The acknowledgment also clears TimestampOverflowOffOn/TimestampOverflowOnOff.

Input Tag Definitions

Table 29. Input Tags

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Module is not applying new output tag data because the controller is in Program Mode. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied or there is no output tag data for the connection (For example, all points configured as digital input without timestamp).
ConnectionFaulted	BOOL	Indicates if a connection to the target is running. The module always returns a zero in this member. The controller overwrites the zero with a one when the connection is not up.	• 0 = Connection is running • 1 = Connection is not running
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
Uncertain (Packed data)	BOOL	Indicates that the point data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module.	• 0 = Good data • 1 = Uncertain data
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master was detected on the backplane, but the time master has timed out The module is using its local clock and can be drifting away from the last known master time.

Table 29. Input Tags (continued)

Name	Data Type	Definition	Valid Values
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
Counterxx.Data	BOOL	Indicates the current digital input value.	• 0 = Off • 1 = On
Counterxx.Fault	BOOL	Indicates that counter data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault
Counterxx.Uncertain	BOOL	Indicates that the counter data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
Counterxx.Done	BOOL	If RolloverAtPreset is set, indicates if Count ≥ Preset. If RolloverAtPreset is not set, always 0.	• 0 = Counter has not reached the Preset value • 1 = Counter has reached the Preset value
Counterxx.Rollover	BOOL	The counter counted up to Preset -1 and continued counting from 0. The RolloverAck bit transitioning from 0 to 1 or the Reset bit transitioning from 0 to 1 clears this bit.	• 0 = Counter has not rolled over from Preset -1 to 0 • 1 = Counter counted up to Preset -1 and continued counting from 0
Counterxx.Count	DINT	The number of rising edge of input signal counted by the counter.	All values
Ptxx.Data PtxxData (Packed data)	BOOL	Indicates the current digital input value.	• 0 = Off • 1 = On
Data (Packed data)	INT	Indicates the current values for all points of the module. Each bit represents 1 point. For example, Data.3 represents Pt03.	Data.0...Data.7: • 0 = Off • 1 = On
Ptxx.Fault PtxxFault (Packed data)	BOOL	Indicates that point data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault

Table 29. Input Tags (continued)

Name	Data Type	Definition	Valid Values
Fault (Packed data)	INT	Indicates the fault state for all points of the module. Each bit represents 1 point. For example, Fault.3 represent Pt03. Fault state indicates that point data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	Fault.0...Fault.7: • 0 = Good • 1 = Bad, causing fault
Ptxx.Uncertain	BOOL	Indicates that the point data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
Ptxx.Chatter	BOOL	Indicates if the input is chattering per the ChatterTime and ChatterCount settings.	• 0 = Normal • 1 = Input is chattering
Ptxx.TimestampOverflowOffOn	BOOL	Indicates an Off to On timestamp was lost. A timestamp can be lost when TimestampLatchEn is set but the reported timestamp is not acknowledged in time.	0 or 1
Ptxx.TimestampOverflowOnOff	BOOL	Indicates an On to Off timestamp was lost. A timestamp can be lost when TimestampLatchEn is set but the reported timestamp is not acknowledged in time.	0 or 1
Ptxx.CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
Ptxx.CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master was detected on the backplane, but the time master has timed out The module is using its local clock and can be drifting away from the last known master time.
Ptxx.TimestampOffOnNumber	INT	An Off to On timestamp identifier for the currently produced timestamp.	All values
Ptxx.TimestampOnOffNumber	INT	An On to Off timestamp identifier for the currently produced timestamp.	All values
Ptxx.TimestampOffOn	LINT	64-bit timestamp corresponding to when a change of state Off to On was recorded at the input.	All values
Ptxx.TimestampOnOff	LINT	64-bit timestamp corresponding to when a change of state On to Off was recorded at the input.	All values

Output Tag Definitions

Table 30. Output Tags

Name	Data Type	Definition	Valid Values
Counterxx.Reset	BOOL	When this bit transitions from 0 to 1, Count and Rollover are set to zero.	• 0 = Count and Rollover values are not set to 0 • 1 = Count and Rolloever values are set to 0
Counterxx.RolloverAck	BOOL	Clears the Rollover bit in the input tag when it transitions from 0 to 1.	• 0 = Rollover bit is not cleared • 1 = Rollover bit is cleared
Counterxx.Preset	DINT	• If RolloverAtPreset is set, when the counter reaches Preset-1 and continues counting, it rolls over to 0 and the Rollover bit is set. The Done bit is always 0. • If RolloverAtPreset is not set, when the counter counts to the Preset value, the Done bit is set. When the counter reaches maximum DINT (2,147,483,647) and continues counting, it rolls over to 0 and the Rollover bit is set.	0...2,147,483,647
Ptxx.ResetTimestamps	BOOL	Erases all recorded timestamps for the input point when it transitions from 0 to 1.	• 0 = Timestamps are not erased • 1 = Timestamps are erased
Ptxx.TimestampOffOnNumberAck	INT	An Off to On timestamp identifier that the controller writes to indicate that the identified timestamp has been seen and acted on. When Latching is enabled and the Timestamp Number that is received from the controller matches the most recent timestamp that is produced, the module is then allowed to produce a new timestamp.	All values
Ptxx.TimestampOnOffNumberAck	INT	An On to Off timestamp identifier that the controller writes to indicate that the identified timestamp has been seen and acted on. When Latching is enabled and the Timestamp Number that is received from the controller matches the most recent timestamp that is produced, the module is then allowed to produce a new timestamp.	All values

Diagnostic Assembly

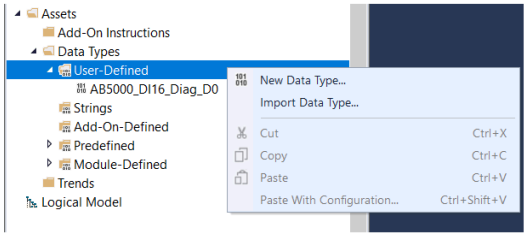
Diagnostic assembly helps you troubleshoot and diagnose the fault in your system.

Create User-defined Diagnostic Assembly Types

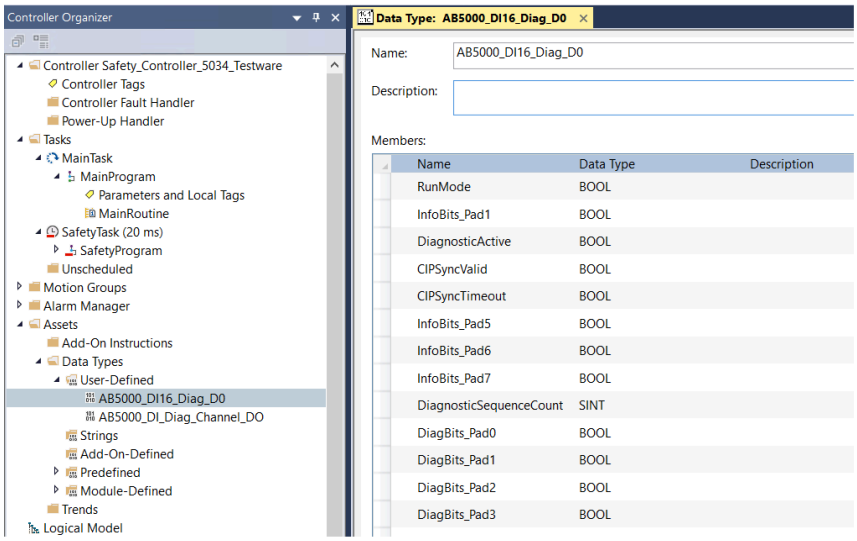
You can use the Studio 5000 Logix Designer application to create user-defined Diagnostic Assembly types.

Create user-defined diagnostic assembly by following the below steps:

1. From the Controller Organizer pane, go to Assets → Data types → User-Defined.
2. Right-click on the User-Defined folder and select New Data Type.



3. Add a Name and Description (optional) for your diagnostic assembly.
4. Under Members area, add the data members based on the diagnostic assembly detailed below.



IMPORTANT: The members indicated in the tables are arranged according to Data Alignment Rules of controllers. Strictly follow the data type and the sequence of the members that are indicated in the tables of this appendix. If the data type and the sequence are not followed, data misalignment may occur after executing Get Attribute Single Message (MSG) instruction.

Diagnostic Assembly

Diagnostic Digital 8 Point with Diagnostics Assembly

- Instance ID = 0x3CE (974)
- Size = 224 bytes

Table 31. Diagnostic Assembly Instance – 974

Name	Data Type	Size in Bytes
RunMode	BOOL	1
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
CIPSyncValid	BOOL	
CIPSyncTimeout	BOOL	
InfoBits_Pad5	BOOL	
InfoBits_Pad6	BOOL	
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
DiagBits_Pad0	BOOL	2
DiagBits_Pad1	BOOL	

Table 31. Diagnostic Assembly Instance – 974 (continued)

Name	Data Type	Size in Bytes
DiagBits_Pad2	BOOL	
DiagBits_Pad3	BOOL	
DiagBits_Pad4	BOOL	
DiagBits_Pad5	BOOL	
DiagBits_Pad6	BOOL	
DiagBits_Pad7	BOOL	
DiagBits_Pad8	BOOL	
DiagBits_Pad9	BOOL	
BaseUnsupportedFault	BOOL	
BaseIDFault	BOOL	
FlashUpdateRequired	BOOL	
SelfTestFault	BOOL	
DiagBits_Pad14	BOOL	
DiagBits_Pad15	BOOL	
Pad	INT	4
LocalClockOffset	LINT	8
LocalClockOffsetTimestamp	LINT	8
GrandMasterClockID[8]	SINT	8
Points [0...7]	AB:5000_DI_Diag_Channel:D:0	192

Diagnostic Counters

Diagnostic Counters Assembly for I/O

- Instance ID = 0x301 (769)
- Size = 16 bytes

Table 32. Diagnostic Assembly Instance – 769

Name	Data Type	Size in Bytes
RunMode	BOOL	
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
InfoBits_Pad3	BOOL	1
InfoBits_Pad4	BOOL	
InfoBits_Pad5	BOOL	
InfoBits_Pad6	BOOL	

Table 32. Diagnostic Assembly Instance – 769 (continued)

Name	Data Type	Size in Bytes
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
CIPConnections	INT	2
CIPLostPackets	DINT	4
CIPTimeouts	DINT	4
CPUUtilization	INT	2
Pad	INT	2

Diagnostic Channel

This data type is retrieved as part of the diagnostic assembly instance.
Diagnostic Digital with Diagnostics Channel (Input)

- Data Type = AB:5000_DI_Diag_Channel:D:0
- Size = 24 bytes

Table 33. Structure for Data Type AB:5000_DI_Diag_Channel:D:0

Name	Data Type	Size in Bytes
DataBits_Pad0	BOOL	2
Fault	BOOL	
Uncertain	BOOL	
DataBits_Pad3	BOOL	
DataBits_Pad4	BOOL	
DataBits_Pad5	BOOL	
FieldPowerOff	BOOL	
DataBits_Pad7	BOOL	
DataBits_Pad8	BOOL	
DataBits_Pad9	BOOL	
DataBits_Pad10	BOOL	
DataBits_Pad11	BOOL	
DataBits_Pad12	BOOL	
DataBits_Pad13	BOOL	
DataBits_Pad14	BOOL	
DataBits_Pad15	BOOL	
DiagBits_Pad0...DiagBits_Pad15	INT	2
Pad	DINT	4

Table 33. Structure for Data Type AB:5000_DI_Diag_Channel:D:0 (continued)

Name	Data Type	Size in Bytes
FieldPowerOnTimestamp	LINT	8
FieldPowerOffTimestamp	LINT	8

Definitions for Diagnostic Assembly Types

Table 34. Definition of Members in Diagnostic Assembly Data Types

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state.	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Module is not applying new output tag data because the controller is in Program Mode. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied or there is no output tag data for the connection (For example, all points configured as digital input without timestamp).
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master has timed out The module is using its local clock and can be drifting away from the last known master time.
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
LocalClockOffset	LINT	The offset from the local clock to the system time. This value helps to detect steps in time. This value updates when a PTP update is received.	All values

Table 34. Definition of Members in Diagnostic Assembly Data Types (continued)

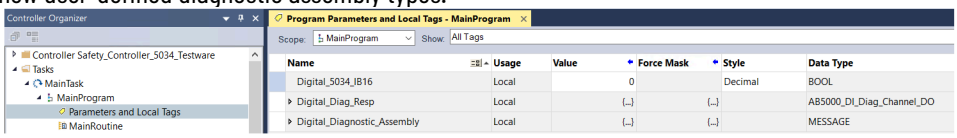
Name	Data Type	Definition	Valid Values
LocalClockOffsetTimestamp	LINT	Indicates the time of the local clock offset.	A valid time or None if there is no recorded event time. Time format is YYYY-MMDD-HH:mm:SS_mmm_uuu_nnn(UTC-00:00). • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds • uuu = microseconds • nnn = nanoseconds • UTC-00:00 = Time zone
GrandMasterClockID	SINT[8]	The EUI-64 Identity of the CIP Sync Grandmaster clock the module is synced to.	All values
Fault	BOOL	Indicates that the data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault
Uncertain	BOOL	Indicates that the data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
FieldPowerOff	BOOL	Indicates that a field power loss condition exists on the channel.	• 0 = Field power off condition does not exist • 1 = Field power off condition exists
FieldPowerOnTimestamp	LINT	Indicates the time of the last field power turned on event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds

Table 34. Definition of Members in Diagnostic Assembly Data Types (continued)

Name	Data Type	Definition	Valid Values
FieldPowerOffTimestamp	LINT	Indicates the time of the last field power turned off event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
CIPConnections	INT	Indicates the number of CIP connections that are currently open.	0...24
CIPLostPackets	DINT	Indicates the running sum of the number of Sequenced Address Item Sequence Numbers that are skipped in Class 0 and Class 1 connections consumed by the adapter and its children.	0...2,147,483,647
CIPTimeouts	DINT	Indicates the running count of the number of connections that time out, both originated and targeted, to and through the adapter.	0...2,147,483,647
CPUUtilization	INT	Indicates the usage of the compute engine.	0...100%

Create Message Type User Tags

Create MESSAGE type user tags for requests and associated response user tags for each of the new user-defined diagnostic assembly types.



From the Controller Organizer pane, expand Tasks → MainTask → MainProgram

1. Create MESSAGE type user tags for each request.
2. Create associated response user tags for each new user-defined diagnostic assembly type.
3. Add the user tags to your ladder program.

4. Expand the message tag to open the message configuration dialog.
5. On the Configuration tab, select:
   - Service type: Get Attribute Single
   - Class: 4
   - Attribute: 3

- Instance:
  - **5034-IB8 and 5034-IB8XT**
    974 (3CEh) Diagnostic Digital 8 Point with Diagnostics Assembly
    769 (301h) Diagnostic Counters Base I/O Assembly
- Destination element: User-defined data type suitable for the instance entered.

6. On the Communication tab, select the path to the module that you wish to send the messages to.
7. Download the project and set to Run mode.

   You can monitor the user-defined tag values from the Program Parameters and Local Tags window, under the MainProgram task in the Controller Organizer pane.

5034-OB16 and 5034-OB16XT Details

Module Configuration

Before you start configuring your I/O module, you must create a Studio 5000 Logix Designer application project for the Logix 5000 controller that owns the I/O module. The project includes configuration data for the module.

The Studio 5000 Logix Designer application transfers the project to the owner-controller during the program download. Data is then transferred to the I/O modules over the EtherNet/IP network.

The I/O modules can operate immediately after receiving and applying the configuration data.

Overview View

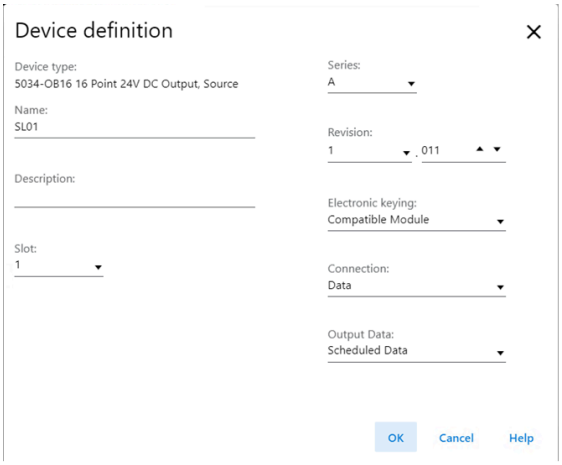
Use Overview to view the definition of a device, including the device type, revision, electronic keying, connection, and other device-specific values.

Figure 41. Overview View Example

Device Definition

To change the definition of a device, select Device definition in the Overview view.

Figure 42. Device Definition Example



Device Definition includes these parameters:

Table 35. Device Definition Parameters

Parameter	Definition	Available Choices
Device Type	Displays the device catalog number and type.	Device-specific
Name	Enter an IEC 61131 compliant device name. If an invalid character is entered in this field, or if the name exceeds 40 characters, the software ignores the character.	All valid values
Description	Enter the description of the device.	All valid values
Slot	Specify the slot number where the device resides. Only slots between 1 and the maximum number of I/O devices are valid depending on the platform. When the device is created, the slot number defaults to the first available slot position. When the controller is changed to one supporting a smaller maximum I/O count, the current slot value may no longer be valid.	1...32
Series	Specifies the series of the device.	Device-specific

Table 35. Device Definition Parameters (continued)

Parameter	Definition	Available Choices
Revision	Specifies the major and minor revisions of the device. The valid range for minor revision is from 1...255.	Device-specific
Electronic Keying	Defines the electronic keying used for the device. Electronic keying compares the device defined in the project to the installed device. If keying fails, a fault occurs. For detailed information on Electronic keying, see Electronic Keying in Logix 5000 Control Systems Application Technique, publication LOGIX-AT001.	• Exact Match • Compatible Module • Disable Keying
Connection	Specify the type of data transferred between the device and controller. For the Listen Only Data choice, the controller and device establish communication without the controller sending any configuration or output data to the device. A full input data connection is established but depends on the connection between the owner-controller and the device.	• Data • Listen Only Data
Output Data	Select the output data type for the device.	• Data • Packed Data • Scheduled Data

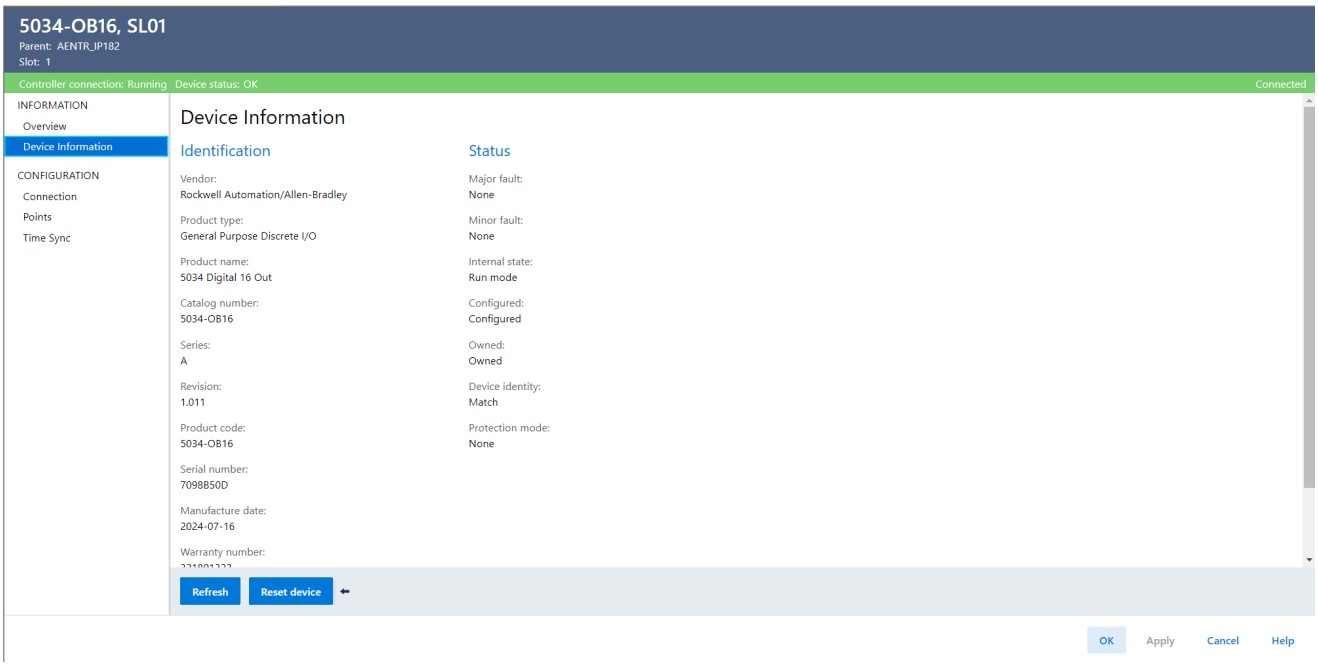
Device Information View

Use Device Information to view device and status information when the device is online.

Use Device Information to:

- Determine the identity of the device.
- View the device's current operational state.
- View whether the device was configured by the owner controller.
- View whether an owner controller is currently connected to the device.
- Retrieve the latest information from the device.
- Reset a device to its power-up state.
- If supported, view the protection mode of the device.

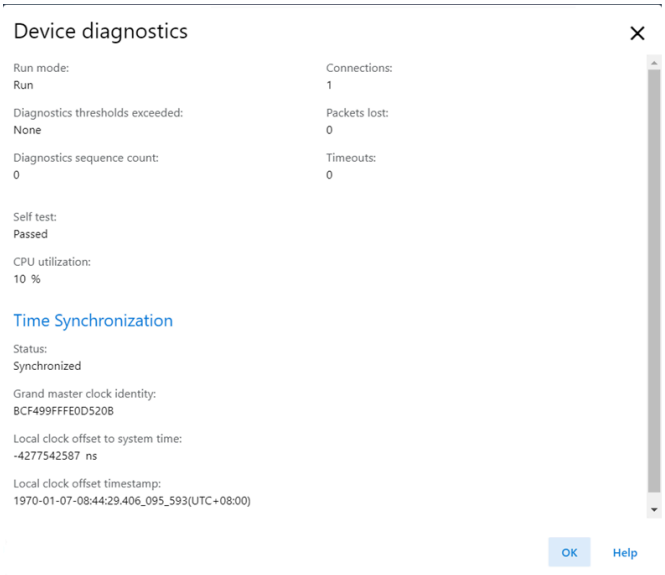
Figure 43. Device Information View Example



Device Diagnostics

To view the device diagnostics, select Diagnostics in the Device Information view.

Figure 44. Device Diagnostics Example



Connection View

Use Connection to define controller-to-device behavior.

- Set the RPI rate. For more information, see Requested Packet Interval on page .
- Select Unicast or Multicast connection to use on the EtherNet/IP network. For more information, see Unicast or Multicast Connection on page 20.
- View the reason for a connection fault.

If there is a connection fault, the Connection Fault area displays the error code with a description that helps you to troubleshoot the module. For more information, see Troubleshoot Your Module on page 42.

- Inhibit the module. For more information, see Module Inhibiting on page 17.
- Configure whether a connection failure while the controller is in Run mode causes a major or minor fault.
- Enable or disable Automatic Diagnostics.

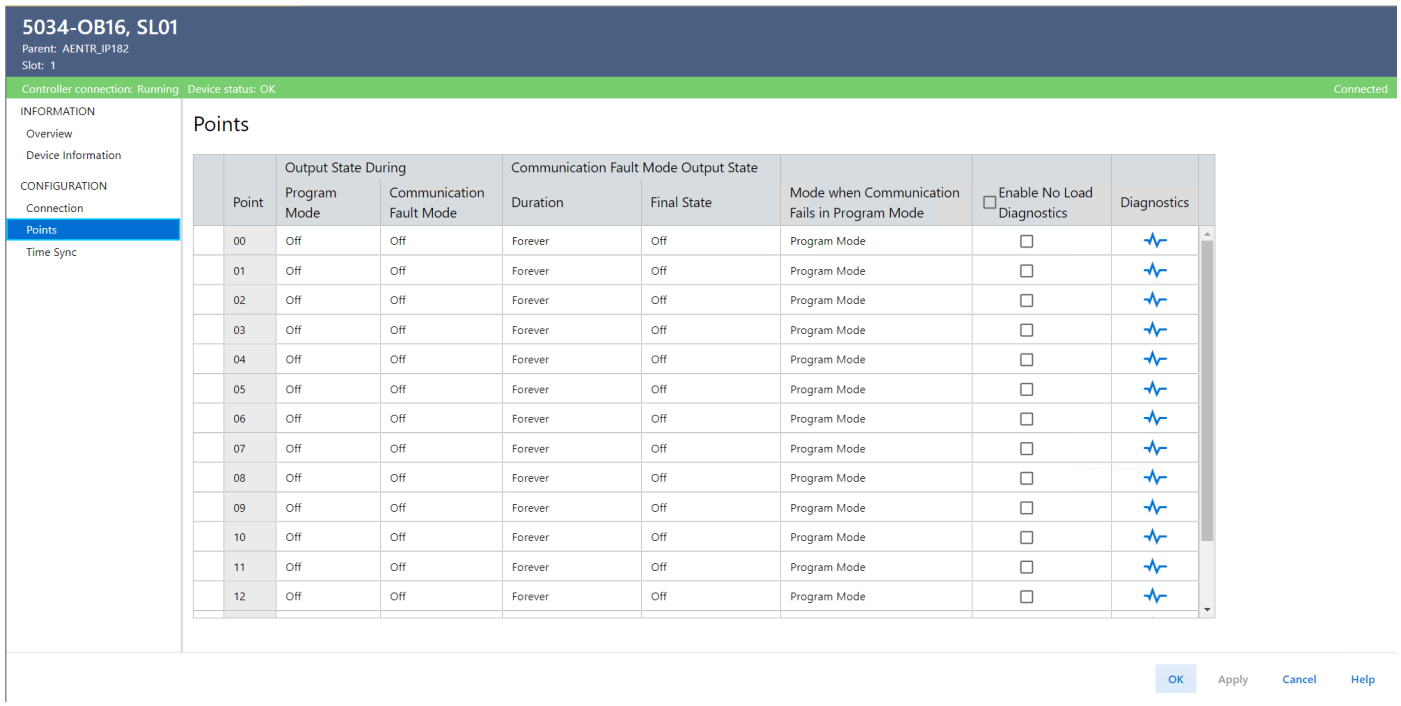
ATTENTION: If you do not enable Automatic Diagnostics, the device does not publish diagnostics to FatoryTalk Alarms and Events.

Figure 45. Connection View Example

Points View

Use Points to view or configure the points for the device.

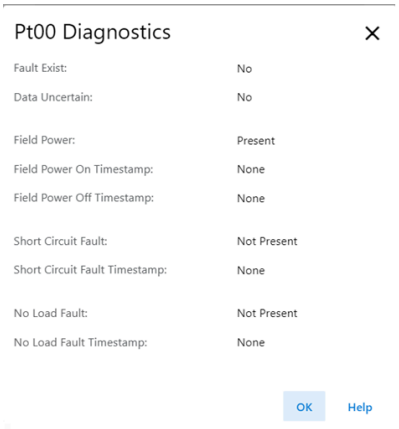
Figure 46. Points View Example



Ptxx Diagnostics

To view the Ptxx diagnostics, select Diagnostics in the Points or Ptxx view.

Figure 47. Ptxx Diagnostics Example

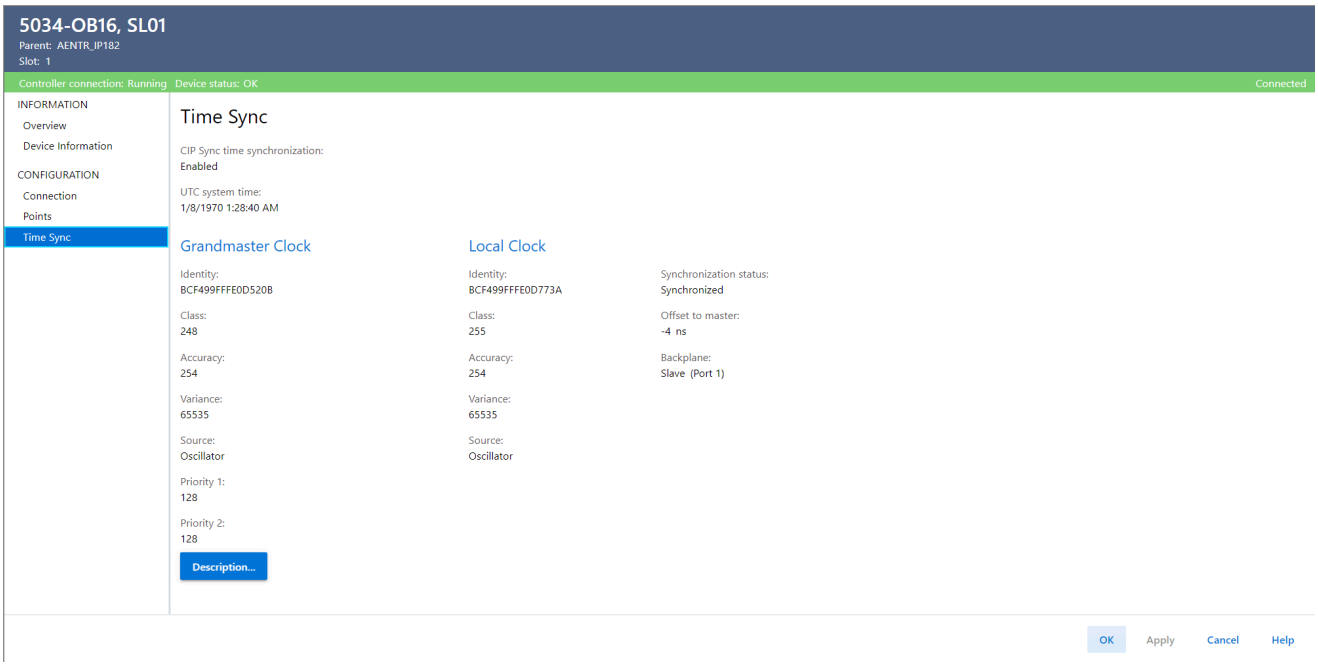


Time Sync View

The Time Sync view is read-only and displays the CIP Sync status information about the module when the project is online. The Time Sync category displays the following information:

- CIP Sync time synchronization status
- UTC system time
- Grandmaster Clock information
- Grandmaster Clock description
- Local Clock information

Figure 48. Time Sync View Example

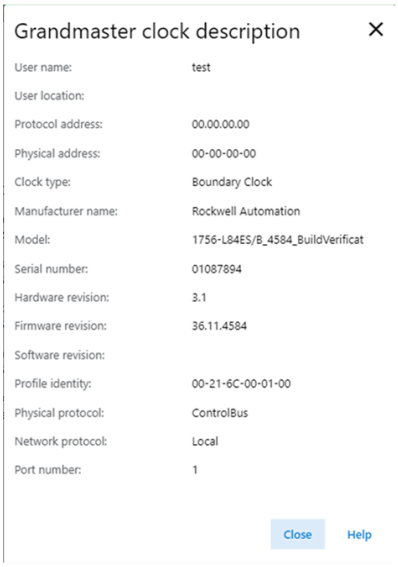


Grandmaster Clock Description

The Grandmaster clock description dialog provides detailed information about the grandmaster clock.

To view the Grandmaster clock description, select Description in the Time Sync view.

Figure 49. Grandmaster Clock Description Example



Use the Status Indicators for Troubleshooting

PointMax I/O modules use the following status indicators:

- SA Power Indicator - This indicator operates the same for all PointMax I/O modules.
- Module Status Indicator - This indicator operates the same for all PointMax I/O modules.
- Channel Status Indicator - This indicator operates differently based on the module type you are using.

SA Power Indicator

Table 36. Interpret SA Power Indicator – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered or outside its designed operating range.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	There is SA power to the module	None
Steady red	There is no SA power to the module or SA power is not in the valid range.	Complete the following actions: 1. Confirm that SA power wiring is properly connected to the adapter, expansion power module, or 5034-MBSA mounting base. 2. Check the following: ◦ Check that the SA voltage is in the correct range. ◦ If an external power supply is used, confirm that the power supply is turned on. ◦ Confirm that there is sufficient voltage supplied to the module. ◦ Make sure that the mounting base to mounting base connection is properly secured. Go to Chassis Information view in the Module Properties of the adapter module to check the Field Power status of mounting bases installed in all slots.

Module Status Indicator

Table 37. Interpret Module Status Indicator – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	The module has a connection to the owner-controller and is operating normally.	None
Flashing green	One of the following conditions exist: • The module has powered up successfully. • The module is OK, but it does not have a connection. No connection can result from missing, incomplete, or incorrect module configuration.	Complete the following actions: • Troubleshoot your Studio 5000 Logix Designer application to determine what is preventing a connection from the module to the controller and correct the issue. • Confirm that the system conditions require the controller to be in Remote Run mode or Run mode, transition the controller to one of those modes.
Steady red	The module experienced a nonrecoverable fault.	Complete the following actions: 1. Cycle power to the module. 2. If the status indicator remains in the steady red state, replace the module.

Table 37. Interpret Module Status Indicator – Standard I/O Modules (continued)

Indicator State	Description	Recommended Action
Flashing red	One of the following conditions exist: • A module firmware update is in progress. • A module firmware update attempt failed. • The device has experienced a recoverable fault. • A connection to the module has timed out.	Complete one of the following: • Let the firmware update progress complete. • Reattempt a firmware update after one fails. • Use the Studio 5000 Logix Designer application to determine whether a module recoverable fault is occurred. It is shown in Device Information view. To clear a recoverable fault, complete one of the following: ◦ Cycle module power. ◦ Select Reset device in the Studio 5000 Logix Designer project via the Device Information view of the Module Properties dialog. If the fault does not clear after cycling power and module reset, contact Rockwell Automation Technical Support. • Use the Studio 5000 Logix Designer application to determine if a connection has timed out. The Connection view in the Module Properties indicates whether a connection request has timed out. If a connection has timed out, determine the cause and correct it. For example, a cable failure can cause a connection timeout.
Flashing red/green	The module is in a self-test mode.	None

Point Status Indicators

Table 38. Interpret Point Status Indicators – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	One of the following: • The point is Off. • There is no backplane power.	One of the following: • Confirm that the point is configured properly. • Confirm that there is backplane power supplied through the EtherNet/IP adapter.
Steady yellow	The point is On.	None
Flashing red	One of the following: • A Field Power Loss condition exists. • A No Load or Short Circuit condition is detected.	One of the following: • Locate and correct the cause of field power loss condition. • A No Load or Short Circuit condition is detected.

Module Tag Definitions

Module tags are created when you add a module to the Studio 5000 Logix Designer application project.

The set of module tags associated with a module depends on the module type and Module Definition choices made during module configuration.

The tables contained in this section list all of the tags available with a module. Not all tags in the list are used when that module type is added to a project. Tag use varies by module configuration.

Configuration Tag Definitions

Table 39. Configuration Tags

Name	Data Type	Definition	Valid Values
Ptxx.FaultMode	BOOL	Selects the behavior that the output point takes if a communication fault occurs. FaultValue defines the value to go to when set to user-defined value.	• 0 = Go to a user-defined value • 1 = Hold last state
Ptxx.FaultValue	BOOL	Defines the value that the discrete output assumes if a communication fault occurs when FaultMode = 0.	• 0 = Off • 1 = On
Ptxx.ProgMode	BOOL	Selects the behavior that the output point takes when transitioned into Program Mode or Inhibit mode. ProgValue defines the value to go to when set to user-defined value.	• 0 = Go to a user-defined value • 1 = Hold last state
Ptxx.ProgValue	BOOL	Defines the value that the output takes when the connection transitions to Program Mode or Inhibit mode if the ProgMode bit is set to user-defined value.	• 0 = The output state is Off during Program Mode or Inhibit mode • 1 = The output state is On during Program Mode or Inhibit mode
Ptxx.FaultFinalState	BOOL	If FaultValueStateDuration is nonzero, determines the final Output state after the configured FaultValueStateDuration time out occurs.	• 0 = The output state is Off after the FaultValueStateDuration time expires • 1 = The output state is On after the FaultValueStateDuration time expires
Ptxx.ProgramToFaultEn	BOOL	Determines if an output transitions to the Communication Fault Mode if the connection faults while in Program Mode.	• 0 = Stay in Program Mode • 1 = Go to Communication Fault Mode
Ptxx.NoLoadEn	BOOL	Enables No Load detection for output points.	• 0 = Disable • 1 = Enable
Ptxx.FaultValueStateDuration	SINT	This value determines the length of time the Communication Fault Mode state is held before the FaultFinalState is applied.	• 0 = Hold forever • 1, 2, 5, or 10 seconds

Input Tag Definitions

Table 40. Input Tags

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Because the controller is in Program Mode, the module is not applying new output tag data but is applying the Program Mode state of the output point instead. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied.
ConnectionFaulted	BOOL	Indicates if a connection to the target is running. The module always returns a zero in this member. The controller overwrites the zero with a one when the connection is not up.	• 0 = Connection is running • 1 = Connection is not running
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
Uncertain (Packed data)	BOOL	Indicates if the module is operating outside the designed operating range, or data is under manual or override control.	• 0 = Good data • 1 = Uncertain data
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master was detected on the backplane, but the time master has timed out The module is using its local clock and can be drifting away from the last known master time.
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
Ptxx.Data PtxxData (Packed data)	BOOL	Echo of the current digital output value.	• 0 = Off • 1 = On

Table 40. Input Tags (continued)

Name	Data Type	Definition	Valid Values
Data (Packed data)	INT	Indicates the echo values for all points of the module. Each bit represents 1 point. For example, Data.3 represents Pt03.	Data.0...Data.15: • 0 = Off • 1 = On
Ptxx.Fault PtxxFault (Packed data)	BOOL	Indicates that point data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault

Table 40. Input Tags (continued)

Name	Data Type	Definition	Valid Values
Fault (Packed data)	INT	Indicates the fault state for all points of the module. Each bit represents 1 point. For example, Fault.3 represent Pt03. Fault state indicates that point data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	Fault.0...Fault.15: • 0 = Good • 1 = Bad, causing fault
Ptxx.Uncertain	BOOL	Indicates that the point data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
Ptxx.NoLoad	BOOL	Indicates that the signal wire is disconnected from one of the RTB terminals or the RTB is removed.	• 0 = No fault • 1 = Fault
Ptxx.ShortCircuit	BOOL	Indicates an output short circuit or overcurrent.	• 0 = No short circuit • 1 = Short circuit or overcurrent
Schedule[x].State	SINT	Current state of the schedule tags at index x	• 0 = Inactive • 1 = Active – Schedule is next to be applied to the output • 2 = Current – Schedule is not the next to be applied to one of the outputs • 3 = Expired – Schedule has been applied • 4 = Discarded – One of the following: ◦ The requested schedule was late (received after its scheduled application time) and a more recent schedule has already been applied to that output. ◦ The output point does not exist or scheduling is not enabled on the output point. • 5 = Late – Received schedule after the time is to be applied
Schedule[x].ScheduleNumber	SINT	Echo of SequenceNumber from the output tag	All values
LateScheduleCount	INT	Count of schedules that arrive late. That is, the arrival time is after scheduled time. Counter rolls over every 65,535 late updates. The output is still being driven to new state if this is the most recent schedule for that point. Useful in indicating that network delays/losses are causing scheduling issues.	All values
LostScheduleCount	INT	Increments whenever the schedule sequence number in the output tag skips a value, which can indicate a lost schedule. Counter rolls over every 65,535 lost updates.	All values

Output Tag Definitions

Table 41. Output Tags

Name	Data Type	Definition	Valid Values
TimeBase	LINT	Indicates the TimeBase for all schedule times. The TimeBase + The Schedule[n].TimeOffset determines the time for the schedule.	Any positive value
Ptxx.Data PtxxData (Packed data)	BOOL	Current digital output data to be applied	• 0 = Off • 1 = On
Data (Packed data)	INT	Indicates the current values to be applied for all points of the module. Each bit represents 1 point. For example, Data.3 represents Pt03.	Data.0…Data.15: • 0 = Off • 1 = On
Ptxx.ScheduleEn	BOOL	Specifies the use of normal output data or scheduled data.	• 0 = Normal output data • 1 = Scheduled data
Schedule[x].ID	SINT	Indicates which hardware scheduler to use.	• 0 = No schedule • 1…32 = Valid hardware scheduler ID
Schedule[x].SequenceNumber	SINT	For every new schedule of Schedule[x], the sequence number is increased. The expected sequence to request the module to perform a new schedule is: 1. Set all other Schedule[x] members properly in the output tag. 2. Increase the sequence number after step 1 is completed. Once the module receives a new sequence number of Schedule[x], it starts processing it.	All values
Schedule[x].OutputPointSelect	SINT	Selects the output point that this schedule applies to. 0xFF means no output point selected.	0…15
Schedule[x].Data	BOOL	Output data to be applied at time that is specified in schedule.	0 or 1
Schedule[x].TimeOffset	DINT	Offset from schedule base time. For more information, see the definition for TimeBase.	All values

Diagnostic Assembly

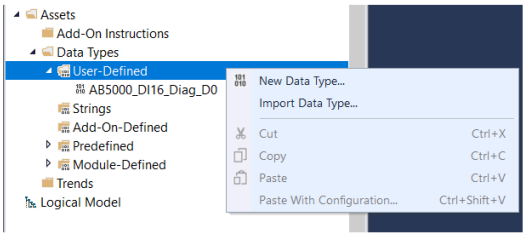
Diagnostic assembly helps you troubleshoot and diagnose the fault in your system.

Create User-defined Diagnostic Assembly Types

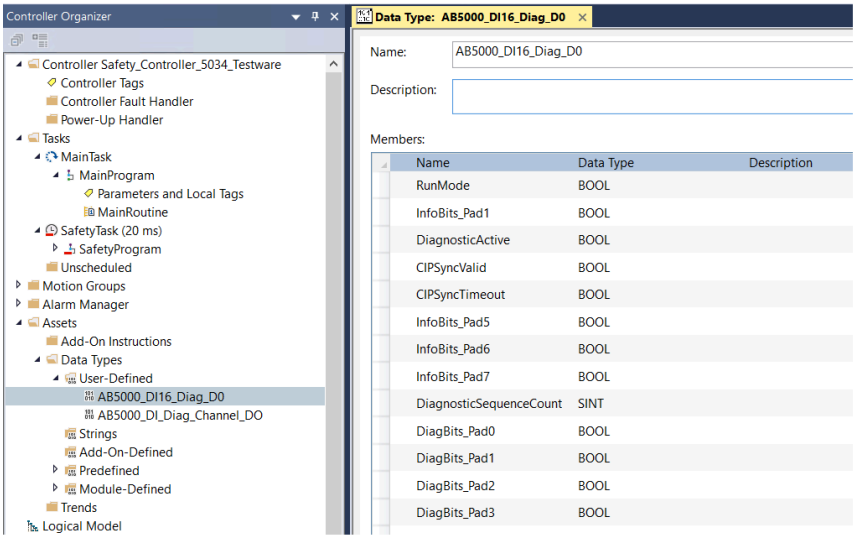
You can use the Studio 5000 Logix Designer application to create user-defined Diagnostic Assembly types.

Create user-defined diagnostic assembly by following the below steps:

1. From the Controller Organizer pane, go to Assets → Data types → User-Defined.
2. Right-click on the User-Defined folder and select New Data Type.



3. Add a Name and Description (optional) for your diagnostic assembly.
4. Under Members area, add the data members based on the diagnostic assembly detailed below.



IMPORTANT: The members indicated in the tables are arranged according to Data Alignment Rules of controllers. Strictly follow the data type and the sequence of the members that are indicated in the tables of this appendix. If the data type and the sequence are not followed, data misalignment may occur after executing Get Attribute Single Message (MSG) instruction.

Diagnostic Assembly

Diagnostic Digital 16 Point with Diagnostics Assembly A

- Instance ID = 0x316 (790)
- Size = 352 bytes

Table 42. Diagnostic Assembly Instance – 790

Name	Data Type	Size in Bytes
RunMode	BOOL	1
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
CIPSyncValid	BOOL	

Table 42. Diagnostic Assembly Instance – 790 (continued)

Name	Data Type	Size in Bytes
CIPSyncTimeout	BOOL	
InfoBits_Pad5	BOOL	
InfoBits_Pad6	BOOL	
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
DiagBits_Pad0	BOOL	
DiagBits_Pad1	BOOL	
DiagBits_Pad2	BOOL	
DiagBits_Pad3	BOOL	
DiagBits_Pad4	BOOL	
DiagBits_Pad5	BOOL	
DiagBits_Pad6	BOOL	
DiagBits_Pad7	BOOL	
DiagBits_Pad8	BOOL	2
DiagBits_Pad9	BOOL	
BaseUnsupportedFault	BOOL	
BaseIDFault	BOOL	
FlashUpdateRequired	BOOL	
SelfTestFault	BOOL	
DiagBits_Pad14	BOOL	
DiagBits_Pad15	BOOL	
Pad	INT	4
LocalClockOffset	LINT	8
LocalClockOffsetTimestamp	LINT	8
GrandMasterClockID[8]	SINT	8
Points[0...7]	AB:5000_DO_Diag2_Channel:D:0	320

Diagnostic Digital 16 Point with Diagnostics Assembly B

- Instance ID = 0x317 (791)
- Size = 320 bytes

Table 43. Diagnostic Assembly Instance – 791

Name	Data Type	Size in Bytes
Points[8...15]	AB:5000_DO_Diag2_Channel:D:0	320

Diagnostic Counters

Diagnostic Counters Assembly for I/O

- Instance ID = 0x301 (769)
- Size = 16 bytes

Table 44. Diagnostic Assembly Instance – 769

Name	Data Type	Size in Bytes
RunMode	BOOL	1
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
InfoBits_Pad3	BOOL	
InfoBits_Pad4	BOOL	
InfoBits_Pad5	BOOL	
InfoBits_Pad6	BOOL	
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
CIPConnections	INT	2
CIPLostPackets	DINT	4
CIPTimeouts	DINT	4
CPUUtilization	INT	2
Pad	INT	2

Diagnostic Channel

This data type is retrieved as part of the diagnostic assembly instance.

Diagnostic Digital with Diagnostics Channel (Output)

- Data Type = AB:5000_DO_Diag2_Channel:D:0
- Size = 40 bytes

Table 45. Structure for Data Type AB:5000_DO_Diag2_Channel:D:0

Name	Data Type	Size in Bytes
DataBits_Pad0	BOOL	2
Fault	BOOL	
Uncertain	BOOL	
NoLoad	BOOL	
ShortCircuit	BOOL	
DataBits_Pad5	BOOL	
FieldPowerOff	BOOL	
DataBits_Pad7	BOOL	

Table 45. Structure for Data Type AB:5000_DO_Diag2_Channel:D:0 (continued)

Name	Data Type	Size in Bytes
DataBits_Pad8	BOOL	
DataBits_Pad9	BOOL	
DataBits_Pad10	BOOL	
DataBits_Pad11	BOOL	
DataBits_Pad12	BOOL	
DataBits_Pad13	BOOL	
DataBits_Pad14	BOOL	
DataBits_Pad15	BOOL	
DiagBits_Pad0...DiagBits_Pad15	INT	2
Pad	DINT	4
NoLoadTimestamp	LINT	8
ShortCircuitTimestamp	LINT	8
FieldPowerOnTimestamp	LINT	8
FieldPowerOffTimestamp	LINT	8

Definitions for Diagnostic Assembly Types

Table 46. Definition of Members in Diagnostic Assembly Data Types

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state.	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Module is not applying new output tag data because the controller is in Program Mode. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied or there is no output tag data for the connection (For example, all points configured as digital input without timestamp).
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master has timed out The module is using its local clock and can be drifting away from the last known master time.
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
LocalClockOffset	LINT	The offset from the local clock to the system time. This value helps to detect steps in time. This value updates when a PTP update is received.	All values
LocalClockOffsetTimestamp	LINT	Indicates the time of the local clock offset.	A valid time or None if there is no recorded event time. Time format is YYYY-MMDD-HH:mm:SS_mmm_uuu_nnn(UTC-00:00). • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds • uuu = microseconds • nnn = nanoseconds • UTC-00:00 = Time zone

Table 46. Definition of Members in Diagnostic Assembly Data Types (continued)

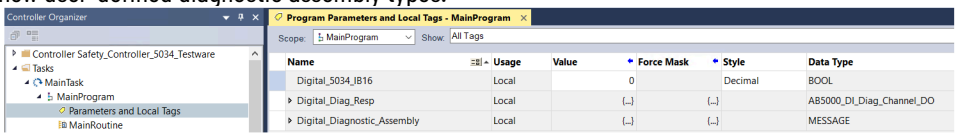
Name	Data Type	Definition	Valid Values
GrandMasterClockID	SINT[8]	The EUI-64 Identity of the CIP Sync Grandmaster clock the module is synced to.	All values
Fault	BOOL	Indicates that the data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault
Uncertain	BOOL	Indicates that the data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
FieldPowerOff	BOOL	Indicates that a field power loss condition exists on the channel.	• 0 = Field power off condition does not exist • 1 = Field power off condition exists
FieldPowerOnTimestamp	LINT	Indicates the time of the last field power turned on event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
FieldPowerOffTimestamp	LINT	Indicates the time of the last field power turned off event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
NoLoad	BOOL	Indicates whether a load fault is present.	• 0 = No Load condition does not exist • 1 = No Load condition exists
ShortCircuit	BOOL	Indicates whether an output short circuit or overcurrent fault is present on the point.	• 0 = Short Circuit condition does not exist • 1 = Short Circuit condition exists

Table 46. Definition of Members in Diagnostic Assembly Data Types (continued)

Name	Data Type	Definition	Valid Values
NoLoadTimestamp	LINT	Indicates the time of the last No Load fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
ShortCircuitTimestamp	LINT	Indicates the time of the last short circuit fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
CIPConnections	INT	Indicates the number of CIP connections that are currently open.	0...24
CIPLostPackets	DINT	Indicates the running sum of the number of Sequenced Address Item Sequence Numbers that are skipped in Class 0 and Class 1 connections consumed by the adapter and its children.	0...2,147,483,647
CIPTimeouts	DINT	Indicates the running count of the number of connections that time out, both originated and targeted, to and through the adapter.	0...2,147,483,647
CPUUtilization	INT	Indicates the usage of the compute engine.	0...100%

Create Message Type User Tags

Create MESSAGE type user tags for requests and associated response user tags for each of the new user-defined diagnostic assembly types.



From the Controller Organizer pane, expand Tasks → MainTask → MainProgram

1. Create MESSAGE type user tags for each request.
2. Create associated response user tags for each new user-defined diagnostic assembly type.
3. Add the user tags to your ladder program.

4. Expand the message tag to open the message configuration dialog.

5. On the Configuration tab, select:
   - Service type: Get Attribute Single
   - Class: 4
   - Attribute: 3
   - Instance:
     - **5034-0B16 and 5034-0B16XT**

       790 (316h) Diagnostic Digital 16 Point with Diagnostics Assembly A

       791 (317h) Diagnostic Digital 16 Point with Diagnostics Assembly B

       769 (301h) Diagnostic Counters Base I/O Assembly
   - Destination element: User-defined data type suitable for the instance entered.
6. On the Communication tab, select the path to the module that you wish to send the messages to.
7. Download the project and set to Run mode.

   You can monitor the user-defined tag values from the Program Parameters and Local Tags window, under the MainProgram task in the Controller Organizer pane.

5034-OB8 and 5034-OB8XT Details

Module Configuration

Before you start configuring your I/O module, you must create a Studio 5000 Logix Designer application project for the Logix 5000 controller that owns the I/O module. The project includes configuration data for the module.

The Studio 5000 Logix Designer application transfers the project to the owner-controller during the program download. Data is then transferred to the I/O modules over the EtherNet/IP network.

The I/O modules can operate immediately after receiving and applying the configuration data.

Overview View

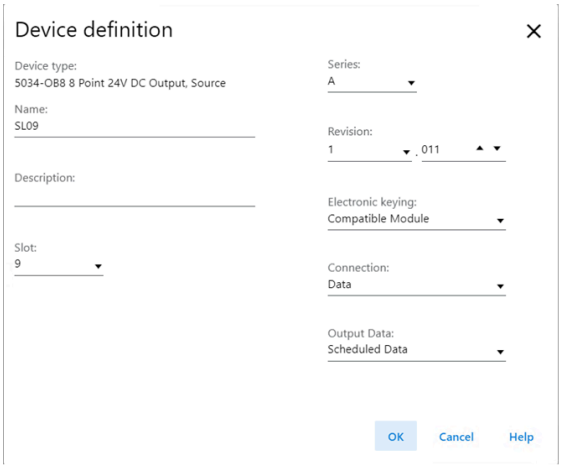
Use Overview to view the definition of a device, including the device type, revision, electronic keying, connection, and other device-specific values.

Figure 50. Overview View Example

Device Definition

To change the definition of a device, select Device definition in the Overview view.

Figure 51. Device Definition Example



Device Definition includes these parameters:

Table 47. Device Definition Parameters

Parameter	Definition	Available Choices
Device Type	Displays the device catalog number and type.	Device-specific
Name	Enter an IEC 61131 compliant device name. If an invalid character is entered in this field, or if the name exceeds 40 characters, the software ignores the character.	All valid values
Description	Enter the description of the device.	All valid values
Slot	Specify the slot number where the device resides. Only slots between 1 and the maximum number of I/O devices are valid depending on the platform. When the device is created, the slot number defaults to the first available slot position. When the controller is changed to one supporting a smaller maximum I/O count, the current slot value may no longer be valid.	1...32
Series	Specifies the series of the device.	Device-specific

Table 47. Device Definition Parameters (continued)

Parameter	Definition	Available Choices
Revision	Specifies the major and minor revisions of the device. The valid range for minor revision is from 1...255.	Device-specific
Electronic Keying	Defines the electronic keying used for the device. Electronic keying compares the device defined in the project to the installed device. If keying fails, a fault occurs. For detailed information on Electronic keying, see Electronic Keying in Logix 5000 Control Systems Application Technique, publication LOGIX-AT001.	• Exact Match • Compatible Module • Disable Keying
Connection	Specify the type of data transferred between the device and controller. For the Listen Only Data choice, the controller and device establish communication without the controller sending any configuration or output data to the device. A full input data connection is established but depends on the connection between the owner-controller and the device.	• Data • Listen Only Data
Output Data	Select the output data type for the device.	• Data • Packed Data • Scheduled Data

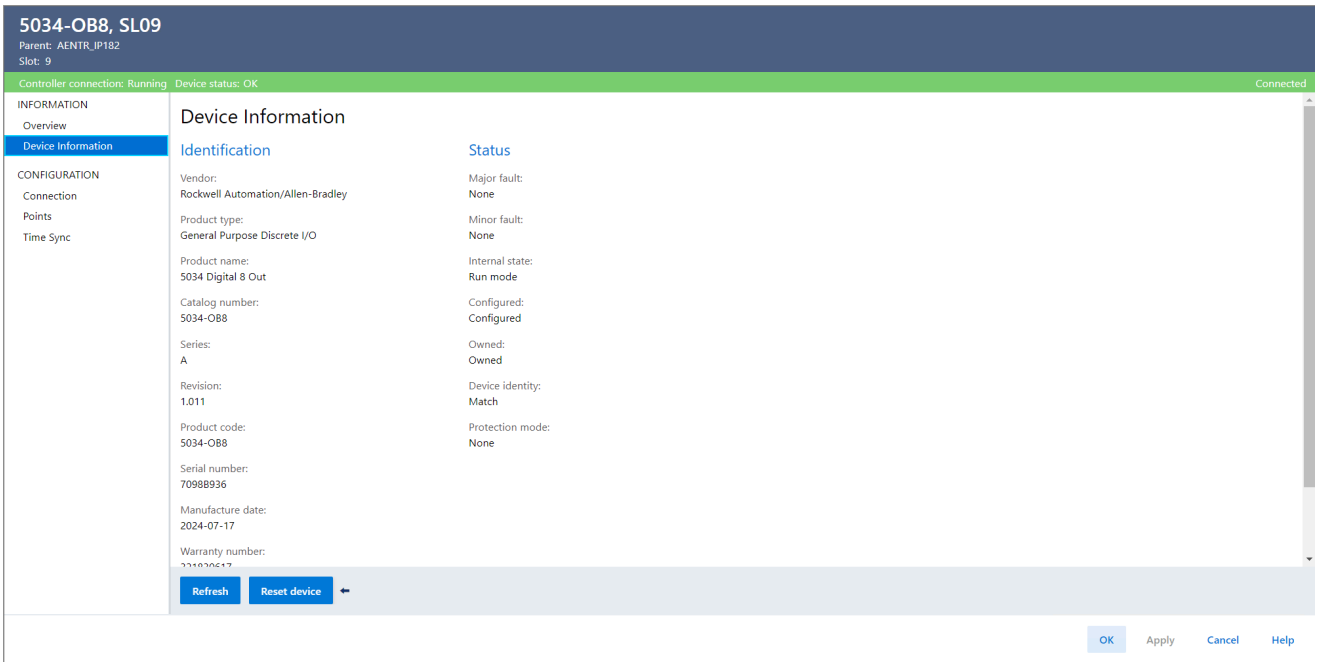
Device Information View

Use Device Information to view device and status information when the device is online.

Use Device Information to:

- Determine the identity of the device.
- View the device's current operational state.
- View whether the device was configured by the owner controller.
- View whether an owner controller is currently connected to the device.
- Retrieve the latest information from the device.
- Reset a device to its power-up state.
- If supported, view the protection mode of the device.

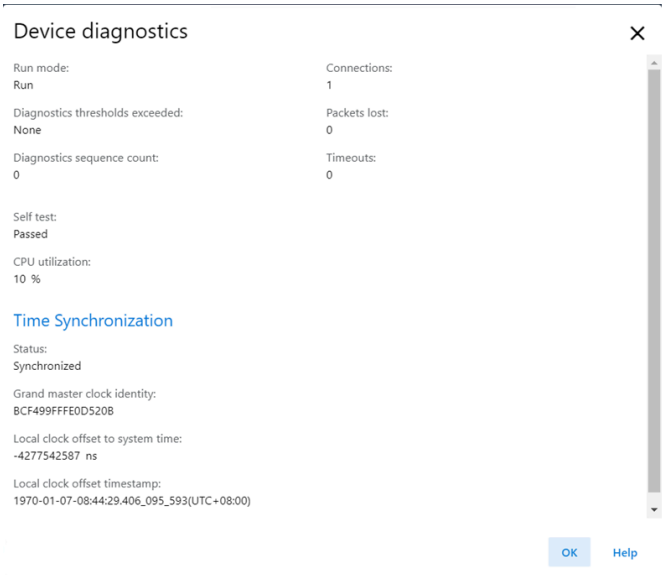
Figure 52. Device Information View Example



Device Diagnostics

To view the device diagnostics, select Diagnostics in the Device Information view.

Figure 53. Device Diagnostics Example



Connection View

Use Connection to define controller-to-device behavior.

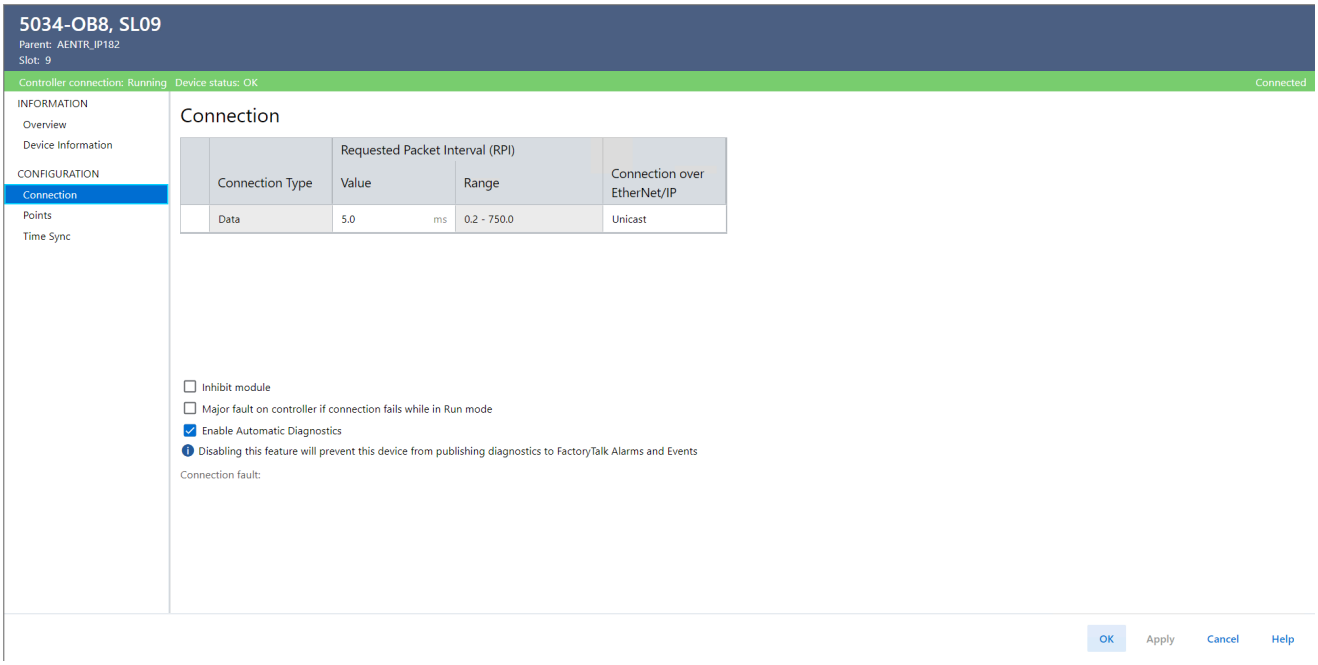
- Set the RPI rate. For more information, see Requested Packet Interval on page .
- Select Unicast or Multicast connection to use on the EtherNet/IP network. For more information, see Unicast or Multicast Connection on page 20.
- View the reason for a connection fault.

If there is a connection fault, the Connection Fault area displays the error code with a description that helps you to troubleshoot the module. For more information, see Troubleshoot Your Module on page 42.

- Inhibit the module. For more information, see Module Inhibiting on page 17.
- Configure whether a connection failure while the controller is in Run mode causes a major or minor fault.
- Enable or disable Automatic Diagnostics.

ATTENTION: If you do not enable Automatic Diagnostics, the device does not publish diagnostics to FatoryTalk Alarms and Events.

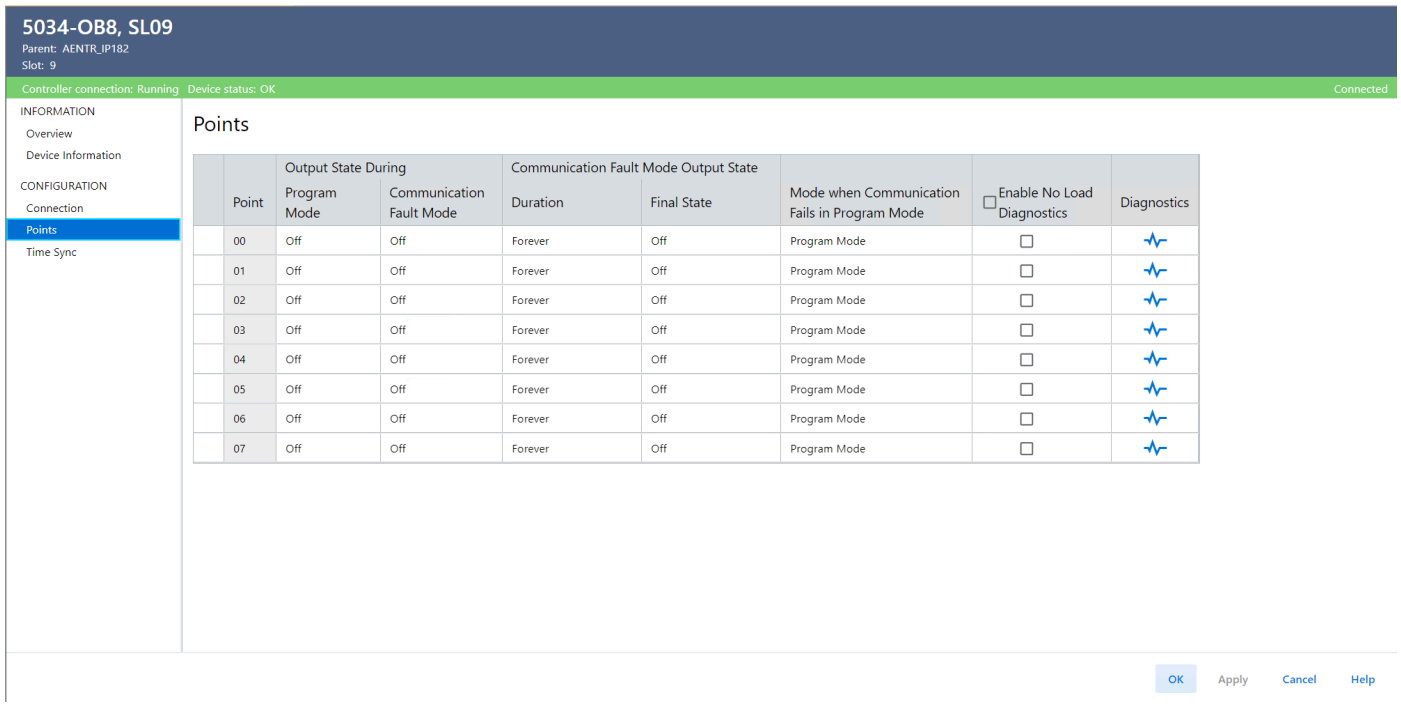
Figure 54. Connection View Example



Points View

Use Points to view or configure the points for the device.

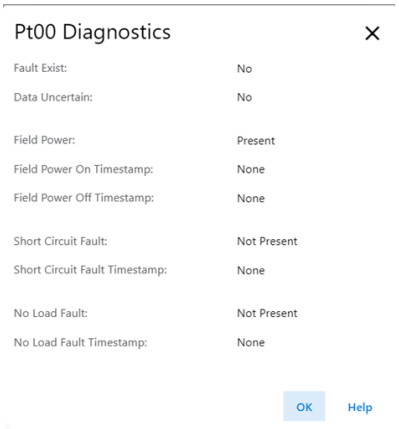
Figure 55. Points View Example



Ptxx Diagnostics

To view the Ptxx diagnostics, select Diagnostics in the Points or Ptxx view.

Figure 56. Ptxx Diagnostics Example

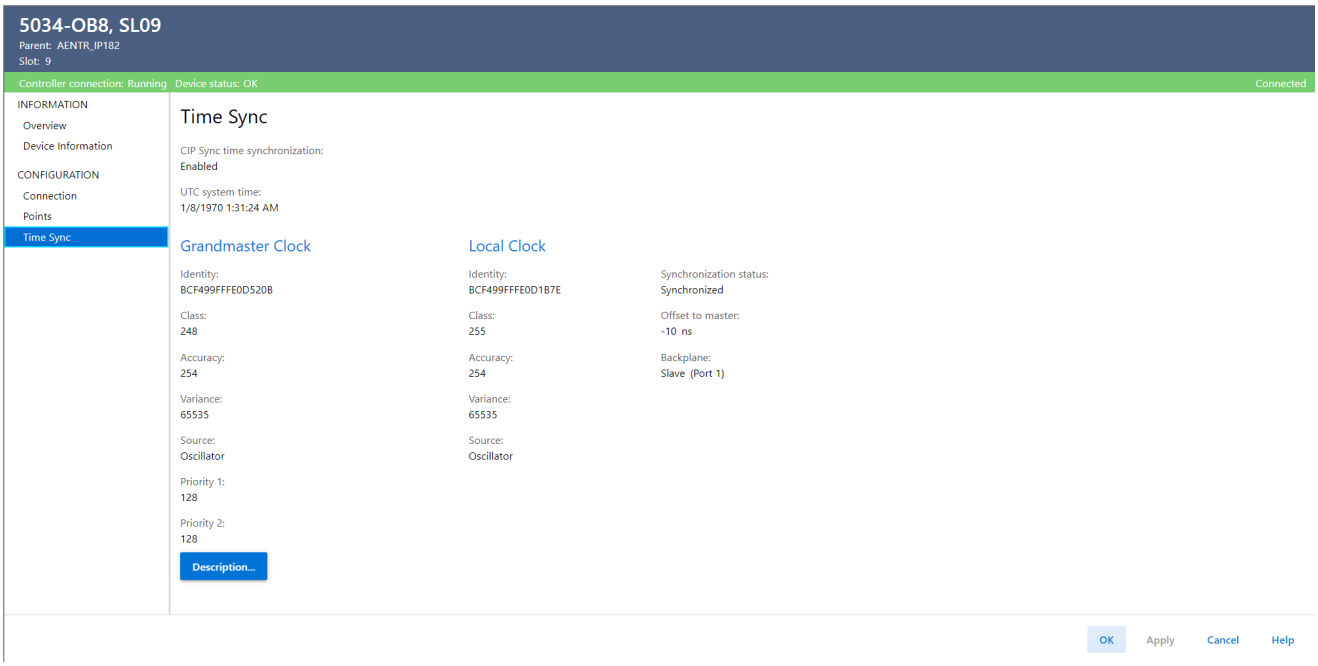


Time Sync View

The Time Sync view is read-only and displays the CIP Sync status information about the module when the project is online. The Time Sync category displays the following information:

- CIP Sync time synchronization status
- UTC system time
- Grandmaster Clock information
- Grandmaster Clock description
- Local Clock information

Figure 57. Time Sync View Example

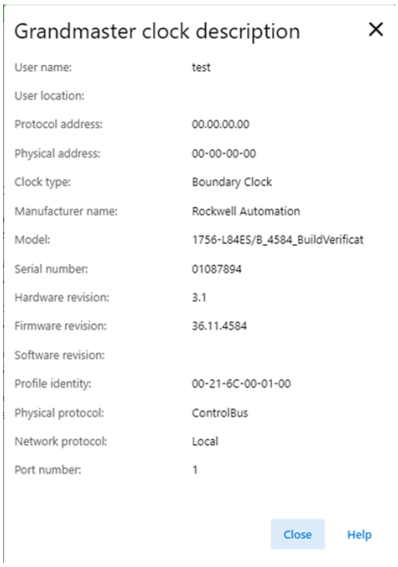


Grandmaster Clock Description

The Grandmaster clock description dialog provides detailed information about the grandmaster clock.

To view the Grandmaster clock description, select Description in the Time Sync view.

Figure 58. Grandmaster Clock Description Example



Use the Status Indicators for Troubleshooting

PointMax I/O modules use the following status indicators:

- SA Power Indicator - This indicator operates the same for all PointMax I/O modules.
- Module Status Indicator - This indicator operates the same for all PointMax I/O modules.
- Channel Status Indicator - This indicator operates differently based on the module type you are using.

SA Power Indicator

Table 48. Interpret SA Power Indicator – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered or outside its designed operating range.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	There is SA power to the module	None
Steady red	There is no SA power to the module or SA power is not in the valid range.	Complete the following actions: 1. Confirm that SA power wiring is properly connected to the adapter, expansion power module, or 5034-MBSA mounting base. 2. Check the following: ◦ Check that the SA voltage is in the correct range. ◦ If an external power supply is used, confirm that the power supply is turned on. ◦ Confirm that there is sufficient voltage supplied to the module. ◦ Make sure that the mounting base to mounting base connection is properly secured. Go to Chassis Information view in the Module Properties of the adapter module to check the Field Power status of mounting bases installed in all slots.

Module Status Indicator

Table 49. Interpret Module Status Indicator – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	The module has a connection to the owner-controller and is operating normally.	None
Flashing green	One of the following conditions exist: • The module has powered up successfully. • The module is OK, but it does not have a connection. No connection can result from missing, incomplete, or incorrect module configuration.	Complete the following actions: • Troubleshoot your Studio 5000 Logix Designer application to determine what is preventing a connection from the module to the controller and correct the issue. • Confirm that the system conditions require the controller to be in Remote Run mode or Run mode, transition the controller to one of those modes.
Steady red	The module experienced a nonrecoverable fault.	Complete the following actions: 1. Cycle power to the module. 2. If the status indicator remains in the steady red state, replace the module.

Table 49. Interpret Module Status Indicator – Standard I/O Modules (continued)

Indicator State	Description	Recommended Action
Flashing red	One of the following conditions exist: • A module firmware update is in progress. • A module firmware update attempt failed. • The device has experienced a recoverable fault. • A connection to the module has timed out.	Complete one of the following: • Let the firmware update progress complete. • Reattempt a firmware update after one fails. • Use the Studio 5000 Logix Designer application to determine whether a module recoverable fault is occurred. It is shown in Device Information view. To clear a recoverable fault, complete one of the following: ◦ Cycle module power. ◦ Select Reset device in the Studio 5000 Logix Designer project via the Device Information view of the Module Properties dialog. If the fault does not clear after cycling power and module reset, contact Rockwell Automation Technical Support. • Use the Studio 5000 Logix Designer application to determine if a connection has timed out. The Connection view in the Module Properties indicates whether a connection request has timed out. If a connection has timed out, determine the cause and correct it. For example, a cable failure can cause a connection timeout.
Flashing red/green	The module is in a self-test mode.	None

Point Status Indicators

Table 50. Interpret Point Status Indicators – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	One of the following: • The point is Off. • There is no backplane power.	One of the following: • Confirm that the point is configured properly. • Confirm that there is backplane power supplied through the EtherNet/IP adapter.
Steady yellow	The point is On.	None
Flashing red	One of the following: • A Field Power Loss condition exists. • A No Load or Short Circuit condition is detected.	One of the following: • Locate and correct the cause of field power loss condition. • A No Load or Short Circuit condition is detected.

Module Tag Definitions

Module tags are created when you add a module to the Studio 5000 Logix Designer application project.

The set of module tags associated with a module depends on the module type and Module Definition choices made during module configuration.

The tables contained in this section list all of the tags available with a module. Not all tags in the list are used when that module type is added to a project. Tag use varies by module configuration.

Configuration Tag Definitions

Table 51. Configuration Tags

Name	Data Type	Definition	Valid Values
Ptxx.FaultMode	BOOL	Selects the behavior that the output point takes if a communication fault occurs. FaultValue defines the value to go to when set to user-defined value.	• 0 = Go to a user-defined value • 1 = Hold last state
Ptxx.FaultValue	BOOL	Defines the value that the discrete output assumes if a communication fault occurs when FaultMode = 0.	• 0 = Off • 1 = On
Ptxx.ProgMode	BOOL	Selects the behavior that the output point takes when transitioned into Program Mode or Inhibit mode. ProgValue defines the value to go to when set to user-defined value.	• 0 = Go to a user-defined value • 1 = Hold last state
Ptxx.ProgValue	BOOL	Defines the value that the output takes when the connection transitions to Program Mode or Inhibit mode if the ProgMode bit is set to user-defined value.	• 0 = The output state is Off during Program Mode or Inhibit mode • 1 = The output state is On during Program Mode or Inhibit mode
Ptxx.FaultFinalState	BOOL	If FaultValueStateDuration is nonzero, determines the final Output state after the configured FaultValueStateDuration time out occurs.	• 0 = The output state is Off after the FaultValueStateDuration time expires • 1 = The output state is On after the FaultValueStateDuration time expires
Ptxx.ProgramToFaultEn	BOOL	Determines if an output transitions to the Communication Fault Mode if the connection faults while in Program Mode.	• 0 = Stay in Program Mode • 1 = Go to Communication Fault Mode
Ptxx.NoLoadEn	BOOL	Enables No Load detection for output points.	• 0 = Disable • 1 = Enable
Ptxx.FaultValueStateDuration	SINT	This value determines the length of time the Communication Fault Mode state is held before the FaultFinalState is applied.	• 0 = Hold forever • 1, 2, 5, or 10 seconds

Input Tag Definitions

Table 52. Input Tags

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Because the controller is in Program Mode, the module is not applying new output tag data but is applying the Program Mode state of the output point instead. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied.
ConnectionFaulted	BOOL	Indicates if a connection to the target is running. The module always returns a zero in this member. The controller overwrites the zero with a one when the connection is not up.	• 0 = Connection is running • 1 = Connection is not running
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
Uncertain (Packed data)	BOOL	Indicates if the module is operating outside the designed operating range, or data is under manual or override control.	• 0 = Good data • 1 = Uncertain data
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master was detected on the backplane, but the time master has timed out The module is using its local clock and can be drifting away from the last known master time.
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
Ptxx.Data PtxxData (Packed data)	BOOL	Echo of the current digital output value.	• 0 = Off • 1 = On

Table 52. Input Tags (continued)

Name	Data Type	Definition	Valid Values
Data (Packed data)	INT	Indicates the echo values for all points of the module. Each bit represents 1 point. For example, Data.3 represents Pt03.	Data.0...Data.7: • 0 = Off • 1 = On
Ptxx.Fault PtxxFault (Packed data)	BOOL	Indicates that point data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault

Table 52. Input Tags (continued)

Name	Data Type	Definition	Valid Values
Fault (Packed data)	INT	Indicates the fault state for all points of the module. Each bit represents 1 point. For example, Fault.3 represent Pt03. Fault state indicates that point data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	Fault.0...Fault.7: • 0 = Good • 1 = Bad, causing fault
Ptxx.Uncertain	BOOL	Indicates that the point data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
Ptxx.NoLoad	BOOL	Indicates that the signal wire is disconnected from one of the RTB terminals or the RTB is removed.	• 0 = No fault • 1 = Fault
Ptxx.ShortCircuit	BOOL	Indicates an output short circuit or overcurrent.	• 0 = No short circuit • 1 = Short circuit or overcurrent
Schedule[x].State	SINT	Current state of the schedule tags at index x	• 0 = Inactive • 1 = Active – Schedule is next to be applied to the output • 2 = Current – Schedule is not the next to be applied to one of the outputs • 3 = Expired – Schedule has been applied • 4 = Discarded – One of the following: ◦ The requested schedule was late (received after its scheduled application time) and a more recent schedule has already been applied to that output. ◦ The output point does not exist or scheduling is not enabled on the output point. • 5 = Late – Received schedule after the time is to be applied
Schedule[x].ScheduleNumber	SINT	Echo of SequenceNumber from the output tag	All values
LateScheduleCount	INT	Count of schedules that arrive late. That is, the arrival time is after scheduled time. Counter rolls over every 65,535 late updates. The output is still being driven to new state if this is the most recent schedule for that point. Useful in indicating that network delays/losses are causing scheduling issues.	All values
LostScheduleCount	INT	Increments whenever the schedule sequence number in the output tag skips a value, which can indicate a lost schedule. Counter rolls over every 65,535 lost updates.	All values

Output Tag Definitions

Table 53. Output Tags

Name	Data Type	Definition	Valid Values
TimeBase	LINT	Indicates the TimeBase for all schedule times. The TimeBase + The Schedule[n].TimeOffset determines the time for the schedule.	Any positive value
Ptxx.Data PtxxData (Packed data)	BOOL	Current digital output data to be applied	• 0 = Off • 1 = On
Data (Packed data)	INT	Indicates the current values to be applied for all points of the module. Each bit represents 1 point. For example, Data.3 represents Pt03.	Data.0…Data.7: • 0 = Off • 1 = On
Ptxx.ScheduleEn	BOOL	Specifies the use of normal output data or scheduled data.	• 0 = Normal output data • 1 = Scheduled data
Schedule[x].ID	SINT	Indicates which hardware scheduler to use.	• 0 = No schedule • 1…32 = Valid hardware scheduler ID
Schedule[x].SequenceNumber	SINT	For every new schedule of Schedule[x], the sequence number is increased. The expected sequence to request the module to perform a new schedule is: 1. Set all other Schedule[x] members properly in the output tag. 2. Increase the sequence number after step 1 is completed. Once the module receives a new sequence number of Schedule[x], it starts processing it.	All values
Schedule[x].OutputPointSelect	SINT	Selects the output point that this schedule applies to. 0xFF means no output point selected.	0…15
Schedule[x].Data	BOOL	Output data to be applied at time that is specified in schedule.	0 or 1
Schedule[x].TimeOffset	DINT	Offset from schedule base time. For more information, see the definition for TimeBase.	All values

Diagnostic Assembly

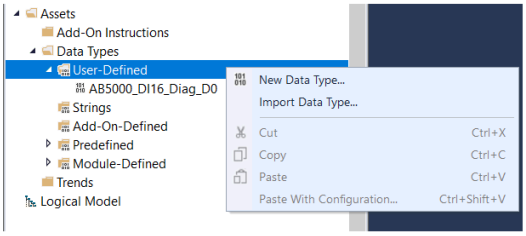
Diagnostic assembly helps you troubleshoot and diagnose the fault in your system.

Create User-defined Diagnostic Assembly Types

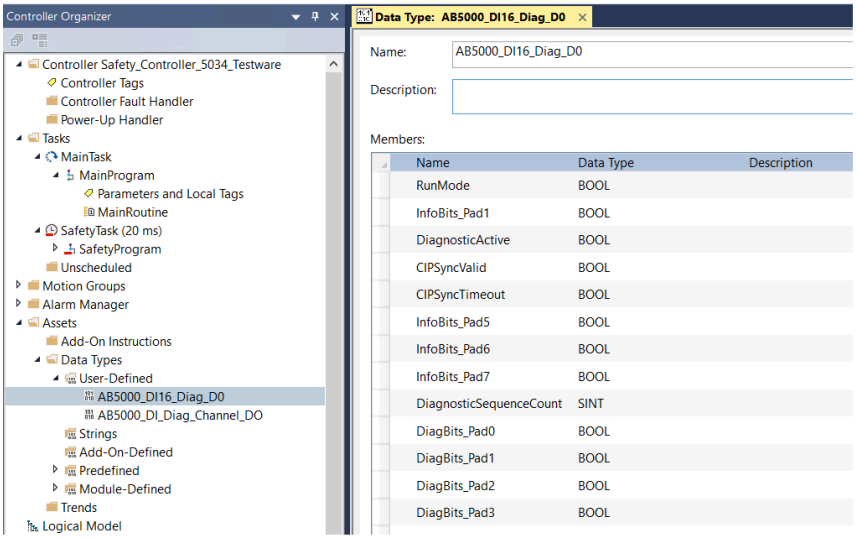
You can use the Studio 5000 Logix Designer application to create user-defined Diagnostic Assembly types.

Create user-defined diagnostic assembly by following the below steps:

1. From the Controller Organizer pane, go to Assets → Data types → User-Defined.
2. Right-click on the User-Defined folder and select New Data Type.



3. Add a Name and Description (optional) for your diagnostic assembly.
4. Under Members area, add the data members based on the diagnostic assembly detailed below.



IMPORTANT: The members indicated in the tables are arranged according to Data Alignment Rules of controllers. Strictly follow the data type and the sequence of the members that are indicated in the tables of this appendix. If the data type and the sequence are not followed, data misalignment may occur after executing Get Attribute Single Message (MSG) instruction.

Diagnostic Assembly

Diagnostic Digital 16 Point with Diagnostics Assembly A

- Instance ID = 0x316 (790)
- Size = 352 bytes

Table 54. Diagnostic Assembly Instance – 790

Name	Data Type	Size in Bytes
RunMode	BOOL	1
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
CIPSyncValid	BOOL	

Table 54. Diagnostic Assembly Instance – 790 (continued)

Name	Data Type	Size in Bytes
CIPSyncTimeout	BOOL	
InfoBits_Pad5	BOOL	
InfoBits_Pad6	BOOL	
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
DiagBits_Pad0	BOOL	
DiagBits_Pad1	BOOL	
DiagBits_Pad2	BOOL	
DiagBits_Pad3	BOOL	
DiagBits_Pad4	BOOL	
DiagBits_Pad5	BOOL	
DiagBits_Pad6	BOOL	
DiagBits_Pad7	BOOL	
DiagBits_Pad8	BOOL	2
DiagBits_Pad9	BOOL	
BaseUnsupportedFault	BOOL	
BaseIDFault	BOOL	
FlashUpdateRequired	BOOL	
SelfTestFault	BOOL	
DiagBits_Pad14	BOOL	
DiagBits_Pad15	BOOL	
Pad	INT	4
LocalClockOffset	LINT	8
LocalClockOffsetTimestamp	LINT	8
GrandMasterClockID[8]	SINT	8
Points[0...7]	AB:5000_DO_Diag2_Channel:D:0	320

Diagnostic Counters

Diagnostic Counters Assembly for I/O

- Instance ID = 0x301 (769)
- Size = 16 bytes

Table 55. Diagnostic Assembly Instance – 769

Name	Data Type	Size in Bytes
RunMode	BOOL	1
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
InfoBits_Pad3	BOOL	
InfoBits_Pad4	BOOL	
InfoBits_Pad5	BOOL	
InfoBits_Pad6	BOOL	
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
CIPConnections	INT	2
CIPLostPackets	DINT	4
CIPTimeouts	DINT	4
CPUUtilization	INT	2
Pad	INT	2

Diagnostic Channel

This data type is retrieved as part of the diagnostic assembly instance.
Diagnostic Digital with Diagnostics Channel (Output)

- Data Type = AB:5000_DO_Diag2_Channel:D:0
- Size = 40 bytes

Table 56. Structure for Data Type AB:5000_DO_Diag2_Channel:D:0

Name	Data Type	Size in Bytes
DataBits_Pad0	BOOL	2
Fault	BOOL	
Uncertain	BOOL	
NoLoad	BOOL	
ShortCircuit	BOOL	
DataBits_Pad5	BOOL	
FieldPowerOff	BOOL	
DataBits_Pad7	BOOL	
DataBits_Pad8	BOOL	
DataBits_Pad9	BOOL	
DataBits_Pad10	BOOL	

Table 56. Structure for Data Type AB:5000_DO_Diag2_Channel:D:0 (continued)

Name	Data Type	Size in Bytes
DataBits_Pad11	BOOL	
DataBits_Pad12	BOOL	
DataBits_Pad13	BOOL	
DataBits_Pad14	BOOL	
DataBits_Pad15	BOOL	
DiagBits_Pad0...DiagBits_Pad15	INT	2
Pad	DINT	4
NoLoadTimestamp	LINT	8
ShortCircuitTimestamp	LINT	8
FieldPowerOnTimestamp	LINT	8
FieldPowerOffTimestamp	LINT	8

Definitions for Diagnostic Assembly Types

Table 57. Definition of Members in Diagnostic Assembly Data Types

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state.	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Module is not applying new output tag data because the controller is in Program Mode. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied or there is no output tag data for the connection (For example, all points configured as digital input without timestamp).
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master has timed out The module is using its local clock and can be drifting away from the last known master time.

Table 57. Definition of Members in Diagnostic Assembly Data Types (continued)

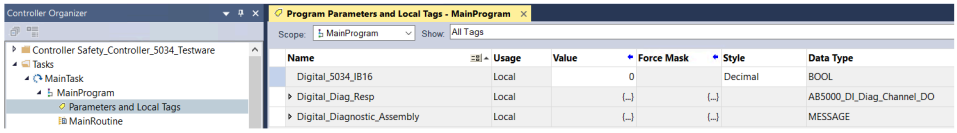
Name	Data Type	Definition	Valid Values
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
LocalClockOffset	LINT	The offset from the local clock to the system time. This value helps to detect steps in time. This value updates when a PTP update is received.	All values
LocalClockOffsetTimestamp	LINT	Indicates the time of the local clock offset.	A valid time or None if there is no recorded event time. Time format is YYYY-MMDD-HH:mm:SS_mmm_uuu_nnn(UTC-00:00). • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds • uuu = microseconds • nnn = nanoseconds • UTC-00:00 = Time zone
GrandMasterClockID	SINT[8]	The EUI-64 Identity of the CIP Sync Grandmaster clock the module is synced to.	All values
Fault	BOOL	Indicates that the data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault
Uncertain	BOOL	Indicates that the data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
FieldPowerOff	BOOL	Indicates that a field power loss condition exists on the channel.	• 0 = Field power off condition does not exist • 1 = Field power off condition exists
FieldPowerOnTimestamp	LINT	Indicates the time of the last field power turned on event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds

Table 57. Definition of Members in Diagnostic Assembly Data Types (continued)

Name	Data Type	Definition	Valid Values
FieldPowerOffTimestamp	LINT	Indicates the time of the last field power turned off event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
NoLoad	BOOL	Indicates whether a load fault is present.	• 0 = No Load condition does not exist • 1 = No Load condition exists
ShortCircuit	BOOL	Indicates whether an output short circuit or overcurrent fault is present on the point.	• 0 = Short Circuit condition does not exist • 1 = Short Circuit condition exists
NoLoadTimestamp	LINT	Indicates the time of the last No Load fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
ShortCircuitTimestamp	LINT	Indicates the time of the last short circuit fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
CIPConnections	INT	Indicates the number of CIP connections that are currently open.	0...24
CIPLostPackets	DINT	Indicates the running sum of the number of Sequenced Address Item Sequence Numbers that are skipped in Class 0 and Class 1 connections consumed by the adapter and its children.	0...2,147,483,647
CIPTimeouts	DINT	Indicates the running count of the number of connections that time out, both originated and targeted, to and through the adapter.	0...2,147,483,647
CPUUtilization	INT	Indicates the usage of the compute engine.	0...100%

Create Message Type User Tags

Create MESSAGE type user tags for requests and associated response user tags for each of the new user-defined diagnostic assembly types.



From the Controller Organizer pane, expand Tasks → MainTask → MainProgram

1. Create MESSAGE type user tags for each request.
2. Create associated response user tags for each new user-defined diagnostic assembly type.
3. Add the user tags to your ladder program.

4. Expand the message tag to open the message configuration dialog.
5. On the Configuration tab, select:
   - Service type: Get Attribute Single
   - Class: 4
   - Attribute: 3
   - Instance:
     - **5034-OB8 and 5034-OB8XT**
       790 (316h) Diagnostic Digital 16 Point with Diagnostics Assembly A
       769 (301h) Diagnostic Counters Base I/O Assembly
   - Destination element: User-defined data type suitable for the instance entered.
6. On the Communication tab, select the path to the module that you wish to send the messages to.
7. Download the project and set to Run mode.

   You can monitor the user-defined tag values from the Program Parameters and Local Tags window, under the MainProgram task in the Controller Organizer pane.

Wiring Related to COM Pins

See the following diagrams for wiring the COM pins on the RTBs when using the 5034-OB8 and 5034-OB8XT modules.

Figure 59. Individual Load Return Wiring on COM Pins

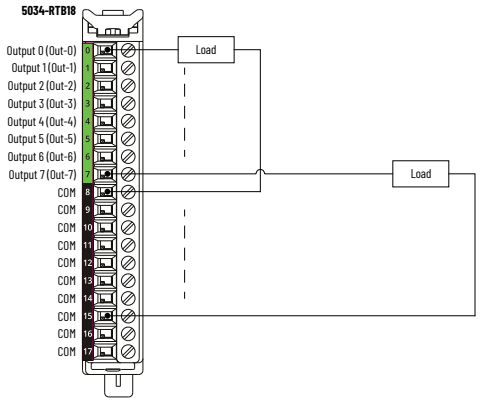
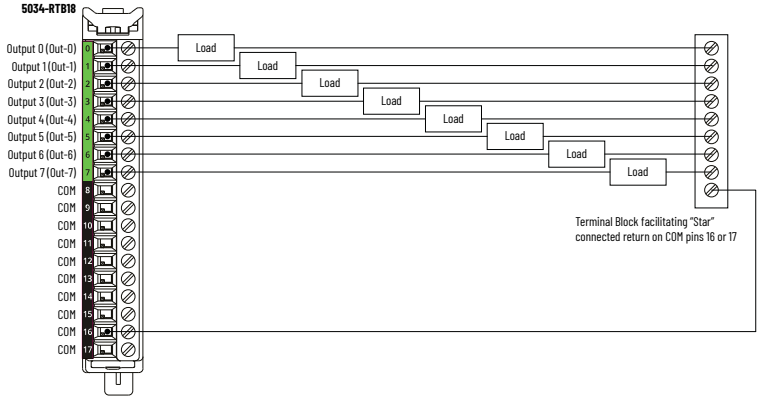


Figure 60. Star-connected Load Return Wiring on COM Pins



5034-OW4I and 5034-OW4IXT Details

Module Configuration

Before you start configuring your I/O module, you must create a Studio 5000 Logix Designer application project for the Logix 5000 controller that owns the I/O module. The project includes configuration data for the module.

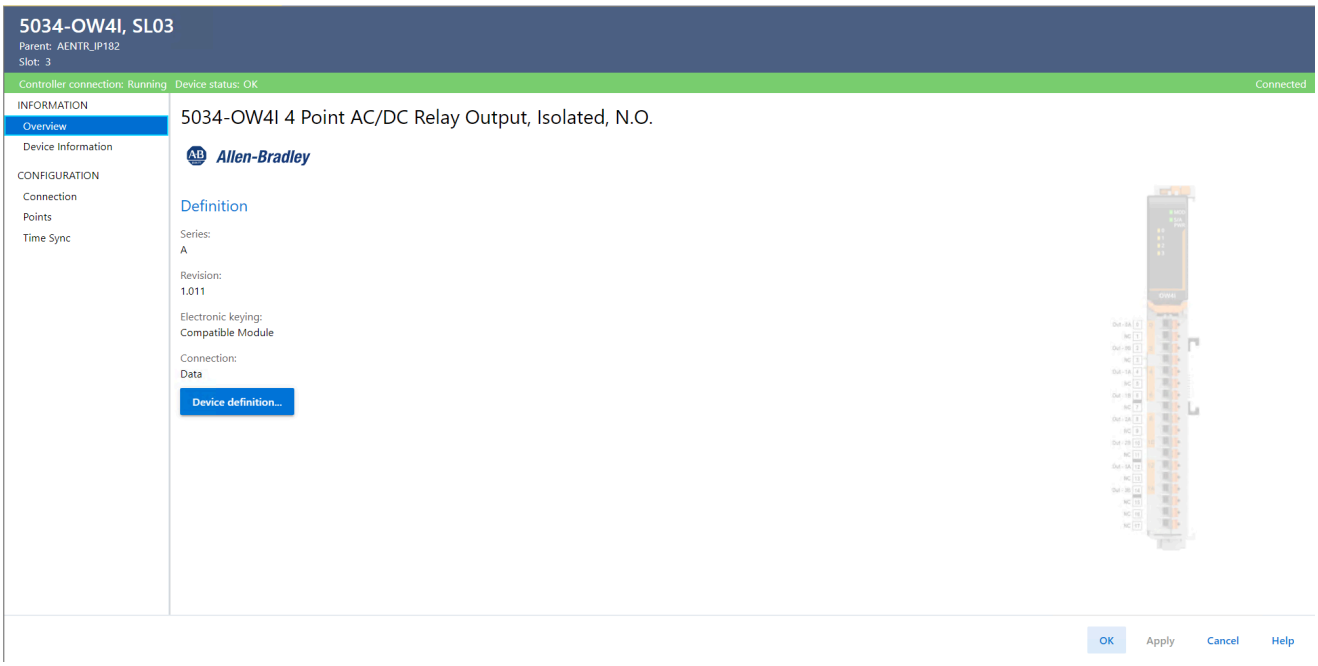
The Studio 5000 Logix Designer application transfers the project to the owner-controller during the program download. Data is then transferred to the I/O modules over the EtherNet/IP network.

The I/O modules can operate immediately after receiving and applying the configuration data.

Overview View

Use Overview to view the definition of a device, including the device type, revision, electronic keying, connection, and other device-specific values.

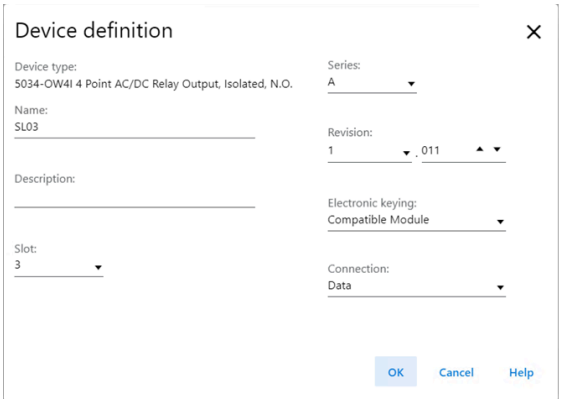
Figure 61. Overview View Example



Device Definition

To change the definition of a device, select Device definition in the Overview view.

Figure 62. Device Definition Example



Device Definition includes these parameters:

Table 58. Device Definition Parameters

Parameter	Definition	Available Choices
Device Type	Displays the device catalog number and type.	Device-specific
Name	Enter an IEC 61131 compliant device name. If an invalid character is entered in this field, or if the name exceeds 40 characters, the software ignores the character.	All valid values
Description	Enter the description of the device.	All valid values
Slot	Specify the slot number where the device resides. Only slots between 1 and the maximum number of I/O devices are valid depending on the platform. When the device is created, the slot number defaults to the first available slot position. When the controller is changed to one supporting a smaller maximum I/O count, the current slot value may no longer be valid.	1...32
Series	Specifies the series of the device.	Device-specific
Revision	Specifies the major and minor revisions of the device. The valid range for minor revision is from 1...255.	Device-specific
Electronic Keying	Defines the electronic keying used for the device. Electronic keying compares the device defined in the project to the installed device. If keying fails, a fault occurs. For detailed information on Electronic keying, see Electronic Keying in Logix 5000 Control Systems Application Technique, publication LOGIX-AT001.	• Exact Match • Compatible Module • Disable Keying
Connection	Specify the type of data transferred between the device and controller. For the Listen Only Data choice, the controller and device establish communication without the controller sending any configuration or output data to the device. A full input data connection is established but depends on the connection between the owner-controller and the device.	• Data • Listen Only Data

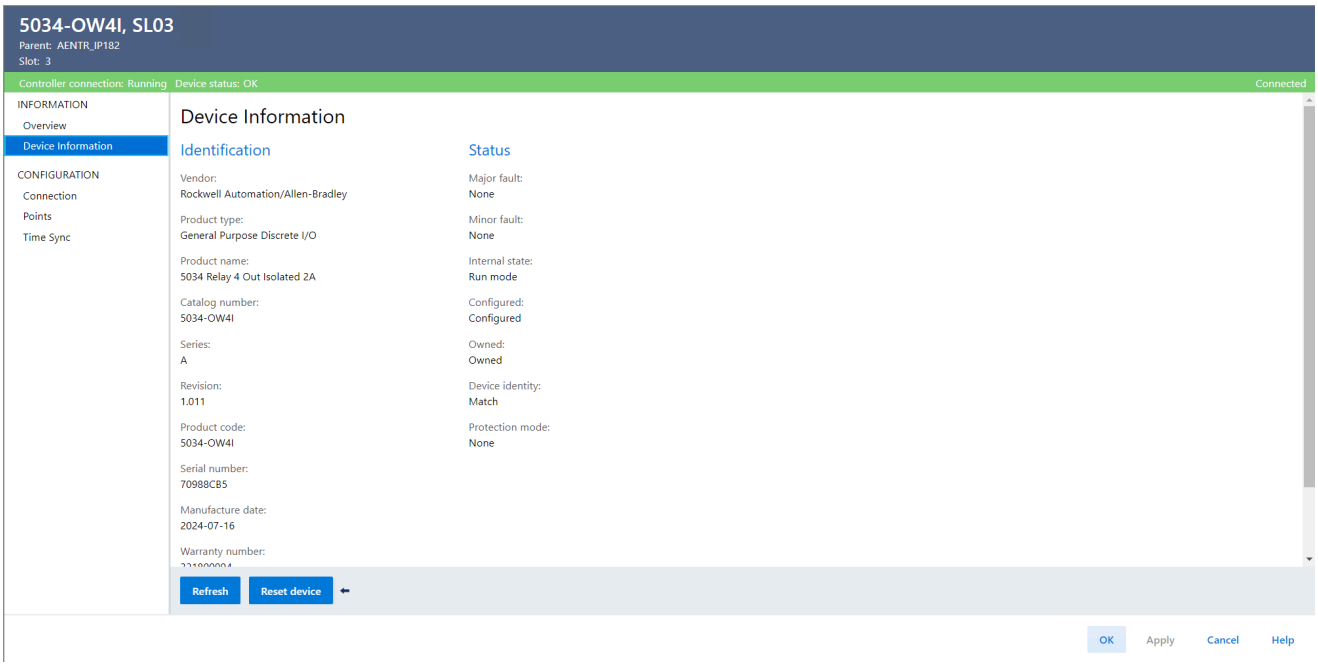
Device Information View

Use Device Information to view device and status information when the device is online.

Use Device Information to:

- Determine the identity of the device.
- View the device's current operational state.
- View whether the device was configured by the owner controller.
- View whether an owner controller is currently connected to the device.
- Retrieve the latest information from the device.
- Reset a device to its power-up state.
- If supported, view the protection mode of the device.

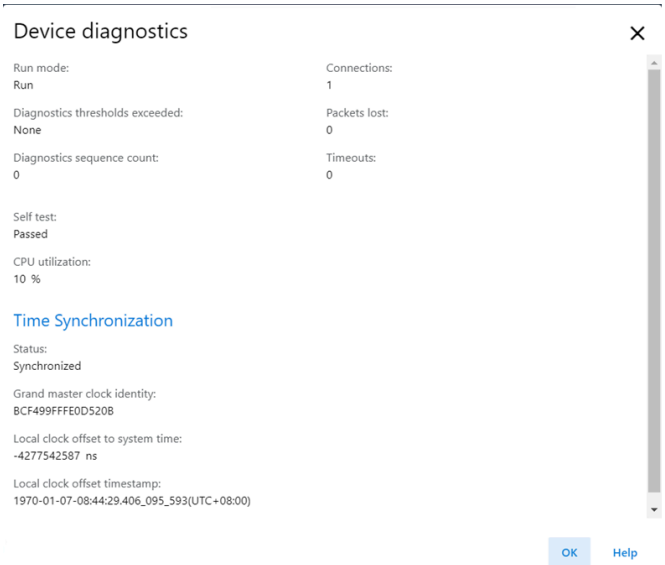
Figure 63. Device Information View Example



Device Diagnostics

To view the device diagnostics, select Diagnostics in the Device Information view.

Figure 64. Device Diagnostics Example



Connection View

Use Connection to define controller-to-device behavior.

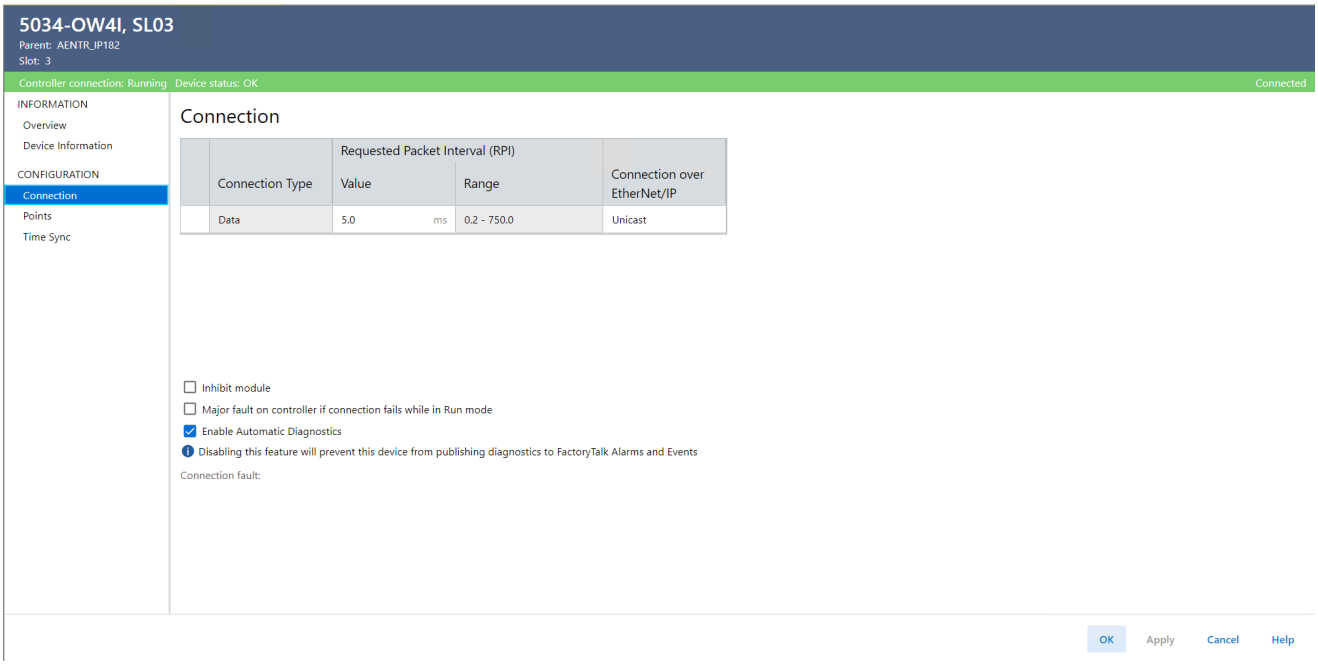
- Set the RPI rate. For more information, see Requested Packet Interval on page .
- Select Unicast or Multicast connection to use on the EtherNet/IP network. For more information, see Unicast or Multicast Connection on page 20.
- View the reason for a connection fault.

If there is a connection fault, the Connection Fault area displays the error code with a description that helps you to troubleshoot the module. For more information, see Troubleshoot Your Module on page 42.

- Inhibit the module. For more information, see Module Inhibiting on page 17.
- Configure whether a connection failure while the controller is in Run mode causes a major or minor fault.
- Enable or disable Automatic Diagnostics.

ATTENTION: If you do not enable Automatic Diagnostics, the device does not publish diagnostics to FatoryTalk Alarms and Events.

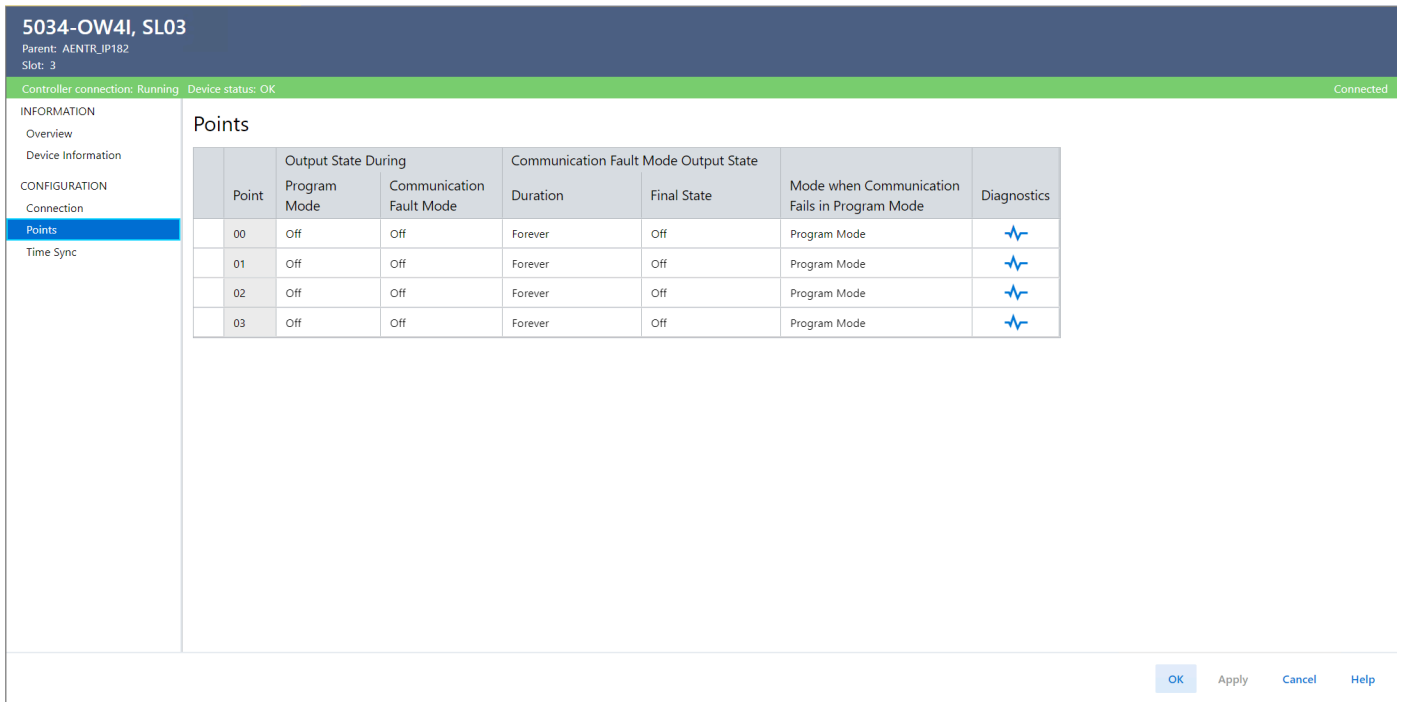
Figure 65. Connection View Example



Points View

Use Points to view or configure the points for the device.

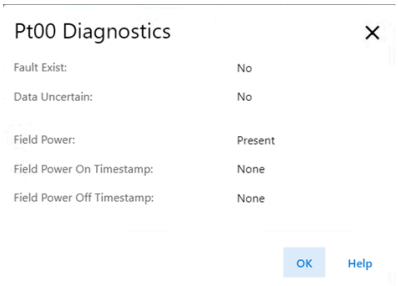
Figure 66. Points View Example



Ptxx Diagnostics

To view the Ptxx diagnostics, select Diagnostics in the Points or Ptxx view.

Figure 67. Ptxx Diagnostics Example

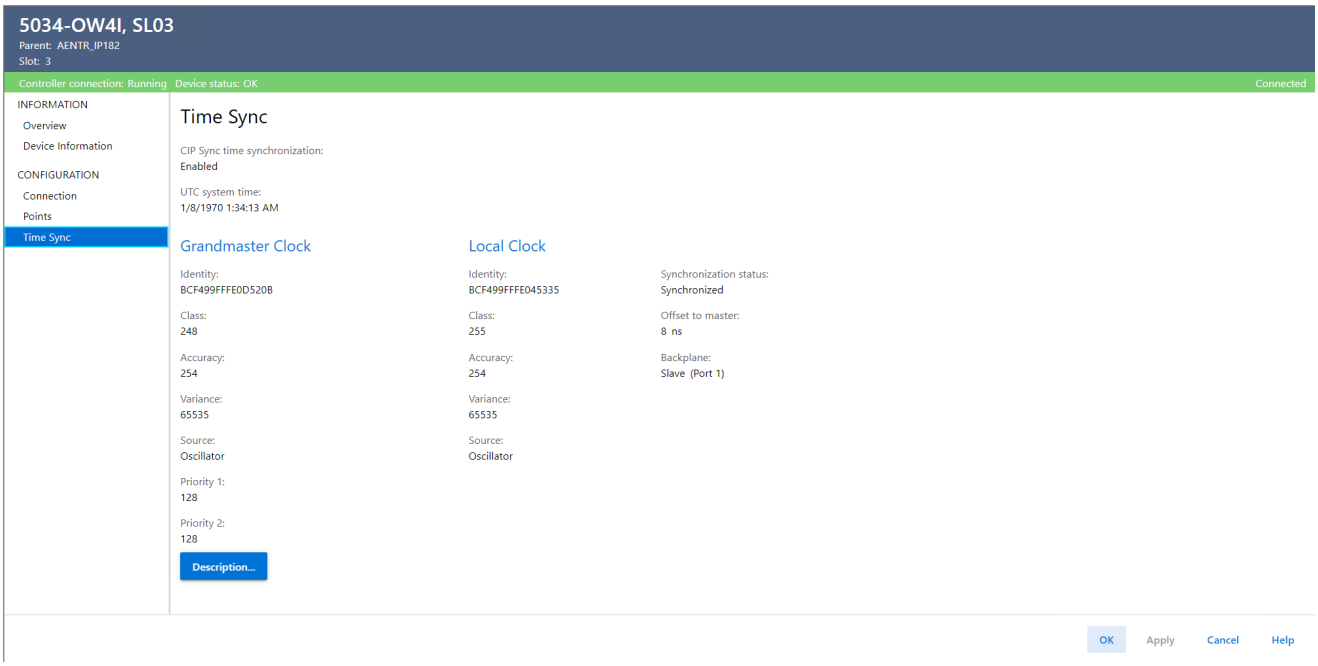


Time Sync View

The Time Sync view is read-only and displays the CIP Sync status information about the module when the project is online. The Time Sync category displays the following information:

- CIP Sync time synchronization status
- UTC system time
- Grandmaster Clock information
- Grandmaster Clock description
- Local Clock information

Figure 68. Time Sync View Example

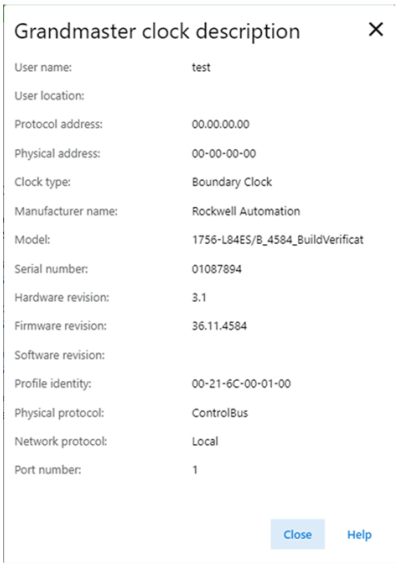


Grandmaster Clock Description

The Grandmaster clock description dialog provides detailed information about the grandmaster clock.

To view the Grandmaster clock description, select Description in the Time Sync view.

Figure 69. Grandmaster Clock Description Example



Use the Status Indicators for Troubleshooting

PointMax I/O modules use the following status indicators:

- SA Power Indicator - This indicator operates the same for all PointMax I/O modules.
- Module Status Indicator - This indicator operates the same for all PointMax I/O modules.
- Channel Status Indicator - This indicator operates differently based on the module type you are using.

SA Power Indicator

Table 59. Interpret SA Power Indicator – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered or outside its designed operating range.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	There is SA power to the module	None
Steady red	There is no SA power to the module or SA power is not in the valid range.	Complete the following actions: 1. Confirm that SA power wiring is properly connected to the adapter, expansion power module, or 5034-MBSA mounting base. 2. Check the following: ◦ Check that the SA voltage is in the correct range. ◦ If an external power supply is used, confirm that the power supply is turned on. ◦ Confirm that there is sufficient voltage supplied to the module. ◦ Make sure that the mounting base to mounting base connection is properly secured. Go to Chassis Information view in the Module Properties of the adapter module to check the Field Power status of mounting bases installed in all slots.

Module Status Indicator

Table 60. Interpret Module Status Indicator – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	The module has a connection to the owner-controller and is operating normally.	None
Flashing green	One of the following conditions exist: • The module has powered up successfully. • The module is OK, but it does not have a connection. No connection can result from missing, incomplete, or incorrect module configuration.	Complete the following actions: • Troubleshoot your Studio 5000 Logix Designer application to determine what is preventing a connection from the module to the controller and correct the issue. • Confirm that the system conditions require the controller to be in Remote Run mode or Run mode, transition the controller to one of those modes.
Steady red	The module experienced a nonrecoverable fault.	Complete the following actions: 1. Cycle power to the module. 2. If the status indicator remains in the steady red state, replace the module.

Table 60. Interpret Module Status Indicator – Standard I/O Modules (continued)

Indicator State	Description	Recommended Action
Flashing red	One of the following conditions exist: • A module firmware update is in progress. • A module firmware update attempt failed. • The device has experienced a recoverable fault. • A connection to the module has timed out.	Complete one of the following: • Let the firmware update progress complete. • Reattempt a firmware update after one fails. • Use the Studio 5000 Logix Designer application to determine whether a module recoverable fault is occurred. It is shown in Device Information view. To clear a recoverable fault, complete one of the following: ◦ Cycle module power. ◦ Select Reset device in the Studio 5000 Logix Designer project via the Device Information view of the Module Properties dialog. If the fault does not clear after cycling power and module reset, contact Rockwell Automation Technical Support. • Use the Studio 5000 Logix Designer application to determine if a connection has timed out. The Connection view in the Module Properties indicates whether a connection request has timed out. If a connection has timed out, determine the cause and correct it. For example, a cable failure can cause a connection timeout.
Flashing red/green	The module is in a self-test mode.	None

Point Status Indicators

Table 61. Interpret Point Status Indicators – Standard I/O Modules

Indicator State	Description	Recommended Action
Off	One of the following: • The point is Off. • There is no backplane power. • A Field Power Loss condition exists.	One of the following: • Confirm that the point is configured properly. • Confirm that there is backplane power supplied through the EtherNet/IP adapter. • Locate and correct the cause of field power loss condition.
Steady yellow	The point is On.	None

Module Tag Definitions

Module tags are created when you add a module to the Studio 5000 Logix Designer application project.

The set of module tags associated with a module depends on the module type and Module Definition choices made during module configuration.

The tables contained in this section list all of the tags available with a module. Not all tags in the list are used when that module type is added to a project. Tag use varies by module configuration.

Configuration Tag Definitions

Table 62. Configuration Tags

Name	Data Type	Definition	Valid Values
Ptxx.FaultMode	BOOL	Selects the behavior that the output point takes if a communication fault occurs. FaultValue defines the value to go to when set to user-defined value.	• 0 = Go to a user-defined value • 1 = Hold last state
Ptxx.FaultValue	BOOL	Defines the value that the discrete output assumes if a communication fault occurs when FaultMode = 0.	• 0 = Off • 1 = On
Ptxx.ProgMode	BOOL	Selects the behavior that the output point takes when transitioned into Program Mode or Inhibit mode. ProgValue defines the value to go to when set to user-defined value.	• 0 = Go to a user-defined value • 1 = Hold last state
Ptxx.ProgValue	BOOL	Defines the value that the output takes when the connection transitions to Program Mode or Inhibit mode if the ProgMode bit is set to user-defined value.	• 0 = The output state is Off during Program Mode or Inhibit mode • 1 = The output state is On during Program Mode or Inhibit mode
Ptxx.FaultFinalState	BOOL	If FaultValueStateDuration is nonzero, determines the final Output state after the configured FaultValueStateDuration timeout occurs.	• 0 = The output state is Off after the FaultValueStateDuration time expires • 1 = The output state is On after the FaultValueStateDuration time expires
Ptxx.ProgramToFaultEn	BOOL	Determines if an output transitions to the Communication Fault Mode if the connection faults while in Program Mode.	• 0 = Stay in Program Mode • 1 = Go to Communication Fault Mode
Ptxx.FaultValueStateDuration	SINT	This value determines the length of time the Communication Fault Mode state is held before the FaultFinalState is applied.	• 0 = Hold forever • 1, 2, 5, or 10 seconds

Input Tag Definitions

Table 63. Input Tags

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Because the controller is in Program Mode, the module is not applying new output tag data but is applying the Program Mode state of the output point instead. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied.
ConnectionFaulted	BOOL	Indicates if a connection to the target is running. The module always returns a zero in this member. The controller overwrites the zero with a one when the connection is not up.	• 0 = Connection is running • 1 = Connection is not running
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
Ptxx.Data	BOOL	Echo of the current digital relay output value	• 0 = Off • 1 = On
Ptxx.Fault	BOOL	Indicates that point data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault
Ptxx.Uncertain	BOOL	Indicates that the point data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data

Output Tag Definitions

Table 64. Output Tags

Name	Data Type	Definition	Valid Values
Ptxx.Data	BOOL	Current digital output data to be applied.	• 0 = Off • 1 = On

Diagnostic Assembly

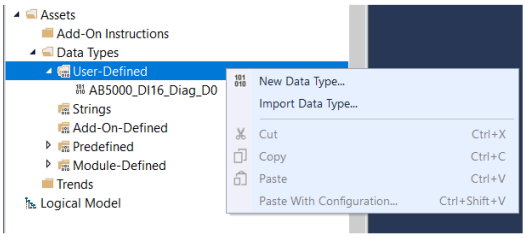
Diagnostic assembly helps you troubleshoot and diagnose the fault in your system.

Create User-defined Diagnostic Assembly Types

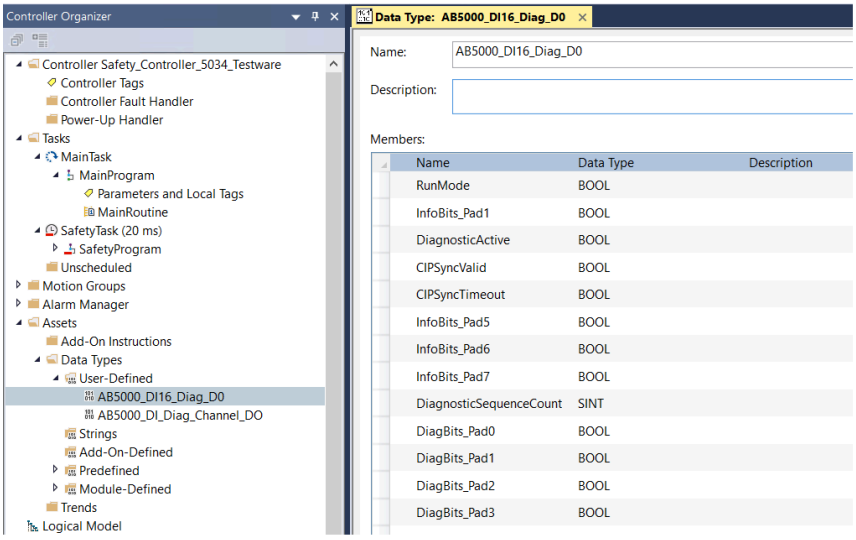
You can use the Studio 5000 Logix Designer application to create user-defined Diagnostic Assembly types.

Create user-defined diagnostic assembly by following the below steps:

1. From the Controller Organizer pane, go to Assets → Data types → User-Defined.
2. Right-click on the User-Defined folder and select New Data Type.



3. Add a Name and Description (optional) for your diagnostic assembly.
4. Under Members area, add the data members based on the diagnostic assembly detailed below.



IMPORTANT: The members indicated in the tables are arranged according to Data Alignment Rules of controllers. Strictly follow the data type and the sequence of the members that are indicated in the tables of this appendix. If the data type and the sequence are not followed, data misalignment may occur after executing Get Attribute Single Message (MSG) instruction.

Diagnostic Assembly

Diagnostic Digital 4 Point with Diagnostics Assembly

- Instance ID = 0x8018 (32,792)
- Size = 192 bytes

Table 65. Diagnostic Assembly Instance – 32,792

Name	Data Type	Size in Bytes
RunMode	BOOL	1
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
CIPSyncValid	BOOL	
CIPSyncTimeout	BOOL	
InfoBits_Pad5	BOOL	
FieldPowerOff	BOOL	
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
DiagBits_Pad0	BOOL	2
DiagBits_Pad1	BOOL	
DiagBits_Pad2	BOOL	
DiagBits_Pad3	BOOL	
DiagBits_Pad4	BOOL	
DiagBits_Pad5	BOOL	
DiagBits_Pad6	BOOL	
DiagBits_Pad7	BOOL	
DiagBits_Pad8	BOOL	
DiagBits_Pad9	BOOL	
BaseUnsupportedFault	BOOL	
BaseIDFault	BOOL	
FlashUpdateRequired	BOOL	
SelfTestFault	BOOL	
DiagBits_Pad14	BOOL	
DiagBits_Pad15	BOOL	
Pad	INT	4
LocalClockOffset	LINT	8
LocalClockOffsetTimestamp	LINT	8
GrandMasterClockID[8]	SINT	8

Table 65. Diagnostic Assembly Instance – 32,792 (continued)

Name	Data Type	Size in Bytes
AB:5000_DO_Diag2_Channel:D:0 [0...3]	AB:5000_DO_Diag2_Channel:D:0	160

Diagnostic Counters

Diagnostic Counters Assembly for I/O

- Instance ID = 0x301 (769)
- Size = 16 bytes

Table 66. Diagnostic Assembly Instance – 769

Name	Data Type	Size in Bytes
RunMode	BOOL	1
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
InfoBits_Pad3	BOOL	
InfoBits_Pad4	BOOL	
InfoBits_Pad5	BOOL	
InfoBits_Pad6	BOOL	
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
CIPConnections	INT	2
CIPLostPackets	DINT	4
CIPTimeouts	DINT	4
CPUUtilization	INT	2
Pad	INT	2

Diagnostic Channel

This data type is retrieved as part of the diagnostic assembly instance.

Diagnostic Digital with Diagnostics Channel (Output)

- Data Type = AB:5000_DO_Diag2_Channel:D:0
- Size = 40 bytes

Table 67. Structure for Data Type AB:5000_DO_Diag2_Channel:D:0

Name	Data Type	Size in Bytes
DataBits_Pad0	BOOL	2
Fault	BOOL	
Uncertain	BOOL	

Table 67. Structure for Data Type AB:5000_DO_Diag2_Channel:D:0 (continued)

Name	Data Type	Size in Bytes
NoLoad	BOOL	
ShortCircuit	BOOL	
DataBits_Pad5	BOOL	
FieldPowerOff	BOOL	
DataBits_Pad7	BOOL	
DataBits_Pad8	BOOL	
DataBits_Pad9	BOOL	
DataBits_Pad10	BOOL	
DataBits_Pad11	BOOL	
DataBits_Pad12	BOOL	
DataBits_Pad13	BOOL	
DataBits_Pad14	BOOL	
DataBits_Pad15	BOOL	
DiagBits_Pad0...DiagBits_Pad15	INT	2
Pad	DINT	4
NoLoadTimestamp	LINT	8
ShortCircuitTimestamp	LINT	8
FieldPowerOnTimestamp	LINT	8
FieldPowerOffTimestamp	LINT	8

Definitions for Diagnostic Assembly Types

Table 68. Definition of Members in Diagnostic Assembly Data Types

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state.	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Module is not applying new output tag data because the controller is in Program Mode. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied or there is no output tag data for the connection (For example, all points configured as digital input without timestamp).
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master has timed out The module is using its local clock and can be drifting away from the last known master time.
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
LocalClockOffset	LINT	The offset from the local clock to the system time. This value helps to detect steps in time. This value updates when a PTP update is received.	All values
LocalClockOffsetTimestamp	LINT	Indicates the time of the local clock offset.	A valid time or None if there is no recorded event time. Time format is YYYY-MMDD-HH:mm:SS_mmm_uuu_nnn(UTC-00:00). • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds • uuu = microseconds • nnn = nanoseconds • UTC-00:00 = Time zone

Table 68. Definition of Members in Diagnostic Assembly Data Types (continued)

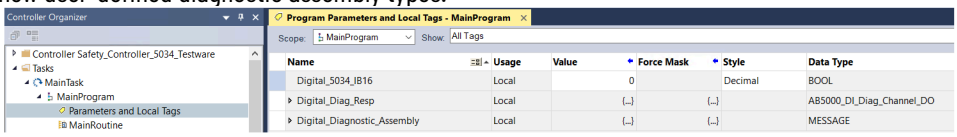
Name	Data Type	Definition	Valid Values
GrandMasterClockID	SINT[8]	The EUI-64 Identity of the CIP Sync Grandmaster clock the module is synced to.	All values
Fault	BOOL	Indicates that the data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault
Uncertain	BOOL	Indicates that the data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
FieldPowerOff	BOOL	Indicates that a field power loss condition exists on the channel.	• 0 = Field power off condition does not exist • 1 = Field power off condition exists
FieldPowerOnTimestamp	LINT	Indicates the time of the last field power turned on event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
FieldPowerOffTimestamp	LINT	Indicates the time of the last field power turned off event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
NoLoad	BOOL	Indicates whether a load fault is present.	• 0 = No Load condition does not exist • 1 = No Load condition exists
ShortCircuit	BOOL	Indicates whether an output short circuit or overcurrent fault is present on the point.	• 0 = Short Circuit condition does not exist • 1 = Short Circuit condition exists

Table 68. Definition of Members in Diagnostic Assembly Data Types (continued)

Name	Data Type	Definition	Valid Values
NoLoadTimestamp	LINT	Indicates the time of the last No Load fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
ShortCircuitTimestamp	LINT	Indicates the time of the last short circuit fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
CIPConnections	INT	Indicates the number of CIP connections that are currently open.	0...24
CIPLostPackets	DINT	Indicates the running sum of the number of Sequenced Address Item Sequence Numbers that are skipped in Class 0 and Class 1 connections consumed by the adapter and its children.	0...2,147,483,647
CIPTimeouts	DINT	Indicates the running count of the number of connections that time out, both originated and targeted, to and through the adapter.	0...2,147,483,647
CPUUtilization	INT	Indicates the usage of the compute engine.	0...100%

Create Message Type User Tags

Create MESSAGE type user tags for requests and associated response user tags for each of the new user-defined diagnostic assembly types.



From the Controller Organizer pane, expand Tasks → MainTask → MainProgram

1. Create MESSAGE type user tags for each request.
2. Create associated response user tags for each new user-defined diagnostic assembly type.
3. Add the user tags to your ladder program.

4. Expand the message tag to open the message configuration dialog.

5. On the Configuration tab, select:
   - Service type: Get Attribute Single
   - Class: 4
   - Attribute: 3
   - Instance:
     - **5034-0W4I and 5034-0W4IXT**
       32,792 (8018h) Diagnostic Digital 4 Point with Diagnostics Assembly
       769 (301h) Diagnostic Counters Base I/O Assembly
   - Destination element: User-defined data type suitable for the instance entered.
6. On the Communication tab, select the path to the module that you wish to send the messages to.
7. Download the project and set to Run mode.

   You can monitor the user-defined tag values from the Program Parameters and Local Tags window, under the MainProgram task in the Controller Organizer pane.

5034-IB8S and 5034-IB8SXT Details

Module Configuration

Before you start configuring your I/O module, you must create a Studio 5000 Logix Designer application project for the Logix 5000 controller that owns the I/O module. The project includes configuration data for the module.

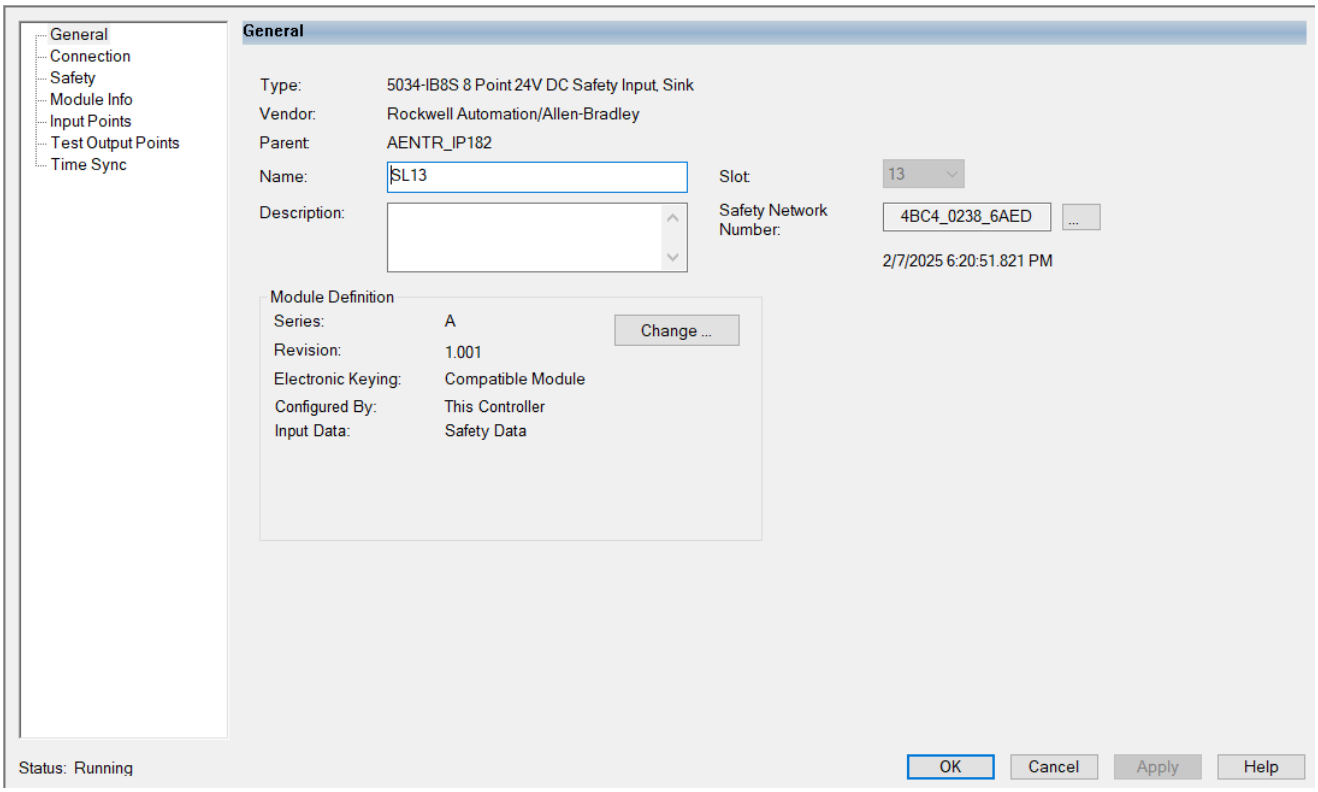
The Studio 5000 Logix Designer application transfers the project to the owner-controller during the program download. Data is then transferred to the I/O modules over the EtherNet/IP network.

The I/O modules can operate immediately after receiving and applying the configuration data.

General View

Use General to view the definition of a device, including the device type, revision, electronic keying, connection, and other device-specific values.

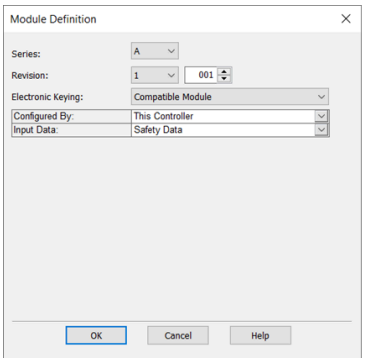
Figure 70. General View Example



Module Definition

To change the definition of a device, select Module definition in the General view.

Figure 71. Module Definition Example



Module Definition includes these parameters:

Table 69. Module Definition Parameters

Parameter	Definition	Available Choices
Series	Specifies the series of the device.	Device-specific
Revision	Specifies the major and minor revisions of the device. The valid range for minor revision is from 1...255.	Device-specific
Electronic Keying	Defines the electronic keying used for the device. Electronic keying compares the device defined in the project to the installed device. If keying fails, a fault occurs. For detailed information on Electronic keying, see Electronic Keying in Logix 5000 Control Systems Application Technique, publication LOGIX-AT001.	• Exact Match • Compatible Module
Configured By	Determines which tags are generated when configuration is complete. For the External Means choice, the controller and module establish communication without the controller sending any configuration or output data to the module.	• External Means • This Controller
Input Data	Select the input data type for the device.	• Safety Data • Safety Packed Data

Safety Network Number

The Studio 5000 Logix Designer application automatically assigns a Safety Network Number (SNN) to safety modules as they are added to the project.

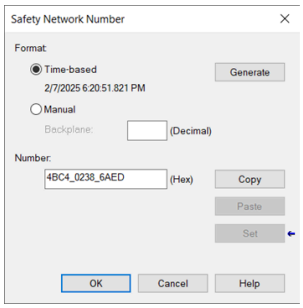
The SNN is a time-based number that uniquely identifies subnets across all networks in the safety system. All safety modules in a same system use the same SNN and are automatically assigned the same SNN by default.

The Studio 5000 Logix Designer application assigns an SNN to the first safety module that is added to a remote system. The application assigns the same SNN to additional safety modules that are added to this remote I/O system.

For more information on Safety Network Numbers, see the GuardLogix 5580 and Compact GuardLogix 5380 Controller Systems Safety Reference Manual, publication 1756-RM012.

To change the SNN of a device, select the ellipses next to the SNN field in the General view.

Figure 72. Safety Network Number Example



Connection View

Use Connection to define controller-to-device behavior.

IMPORTANT: For PointMax safety I/O modules, you set the RPI on the Safety view.

- Select Unicast or Multicast connection to use on the EtherNet/IP network. For more information, see Unicast or Multicast Connection on page 20.
- View the reason for a connection fault.

  If there is a connection fault, the Module Fault area displays the error code with a description that helps you to troubleshoot the module. For more information, see Troubleshoot Your Module on page 42.

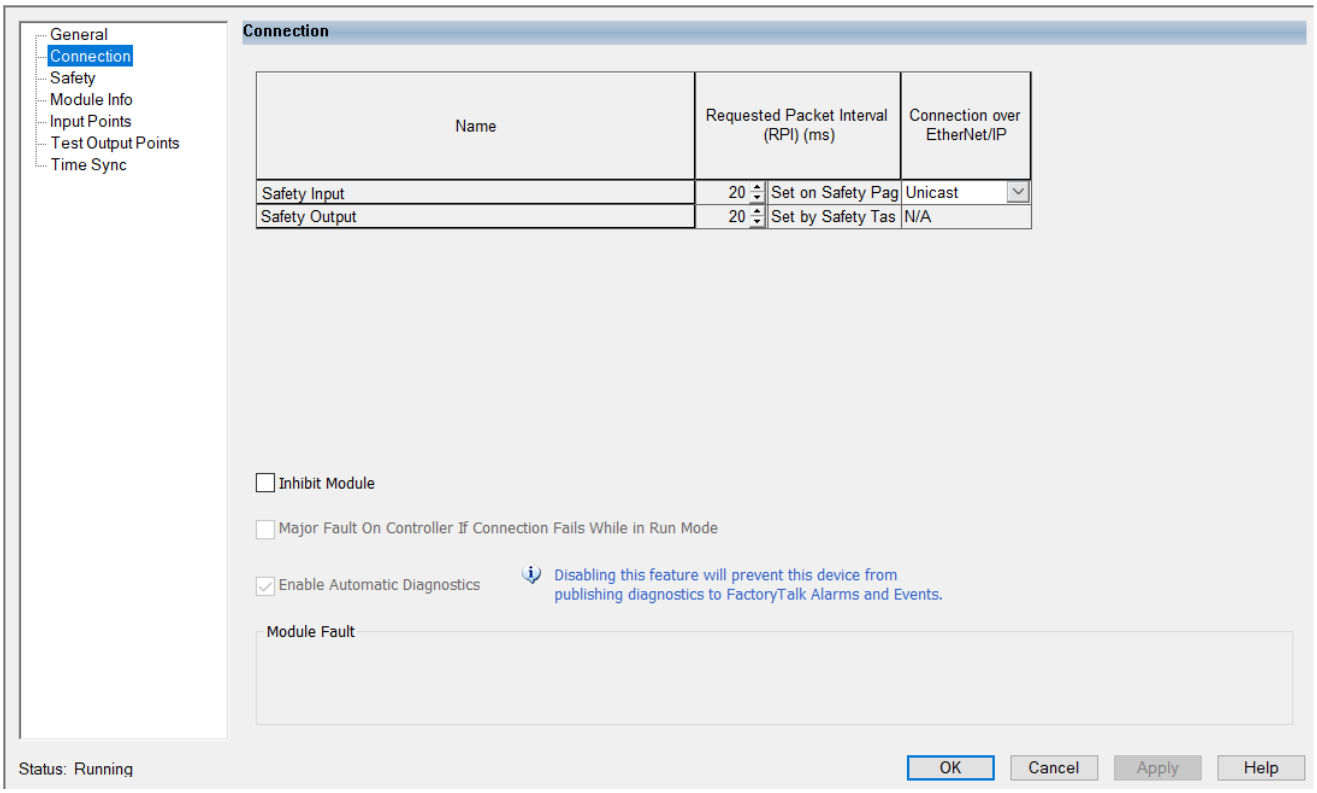
- Inhibit the module. For more information, see Module Inhibiting on page 17.

  Configure whether a connection failure while the controller is in Run mode causes a major or minor fault.

- Enable or disable Automatic Diagnostics.

  ATTENTION: If you do not enable Automatic Diagnostics, the device does not publish diagnostics to FatoryTalk Alarms and Events.

Figure 73. Connection View Example



Connection over EtherNet/IP

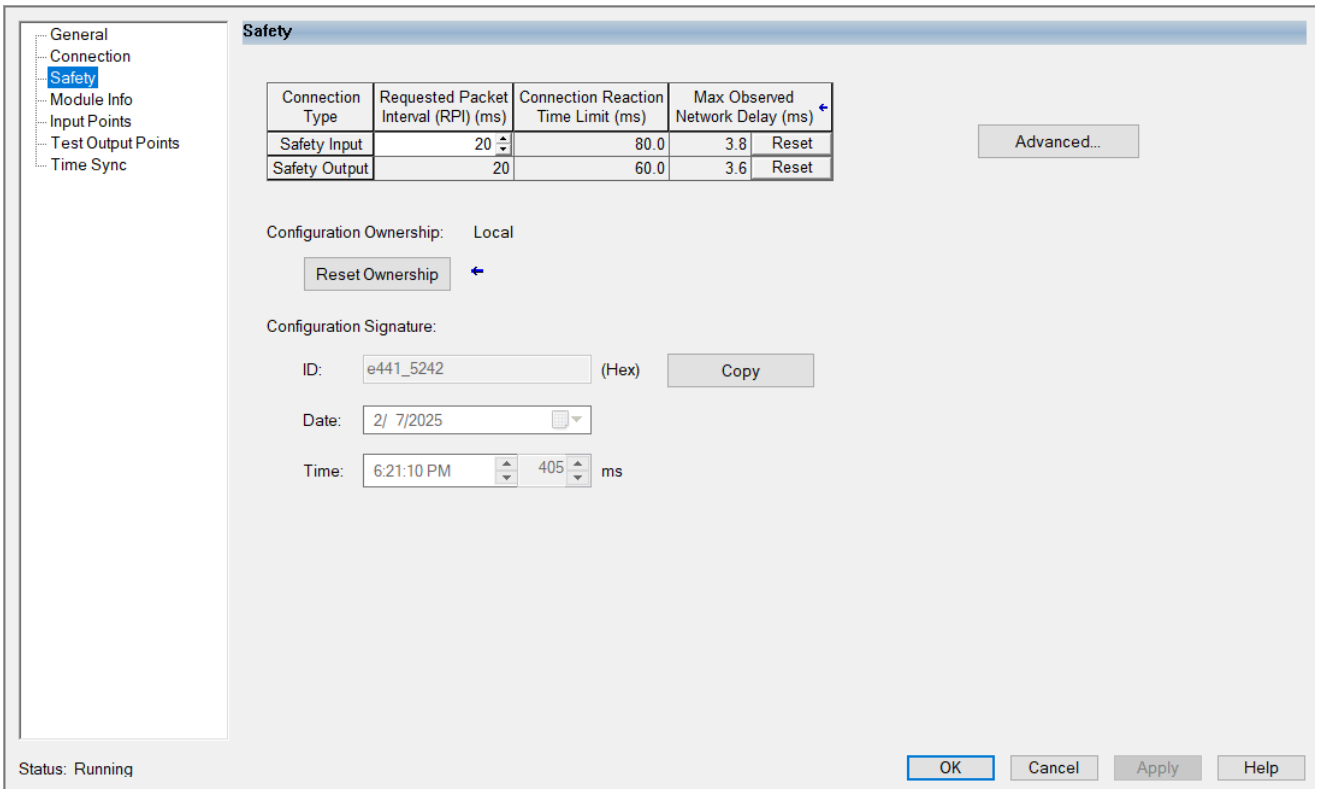
PointMax I/O safety modules support the Connection over EtherNet/IP parameter.

- With safety input data, you can choose Unicast or Multicast.
- With safety output data, the connection is set to Unicast and N/A is shown. You cannot change this parameter.

Safety View

Safety lets you set the RPI rate.

Figure 74. Safety View Example

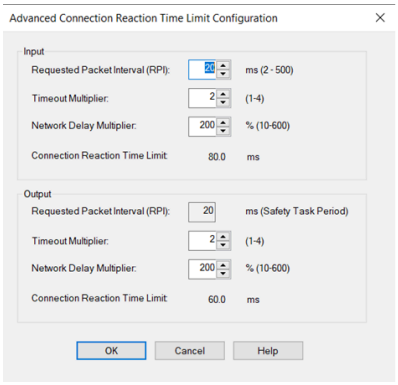


Connection Reaction Time Limit

To change the Connection Reaction Time Limit configuration, select Advanced in the Safety view. For more information, see Connection Reaction Time Limit With Safety Modules on page 25.

IMPORTANT: The Safety Task Period determines the output RPI.

Figure 75. Advanced Connection Reaction Time Limit Configuration Example



Module Info View

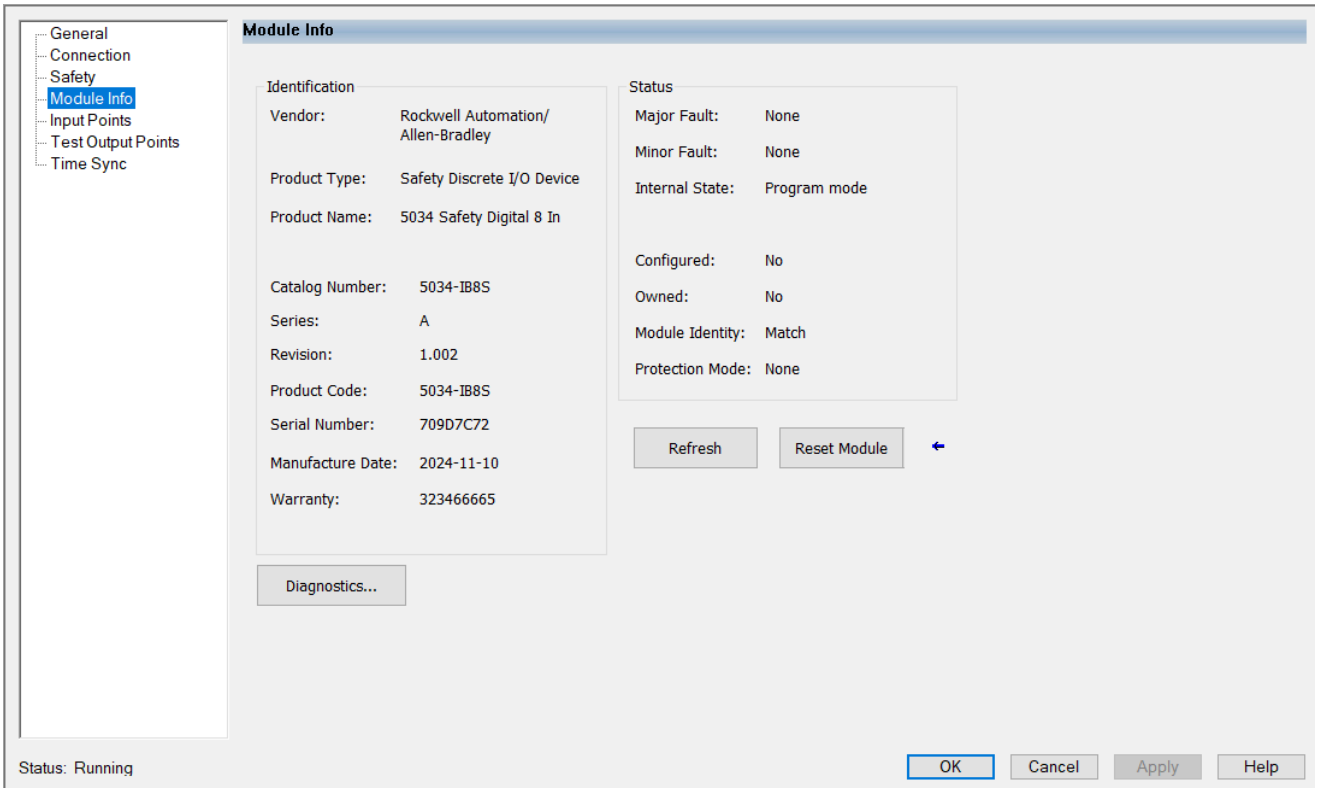
Use Module Info to view device and status information when the device is online.

Use Module Info to:

- Determine the identity of the device.
- View the device's current operational state.

- View whether the device was configured by the owner controller.
- View whether an owner controller is currently connected to the device.
- Retrieve the latest information from the device.
- Reset a device to its power-up state.
- If supported, view the protection mode of the device.

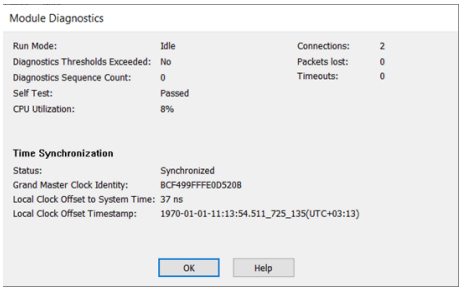
Figure 76. Module Info View Example



Module Diagnostics

To view the device diagnostics, select Diagnostics in the Module Info view.

Figure 77. Module Diagnostics Example

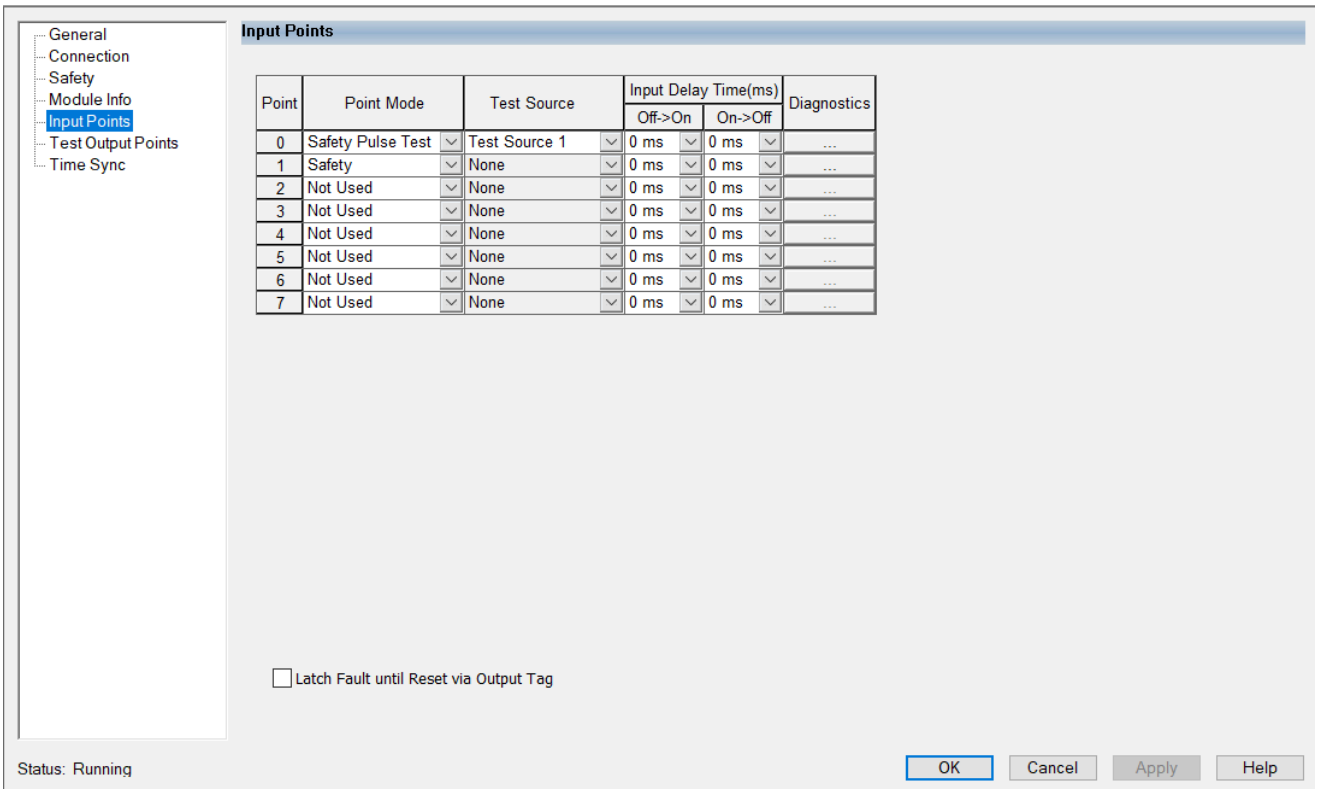


Input Points View

Input Points is only available if you choose This Controller for the Configured By parameter on the Module Definition dialog.

You must configure each point to use it in a safety application. The inputs are disabled by default.

Figure 78. Input Points View Example

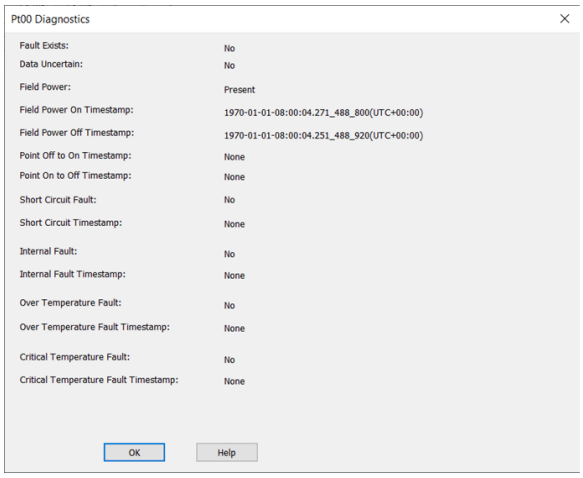


For more information on input delay times, see Safety Input Delay Time on page 50.

Ptxx Diagnostics

To view the Ptxx diagnostics, select Diagnostics in the Input Points view.

Figure 79. Ptxx Diagnostics Example

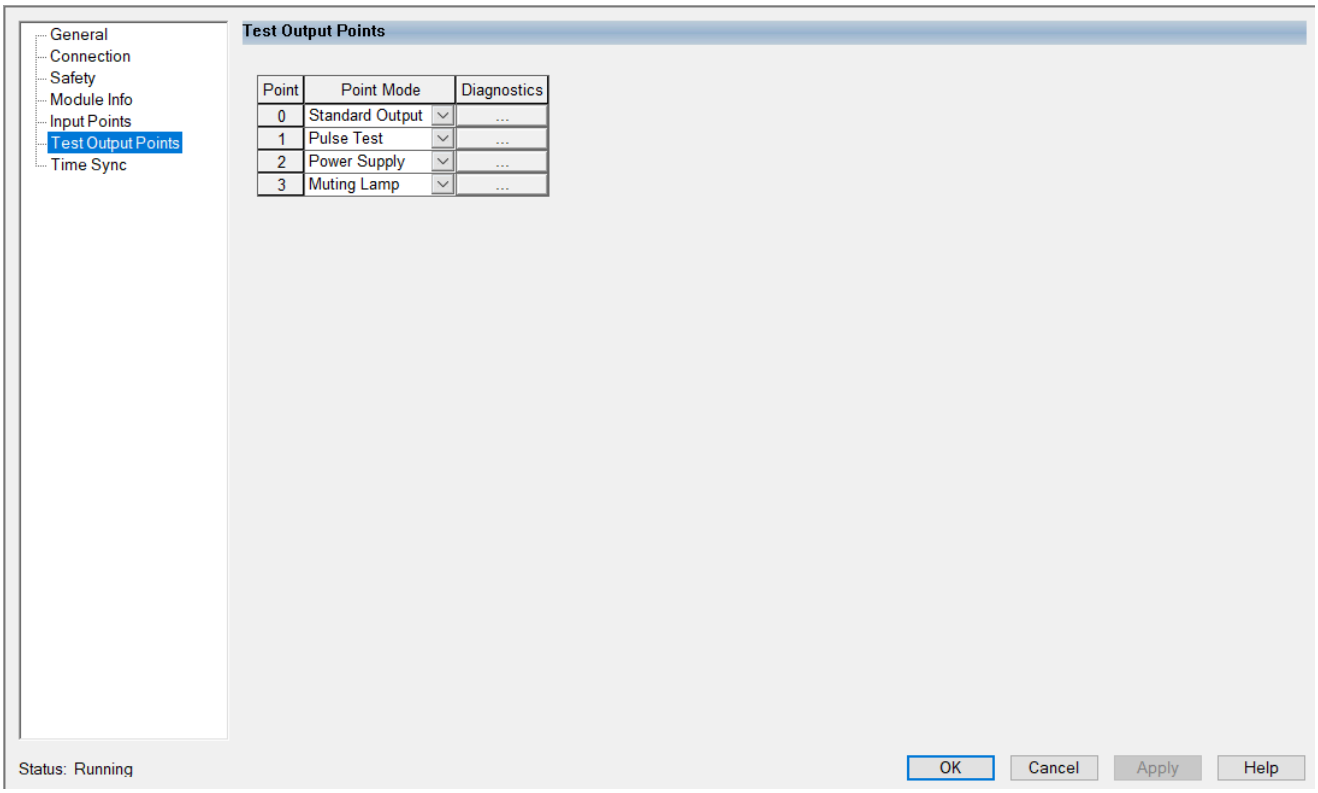


Test Outputs Points View

Test Output Points is only available if you choose This Controller for the Configured By parameter on the Module Definition dialog.

You must configure each point to use it in a safety application. The outputs are disabled by default.

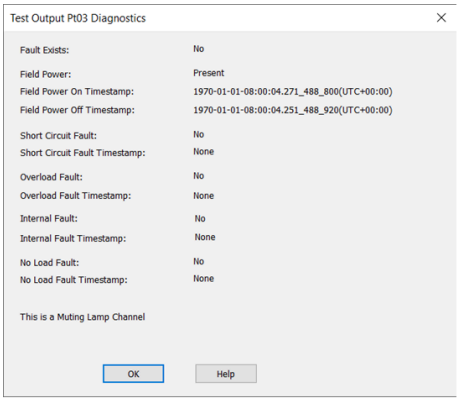
Figure 80. Test Output Points View Example



Test Output Ptxx Diagnostics

To view the Test Output Ptxx diagnostics, select Diagnostics in the Test Output Points view.

Figure 81. Test Output Ptxx Diagnostics Example

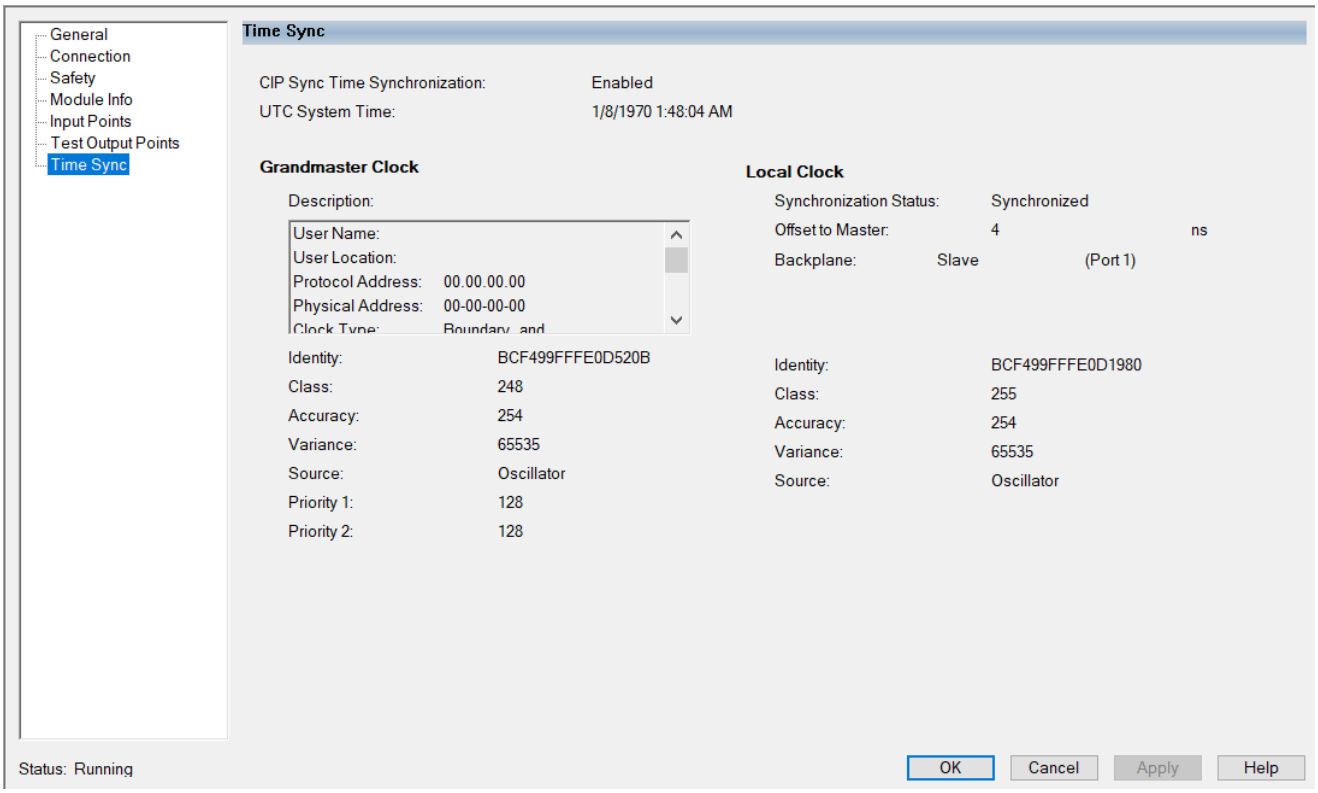


Time Sync View

The Time Sync view is read-only and displays the CIP Sync status information about the module when the project is online. The Time Sync category displays the following information:

- CIP Sync time synchronization status
- UTC system time
- Grandmaster Clock information
- Grandmaster Clock description
- Local Clock information

Figure 82. Time Sync View Example



Use the Status Indicators for Troubleshooting

PointMax I/O modules use the following status indicators:

- SA Power Indicator - This indicator operates the same for all PointMax I/O modules.
- Module Status Indicator - This indicator operates the same for all PointMax I/O modules.
- Channel Status Indicator - This indicator operates differently based on the module type you are using.

SA Power Indicator

Table 70. Interpret SA Power Indicator – Safety I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered. A safety connection cannot be made or maintained.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.

Table 70. Interpret SA Power Indicator – Safety I/O Modules (continued)

Indicator State	Description	Recommended Action
Steady green	There is SA power to the module	None
Steady red	• There is no SA power to the module. • SA voltage is not within a valid range. A safety connection cannot be made or maintained.	Complete the following actions: 1. Confirm that the SA Power wiring on the terminal block is installed properly. 2. Check the following: ◦ Confirm that there is sufficient voltage supplied to the module. ◦ If an external power supply is used, confirm that the power supply is turned on. ◦ Confirm that the SA voltage is within the correct range (18...30V).

Module Status Indicator

Table 71. Interpret Module Status Indicator – Safety I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	The module has a connection to a controller and is operating normally.	None
Flashing green	One of the following conditions exist: • The module has powered up successfully. • The module is OK, but it does not have a connection. No connection can result from missing, incomplete, or incorrect module configuration. • A connection can be established with the controller, but initial time coordination exchange is not complete. • Connection to an output module is in the idle state.	Complete the following actions: • Troubleshoot your Studio 5000 Logix Designer application to determine what is preventing a connection from the module to the controller and correct the issue. • Confirm that the system conditions require the controller to be in Remote Run mode or Run mode, transition the controller to one of those modes.
Steady red	The module experienced a nonrecoverable fault.	Complete the following actions: 1. Cycle power to the module. 2. If the status indicator remains in the steady red state, replace the module.

Table 71. Interpret Module Status Indicator – Safety I/O Modules (continued)

Indicator State	Description	Recommended Action
Flashing red	One of the following conditions exist: • A module firmware update is in progress. • A module firmware update attempt failed. • The device has experienced a recoverable fault. • A connection to the module has timed out.	Complete one of the following: • Let the firmware update progress complete. • Reattempt a firmware update after one fails. • Use the Studio 5000 Logix Designer application to determine the cause of the module fault. The Connection and Module Info categories of the modules configuration indicate the fault type. To clear a recoverable fault, complete one of the following: ◦ Cycle module power. ◦ Select Reset Module in the Studio 5000 Logix Designer project via the Module Info category of the Module Properties dialog. If the fault does not clear after cycling power and selecting Reset Module, contact Rockwell Automation Technical Support. • Use the Studio 5000 Logix Designer application to determine if a connection has timed out. The Connection view in the Module Properties indicates whether a connection request has timed out. If a connection has timed out, determine the cause and correct it. For example, a cable failure can cause a connection timeout.
Flashing red/green	This pattern indicates that a UNID for the safety device needs to be configured.	None

Point Status Indicators

Table 72. Interpret Point Status Indicators – Safety I/O Modules

Indicator State	Description	Recommended Action
Off	One of the following: • The point is Off. • There is no backplane power. • The point is not used.	One of the following: • Confirm that the point is configured properly. • Confirm that there is backplane power supplied through the EtherNet/IP adapter.
Steady yellow	The point is On.	None
Flashing red	The module experienced one or more recoverable faults.	Locate and correct the faults.
Steady red	One of the following: • A Field Power Loss condition exists. • An internal channel fault exists.	One of the following: • Locate and correct the cause of field power loss condition. • Locate and correct the internal fault.

Module Tag Definitions

Module tags are created when you add a module to the Studio 5000 Logix Designer application project.

The set of module tags associated with a module depends on the module type and Module Definition choices made during module configuration.

The tables contained in this section list all of the tags available with a module. Not all tags in the list are used when that module type is added to a project. Tag use varies by module configuration.

Input Tag Definitions

Table 73. Input Tags

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state	• 0 = Idle • 1 = Run
ConnectionFaulted	BOOL	Indicates if a connection to the target is running. The module always returns a zero in this member. The controller overwrites the zero with a one when the connection is not up.	• 0 = Connection is running • 1 = Connection is not running
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
Uncertain (Packed data)	BOOL	Indicates that the module data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy.	• 0 = Good data • 1 = Uncertain data

Table 73. Input Tags (continued)

Name	Data Type	Definition	Valid Values
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
Ptxx.Data PtxxData (Packed data)	BOOL	Indicates the current digital input value.	• 0 = Off • 1 = On
Ptxx.Fault	BOOL	One of the following: • Indicates that point data is inaccurate and cannot be trusted for use in the application. • The point is set to Not Used. If the tag is set to 1, you must troubleshoot the module to correct the cause of the fault.	• 0 = Good data • 1 = Bad data (faulted), or set to Not Used
Ptxx.Uncertain	BOOL	Indicates that the point data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy.	• 0 = Good data • 1 = Uncertain data
Ptxx.ShortCircuit	BOOL	Indicates a short to high is detected on the safety input point.	• 0 = No short circuit • 1 = Short circuit
Ptxx.Status PtxxStatus (Packed data)	BOOL	Indicates the status of the point.	• 0 = Bad data (faulted), or set to Not Used • 1 = Good
Testxx.Readback	BOOL	Indicates the current test output value at the test output.	• 0 = Off • 1 = On
Testxx.Fault	BOOL	One of the following: • Indicates that point data is inaccurate and cannot be trusted for use in the application. • The point is set to Not Used. If the tag is set to 1: • You must troubleshoot the module to correct the cause of the inaccuracy. • If the point is set to Not Used, no action is required.	• 0 = Good data • 1 = Bad data (faulted), or set to Not Used
Testxx.Uncertain	BOOL	One of the following: • Indicates that point data is inaccurate and cannot be trusted for use in the application. • The point is set to Not Used. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy.	• 0 = Good data • 1 = Uncertain data
Testxx.Status PtxxTestOutputStatus (Packed data)	BOOL	Indicates the status of the test output.	• 0 = Fault or set to Not Used • 1 = Good

Output Tag Definitions

Table 74. Output Tags

Name	Data Type	Definition	Valid Values
Ptxx.ResetFault PtxxResetFault (Packed data)	BOOL	When Latch Fault until Reset via Output Tag is enabled, the I/O point holds safety input fault indications until it checks that the fault is removed. If the fault is removed, it clears only the fault status upon detecting that the ResetFault bit in its point sees a 0 to 1 transition.	A 0 to 1 transition unlatches the fault.
Testxx.Data TestxxData (Packed data)	BOOL	Indicates the current test output value.	• 0 = Off • 1 = On

Diagnostic Assembly

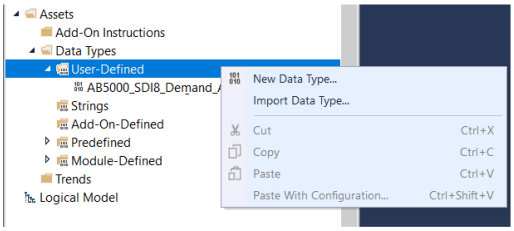
Diagnostic assembly helps you troubleshoot and diagnose the fault in your system.

Create User-defined Diagnostic Assembly Types

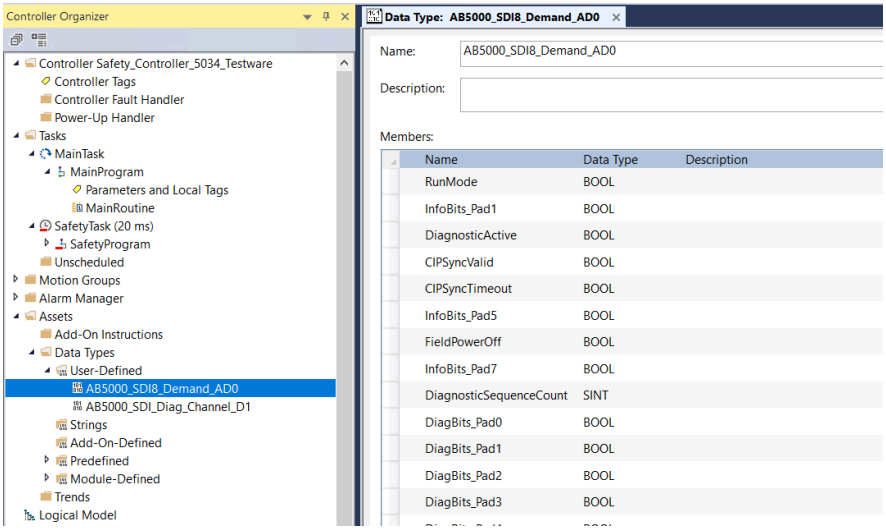
You can use the Studio 5000 Logix Designer application to create user-defined Diagnostic Assembly types.

Create user-defined diagnostic assembly by following the below steps:

1. From the Controller Organizer pane, go to Assets → Data types → User-Defined.
2. Right-click on the User-Defined folder and select New Data Type.



3. Add a Name and Description (optional) for your diagnostic assembly.
4. Under Members area, add the data members based on the diagnostic assembly detailed below.



IMPORTANT: The members indicated in the tables are arranged according to Data Alignment Rules of controllers. Strictly follow the data type and the sequence of the members that are indicated in the tables of this appendix. If the data type and the sequence are not followed, data misalignment may occur after executing Get Attribute Single Message (MSG) instruction.

Diagnostic Assembly

Diagnostic Digital Safety 8 Point Assembly A

- Instance ID = 0x8013 (32,787)
- Size = 320 bytes

Table 75. Diagnostic Assembly Instance – 32,787

Name	Data Type	Size in Bytes
RunMode	BOOL	1
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
CIPSyncValid	BOOL	
CIPSyncTimeout	BOOL	
InfoBits_Pad5	BOOL	
FieldPowerOff	BOOL	
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
DiagBits_Pad0	BOOL	2
DiagBits_Pad1	BOOL	
DiagBits_Pad2	BOOL	
DiagBits_Pad3	BOOL	
DiagBits_Pad4	BOOL	
DiagBits_Pad5	BOOL	
DiagBits_Pad6	BOOL	
DiagBits_Pad7	BOOL	
DiagBits_Pad8	BOOL	
DiagBits_Pad9	BOOL	
BaseUnsupportedFault This field is not used, but you must include it in the data structure.	BOOL	
BaseIDFault This field is not used, but you must include it in the data structure.	BOOL	
FlashUpdateRequired	BOOL	

Table 75. Diagnostic Assembly Instance – 32,787 (continued)

Name	Data Type	Size in Bytes
SelfTestFault	BOOL	
DiagBits_Pad14	BOOL	
DiagBits_Pad15	BOOL	
Pad	DINT	4
LocalClockOffset	LINT	8
LocalClockOffsetTimestamp	LINT	8
GrandMasterClockID[8]	SINT	8
AB:5000_SDI_Diag_Channel:D:1[0...3]	AB:5000_SDI_Diag_Channel:D:1	288

Diagnostic Digital Safety 8 Point Assembly B

- Instance ID = 0x8014 (32,788)
- Size = 288 bytes

Table 76. Diagnostic Assembly Instance – 32,788

Name	Data Type	Size in Bytes
AB:5000_SDI_Diag_Channel:D:1[4...7]	AB:5000_SDI_Diag_Channel:D:1	288

Diagnostic Digital Safety 16 Point Assembly C

- Instance ID = 0x31F (799)
- Size = 352 bytes

Table 77. Diagnostic Assembly Instance – 799

Name	Data Type	Size in Bytes
AB:5000_SDO_Diag2_Channel:D:0[8...11]	AB:5000_SDO_Diag2_Channel:D:0	352

Diagnostic Channel

This data type is retrieved as part of the diagnostic assembly instance.

Diagnostic Digital with Diagnostics Channel (Input)

- Data Type = AB:5000_SDI_Diag_Channel:D:1
- Size = 72 bytes

Table 78. Structure for Data Type AB:5000_SDI_Diag_Channel:D:1

Name	Data Type	Size in Bytes
DataBits_Pad0	BOOL	2
Fault	BOOL	

Table 78. Structure for Data Type AB:5000_SDI_Diag_Channel:D:1 (continued)

Name	Data Type	Size in Bytes
Uncertain	BOOL	
DataBits_Pad3	BOOL	
ShortCircuit	BOOL	
DataBits_Pad5	BOOL	
FieldPowerOff	BOOL	
DataBits_Pad7	BOOL	
DataBits_Pad8	BOOL	
DataBits_Pad9	BOOL	
DataBits_Pad10	BOOL	
DataBits_Pad11	BOOL	
DataBits_Pad12	BOOL	
DataBits_Pad13	BOOL	
DataBits_Pad14	BOOL	
DataBits_Pad15	BOOL	
InternalFault	BOOL	
OverTemperature	BOOL	
CriticalTemperature	BOOL	
DiagBits_Pad3	BOOL	
DiagBits_Pad4	BOOL	
DiagBits_Pad5	BOOL	
DiagBits_Pad6	BOOL	
DiagBits_Pad7	BOOL	
DiagBits_Pad8	BOOL	2
DiagBits_Pad9	BOOL	
DiagBits_Pad10	BOOL	
DiagBits_Pad11	BOOL	
DiagBits_Pad12	BOOL	
DiagBits_Pad13	BOOL	
DiagBits_Pad14	BOOL	
DiagBits_Pad15	BOOL	
Pad	DINT	4
ShortCircuitTimestamp	LINT	8
InternalFaultTimestamp	LINT	8

Table 78. Structure for Data Type AB:5000_SDI_Diag_Channel:D:1 (continued)

Name	Data Type	Size in Bytes
FieldPowerOnTimestamp	LINT	8
FieldPowerOffTimestamp	LINT	8
OverTemperatureTimestamp	LINT	8
CriticalTemperatureTimestamp	LINT	8
OnToOffTimestamp	LINT	8
OffToOnTimestamp	LINT	8

Definitions for Diagnostic Assembly Types

Table 79. Definition of Members in Diagnostic Assembly Data Types

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state.	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection.
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master has timed out The module is using its local clock and can be drifting away from the last known master time.
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
LocalClockOffset	LINT	The offset from the local clock to the system time. This value helps to detect steps in time. This value updates when a PTP update is received.	All values

Table 79. Definition of Members in Diagnostic Assembly Data Types (continued)

Name	Data Type	Definition	Valid Values
LocalClockOffsetTimestamp	LINT	Indicates the time of the local clock offset.	A valid time or None if there is no recorded event time. Time format is YYYY-MMDD-HH:mm:SS_mmm_uuu_nnn(UTC-00:00). • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds • uuu = microseconds • nnn = nanoseconds • UTC-00:00 = Time zone
GrandMasterClockID	SINT[8]	The EUI-64 Identity of the CIP Sync Grandmaster clock the module is synced to.	All values
Fault	BOOL	Indicates that the data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault
Uncertain	BOOL	Indicates that the data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
NoLoad	BOOL	Indicates whether a load fault is present.	• 0 = No Load condition does not exist • 1 = No Load condition exists
ShortCircuit	BOOL	Indicates whether an output short circuit to high is present on the point.	• 0 = Short Circuit condition does not exist • 1 = Short Circuit condition exists
FieldPowerOff	BOOL	Indicates that a field power loss condition exists on the point.	• 0 = Field power off condition does not exist • 1 = Field power off condition exists
FieldPowerOnTimestamp	LINT	Indicates the time of the last field power turned on event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds

Table 79. Definition of Members in Diagnostic Assembly Data Types (continued)

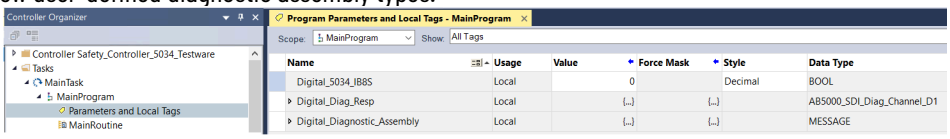
Name	Data Type	Definition	Valid Values
FieldPowerOffTimestamp	LINT	Indicates the time of the last field power turned off event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
Internal Fault	BOOL	Indicates whether an internal fault is present. If there is an internal fault, cycle power to the module. If the problem persists, contact Technical Support.	• 0 = No internal issue found in the product • 1 = One or more of several internal diagnostics indicate an internal issue in the product
Overload	BOOL	Indicates whether an overload fault is present on the point.	• 0 = Overload condition does not exist • 1 = Overload condition exists
OverTemperature	BOOL	Indicates whether an over temperature condition is present. Over temperature means that the device is at a normal or higher temperature than its rated operating limits.	• 0 = Over temperature condition does not exist • 1 = Module is at a higher temperature than its rated operating limits
CriticalTemperature	BOOL	Indicates whether a critical temperature condition is present. Critical temperature means that the device is above the critical temperature limit for proper operation and may shut down without further warning.	• 0 = Critical temperature condition does not exist • 1 = Module is above the critical temperature limit
NoLoadTimestamp	LINT	Indicates the time of the last No Load fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
ShortCircuitTimestamp	LINT	Indicates the time of the last short circuit fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds

Table 79. Definition of Members in Diagnostic Assembly Data Types (continued)

Name	Data Type	Definition	Valid Values
InternalFaultTimestamp	LINT	Indicates the time of the last internal fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
OverloadTimestamp	LINT	Indicates the time of the last overload fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
OverTemperatureTimestamp	LINT	Indicates the time of the last over temperature condition.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
CriticalTemperatureTimestamp	LINT	Indicates the time of the last critical temperature condition.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
CIPConnections	INT	Indicates the number of CIP connections that are currently open.	0...24
CIPLostPackets	DINT	Indicates the running sum of the number of Sequenced Address Item Sequence Numbers that are skipped in Class 0 and Class 1 connections consumed by the adapter and its children.	0...2,147,483,647
CIPTimeouts	DINT	Indicates the running count of the number of connections that time out, both originated and targeted, to and through the adapter.	0...2,147,483,647
CPUUtilization	INT	Indicates the usage of the compute engine.	0...100%

Create Message Type User Tags

Create MESSAGE type user tags for requests and associated response user tags for each of the new user-defined diagnostic assembly types.



From the Controller Organizer pane, expand Tasks → MainTask → MainProgram

1. Create MESSAGE type user tags for each request.
2. Create associated response user tags for each new user-defined diagnostic assembly type.
3. Add the user tags to your ladder program.

4. Expand the message tag to open the message configuration dialog.
5. On the Configuration tab, select:
   - Service type: Get Attribute Single
   - Class: 4
   - Attribute: 3
   - Instance:
     - **5034-IB8S and 5034-IB8SXT**
       32,787 (8013h) Diagnostic Digital Safety 8 Point Assembly A
       32,788 (8014h) Diagnostic Digital Safety 8 Point Assembly B
       799 (31Fh) Diagnostic Digital Safety 16 Point Assembly C
   - Destination element: User-defined data type suitable for the instance entered.
6. On the Communication tab, select the path to the module that you wish to send the messages to.
7. Download the project and set to Run mode.

   You can monitor the user-defined tag values from the Program Parameters and Local Tags window, under the MainProgram task in the Controller Organizer pane.

Safety Function for Safety Input Module

The safety input module communicates the safe state of its input via the input data value on demand to the safety controller.

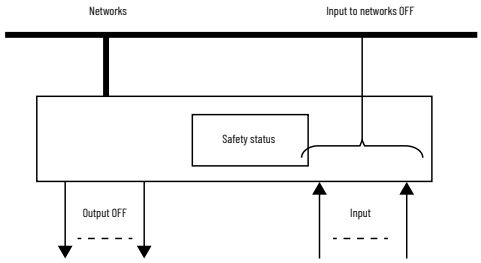
Safe State for Safety Input Module

ATTENTION:

- The safe state of the module and its data is defined as the off state.
- Use safety modules only in applications where the off state is the safe state.

The safe state of the safety input module is safety input data to network = OFF.

Figure 83. Safety Status



Safety Application Suitability Levels

Table 80. Safety Application Suitability for PointMax Safety Input Modules

Suitability Level	Conditions	Notes
Applications that are rated up to, and including, SIL 3 as defined in IEC 61508, and PLc, Cat. 2 as defined in ISO 13849-1	The modules uses single-channel mode: • Point mode is Safety Pulse Test • Point mode is Safety	Consider the following: • The channel mode type, that is, single or dual, affects Performance Level and Category. You can use the modules in SIL 3 applications regardless of channel mode type. • To achieve SIL 3 single-channel, the sensor that is used must be SIL 3 single-channel as well. • The requirement that Point mode be Safety Pulse Test assumes that only the safety I/O module provides diagnostics to a specific Suitability Level. The larger safety system within which the safety I/O module resides can provide the diagnostics necessary to achieve the stated Suitability Level without the requirement that Point mode be Safety Pulse Test. To achieve the specific Safety Integrity Level, see the wiring diagrams for the respective safety module.
Applications that are rated up to, and including, SIL 3 as defined in IEC 61508, and PLe, Cat. 4 as defined in ISO 13849-1	The modules use single-channel mode: • Point mode is Safety Pulse Test • Point mode is Safety • External Wiring Fault exclusion – Use cable with shielding connected to the protective bonding circuit on each separate conductor, or in flat cables, use one earthed conductor between each signal conductor. The modules use dual-channel mode: • Point mode is Safety Pulse Test The modules use dual-channel mode: • Point mode is Safety • External Wiring Fault exclusion – Use cable with shielding connected to the protective bonding circuit on each separate conductor, or in flat cables, use one earthed conductor between each signal conductor.	

Safety Data for Safety I/O Module

The Digital Safety Parameter Data tables list calculated values for probability of a dangerous failure on demand (PFD), average frequency of a dangerous failure per hour (PFH), and mean time to failure (MTTF). PFD and PFH calculations comply with IEC 61508, edition 2010.

PFD and PFH must be calculated for the devices within the system to comply with the SIL level that is required for application.

You must be responsible for following the requirements of ISO 13849-1:2023, to assess Performance Levels in their safety system.

You must validate the system functionality before starting operation. You are responsible for making sure that the system meets what is indicated in your Safety Requirement Specification. You can validate the system functionality as follows:

- You must functionally test every I/O module by individually toggling each input point and also verify that the controller detects it within the safety reaction time (SRT).
- You must individually toggle each output point by the controller and verify that the output point changes state.

For more information, see the safety controller manuals that are listed in Additional Resources on page 9.

Safety Input Module Safety Data

Table 81. 5034-IB8S and 5034-IB8SXT Digital Safety Parameter Data

Attribute	Point Operation Type	
	Single Channel	Dual Channel (at controller instruction)
Total Failure Rate (λ (safety related))	3.93497E-06	3.98296E-06
Safe Failure Fraction (SFF)	99.997%	99.997%
Safe Failure Rate (λ_S)	1.96748E-06	1.99148E-06
Diagnostic Coverage (DC)	99.993%	99.994%
Safe Detected Failure Rate (λ_{SD})	1.96736E-06	1.99136E-06
Safe Undetected Failure Rate (λ_{SU})	1.28515E-10	1.23271E-10
Dangerous Failure Rate (λ_D)	1.96748E-06	1.99148E-06
Dangerous Detected Failure Rate (λ_{DD})	1.96736E-06	1.99136E-06
Dangerous Undetected Failure Rate (λ_{DU})	1.28515E-10	1.23271E-10
Diagnostic Test Interval (DTI) (hours)	8	8
Hardware Fault Tolerance (HFT)	0	1
Spurious Trip Rate (STR)	3.909E-06	4.079E-06
Mean Time to Failure, Spurious (MTTF-spurious), (hours)	255799	245171
PFH (1/hours)	1.285E-10	1.233E-10
PFD_{avg}, at Mission Time of 20 years	1.126E-05	1.080E-05
Safety Reaction Time (SRT), (millisecond) Condition for Safety Reaction Time is no more than 1 demand per 1.5 seconds.	7 @ RPI of 2 ms	7 @ RPI of 2 ms

Mean Time to Fail Dangerous ($MTTF_D$) = $1/\lambda_D$
Mean Time to Repair (MTTR) is 8 Hours = DTI

Wiring Diagrams for Safety Mode and Safety Pulse Mode

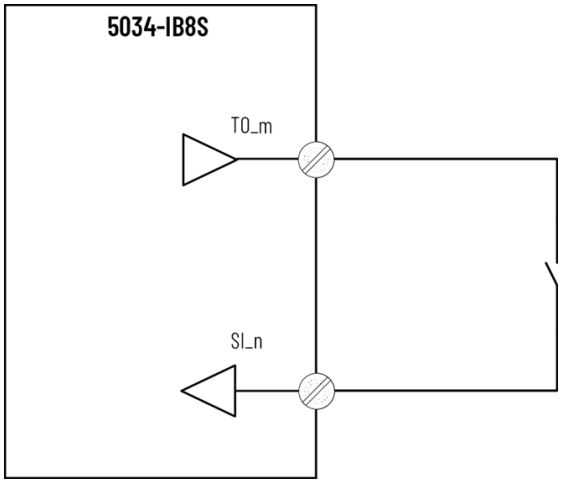
The following wiring diagrams show the input modules in Safety Mode and Safety Pulse Mode.

A Test Output (TO) can be associated to any Safety Input (SI). One TO can only be wired to a maximum of four SI.

In Safety Pulse Mode, if the external wiring shorts two SI from the same TO point, the short circuit is not detectable.Therefore, connect two SI from different TO points when in Safety Pulse Mode.

IMPORTANT: You must use an SELV/PELV-listed power supply with the safety modules.

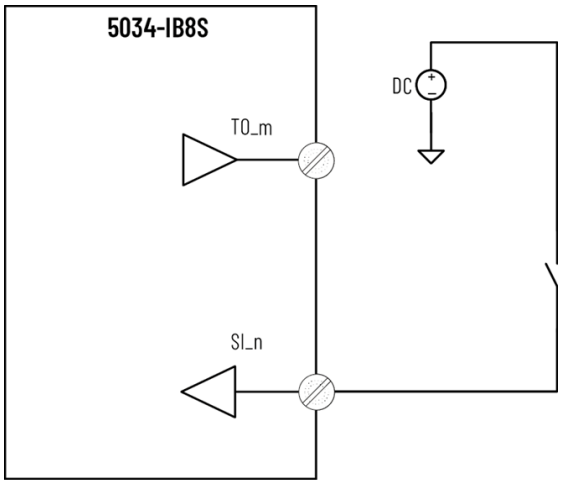
Figure 84. 5034-IB8S and 5034-IB8SXT – SIL 3, PLc, Cat. 2 in Single-channel Safety Pulse Mode



- SI_n (n = 0...7)
- TO_m (m = 0...3)
- TO configured to pulse test mode

SIL Level and Category	Fault Exclusion	Other	Point Mode
SIL 3, PLc, Cat. 2	None	External connected device must be SIL 3 rated	Safety Pulse Mode

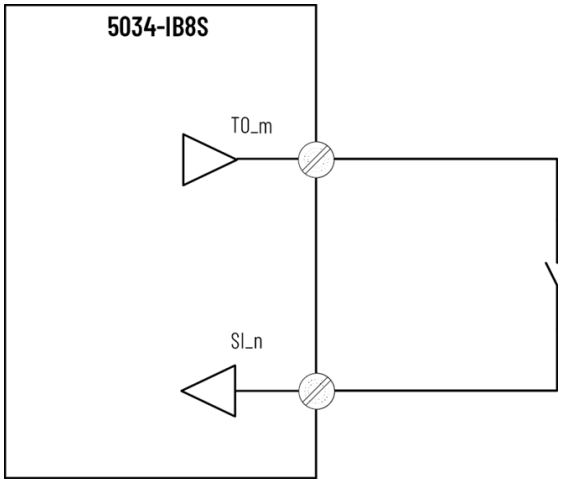
Figure 85. 5034-IB8S and 5034-IB8SXT – SIL 3, PLc, Cat. 2 in Single-channel Safety Mode



- SI_n (n = 0...7)
- TO_m (m = 0...3)
- Any TO in power supply mode or external power supply can be used

SIL Level and Category	Fault Exclusion	Other	Point Mode
SIL 3, PLc, Cat. 2	None	External connected device must be SIL 3 rated	Safety Mode

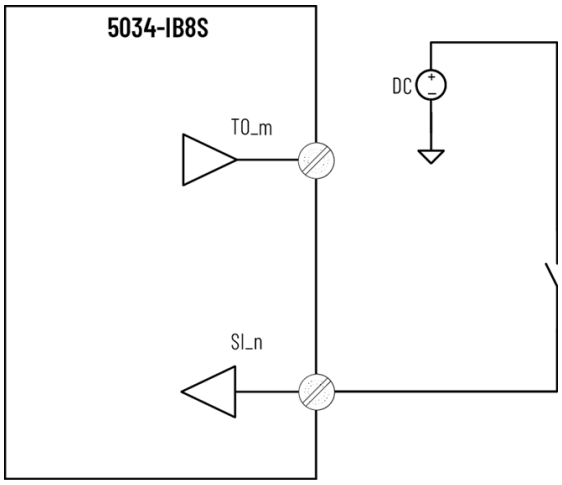
Figure 86. 5034-IB8S and 5034-IB8SXT – SIL 3, PLe, Cat. 4 in Single-channel Safety Pulse Mode



- SI_n (n = 0...7)
- TO_m (m = 0...3)
- TO configured to pulse test mode

SIL Level and Category	Fault Exclusion	Other	Point Mode
SIL 3, PLe, Cat. 4	External Wiring Fault	Use SIL 3, PLe, Cat. 4 qualified sensor	Safety Pulse Mode

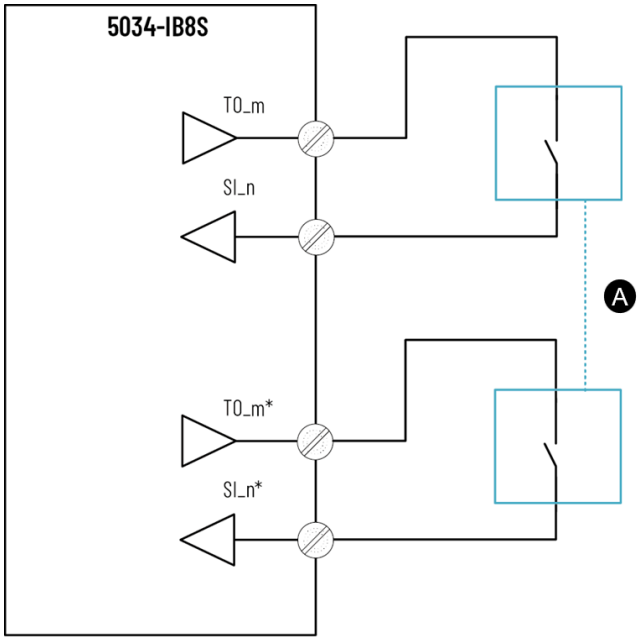
Figure 87. 5034-IB8S and 5034-IB8SXT – SIL 3, PLe, Cat. 4 in Single-channel Safety Mode



- SI_n (n = 0...7)
- TO_m (m = 0...3)
- Any TO in power supply mode or external power supply can be used

SIL Level and Category	Fault Exclusion	Other	Point Mode
SIL 3, PLe, Cat. 4	External Wiring Fault	Use SIL 3, PLe, Cat. 4 qualified sensor	Safety Mode

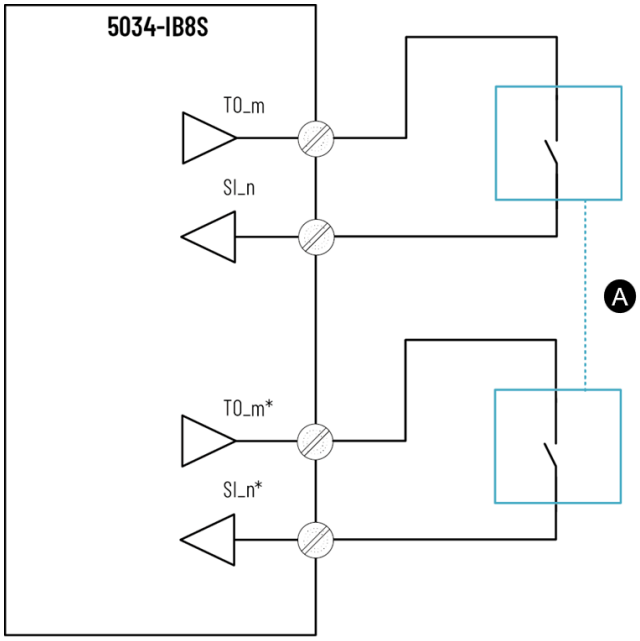
Figure 88. 5034-IB8S and 5034-IB8SXT – SIL 3, PLe, Cat. 4 in Safety Pulse Mode Using 2 Single-channel



- A = Two single-channel sensors sensing same process value
- SI_n (n = 0...7)
- TO_m (m = 0...3)
- n ≠ n*
- m ≠ m*
- TO configured to pulse test mode

SIL Level and Category	Fault Exclusion	Point Mode
SIL 3, PLe, Cat. 4	None	Safety Pulse Mode

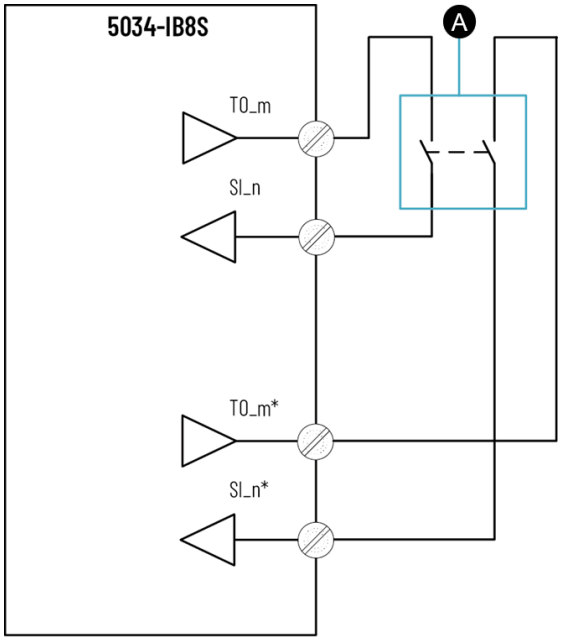
Figure 89. 5034-IB8S and 5034-IB8SXT – SIL 3, PLe, Cat. 4 in Safety Mode Using 2 Single-channel



- A = Two single-channel sensors sensing same process value
- SI_n (n = 0...7)
- TO_m (m = 0...3)
- n ≠ n*
- Any TO in power supply mode or external power supply can be used

SIL Level and Category	Fault Exclusion	Point Mode
SIL 3, PLe, Cat. 4	External Wiring Fault	Safety Mode

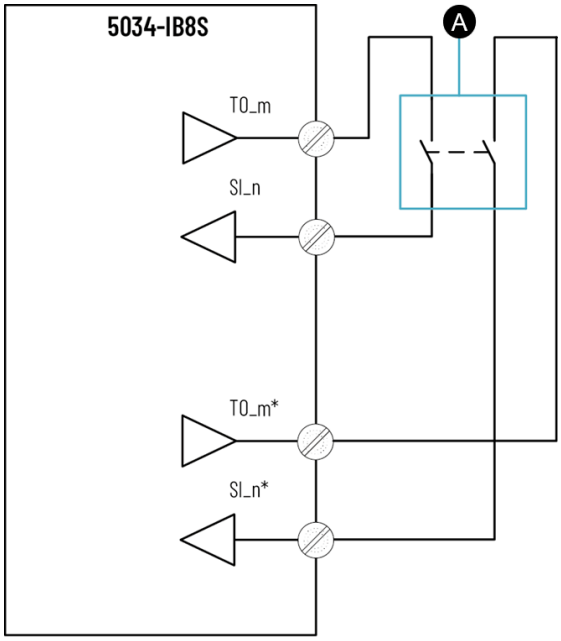
Figure 90. 5034-IB8S and 5034-IB8SXT – SIL 3, PLe, Cat. 4 in Safety Pulse Mode Using 2 Single-channel



- A = Equivalent sensor
- SI_n (n = 0...7)
- TO_m (m = 0...3)
- n ≠ n*
- m ≠ m*
- TO configured to pulse test mode

SIL Level and Category	Fault Exclusion	Point Mode
SIL 3, PLe, Cat. 4	None	Safety Pulse Mode

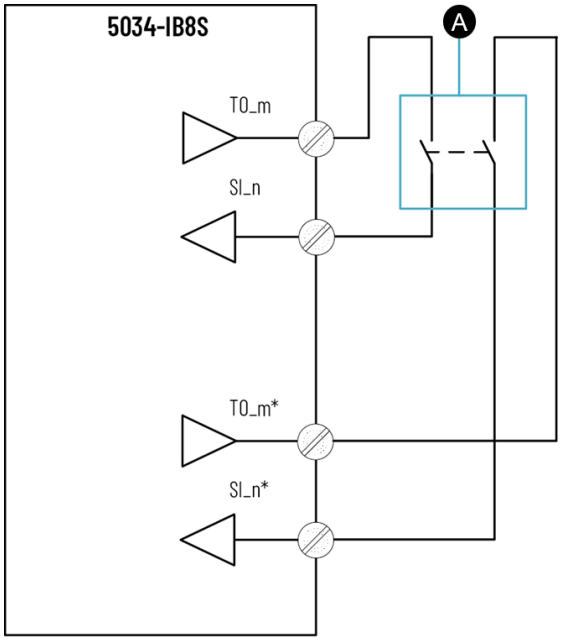
Figure 91. 5034-IB8S and 5034-IB8SXT – SIL 3, PLe, Cat. 4 in Safety Mode Using 2 Single-channel



- A = Equivalent sensor
- SI_n (n = 0...7)
- TO_m (m = 0...3)
- n ≠ n*
- Any TO in power supply mode or external power supply can be used

SIL Level and Category	Fault Exclusion	Point Mode
SIL 3, PLe, Cat. 4	External Wiring Fault	Safety Mode

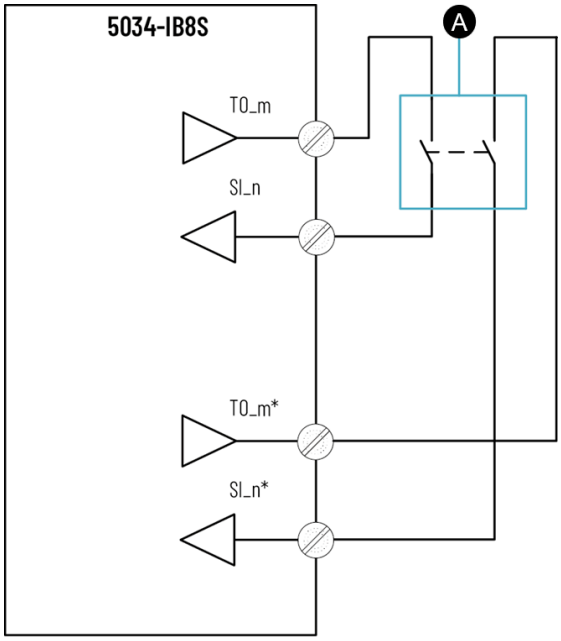
Figure 92. 5034-IB8S and 5034-IB8SXT – SIL 3, PLe, Cat. 4 in Safety Pulse Mode Using 2 Single-channel



- A = Non-equivalent sensor
- SI_n (n = 0...7)
- TO_m (m = 0...3)
- n ≠ n*
- m ≠ m*
- TO configured to pulse test mode

SIL Level and Category	Fault Exclusion	Point Mode
SIL 3, PLe, Cat. 4	None	Safety Pulse Mode

Figure 93. 5034-IB8S and 5034-IB8SXT – SIL 3, PLe, Cat. 4 in Safety Mode using 2 Single-channel



- A = Non-equivalent sensor
- SI_n (n = 0...7)
- TO_m (m = 0...3)
- n ≠ n*
- Any TO in power supply mode or external power supply can be used

SIL Level and Category	Fault Exclusion	Point Mode
SIL 3, PLe, Cat. 4	External Wiring Fault	Safety Mode

5034-OB8S and 5034-OB8SXT Details

Module Configuration

Before you start configuring your I/O module, you must create a Studio 5000 Logix Designer application project for the Logix 5000 controller that owns the I/O module. The project includes configuration data for the module.

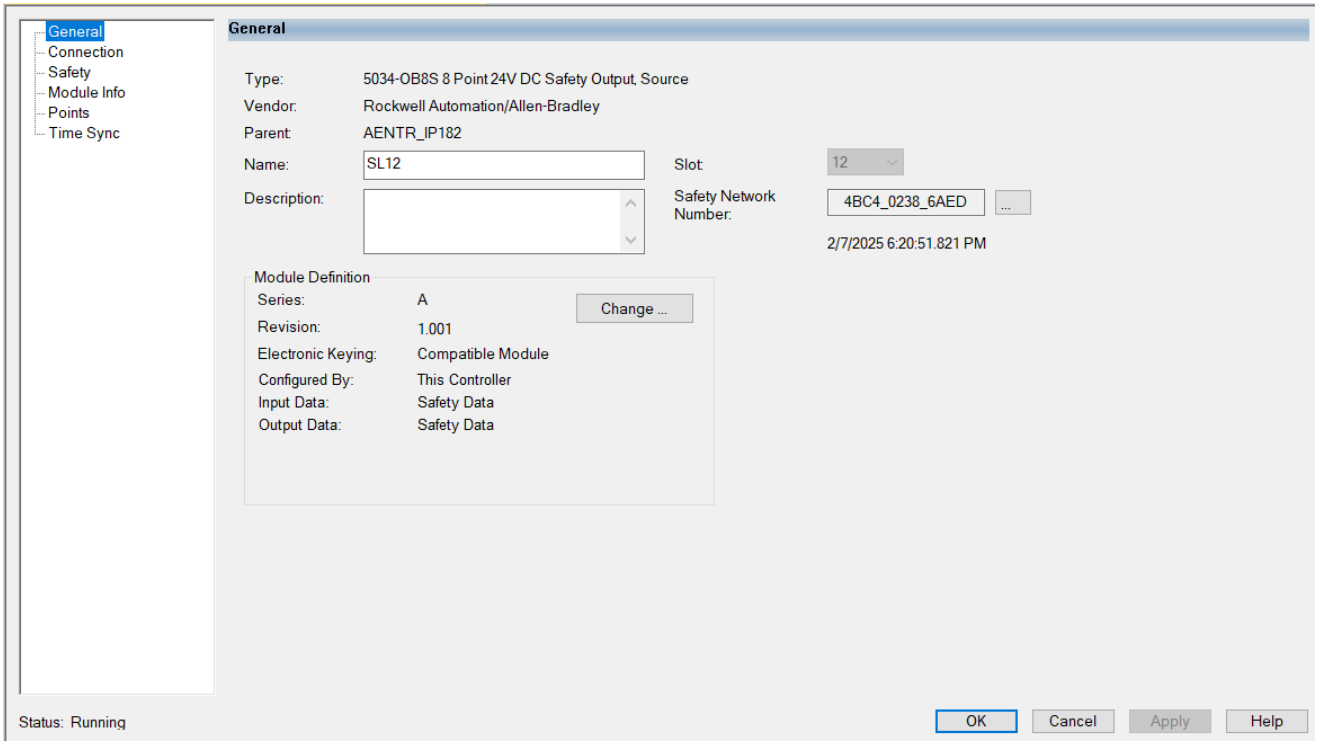
The Studio 5000 Logix Designer application transfers the project to the owner-controller during the program download. Data is then transferred to the I/O modules over the EtherNet/IP network.

The I/O modules can operate immediately after receiving and applying the configuration data.

General View

Use General to view the definition of a device, including the device type, revision, electronic keying, connection, and other device-specific values.

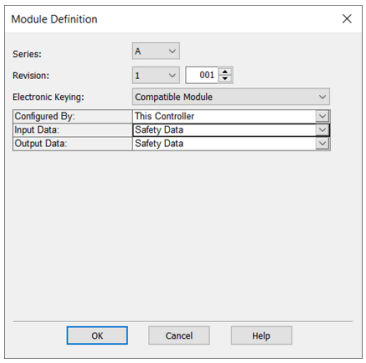
Figure 94. General View Example



Module Definition

To change the definition of a device, select Module definition in the General view.

Figure 95. Module Definition Example



Module Definition includes these parameters:

Table 82. Module Definition Parameters

Parameter	Definition	Available Choices
Series	Specifies the series of the device.	Device-specific
Revision	Specifies the major and minor revisions of the device. The valid range for minor revision is from 1...255.	Device-specific
Electronic Keying	Defines the electronic keying used for the device. Electronic keying compares the device defined in the project to the installed device. If keying fails, a fault occurs. For detailed information on Electronic keying, see Electronic Keying in Logix 5000 Control Systems Application Technique, publication LOGIX-AT001.	• Exact Match • Compatible Module
Configured By	Determines which tags are generated when configuration is complete. For the External Means choice, the controller and module establish communication without the controller sending any configuration or output data to the module.	• External Means • This Controller
Input Data	Select the input data type for the device.	• Safety Data • Safety Packed Data
Output Data	Select the output data type for the device.	• None – If Configured By is set to External Means • Safety Data – If Configured By is set to This Controller • Safety Packed Data – If Input Data is set to Safety Packed Data

Safety Network Number

The Studio 5000 Logix Designer application automatically assigns a Safety Network Number (SNN) to safety modules as they are added to the project.

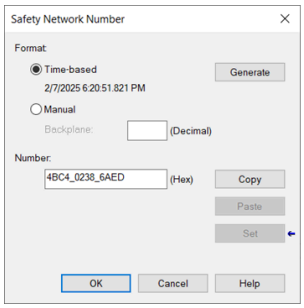
The SNN is a time-based number that uniquely identifies subnets across all networks in the safety system. All safety modules in a same system use the same SNN and are automatically assigned the same SNN by default.

The Studio 5000 Logix Designer application assigns an SNN to the first safety module that is added to a remote system. The application assigns the same SNN to additional safety modules that are added to this remote I/O system.

For more information on Safety Network Numbers, see the GuardLogix 5580 and Compact GuardLogix 5380 Controller Systems Safety Reference Manual, publication 1756-RM012.

To change the SNN of a device, select the ellipses next to the SNN field in the General view.

Figure 96. Safety Network Number Example



Connection View

Use Connection to define controller-to-device behavior.

- Choose a Unicast or Multicast connection over EtherNet/IP.

  Unicast connections are point-to-point transmissions between a source node and destination node on the network. A transmission is sent to one destination

  Multicast connections deliver information from one sender to multiple receivers simultaneously. Copies of one transmission are passed to a selected subset of possible destinations.

  For more information on unicast and multicast connections, see the PointMax EtherNet/IP Adapter User Manual, publication 5034-UM001.

- Choose to inhibit the device.

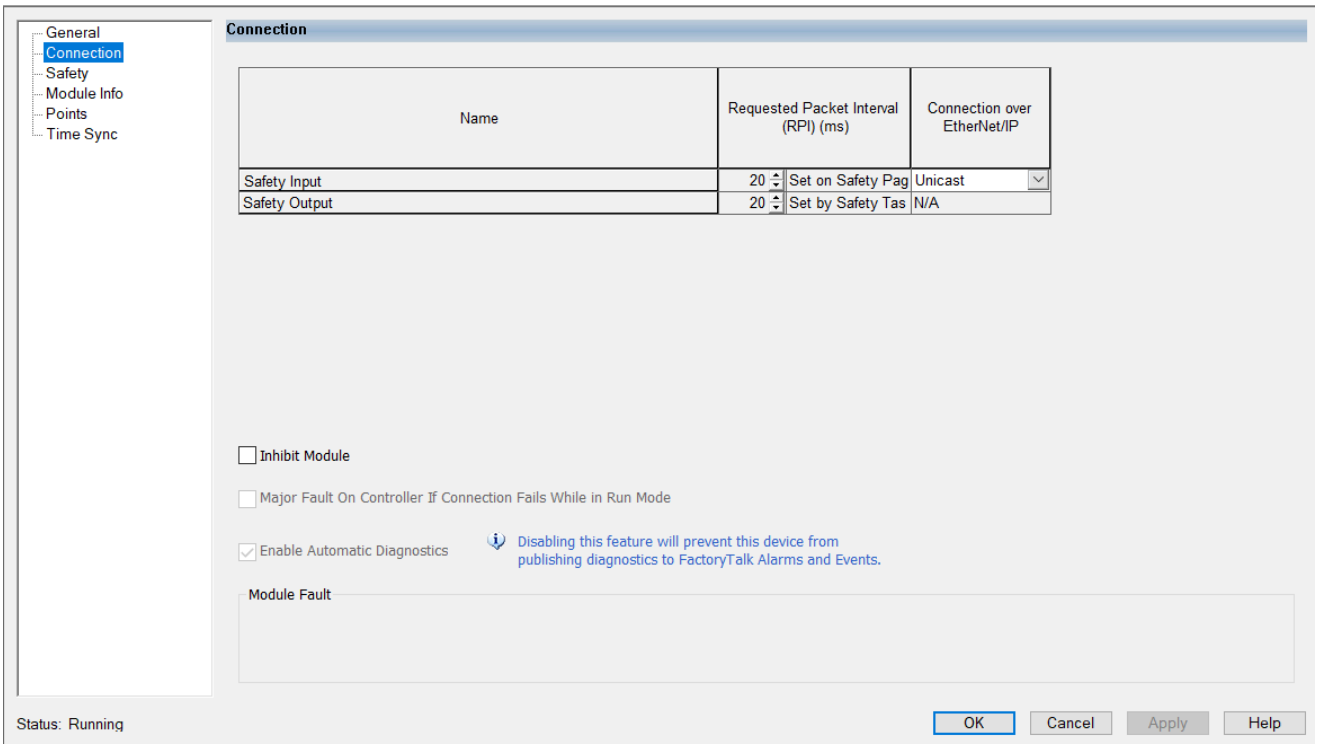
  For more information on how to inhibit the module, see Module Inhibiting on page 17.

- Enable Automatic Diagnostics.
- View module faults.

IMPORTANT: For PointMax safety I/O modules, you set the RPI on the Safety view.

The Module Fault area of the Device Information view is useful during module troubleshooting. For more information, see Troubleshoot Your Module on page 42.

Figure 97. Connection View Example



Connection over EtherNet/IP

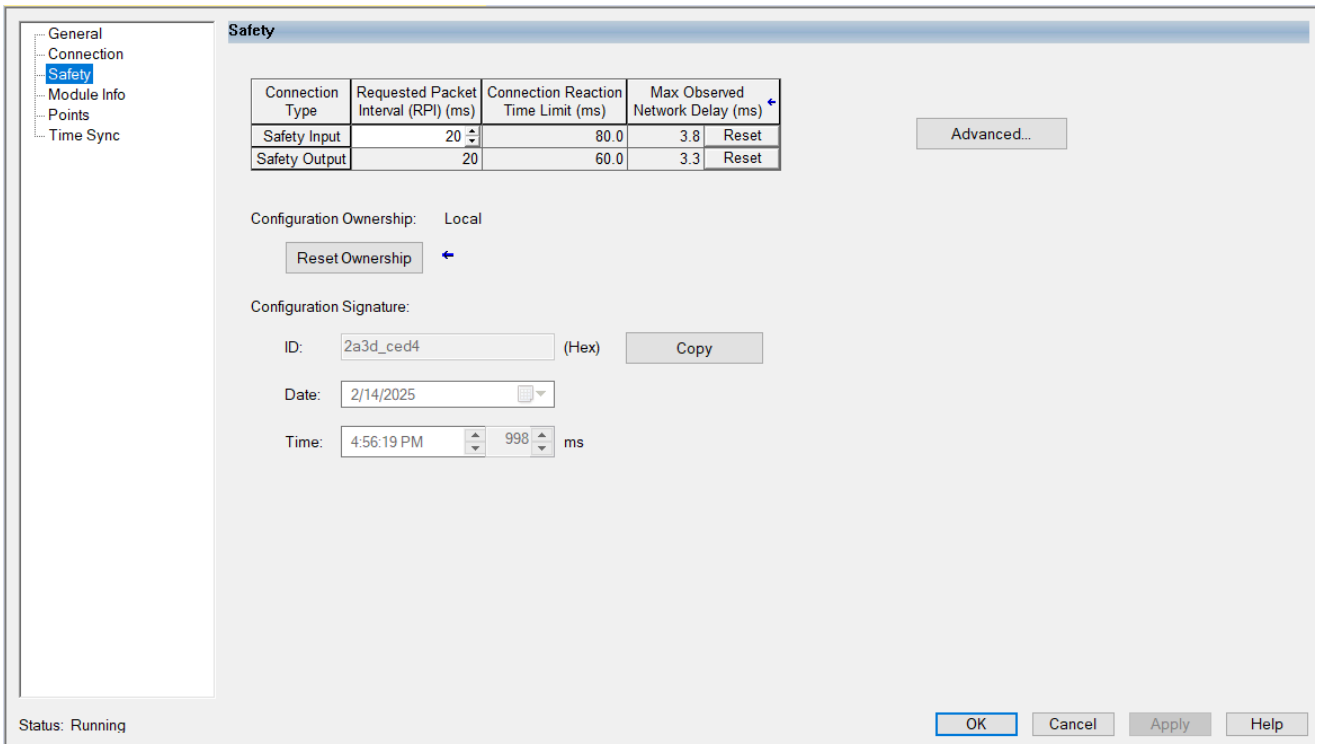
PointMax I/O safety modules support the Connection over EtherNet/IP parameter.

- With safety input data, you can choose Unicast or Multicast.
- With safety output data, the connection is set to Unicast and N/A is shown. You cannot change this parameter.

Safety View

Safety lets you set the RPI rate.

Figure 98. Safety View Example

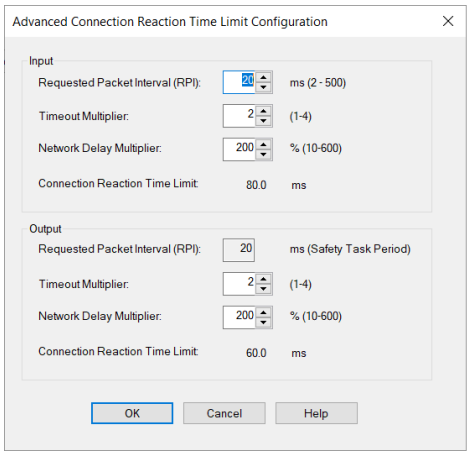


Connection Reaction Time Limit

To change the Connection Reaction Time Limit configuration, select Advanced in the Safety view. For more information, see Connection Reaction Time Limit With Safety Modules on page 25.

IMPORTANT: The Safety Task Period determines the RPI of the safety output.

Figure 99. Advanced Connection Reaction Time Limit Configuration Example



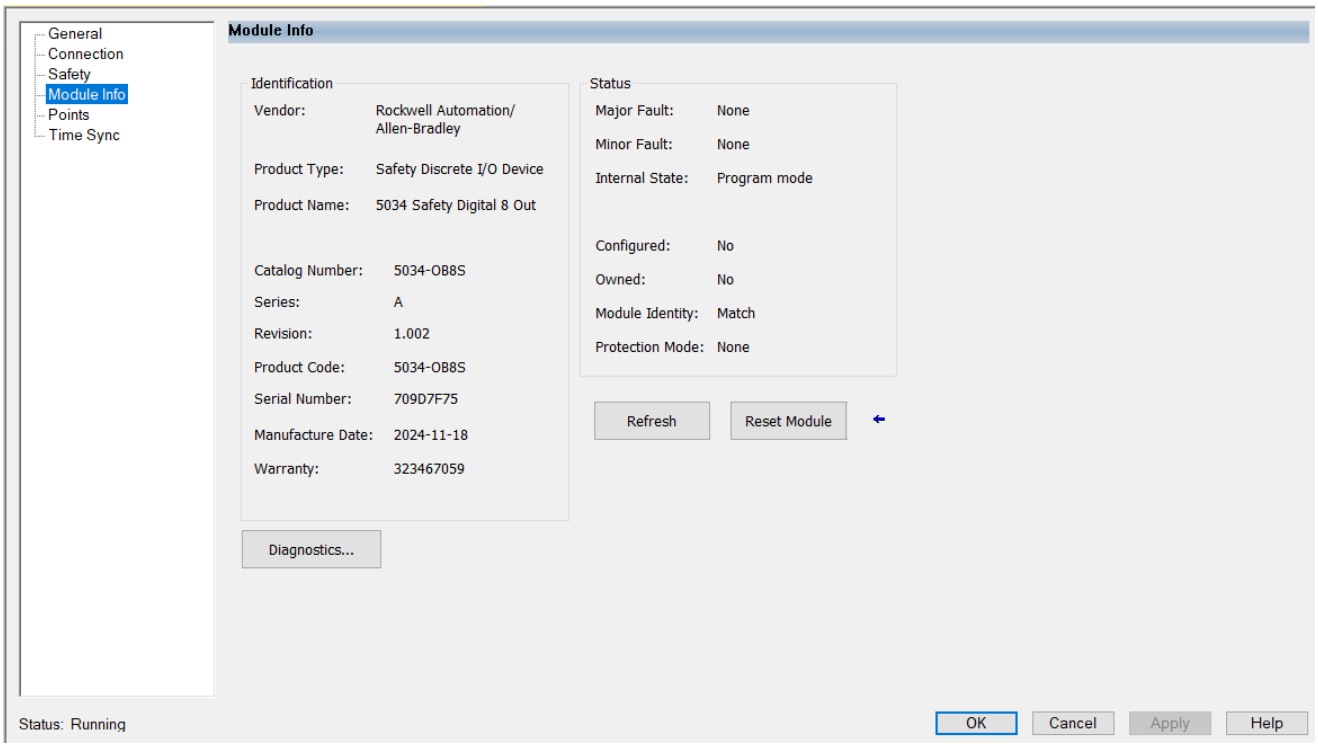
Module Info View

Use Module Info to view device and status information when the device is online.

Use Module Info to:

- Determine the identity of the device.
- View the device's current operational state.
- View whether the device was configured by the owner controller.
- View whether an owner controller is currently connected to the device.
- Retrieve the latest information from the device.
- Reset a device to its power-up state.
- If supported, view the protection mode of the device.

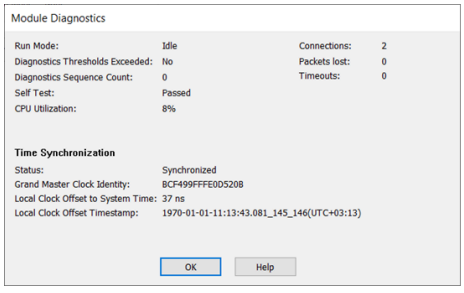
Figure 100. Module Info View Example



Module Diagnostics

To view the device diagnostics, select Diagnostics in the Module Info view.

Figure 101. Module Diagnostics Example

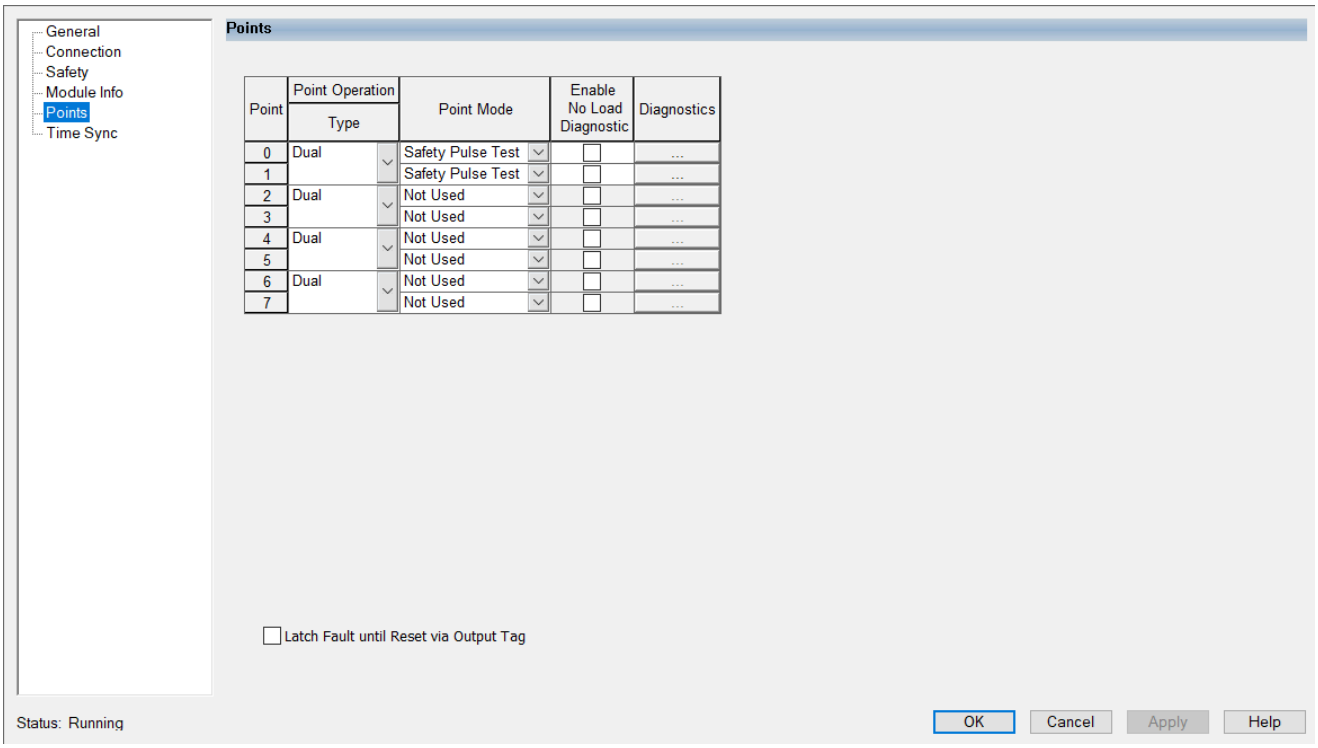


Points View

Points is only available if you choose This Controller for the Configured By parameter on the Module Definition dialog.

You must configure each point to use it in a safety application. The outputs are disabled by default.

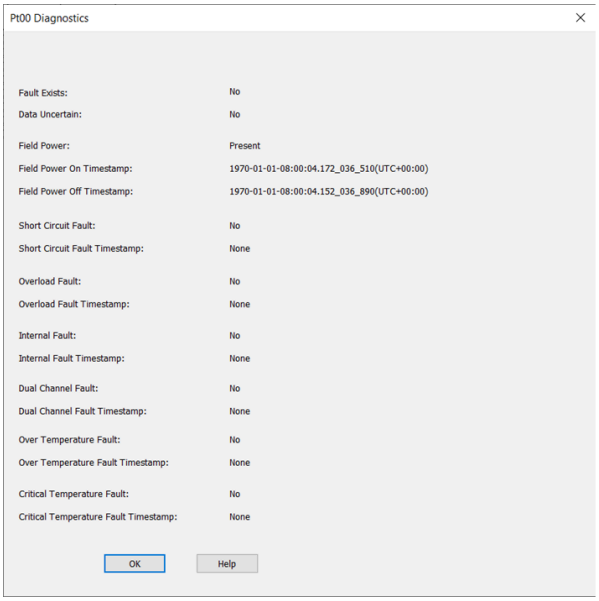
Figure 102. Points View Example



Ptxx Diagnostics

To view the Ptxx diagnostics, select Diagnostics in the Points view.

Figure 103. Ptxx Diagnostics Example



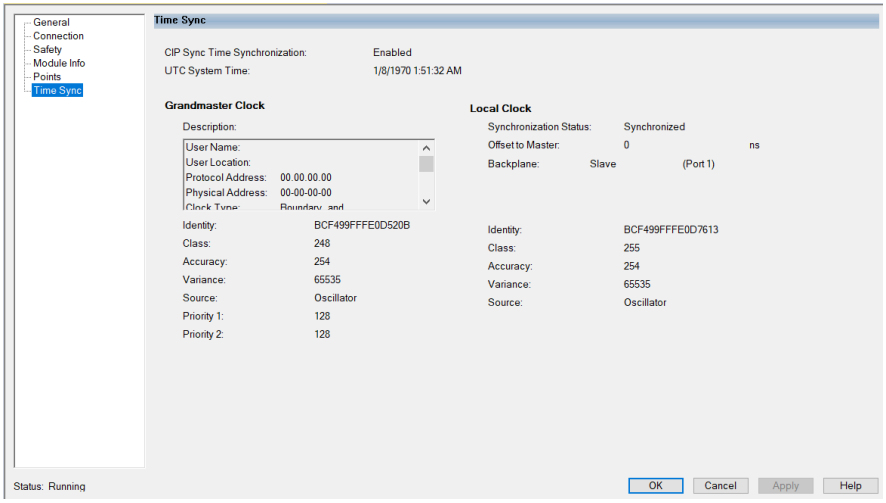
Time Sync View

The Time Sync view is read-only and displays the CIP Sync status information about the module when the project is online. The Time Sync category displays the following information:

- CIP Sync time synchronization status
- UTC system time

- Grandmaster Clock information
- Grandmaster Clock description
- Local Clock information

Figure 104. Time Sync View Example



Use the Status Indicators for Troubleshooting

PointMax I/O modules use the following status indicators:

- SA Power Indicator - This indicator operates the same for all PointMax I/O modules.
- Module Status Indicator - This indicator operates the same for all PointMax I/O modules.
- Channel Status Indicator - This indicator operates differently based on the module type you are using.

SA Power Indicator

Table 83. Interpret SA Power Indicator – Safety I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered. A safety connection cannot be made or maintained.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	There is SA power to the module	None
Steady red	• There is no SA power to the module. • SA voltage is not within a valid range.	Complete the following actions: 1. Confirm that the SA Power wiring on the terminal block is installed properly. 2. Check the following: ◦ Confirm that there is sufficient voltage supplied to the module. ◦ If an external power supply is used, confirm that the power supply is turned on. ◦ Confirm that the SA voltage is within the correct range (18...30V).

Module Status Indicator

Table 84. Interpret Module Status Indicator – Safety I/O Modules

Indicator State	Description	Recommended Action
Off	The module is not powered.	Complete the following actions: 1. Confirm that the system is powered. 2. Confirm that the module is installed properly.
Steady green	The module has a connection to a controller and is operating normally.	None
Flashing green	One of the following conditions exist: • The module has powered up successfully. • The module is OK, but it does not have a connection. No connection can result from missing, incomplete, or incorrect module configuration. • A connection can be established with the controller, but initial time coordination exchange is not complete. • Connection to an output module is in the idle state.	Complete the following actions: • Troubleshoot your Studio 5000 Logix Designer application to determine what is preventing a connection from the module to the controller and correct the issue. • Confirm that the system conditions require the controller to be in Remote Run mode or Run mode, transition the controller to one of those modes.
Steady red	The module experienced a nonrecoverable fault.	Complete the following actions: 1. Cycle power to the module. 2. If the status indicator remains in the steady red state, replace the module.
Flashing red	One of the following conditions exist: • A module firmware update is in progress. • A module firmware update attempt failed. • The device has experienced a recoverable fault. • A connection to the module has timed out.	Complete one of the following: • Let the firmware update progress complete. • Reattempt a firmware update after one fails. • Use the Studio 5000 Logix Designer application to determine the cause of the module fault. The Connection and Module Info categories of the modules configuration indicate the fault type. To clear a recoverable fault, complete one of the following: ◦ Cycle module power. ◦ Select Reset Module in the Studio 5000 Logix Designer project via the Module Info category of the Module Properties dialog. If the fault does not clear after cycling power and selecting Reset Module, contact Rockwell Automation Technical Support. • Use the Studio 5000 Logix Designer application to determine if a connection has timed out. The Connection view in the Module Properties indicates whether a connection request has timed out. If a connection has timed out, determine the cause and correct it. For example, a cable failure can cause a connection timeout.
Flashing red/green	This pattern indicates that a UNID for the safety device needs to be configured.	None

Point Status Indicators

Table 85. Interpret Point Status Indicators – Safety I/O Modules

Indicator State	Description	Recommended Action
Off	One of the following: • The point is Off. • There is no backplane power. • The point is not used.	One of the following: • Confirm that the point is configured properly. • Confirm that there is backplane power supplied through the EtherNet/IP adapter.

Table 85. Interpret Point Status Indicators – Safety I/O Modules (continued)

Indicator State	Description	Recommended Action
Steady yellow	The point is On.	None
Flashing red	The module experienced one or more recoverable faults.	Locate and correct the faults.
Steady red	One of the following: • A Field Power Loss condition exists. • An internal channel fault exists.	One of the following: • Locate and correct the cause of field power loss condition. • Locate and correct the internal fault.

Module Tag Definitions

Module tags are created when you add a module to the Studio 5000 Logix Designer application project.

The set of module tags associated with a module depends on the module type and Module Definition choices made during module configuration.

The tables contained in this section list all of the tags available with a module. Not all tags in the list are used when that module type is added to a project. Tag use varies by module configuration.

Input Tag Definitions

Table 86. Input Tags

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state	• 0 = Idle • 1 = Run
ConnectionFaulted	BOOL	Indicates if a connection to the target is running. The module always returns a zero in this member. The controller overwrites the zero with a one when the connection is not up.	• 0 = Connection is running • 1 = Connection is not running
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
Uncertain (Packed data)	BOOL	Indicates if the module is operating outside the designed operating range (such as temperature). If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy.	• 0 = Good data • 1 = Uncertain data

Table 86. Input Tags (continued)

Name	Data Type	Definition	Valid Values
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
Ptxx.Readback PtxxReadback (Packed data)	BOOL	Indicates the current readback from the screw.	• 0 = Off • 1 = On
Ptxx.Fault	BOOL	One of the following: • Indicates that point data is inaccurate and cannot be trusted for use in the application. • The point is set to Not Used. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy.	• 0 = Good • 1 = Bad, causing fault
Ptxx.Uncertain	BOOL	Indicates that the point data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy.	• 0 = Good data • 1 = Uncertain data
Ptxx.Status PtxxStatus (Packed data)	BOOL	Indicates the status of the point.	• 0 = Bad, causing a fault • 1 = Good

Output Tag Definitions

Table 87. Output Tags

Name	Data Type	Definition	Valid Values
Ptxx.Data PtxxData (Packed data)	BOOL	Indicates the current digital output value.	• 0 = Off • 1 = On
Ptxx.ResetFault PtxxResetFault (Packed data)	BOOL	When Latch Fault until Reset via Output Tag is enabled, the I/O point holds safety output fault indications until it checks that the fault is removed. If the fault is removed, it clears only the fault status upon detecting that the ResetFault bit in its point sees a 0 to 1 transition.	A 0 to 1 transition unlatches the fault.

Diagnostic Assembly

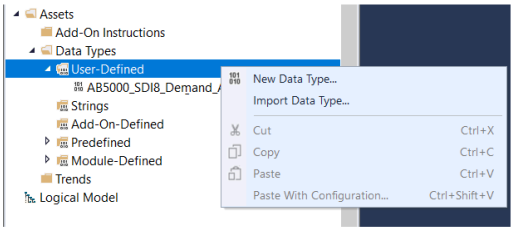
Diagnostic assembly helps you troubleshoot and diagnose the fault in your system.

Create User-defined Diagnostic Assembly Types

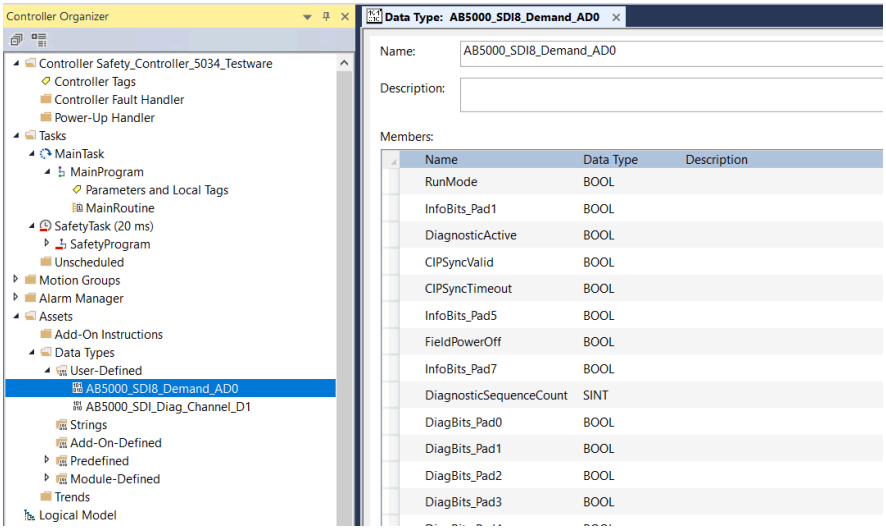
You can use the Studio 5000 Logix Designer application to create user-defined Diagnostic Assembly types.

Create user-defined diagnostic assembly by following the below steps:

1. From the Controller Organizer pane, go to Assets → Data types → User-Defined.
2. Right-click on the User-Defined folder and select New Data Type.



3. Add a Name and Description (optional) for your diagnostic assembly.
4. Under Members area, add the data members based on the diagnostic assembly detailed below.



IMPORTANT: The members indicated in the tables are arranged according to Data Alignment Rules of controllers. Strictly follow the data type and the sequence of the members that are indicated in the tables of this appendix. If the data type and the sequence are not followed, data misalignment may occur after executing Get Attribute Single Message (MSG) instruction.

Diagnostic Assembly

Diagnostic Digital Safety 8 Output Point Assembly A

- Instance ID = 0x8016 (32,790)
- Size = 384 bytes

Table 88. Diagnostic Assembly Instance – 32,790

Name	Data Type	Size in Bytes
RunMode	BOOL	1
InfoBits_Pad1	BOOL	
DiagnosticActive	BOOL	
CIPSyncValid	BOOL	

Table 88. Diagnostic Assembly Instance – 32,790 (continued)

Name	Data Type	Size in Bytes
CIPSyncTimeout	BOOL	
InfoBits_Pad5	BOOL	
FieldPowerOff	BOOL	
InfoBits_Pad7	BOOL	
DiagnosticSequenceCount	SINT	1
DiagBits_Pad0	BOOL	
DiagBits_Pad1	BOOL	
DiagBits_Pad2	BOOL	
DiagBits_Pad3	BOOL	
DiagBits_Pad4	BOOL	
DiagBits_Pad5	BOOL	
DiagBits_Pad6	BOOL	
DiagBits_Pad7	BOOL	
DiagBits_Pad8	BOOL	
DiagBits_Pad9	BOOL	2
BaseUnsupportedFault This field is not used, but you must include it in the data structure.	BOOL	
BaseIDFault This field is not used, but you must include it in the data structure.	BOOL	
FlashUpdateRequired	BOOL	
SelfTestFault	BOOL	
DiagBits_Pad14	BOOL	
DiagBits_Pad15	BOOL	
Pad	DINT	4
LocalClockOffset	LINT	8
LocalClockOffsetTimestamp	LINT	8
GrandMasterClockID[8]	SINT	8
AB:5000_SDO_Diag2_Channel:D:1[0...3]	AB:5000_SDO_Diag2_Channel:D:1	352

Diagnostic Digital Safety 8 Output Point Assembly B

- Instance ID = 0x8017 (32,791)
- Size = 352 bytes

Table 89. Diagnostic Assembly Instance – 32,791

Name	Data Type	Size in Bytes
AB:5000_SDO_Diag2_Channel:D:1 [4...7]	AB:5000_SDO_Diag2_Channel:D:1	288

Diagnostic Channel

This data type is retrieved as part of the diagnostic assembly instance.

Diagnostic Digital Safety Diagnostics 2 Input Channel (Output)

- Data Type = AB:5000_SDO_Diag2_Channel:D:1
- Size = 88 bytes

Table 90. Structure for Data Type AB:5000_SDO_Diag2_Channel:D:1

Name	Data Type	Size in Bytes
DataBits_Pad0	BOOL	2
Fault	BOOL	
Uncertain	BOOL	
NoLoad	BOOL	
ShortCircuit	BOOL	
DataBits_Pad5	BOOL	
FieldPowerOff	BOOL	
DataBits_Pad7	BOOL	
DualChannelFault	BOOL	
DataBits_Pad9	BOOL	
DataBits_Pad10	BOOL	
DataBits_Pad11	BOOL	
DataBits_Pad12	BOOL	
DataBits_Pad13	BOOL	
DataBits_Pad14	BOOL	
DataBits_Pad15	BOOL	
InternalFault	BOOL	2
Overload	BOOL	
ShortCircuitGround This field is not used, but you must include it in the data structure.	BOOL	
OverTemperature	BOOL	
CriticalTemperature	BOOL	
SafeStateNotChecked24Hours	BOOL	

Table 90. Structure for Data Type AB:5000_SDO_Diag2_Channel:D:1 (continued)

Name	Data Type	Size in Bytes
SafeStateNotChecked6Months	BOOL	
DiagBits_Pad7	BOOL	
DiagBits_Pad8	BOOL	
DiagBits_Pad9	BOOL	
DiagBits_Pad10	BOOL	
DiagBits_Pad11	BOOL	
DiagBits_Pad12	BOOL	
DiagBits_Pad13	BOOL	
DiagBits_Pad14	BOOL	
DiagBits_Pad15	BOOL	
Pad	DINT	4
NoLoadTimestamp	LINT	8
ShortCircuitTimestamp	LINT	8
DualChannelFaultTimestamp	LINT	8
InternalFaultTimestamp	LINT	8
OverloadTimestamp	LINT	8
ShortCircuitGroundTimestamp This field is not used, but you must include it in the data structure.	LINT	8
FieldPowerOnTimestamp	LINT	8
FieldPowerOffTimestamp	LINT	8
OverTemperatureTimestamp	LINT	8
CriticalTemperatureTimestamp	LINT	8

Definitions for Diagnostic Assembly Types

Table 91. Definition of Members in Diagnostic Assembly Data Types

Name	Data Type	Definition	Valid Values
RunMode	BOOL	The module's operating state.	• 0 = Idle – It means one of the following: ◦ Connection is not up. ◦ Connection has been opened but the module has not started producing data for the connection. ◦ Module is not applying new output tag data because the controller is in Program Mode. • 1 = Run – It means the following: ◦ Connection is up. ◦ Module is producing data for the connection. ◦ Output tag data is being applied or there is no output tag data for the connection (For example, all points configured as digital input without timestamp).
DiagnosticActive	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	• 0 = No diagnostics are active • 1 = One or more diagnostics are active or the prognostics threshold is reached
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master. A set bit alone cannot indicate that it is synced to the same master clock of the owner controller. You must compare the Grandmaster Clock ID of both the module and the owner controller.	• 0 = CIP Sync is not available • 1 = CIP Sync is available
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but the module is not synced now due to a timeout.	• 0 = A valid time master has not timed out • 1 = A valid time master has timed out The module is using its local clock and can be drifting away from the last known master time.
DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected.	-128...+127 The value of 0 is skipped except during module powerup.
LocalClockOffset	LINT	The offset from the local clock to the system time. This value helps to detect steps in time. This value updates when a PTP update is received.	All values
LocalClockOffsetTimestamp	LINT	Indicates the time of the local clock offset.	A valid time or None if there is no recorded event time. Time format is YYYY-MMDD-HH:mm:SS_mmm_uuu_nnn(UTC-00:00). • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds • uuu = microseconds • nnn = nanoseconds • UTC-00:00 = Time zone

Table 91. Definition of Members in Diagnostic Assembly Data Types (continued)

Name	Data Type	Definition	Valid Values
GrandMasterClockID	SINT[8]	The EUI-64 Identity of the CIP Sync Grandmaster clock the module is synced to.	All values
Fault	BOOL	Indicates that the data is inaccurate and cannot be trusted for use in the application. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good • 1 = Bad, causing fault
Uncertain	BOOL	Indicates that the data can be inaccurate but the degree of inaccuracy is not known. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. **IMPORTANT:** Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	• 0 = Good data • 1 = Uncertain data
NoLoad	BOOL	Indicates whether a load fault is present.	• 0 = No Load condition does not exist • 1 = No Load condition exists
ShortCircuit	BOOL	Indicates whether an output short circuit to high is present on the point.	• 0 = Short Circuit condition does not exist • 1 = Short Circuit condition exists
FieldPowerOff	BOOL	Indicates that a field power loss condition exists on the point.	• 0 = Field power off condition does not exist • 1 = Field power off condition exists
FieldPowerOnTimestamp	LINT	Indicates the time of the last field power turned on event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds

Table 91. Definition of Members in Diagnostic Assembly Data Types (continued)

Name	Data Type	Definition	Valid Values
FieldPowerOffTimestamp	LINT	Indicates the time of the last field power turned off event.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
DualChannelFault	BOOL	Indicates whether a dual channel fault is present.	• 0 = Good • 1 = Fault is present
Internal Fault	BOOL	Indicates whether an internal fault is present. If there is an internal fault, cycle power to the module. If the problem persists, contact Technical Support.	• 0 = No internal issue found in the product • 1 = One or more of several internal diagnostics indicate an internal issue in the product
Overload	BOOL	Indicates whether an overload fault is present on the point.	• 0 = Overload condition does not exist • 1 = Overload condition exists
OverTemperature	BOOL	Indicates whether an over temperature condition is present. Over temperature means that the device is at a normal or higher temperature than its rated operating limits.	• 0 = Over temperature condition does not exist • 1 = Module is at a higher temperature than its rated operating limits
CriticalTemperature	BOOL	Indicates whether a critical temperature condition is present. Critical temperature means that the device is above the critical temperature limit for proper operation and may shut down without further warning.	• 0 = Critical temperature condition does not exist • 1 = Module is above the critical temperature limit
NoLoadTimestamp	LINT	Indicates the time of the last No Load fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
ShortCircuitTimestamp	LINT	Indicates the time of the last short circuit fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds

Table 91. Definition of Members in Diagnostic Assembly Data Types (continued)

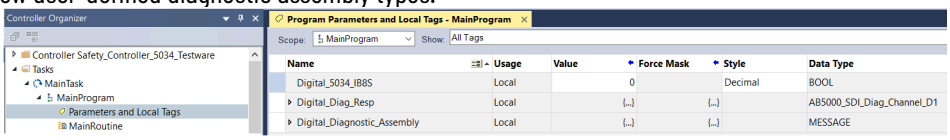
Name	Data Type	Definition	Valid Values
DualChannelFaultTimestamp	LINT	Indicates the time of the last dual channel fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
InternalFaultTimestamp	LINT	Indicates the time of the last internal fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
OverloadTimestamp	LINT	Indicates the time of the last overload fault.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
OverTemperatureTimestamp	LINT	Indicates the time of the last over temperature condition.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
CriticalTemperatureTimestamp	LINT	Indicates the time of the last critical temperature condition.	A valid time or None if there is no recorded event time. Time format is YYYY-MM-DD-HH:mm:SS.mmm. • YYYY = year • MM = month • DD = day • HH = hour (24 hour) • mm = minutes • SS = seconds • mmm = milliseconds
CIPConnections	INT	Indicates the number of CIP connections that are currently open.	0...24

Table 91. Definition of Members in Diagnostic Assembly Data Types (continued)

Name	Data Type	Definition	Valid Values
CIPLostPackets	DINT	Indicates the running sum of the number of Sequenced Address Item Sequence Numbers that are skipped in Class 0 and Class 1 connections consumed by the adapter and its children.	0...2,147,483,647
CIPTimeouts	DINT	Indicates the running count of the number of connections that time out, both originated and targeted, to and through the adapter.	0...2,147,483,647
CPUUtilization	INT	Indicates the usage of the compute engine.	0...100%

Create Message Type User Tags

Create MESSAGE type user tags for requests and associated response user tags for each of the new user-defined diagnostic assembly types.



From the Controller Organizer pane, expand Tasks → MainTask → MainProgram

1. Create MESSAGE type user tags for each request.
2. Create associated response user tags for each new user-defined diagnostic assembly type.
3. Add the user tags to your ladder program.

4. Expand the message tag to open the message configuration dialog.
5. On the Configuration tab, select:
   - Service type: Get Attribute Single
   - Class: 4
   - Attribute: 3
   - Instance:
     - **5034-OB8S and 5034-OB8SXT**
       32,790 (8016h) Diagnostic Digital Safety 8 Output Point Assembly A
       32,791 (8017h) Diagnostic Digital Safety 8 Output Point Assembly B
   - Destination element: User-defined data type suitable for the instance entered.
6. On the Communication tab, select the path to the module that you wish to send the messages to.
7. Download the project and set to Run mode.

   You can monitor the user-defined tag values from the Program Parameters and Local Tags window, under the MainProgram task in the Controller Organizer pane.

Safety Function for Safety Output Module

The safety output module transitions its output to safe state when commanded from the safety controller.

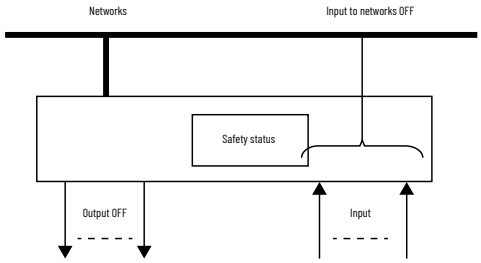
Safe State for Safety Output Module

ATTENTION:

- The safe state of the outputs is defined as the off state.
- Use safety modules only in applications where the off state is the safe state.

The safe state of the safety output module is safety outputs = OFF.

Figure 105. Safety Status



Safety Application Suitability Levels

Table 92. Safety Application Suitability for PointMax Safety Output Modules

Suitability Level	Conditions	Notes
Applications that are rated up to, and including, SIL 3 as defined in IEC 61508, and PLc, Cat. 2 as defined in ISO 13849-1	The modules uses single-channel mode: • Point mode is Safety Pulse Test • Point mode is Safety – You must functionally test and verify that the output point can go to the safe state at least every 6 months for SIL 2, PLd, Cat. 3 rating.	Consider the following: • The channel mode type, that is, single or dual, affects Performance Level and Category. You can use the modules in SIL 3 applications regardless of channel mode type. • To achieve SIL 3 single-channel, the sensor that is used must be SIL 3 single-channel as well. • The requirement that Point mode be Safety Pulse Test assumes that only the safety I/O module provides diagnostics to a specific Suitability Level. The larger safety system within which the safety I/O module resides can provide the diagnostics necessary to achieve the stated Suitability Level without the requirement that Point mode be Safety Pulse Test. To achieve the specific Safety Integrity Level, see the wiring diagrams for the respective safety module.
Applications that are rated up to, and including, SIL 3 as defined in IEC 61508, and PLe, Cat. 4 as defined in ISO 13849-1	The modules use single-channel mode: • Point mode is Safety Pulse Test • Point mode is Safety – You must functionally test and verify that the output point can go to the safe state at least every 24 hours for SIL 3, PLe, Cat. 4 rating. • Use IEC 60947 certified Safety Contactor • External Wiring Fault exclusion – Use cable with shielding connected to the protective bonding circuit on each separate conductor, or in flat cables, use one earthed conductor between each signal conductor. The modules use dual-channel mode: • Point mode is Safety Pulse Test The modules use dual-channel mode: • Point mode is Safety • External Wiring Fault exclusion – Use cable with shielding connected to the protective bonding circuit on each separate conductor, or in flat cables, use one earthed conductor between each signal conductor.	

Safety Data for Safety I/O Module

The Digital Safety Parameter Data tables list calculated values for probability of a dangerous failure on demand (PFD), average frequency of a dangerous failure per hour (PFH), and mean time to failure (MTTF). PFD and PFH calculations comply with IEC 61508, edition 2010.

PFD and PFH must be calculated for the devices within the system to comply with the SIL level that is required for application.

You must be responsible for following the requirements of ISO 13849-1:2023, to assess Performance Levels in their safety system.

You must validate the system functionality before starting operation. You are responsible for making sure that the system meets what is indicated in your Safety Requirement Specification. You can validate the system functionality as follows:

- You must functionally test every I/O module by individually toggling each input point and also verify that the controller detects it within the safety reaction time (SRT).
- You must individually toggle each output point by the controller and verify that the output point changes state.

For more information, see the safety controller manuals that are listed in Additional Resources on page 9.

Safety Output Module Safety Data

Table 93. 5034-OB8S and 5034-OB8SXT Digital Safety Parameter Data

Attribute	Point Operation Type	
	Single Channel	Dual Channel
Total Failure Rate (λ (safety related))	4.00535E-06	4.09308E-06
Safe Failure Fraction (SFF)	99.997%	99.997%
Safe Failure Rate (λ_S)	2.00268E-06	2.04647E-06
Diagnostic Coverage (DC)	99.993%	99.994%
Safe Detected Failure Rate (λ_{SD})	2.00254E-06	2.04635E-06
Safe Undetected Failure Rate (λ_{SU})	1.31748E-10	1.21177E-10
Dangerous Failure Rate (λ_D)	2.00268E-06	2.04660E-06
Dangerous Detected Failure Rate (λ_{DD})	2.00254E-06	2.04648E-06
Dangerous Undetected Failure Rate (λ_{DU})	1.31748E-10	1.21184E-10
Diagnostic Test Interval (DTI) (hours)	8	8
Hardware Fault Tolerance (HFT)	0	1
Spurious Trip Rate (STR)	3.327E-06	3.835E-06
Mean Time to Failure, Spurious (MTTF-spurious), (hours)	300547	260773
PFH (1/hours)	1.317E-10	1.212E-10
PFD_{avg}, at Mission Time of 20 years	4.075E-05	1.062E-05
Safety Reaction Time (SRT), (millisecond) Condition for Safety Reaction Time is no more than 1 demand per 1.5 seconds.	6	6

Table 93. 5034-OB8S and 5034-OB8SXT Digital Safety Parameter Data (continued)

Attribute	Point Operation Type	
	Single Channel	Dual Channel
Mean Time to Fail Dangerous ($MTTF_D$) = $1/\lambda_D$ Mean Time to Repair (MTTR) is 8 Hours = DTI		

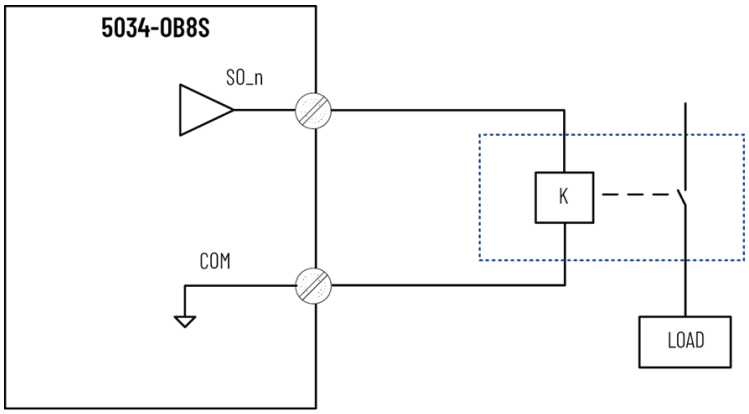
Wiring Diagrams for Safety Mode and Safety Pulse Mode

The following wiring diagrams show the output modules in Safety Mode and Safety Pulse Mode.

IMPORTANT: The Safety level that is shown in the diagrams is applicable to the module itself. Connected devices must have their own status monitoring to achieve application safety level.

IMPORTANT: You must use an SELV/PELV-listed power supply with the safety modules.

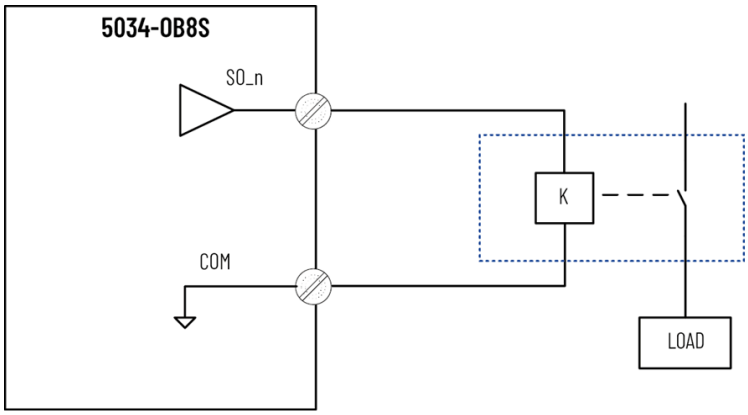
Figure 106. 5034-OB8S and 5034-OB8SXT – SIL 3, PLc, Cat. 2 in Single-channel Safety Mode or Safety Pulse Mode



- n = 0...7

SIL Level and Category	Fault Exclusion	Other	Point Mode
SIL 3, PLc, Cat. 2	None	External connected device must be SIL 3 rated	• Safety Pulse Mode • Safety Mode Condition: You must issue at least one safety demand every 6 months.

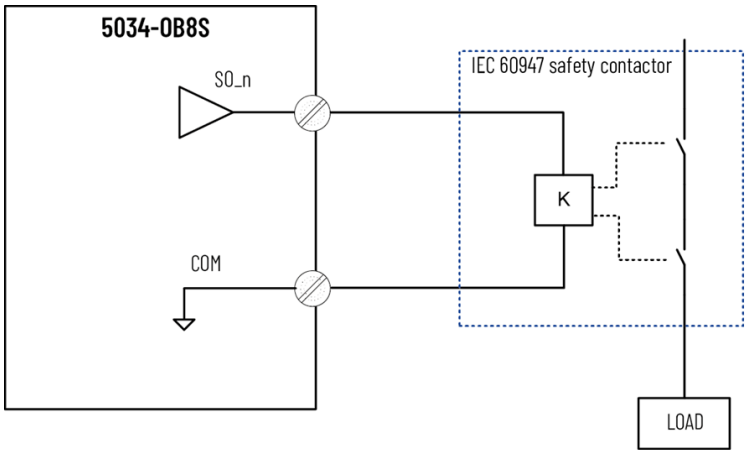
Figure 107. 5034-OB8S and 5034-OB8SXT – SIL 2, PLc, Cat. 2 in Single-channel Safety Mode



- n = 0...7

SIL Level and Category	Fault Exclusion	Point Mode
SIL 2, PLc, Cat. 2	None	Safety Mode Condition: You must issue at least one safety demand every 6 months.

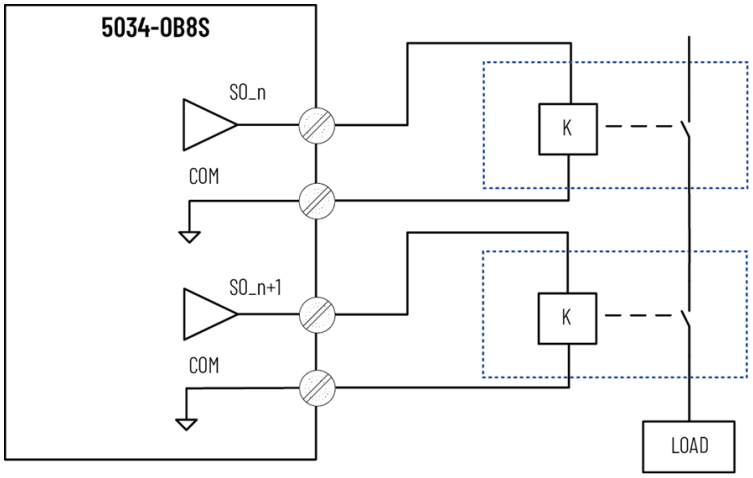
Figure 108. 5034-OB8S and 5034-OB8SXT – SIL 3, PLe, Cat. 4 in Single-channel Safety Mode or Safety Pulse Mode



- n = 0...7

SIL Level and Category	Fault Exclusion	Other	Point Mode
SIL 3, PLe, Cat. 4	External Wiring Fault	Use IEC 60947 safety contactor	Safety Pulse Mode
			Safety Mode Condition: You must issue at least one safety demand every 24 hours.

Figure 109. 5034-OB8S and 5034-OB8SXT – SIL 3, PLe, Cat. 4 in Dual-channel Safety Pulse Mode or Safety Mode



- n = 0, 2, 4, 6
- The channel pairs that support dual-channel mode are:
  - Channel 0, 1 pair
  - Channel 2, 3 pair
  - Channel 4, 5 pair
  - Channel 6, 7 pair

SIL Level and Category	Fault Exclusion	Point Mode
SIL 3, PLe, Cat. 4	None	Safety Pulse Mode
	External Wiring Fault	Safety Mode Condition: You must issue at least one safety demand every 24 hours.

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, and product notification updates.	rok.auto/support
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Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
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At the end of life, this equipment should be collected separately from any unsorted municipal waste.

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