



# FLEXHA 5000 I/O System

## Catalog Numbers

5015-AENFTXT, 5015-A2AXT, 5015-A4IOXT, 5015-BEBLXT, 5015-BEBRXT, 5015-BECCOMXT, 5015-BECPWRXT, 5015-BIMXT, 5015-BPGNDXT, 5015-ECRXT, 5015-MLTRXT, 5015-MP300XT, 5015-MP700XT, 5015-MP900XT, 5015-MP1250XT, 5015-N2RTBXT, 5015-RTBPWPXT, 5015-RTBPXT, 5015-RTBRPXT, 5015-RTBSAJXT, 5015-STBPXT, 5015-N2IOXT, 5015-N2SAXT, 5015-PB100FTXT, 5015-U8IHFTXT



**Allen-Bradley**

by ROCKWELL AUTOMATION

# 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.

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## About This Publication

This manual describes the FLEXHA 5000™ I/O system in a High Availability (HA) Logix 5000® control system.

Make sure that you are familiar with the following:

- Use of redundant ControlLogix® 5580 controllers in a Logix 5000 control system
- Use of redundant 1756-EN4TR ControlLogix EtherNet/IP™ communication modules in an EtherNet/IP network
- Use of Studio 5000 Logix Designer® environment

## Download Release Notes, Firmware, AOP, EDS, and Other Files

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center (PCDC) at [rok.auto/pcdc](http://rok.auto/pcdc).

---

**IMPORTANT** Before you design, install or operate a FLEXHA 5000 I/O system, we strongly recommend that you go to the PCDC to download and read the firmware release notes for components that are used in the system. The release notes describe system functionality that you should be aware of before you use the system.

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## Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Updated the minimum firmware revision to use the FLEXHA 5000 8-channel Universal I/O module, catalog number 5015-U8IHFTXT, to revision 1.012	12
Updated the System Orientation section to include a reference to the FLEXHA 5000 I/O System Specification Technical Data	88

## Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at [rok.auto/literature](http://rok.auto/literature).

Resource	Description
FLEXHA 5000 I/O System Installation Instructions, publication <a href="#">5015-IN001</a>	Describes how to assemble and install a FLEXHA 5000 I/O system.
FLEXHA 5000 I/O System Specification Technical Data, publication <a href="#">5015-ID001</a>	Provide specifications for the components and wiring diagrams for the I/O modules in a FLEXHA 5000 I/O system.
EtherNet/IP Parallel Redundancy Protocol Application Technique, publication <a href="#">ENET-AT006</a>	Describes how you can configure a Parallel Redundancy Protocol (PRP) network with a compatible device or switch.
EtherNet/IP Device Level Ring Application Technique, publication <a href="#">ENET-AT007</a>	Describes DLR network operation, topologies, configuration considerations, and diagnostic methods.
Ethernet Reference Manual, publication <a href="#">ENET-RM002</a>	Describes how to use Rockwell Automation on EtherNet/IP networks for plant-wide integration.
Industrial Automation Wiring and Grounding Guidelines, publication <a href="#">1770-4.1</a>	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, <a href="http://rok.auto/certifications">rok.auto/certifications</a> .	Provides declarations of conformity, certificates, and other certification details.

**Notes:**

## FLEXHA 5000 I/O System Overview

### High Availability

Availability is the percentage of time that a system is functioning and able to perform its mission. High availability is a characteristic of a system that aims to achieve an agreed level of availability, for a higher than normal period. FLEXHA 5000™ I/O systems support high availability (HA).

### System Description

A FLEXHA 5000 I/O system is a fault-tolerant I/O system that lets you eliminate single-points of failure in a remote I/O system. You can use FLEXHA 5000 I/O systems with standard or HA ControlLogix® 5580 controllers and 1756-EN4TR ControlLogix EtherNet/IP™ communication modules in an industrial automation control system (IACS).

For the highest level of system availability in an IACS, use the FLEXHA 5000 I/O system with redundant ControlLogix 5580 controllers. You must **enable redundancy** in the controllers' configuration, as shown on [page 133](#).

The HA concept uses device and network duplication to establish redundancy in the system and maintain control in the event of a faulted HA device. A faulted redundant system component can be serviced while the control application continues to operate.

The Adapter Base is a component that supports the use of Redundant Power Conditioners, Redundant EtherNet/IP adapters, and other components.

I/O Bases are components that support the use of I/O modules and other components. Use I/O modules in these modes.

- **Simplex mode** - When used in Simplex mode, an I/O module obtains inputs from or provides outputs to the field signal. In this case, HA is maintained for the communications with the Redundant Adapter Pair. But there is no HA in the I/O signal.
- **Duplex mode** - When used in Duplex mode, the Duplex Pair of I/O modules share the same configuration. They both obtain inputs from or provide outputs to the field signal.

Through Concurrent Communication (defined on [page 50](#)), if one I/O module fails to work as configured, the other I/O module seamlessly maintains control.

In this case, HA is maintained for communication with the Redundant Adapter Pair and the I/O signal.

Use FLEXHA 5000 I/O systems in these redundant network topologies:

- Device Level Ring (DLR)
- Parallel Redundancy Protocol (PRP)

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**IMPORTANT** We strongly recommend that you install your FLEXHA 5000 I/O system in a secure cabinet. A physically secure cabinet reduces accessibility to the system by unauthorized personnel and reduces the risk of compromise.

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**WARNING:** If your application requires the Power Conditioner to deplete residual energy to 0.2 mJ, you must complete these steps to be compliant with the IEC/EN 60079-0 standard:

- One of these tasks:
    - Connect at least one diagnostic input terminal to a normally closed contact. For more information on how to make the connection, see the FLEXHA 5000 I/O System Installation Instructions, publication [5015-IN001](#).
    - Manually wire at least one diagnostic input terminal to the return terminal on the diagnostic RTB.
  - Wait at least 5 minutes after removal of power before opening the enclosure to access the FLEXHA 5000 I/O system.
- 

## System Installation

For information on how to install a FLEXHA 5000 I/O system, see the FLEXHA 5000 I/O System Installation Instructions, publication [5015-IN001](#).

## Software and Firmware Requirements

There are minimum software versions and device firmware revisions that are required to use a FLEXHA 5000 I/O system.

**Table 1 - FLEXHA 5000 I/O System Requirements**

Software/Device	Software Version	Firmware Revision
Studio 5000 Logix Designer® application	Version 35.00.00 or later	–
FactoryTalk® Linx software	Version 6.31.00 or later	–
ControlFLASH Plus™ software	Version 5.00.00 or later	–
ControlLogix 5580 controllers	–	Revision 35.011 or later
1756-EN4TR ControlLogix EtherNet/IP Communication Modules	–	Revision 5.001 or later
FLEXHA 5000 EtherNet/IP adapter	–	Revision 2.011 or later
FLEXHA 5000 8-Channel Universal I/O Module	–	Revision 1.012
FLEXHA 5000 Power Conditioners	–	Revision 2.005
FLEXHA 5000 Media Landing Card	–	Revision 2.005
FLEXHA 5000 Backplane Interface Module	–	Revision 1.011

The other FLEXHA 5000 I/O system components do not have firmware.

For information on how to update firmware see, [Update Firmware Revisions on page 125](#).

## Software Configurable

Use the Logix Designer application to configure the module, monitor system operation, and troubleshoot issues. You can also use the Logix Designer application to retrieve this information from any module in the system:

- Serial number
- Firmware revision information
- Product code
- Vendor
- Error and fault information
- Diagnostic information

## Component Firmware

FLEXHA 5000 I/O system components are manufactured with module firmware installed. If updated firmware revisions are available, you can update the firmware on the component. Updated firmware revisions are made available for various reasons, for example, to correct an anomaly that existed in previous module firmware revisions.

Access updated firmware files at the PCDC. The PCDC is available at: [rok.auto/pcdc](http://rok.auto/pcdc). Only download firmware and access product release notes from the Rockwell Automation PCDC. Do not download firmware from non-Rockwell Automation sites.

For more information on how to update the firmware on FLEXHA 5000 I/O components, see [Update Firmware Revisions on page 125](#).

# FLEXHA 5000 I/O System Components

In the example system, components are installed in an Adapter Bank and I/O Bank. The Adapter Bank is required in all FLEXHA 5000 I/O systems, but I/O Banks are optional.

I/O Banks are optional because you can install I/O modules and related components on the Adapter Bank. The components that connect the banks, for example, the Backplane Communication Extension cables (16), are only used if you have multiple banks.

Figure 1 - Example FLEXHA 5000 I/O System Components

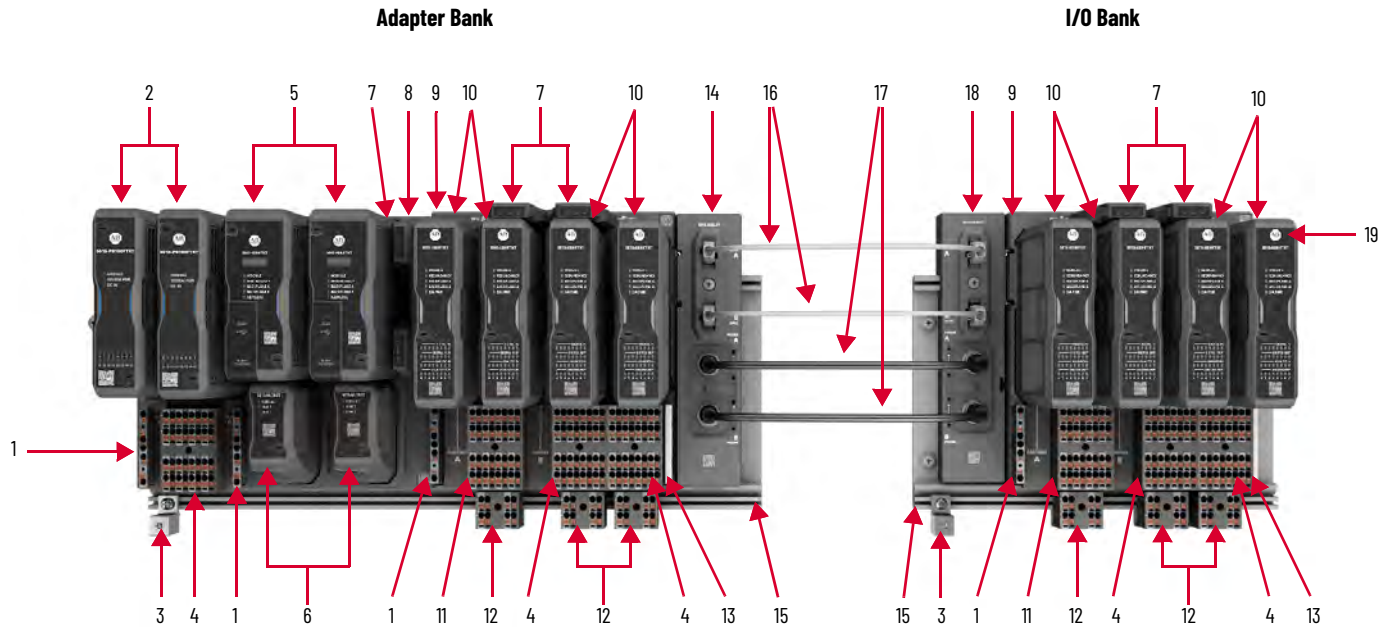


Table 2 lists the components that you use to install the example FLEXHA 5000 I/O system. Order the components individually or as part of a kit.

Table 2 - FLEXHA 5000 I/O Components

Number	Catalog Numbers	Component	More Information on Page
1	5015-RTBPWPXT	Removable Terminal Block for MOD Power/SA Power, Push-in	17
2	5015-PB100FTXT	Redundant Power Conditioners	19
3	5015-BPGNDXT	Ground Lug	16
4	5015-RTBPXT	Removable Terminal Block, Push-in, Simplex or Diagnostic Input	18
5	5015-AENFTXT	Redundant EtherNet/IP Adapters	19
6	5015-MLTRXT	Media Landing Cards	20
7	5015-BIMXT	Backplane Interface Modules	20
8	5015-A2AXT	Adapter Base	16
9	5015-A4IOXT	I/O Base	17
10	5015-U8IHFTXT	Universal I/O Modules	21
11	5015-RTBRPXT	Removable Terminal Block, Push-in, Duplex	18
12	5015-STBPXT	Shield RTB, Push-in	21
13	5015-N2SAXT	SA Power RTB Filler	22
14	5015-BEBLXT	Bank Expansion Bases, Left	22
15	5015-MP300XT 5015-MP700XT 5015-MP900XT 5015-MP1250XT	Mounting Plates	15
16	5015-BECCOMXT	Backplane Communication Extension Cables	23
17	5015-BECPWRXT	Backplane Power Extension Cable	24

Table 2 - FLEXHA 5000 I/O Components

Number	Catalog Numbers	Component	More Information on Page
18	5015-BEBRXT	Bank Expansion Base, Right	23
19	5015-ECRXT	End Cap	24
Not shown	5015-N2IOXT	I/O Slot Filler	25
	5015-N2RTBXT	Removable Terminal Block, Filler, Simplex	26
	5015-RTBSAJXT	Removable Terminal Block, Jumper for SA Power	26

## Mounting Plates

Install FLEXHA 5000 I/O systems on extruded mounting plates that are installed in a cabinet. We recommend that you use mounting plate lengths that fit your component configuration.

Figure 2 - FLEXHA 5000 I/O System Mounting Plate



Install these components on mounting plates:

- Adapter Base
- I/O Base
- Ground lug
- Shield terminal block (STB)

Table 3 - FLEXHA 5000 I/O System Mounting Plate Options

Catalog Number	Description
5015-MP300XT	Length = 192 x 300 x 15 mm (7.56 x 11.81 x 0.59 in.) Supports various different component configurations. For example, you can use the following with this mounting plate: <ul style="list-style-type: none"> <li>• An Adapter Base, catalog number 5015-A2AXT, and one Bank Expansion Base, Left, catalog number 5015-BEBLXT</li> <li>or</li> <li>• One I/O Base, catalog number 5015-A4IO, and one Bank Expansion Base, Right, catalog number 5015-BEBRXT</li> </ul>
5015-MP700XT	Length = 192 x 700 x 15 mm (7.56 x 27.56 x 0.59 in.) Supports various different component configurations. For example, you can use the following with this mounting plate: <ul style="list-style-type: none"> <li>• An Adapter Base with up to two I/O Bases, and one Bank Expansion Base, Left</li> <li>or</li> <li>• One Bank Expansion Base, Right, two I/O bases, and one Bank Expansion Base, Left</li> </ul>
5015-MP900XT	Length = 192 x 900 x 15 mm (7.56 x 35.43 x 0.59 in.) Supports various different component configurations. For example, you can use the following with this mounting plate: <ul style="list-style-type: none"> <li>• An Adapter Base with up to three I/O Bases, and one Bank Expansion Base, Left</li> <li>or</li> <li>• One Bank Expansion Base, Right, up to four I/O bases, and one Bank Expansion Base, Left</li> </ul>
5015-MP1250XT	Length = 192 x 1250 x 15 mm (7.56 x 47.24 x 0.59 in.) Supports various different component configurations. For example, you can use the following with this mounting plate: <ul style="list-style-type: none"> <li>• An Adapter Base and up to five I/O Bases</li> <li>or</li> <li>• One Bank Expansion Base, Right, up to four I/O bases, and one Bank Expansion Base, Left</li> </ul>



For information on FLEXHA 5000 I/O system component dimensions, see the FLEXHA 5000 I/O System Specifications Technical Data, publication [5015-TD001](#).

Integrated Architecture® Builder (IAB) software from Rockwell Automation provides additional assistance in selecting the correct mounting plate size. Access IAB software at this location:

<https://www.rockwellautomation.com/en-us/support/product/product-selection-configuration/integrated-architecture-builder.html>

### Ground Lug

The mounting plate functions as the bonding point to Protective Earth (PE) for a FLEXHA 5000 I/O system. You must install a ground lug on the mounting plate and connect it to the installation PE point. Install one ground lug on each mounting plate.

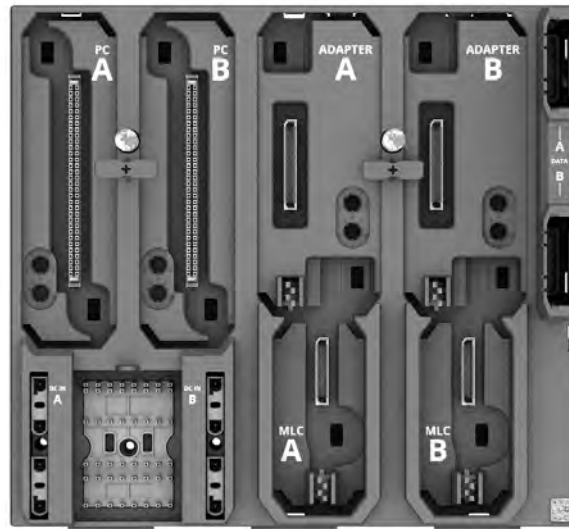
Figure 3 - FLEXHA 5000 I/O System Ground Lug



### Adapter Base

The Adapter Base supports components that provide system power, EtherNet/IP network connections, and power diagnostics. There is only one Adapter Base in a FLEXHA 5000 I/O system. It is required.

Figure 4 - FLEXHA 5000 I/O System Adapter Base

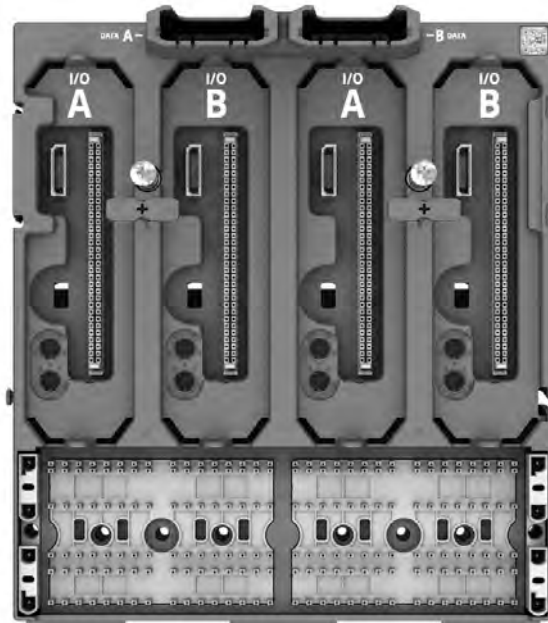




## I/O Base

I/O Bases support components that provide SA Power, provide backplane communication and connect to field-side devices. I/O Bases are installed directly next to the Adapter Base, other I/O Bases, or a Bank Expansion Base, Right.

Figure 5 - FLEXHA 5000 I/O System I/O Base



## MOD Power/SA Power RTB

The same RTB type is used to connect MOD power and SA power.

- Two MOD power RTBs, that is, A and B, reside in the Adapter Base. They connect 24V DC power from an external power supply to Power Conditioners.

---

**IMPORTANT** Each power connection requires its own power RTB.

---

- An SA Power RTB connects sensor actuator (SA) power, also known as field-side power, to an I/O Base. SA Power RTBs are installed on the left side of an I/O Base, unless an SA Power Jumper is installed between two I/O Bases to extend SA Power from one I/O Base to the next.

Figure 6 - FLEXHA 5000 I/O System MOD Power/SA Power RTB

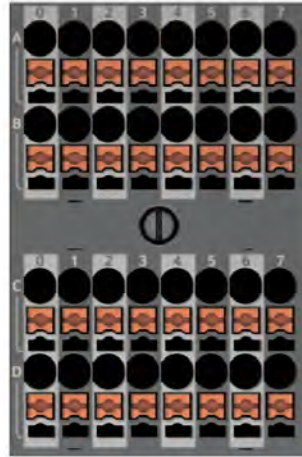


## Diagnostic Input/Simplex RTB

The same RTB type is used to monitor system conditions and connect field devices to I/O modules that are operating in Simplex mode.

- A diagnostic input RTB resides in the Adapter Base and is used to monitor system conditions. For example, you can use this RTB to connect to power supply status contacts and Field Power Redundancy Device (FPRD) contacts, monitor whether the cabinet door is open, among other things.  
Diagnostic input information is available in the EtherNet/IP adapter's status tags in the Logix Designer application project.
- A Simplex RTB connects field devices to I/O modules operating in Simplex mode. The RTB is installed in I/O Bases.

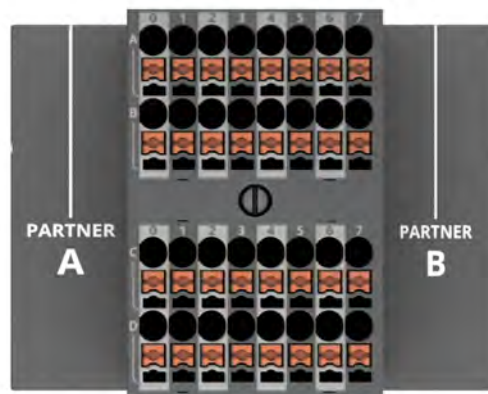
Figure 7 - FLEXHA 5000 I/O System Diagnostic Input/Simplex RTB



## Duplex RTB

A Duplex RTB connects field devices to I/O modules operating as a Duplex pair. The RTB is installed in I/O Bases.

Figure 8 - FLEXHA 5000 I/O System Duplex RTB



## Power Conditioners

Two FLEXHA 5000 Power Conditioners reside in the Adapter Base. Separate external power supplies provide 24V DC power to the Power Conditioners. Connect one external power supply to MOD Power RTB A and another external power supply to MOD Power RTB B.

Each Power Conditioner, that is, A and B, derives a conditioned backplane power bus from one of the MOD power buses, A and B respectively, to maintain HA in the event of any single failure.

The EtherNet/IP adapter makes 16 diagnostic inputs on the Power Conditioners available for activities such as monitoring system conditions.

**Figure 9 - FLEXHA 5000 I/O System Power Conditioner**



## EtherNet/IP Adapters

Two EtherNet/IP adapters, that is, A and B, reside in the Adapter Base. The adapters function as a Redundant Adapter Pair to facilitate communication between the FLEXHA 5000 I/O system and other devices, such as ControlLogix 1756-EN4TR EtherNet/IP communication modules, on an EtherNet/IP network.

**Figure 10 - FLEXHA 5000 EtherNet/IP Adapter**



## Media Landing Cards

Redundant MLCs, that is, A and B, reside in the Adapter Base. Each MLC uses two Ethernet RJ45 connections to connect an adapter to the EtherNet/IP network.

The MLCs operate concurrently with, and independently of, each other.

Figure 11 - FLEXHA 5000 I/O System Media Landing Card



## Backplane Interface Modules

Redundant BIMs, that is, A and B, reside in the Adapter Base and I/O Bases. They provide backplane communication and slot addressing through the FLEXHA 5000 I/O system.

You must install two BIMs in each base for a redundant system. The BIMs operate on separate backplanes, that is, Backplane A and Backplane B.

Figure 12 - FLEXHA 5000 I/O System Backplane Interface Modules



## Universal I/O Module

Universal I/O modules are fault-tolerant I/O modules with eight isolated channels that can operate in Simplex Mode or Duplex Mode. Configure the individual channels to function as any of the following:

- Digital inputs
- Digital outputs
- Analog inputs
- Analog outputs

For channels that are configured as analog input or analog output, HART functionality is also available.

The I/O modules reside in I/O bases.

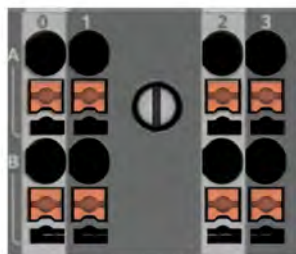
**Figure 13 - FLEXHA 5000 I/O System Universal I/O Module**



## Shield Terminal Block

STBs provides termination for I/O cable shields. Install an STB at the bottom of the mounting plate under I/O module Simplex and Duplex RTBs.

**Figure 14 - FLEXHA 5000 I/O System Shield Terminal Block**



## SA Power RTB Filler

The SA Power RTB Filler is installed on the right side of an I/O Base when SA power is not jumpered from one I/O Base to another. The filler protects the SA power connector from damage. The damage can be physical, for example, mechanical or electrical. Or the damage can be environmental, for example, corrosion.

Figure 15 - FLEXHA 5000 I/O System SA Power RTB Filler



## Bank Expansion Base, Left

The FLEXHA 5000 I/O Bank Expansion Base, Left, is **optional**. You only use it if I/O Banks are used in the system.

FLEXHA 5000 I/O Bank Expansion Bases, Left, are used to add I/O Banks to the FLEXHA 5000 I/O system. The Bases extend backplane communication and power from one bank to another via Backplane Communication Extension cables and Backplane Power Extension cables. The cables are connected from a Bank Expansion Base, Left to a Bank Expansion Base, Right.

Install the Bank Expansion Base, Left, in an Adapter Bank or an I/O Bank. For an example, see [Install I/O Bases in I/O Banks on page 90](#).

Figure 16 - FLEXHA 5000 I/O System Bank Expansion Base, Left



## Bank Expansion Bases, Right

The FLEXHA 5000 I/O Bank Expansion Base, Right, is **optional**. You only use it if I/O Banks are used in the system.

FLEXHA 5000 I/O Bank Expansion Bases, Right, are used to add I/O Banks to the FLEXHA 5000 I/O system. The Bases extend backplane communication and power from one bank to another via Backplane Communication Extension cables and Backplane Power Extension cables. The cables are connected from a Bank Expansion Base, Left to a Bank Expansion Base, Right.

Install the Bank Expansion Base, Right, in I/O Banks. For an example, see [Install I/O Bases in I/O Banks on page 90](#)

**Figure 17 - FLEXHA 5000 I/O System Bank Expansion Bases, Right**

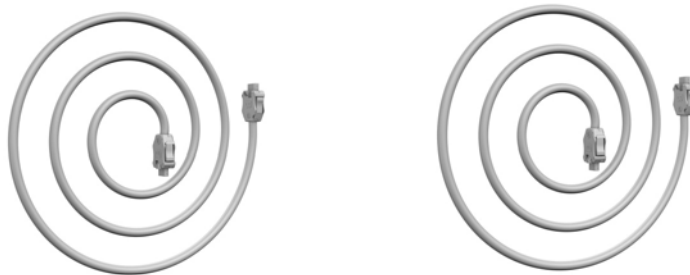


## Backplane Communication Extension Cables

Backplane Communication Extension cables are **optional**. You only use them to connect Banks.

Backplane Communication Extension cables connect Bank Expansion Bases to extend backplane communication from one bank to another. Two communication cables are connected to each Bank Expansion Base.

**Figure 18 - FLEXHA 5000 I/O System Backplane Communication Extension Cables**



## Backplane Power Extension Cables

Backplane Power Extension cables are **optional**. You only use them to connect Banks.

Backplane Power Extension cables connect Bank Expansion Bases, Left and Right, and extend backplane power from one bank to another. Two power cables are connected to each Bank Expansion Base.

Figure 19 - FLEXHA 5000 I/O System Backplane Power Extension Cables



## End Cap

An end cap covers the last base-to-base connector of an I/O Bank to protect the connectors from damage. The damage can be physical, for example, mechanical or electrical. Or the damage can be environmental, for example, corrosion.

Figure 20 - FLEXHA 5000 I/O System End Cap





## I/O Slot Filler

An I/O Slot Filler is **optional**. It is used instead of an I/O module to protect unused I/O connectors on the I/O Base from damage. The potential damage can be physical, for example, mechanical or electrical. Or the damage can be environmental, for example, corrosion.

Figure 21 - FLEXHA 5000 I/O System I/O Slot Filler

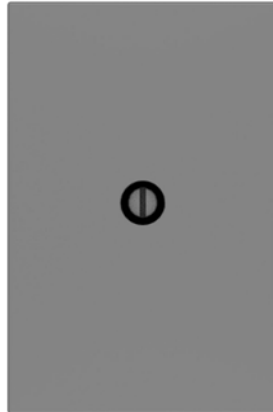


## Simplex RTB Filler

A Simplex RTB Filler is **optional**. It protects unused RTB connectors on the I/O Base from damage. The damage can be physical, for example, mechanical or electrical. Or the damage can be environmental, for example, corrosion.

Two of these RTB fillers are used instead of a Duplex RTB, when necessary.

Figure 22 - FLEXHA 5000 I/O Simplex RTB Filler



## SA Power Jumper

The SA Power jumper is **optional**. It is used to jumper SA power from one I/O Base to another rather than connecting separate SA power sources to each I/O Base. The jumper is installed on the right side of the I/O Base and the left side of the adjoining I/O Base.

You can also two SA Power RTBs to jumper SA power from one I/O Base to another.

Figure 23 - FLEXHA 5000 I/O System SA Power Jumper



## Difference Between a Base and a Bank

There is a difference between bases and banks in a FLEXHA 5000 I/O system. A base is a component that is installed on a mounting plate and upon which you install other components. A bank is comprised of one to seven bases.

### FLEXHA 5000 I/O System Bases

Connect bases directly next to each other or across banks that are connected by expansion kits. These base types are available:

- **Adapter Base** - There is **only one Adapter Base** in a FLEXHA 5000 I/O system. It is required.  
As noted on [page 16](#), the Adapter Base supports components that provide system power, EtherNet/IP network connections, and power diagnostics.  
Install the following on the Adapter Base:
  - Power Conditioners
  - EtherNet/IP adapters
  - MLCs
  - BIMs
  - MOD Power RTBs
  - Diagnostic RTB
  - RTB Slot Filler (optional; used in place of Diagnostic RTB)
  - Bank Expansion Base, Left (optional; used to connect an Adapter Bank to an I/O Bank)
- **I/O Base** - A **maximum of six I/O bases** are allowed in a FLEXHA 5000 I/O system. At least one I/O Base is required.  
Install the following on the I/O Base:
  - I/O modules
  - BIMs
  - Duplex RTBs - One for each pair of I/O modules that are configured for Duplex mode.
  - Simplex RTBs - One for each individual I/O module that is configured for Simplex mode.
  - SA Power RTB
  - SA Power Jumper - Optional; used to continue SA power from one I/O Base to the next
  - SA Power RTB Filler - Optional; used in place of an SA Power RTB or SA Power Jumper
  - I/O Slot Filler - Optional; used in place of an I/O module.
  - RTB Slot Filler - Optional; used with I/O Slot Filler.
  - Bank Expansion Base, Right, and Bank Expansion Base, Left, on an I/O Base - Optional; used to connect to an Adapter Bank or I/O Bank.
  - End cap - Optional

## FLEXHA 5000 I/O System Banks

A bank in a FLEXHA 5000 I/O system is a collection of bases and the components that are installed on them. A **maximum of three banks** are allowed in a FLEXHA 5000 I/O system. Use Bank Expansion Bases, Left and Right, with Backplane Communication Extension cables and Backplane Power Extension cables to connect banks.

These bank types are available:

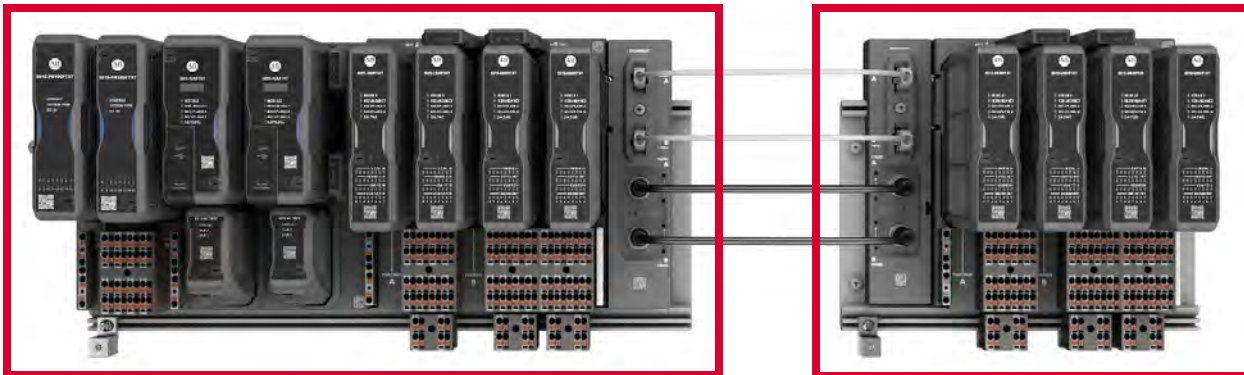
- **Adapter Bank** - There is only one Adapter Bank in a FLEXHA 5000 I/O system. It is required. You must use an Adapter Base in an Adapter Bank. You are not required to use I/O Bases in an Adapter Bank, but you can install a maximum of six I/O Bases on an Adapter Bank.



- **I/O Bank** - You can include a maximum of two I/O Banks in a FLEXHA 5000 I/O system. An Adapter Bank is required, but I/O Banks are optional. I/O Banks support from one to six I/O Bases.

Adapter Bank

I/O Bank



## Difference Between Bank Expansion Base Types

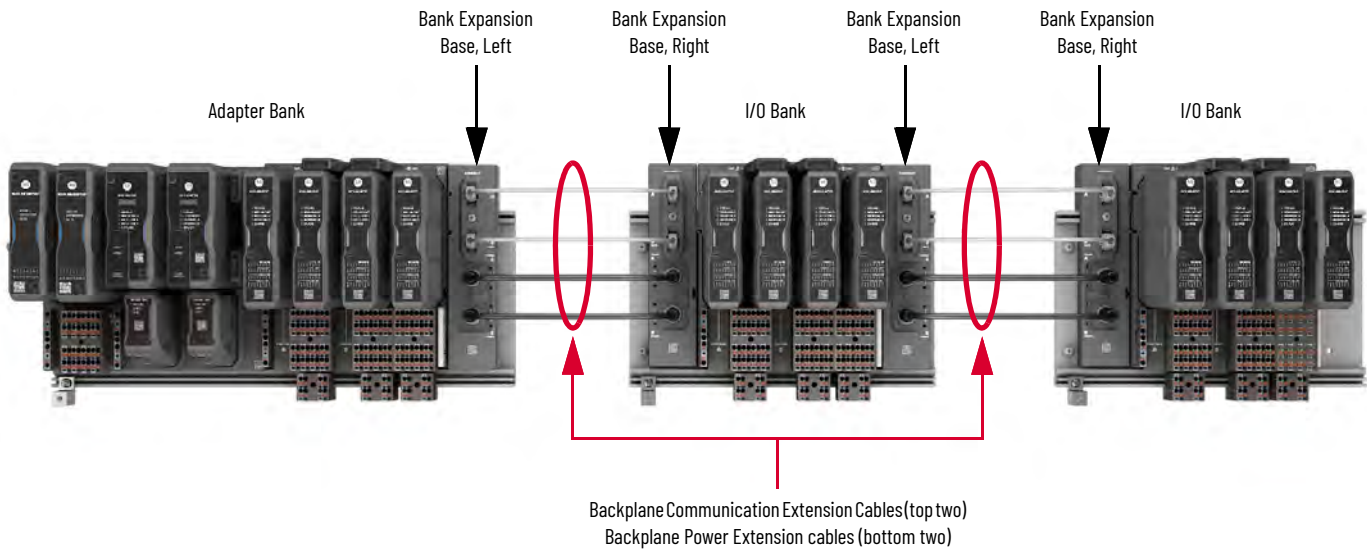
If the FLEXHA 5000 I/O system includes multiple banks, you must use these Bank Expansion Bases to connect them:

- Bank Expansion Base, Left
- Bank Expansion Base, Right

The bases connect system backplane communication and backplane power from one bank to another through two Backplane Communication Extension cables and two Backplane Power Extension cables.

Bank Expansion Bases are installed on the ends of banks. A Bank Expansion Base, Left, is installed on the right side of a bank. A Bank Expansion Base, Right, is installed on the left side of a bank.

**Figure 24 - FLEXHA 5000 I/O System with Bank Expansion Bases Installed**



## Maximum Backplane Size

The redundant backplanes support two adapters and a maximum of 24 I/O modules that are installed on a maximum of three banks.

You must install the Adapter Bank in a horizontal orientation. Install I/O Banks in horizontal or vertical orientations.



You do not have to distribute the number of I/O modules evenly across the number of banks. For example, you can install 16 I/O modules on the Adapter Bank and extend the system to an I/O Bank that supports eight modules.

## I/O Slot Addressing

The FLEXHA 5000 I/O system uses I/O slot addressing to identify the location in which I/O modules reside in the system. I/O slot addresses start at 0 and increment up to 23. The slot in which an I/O module is installed determines its slot address. For example, the first I/O module on the left side of the first I/O Base is assigned slot number 0. As I/O modules are added to successive slots, they're assigned the address for that specific slot.

If a slot is left open, for example, the second slot in the first I/O Base, that slot still uses address 1. An I/O module that is installed in the next slot is assigned slot address 2.

Slot addresses continue to increment as I/O banks are added to the system. Redundant backplanes use the same I/O slot addresses. For example, the first I/O module is in slot 0 on backplane A and backplane B.

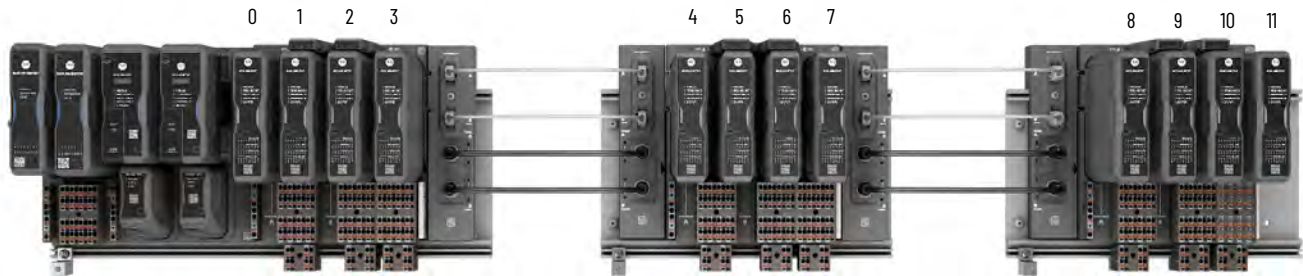
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### IMPORTANT

Duplex pairs of I/O modules must be installed with the first module in an even-numbered slot and the second module in an odd-numbered slot.

---

Figure 25 - FLEXHA 5000 I/O System Banks - Slot Addressing



## Mechanical Keying

FLEXHA 5000 I/O systems provide mechanical keying. Mechanical keying reduces the risk of installing the wrong replacement component in a system. A transferable key is installed in these components:

- Power Conditioners
- EtherNet/IP adapters
- I/O modules

The mechanical keying system consists of a two-position socket and a two-position base plug for each keyed component that is inserted into the system bases. Transferable keys mount in the components and transfer to the base during the initial installation.

Each keyed component uses two keys. One key uses an alpha position indicator--positions A...E. The other key uses a numeric position indicator--positions 1...5. [Table 4](#) lists the key positions for each component out of the box.

**Table 4 - Out-of-the-Box Key Positions**

Component	Key Position
5015-U8IHFTXT	A1
5015-AENFTXT	A1
5015-PB100FTXT	A1

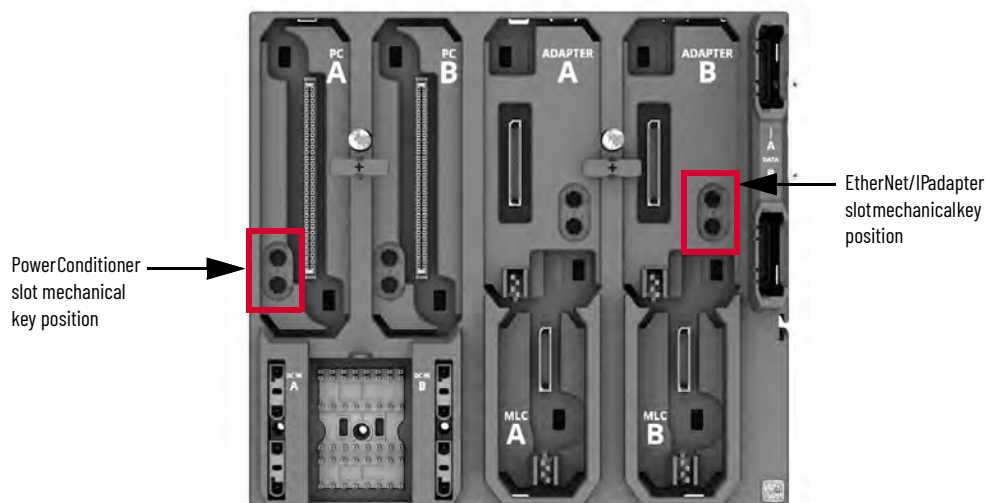


The first time that you install the component in a base, the plug part of the key transfers into the base and remains in that position when you pull the component out of the system. As a result, the slot only accepts components of the same catalog type - as defined by the alpha and numeric key.

### IMPORTANT

If you install a component that's already been used in a new base, there won't be keys to transfer from the component to the base. In this scenario, if you want to use mechanical keying, get the keys from the last place the component was used or order new keys. Then install the keys in the component before installing it in the base.

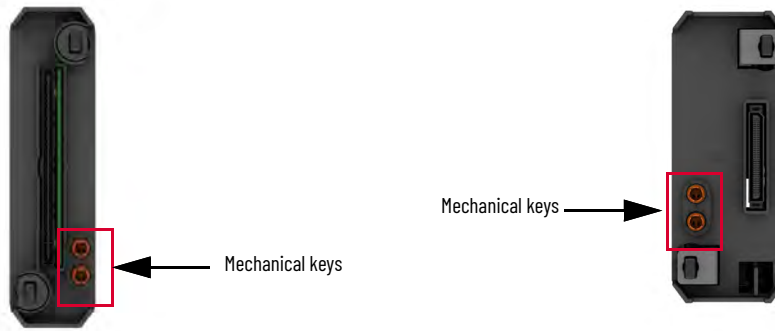
The Power Conditioners and adapters are keyed to the system via their position in the Adapter Base.



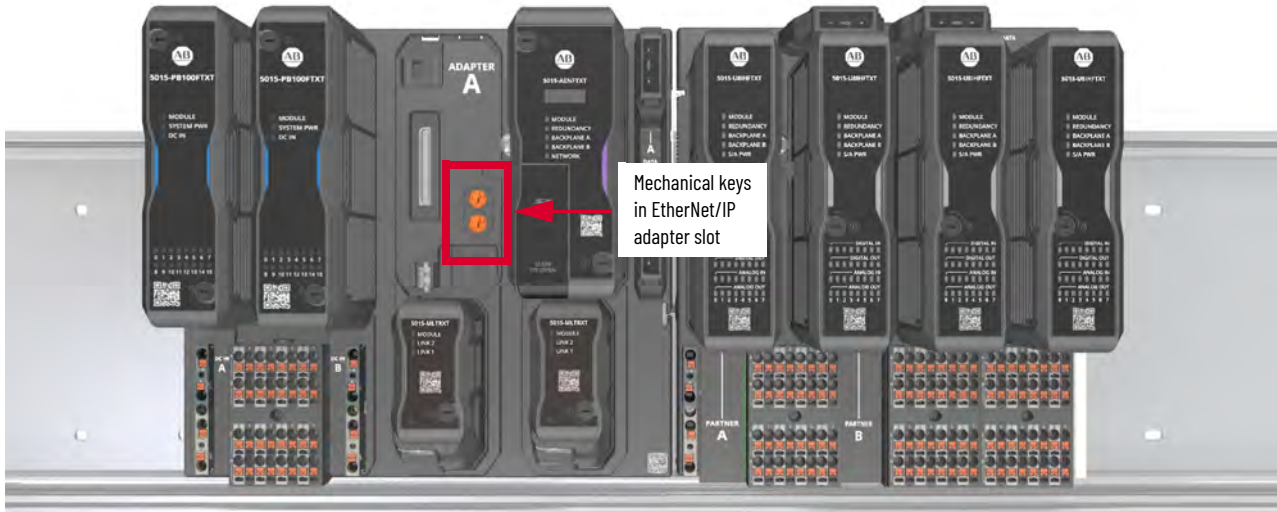
Out of the box, the mechanical keys are in the back on the Power Conditioners and EtherNet/IP adapters.

Power Conditioner

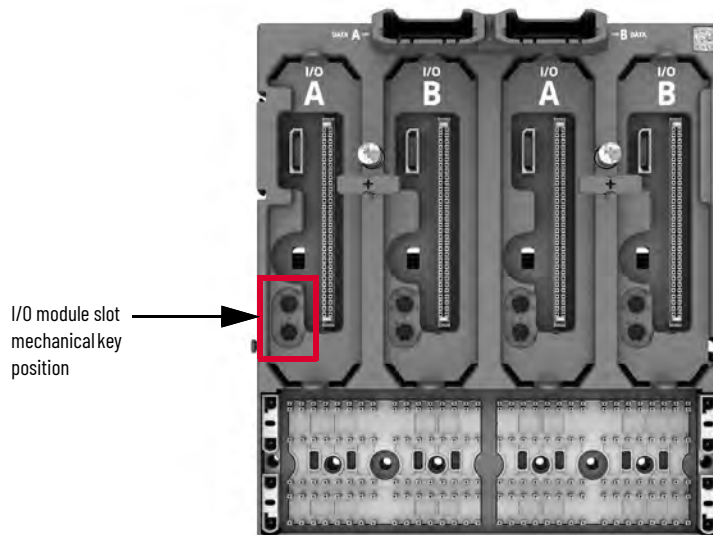
EtherNet/IP Adapter



When you remove a keyed component, the key stays in the base.



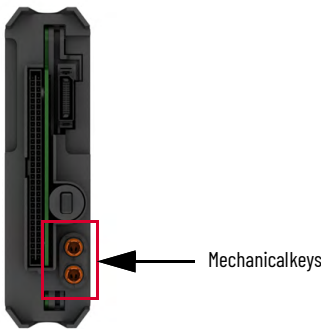
The I/O module is keyed to the system via its position in the I/O Base.



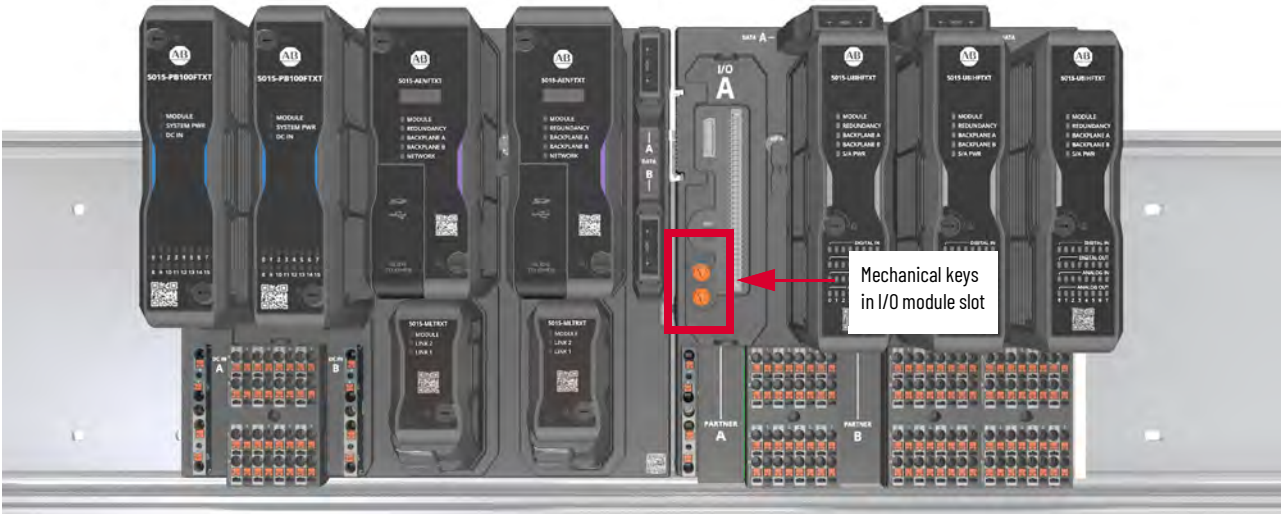


Out of the box, the mechanical keys are in the back of the I/O module.

**I/O Module**



When you remove a keyed component, the key stays in the base.



## Replace a Power Conditioner

To replace a Power Conditioner, complete these steps:

1. Unlock the Power Conditioner's QTAs to turn it off. When the Power Conditioner is turned off, the status indicators turn off.

The Power Conditioner's QTAs are described on [page 36](#).

---

**IMPORTANT** When a Power Conditioner is turned off, only the partner Power Conditioner provides power to the system. Fault tolerance is compromised until the replacement Power Conditioner is installed, turned on and resumes normal operations.

---

2. Pull the Power Conditioner out of the Adapter Base.
3. If the replacement Power Conditioner is new and still has mechanical keys in the back of it, pull out the mechanical keys from the back of it.
4. Install the replacement Power Conditioner in the Adapter Base.
5. Use the Power Conditioner's QTAs to lock it in place and turn on power to it.

## Replace an EtherNet/IP Adapter

To replace an adapter, complete these steps:

1. Unlock the EtherNet/IP adapter's QTAs to turn it off. When the adapter is turned off, the status indicators turn off.

The adapter's QTAs are described on [page 37](#).

---

**IMPORTANT** When an adapter is turned off, the partner EtherNet/IP adapter maintains network communication. Fault tolerance is compromised until the replacement adapter is installed, turned on and resumes normal operations.

---

2. Pull the adapter out of the Adapter Base.
3. If the replacement adapter is new and still has mechanical keys in the back of it, pull them out.
4. Install the replacement adapter in the Adapter Base.
5. Use the adapter's QTAs to lock it in place and turn on power to it.

## Replace an I/O Module

To replace an I/O module, complete the steps that described in the table.

**IMPORTANT** In the tasks described for each replacement scenario, you remove the existing I/O module from the system.

When you turn off an I/O module that is part of a Duplex pair, the partner I/O module assumes control. Fault tolerance is compromised. A fault on the functioning I/O module results in a loss of control until the I/O module that was removed is reinstalled or replaced and normal operation resumes.

When you remove a Simplex I/O module, control is lost for the channels on the module until a replacement I/O module is installed and resumes normal operation.

The I/O module's QTA that is mentioned in the tasks is described on [page 39](#).

**Table 5 - Replace I/O Module - Keying**

Replacement Scenario	Tasks
Replace an I/O module with a new I/O module of the same type.	<ol style="list-style-type: none"> <li>1. Unlock the I/O module's QTA to turn it off. When the I/O module is turned off, the status indicators turn off.<sup>(1)</sup></li> <li>2. Pull the I/O module out of the I/O Base.</li> <li>3. Pull the mechanical keys from the back of the replacement I/O module.</li> <li>4. Install the replacement I/O module in the I/O Base.</li> <li>5. Use the I/O module's QTA to lock it in place and turn on power to it.</li> </ol>
Replace an I/O module with an I/O module of the same type that has already been used.	<ol style="list-style-type: none"> <li>1. Unlock the I/O module's QTA to turn it off. When the I/O module is turned off, the status indicators turn off.<sup>(1)</sup></li> <li>2. Pull the I/O module out of the I/O Base.</li> <li>3. Install the replacement I/O module in the I/O Base.</li> <li>4. Use the I/O module's QTA to lock it in place and turn on power to it.</li> </ol>
Replace an I/O module with a new I/O module of another type.	<ol style="list-style-type: none"> <li>1. Unlock the I/O module's QTA to turn it off. When the I/O module is turned off, the status indicators turn off.<sup>(1)</sup></li> <li>2. Pull the I/O module out of the I/O Base.</li> <li>3. Record the mechanical key positions in the back of the replacement I/O module.</li> <li>4. Pull the mechanical keys from the back of the replacement I/O module.</li> <li>5. Turn the keys in the I/O Base to the correct position so that it matches the positions for the new module type. You can turn the keys by hand.</li> <li>6. Install the replacement I/O module in the I/O Base.</li> <li>7. Use the I/O module's QTA to lock it in place and turn on power to it.</li> </ol>
Replace an I/O module with an I/O module of another type that has already been used.	<ol style="list-style-type: none"> <li>1. Unlock the I/O module's QTA to turn it off. When the I/O module is turned off, the status indicators turn off.<sup>(1)</sup></li> <li>2. Pull the I/O module out of the I/O Base.</li> <li>3. Turn the keys in the I/O Base to the correct position so that it matches the positions for the new module type. You can turn the keys by hand.</li> <li>4. Install the replacement I/O module in the I/O Base.</li> <li>5. Use the I/O module's QTA to lock it in place and turn on power to it.</li> </ol>

(1) In the unlikely event that you unlock the I/O module's QTA and it does not turn off, you must use the Logix Designer application to reset the I/O module. For more information, see [page 39](#).

## Quarter Turn Actuators

Some FLEXHA 5000 I/O system components have QTAs that lock the component in place.

### Power Conditioners

QTAs on the Power Conditioner lock it into place on the Adapter Base.



You must lock the QTAs for a Power Conditioner to turn on. When both actuators are locked, the Power Conditioner is locked mechanically and electrically and enabled for use.

---

**IMPORTANT** A QTA that is positioned in between the locked and unlocked positions can fail to pop out. In this case, the Power Conditioner is unlocked. Be sure that both QTAs are turned to the fully locked position.

---

During normal operation, the following occurs:

- The system monitors the position of the QTAs via a QTA diagnostic. The monitoring is important because:
  - If one QTA becomes unlocked because it was turned, the Power Conditioner continues to operate. If power is cycled before the QTA is relocked, the Power Conditioner does not turn back on. If you relock the QTA, the Power Conditioner turns back on.
  - If both of the QTAs become unlocked, the Power Conditioner is disabled and no longer provides power to the associated backplane. For example, if Power Conditioner A turns off, backplane A no longer has power. The application alerts you that such a state via the EtherNet/IP adapter's status tag *S.PowerConditionerx.MissingFault*.

The EtherNet/IP adapter works here as proxy for the Power Conditioner diagnostics. Because only one Power Conditioner provides backplane power at this point, fault tolerance is compromised and failure on the other Power Conditioner would result in total loss of backplane power in the system. Fault tolerance resumes when both Power Conditioners are functioning properly again.

- The Power Conditioner periodically runs QTA diagnostics. If either diagnostic fails for any reason, the application alerts you to such a condition via the EtherNet/IP adapter's status tag *S.PowerConditionerx.InternalFault*.

The next time power is cycled, the Power Conditioner might not turn on. If it doesn't, replace the Power Conditioner.

## EtherNet/IP Adapters

QTAs lock the adapter into place on the Adapter Base.



You must lock the QTAs for the adapter to turn on. When both actuators are locked, the adapter is locked mechanically and electrically and enabled for use.

---

**IMPORTANT** A QTA that is positioned in between the locked and unlocked positions can fail to pop out. In this case, the adapter is unlocked. Be sure that both QTAs are turned to the fully locked position.

---

At power-up, if both of the QTAs are locked, the adapter runs QTA diagnostics.

- If both of the diagnostics pass, the adapter turns on and begins normal operation.
- If either of the diagnostics fail, the adapter doesn't turn on. The adapter's MODULE status indicator might not turn on or might be red.

If the MODULE status indicator stays off or red for an extended period after full system power-up, replace the adapter.

During normal operation, the following occurs:

- The system monitors the position of the QTAs via QTA diagnostics. This monitoring is important because:
  - If one QTA becomes unlocked because it was turned, the adapter continues to operate. If power is cycled before the QTA is relocked, the adapter doesn't turn back on. The MODULE status indicator does not turn on.
  - If both of the QTAs become unlocked because they were turned, the adapter is disabled. When an adapter is disabled, the other adapter maintains network communication. The application alerts you that such a state via the EtherNet/IP adapter's status tag *S.Modx.MissingFault*.

Fault tolerance is compromised until the disabled adapter resumes normal operations. If power is cycled before both of the QTAs are relocked, the adapters do not turn back on. The MODULE status indicators might not turn on or might be red.

If you relock the unlocked QTAs during normal operation, the adapter returns to normal operation.

- The adapter periodically runs the QTA diagnostics. If either diagnostic fails for any reason, the application alerts you to the condition via an Unrecoverable minor fault on the Device Information dialog box, and the adapter continues to operate. The next time power is cycled, however, the adapter might not turn on, and the MODULE status indicator doesn't turn on. The adapter might turn on but the MODULE status indicator is red. Replace the adapter.

## MLC

The QTA locks the MLC into place on the Adapter Base.



You must lock the QTA for the MLC to turn on. When the QTA is locked, the MLC is locked mechanically and electrically and enabled for use.

---

**IMPORTANT** A QTA that is positioned in between the locked and unlocked positions can fail to pop out. In this case, the MLC is unlocked. Be sure that the QTA is turned to the fully locked position.

---

At power-up, if the QTA is locked at power-up, the MLC runs a QTA diagnostic.

- If the diagnostic passes, the MLC turns on and begins normal operation.
- If the diagnostic fails, the MLC doesn't turn on. The MLC's MODULE status indicator might not turn on or might be red.

If the MODULE status indicator stays off or red for an extended period after full system power-up, replace the MLC.

During normal operation, the following occurs:

- The system monitors the position of the QTA via a QTA diagnostic. This monitoring is important because if the QTA becomes unlocked because it was turned, the MLC turns off and the EtherNet/IP adapter that is associated with it can't communicate with devices in the system.

When the affected EtherNet/IP adapter can't communicate with devices in the system, then the other adapter maintains network communication. The application alerts you that such a state via the EtherNet/IP adapter's status tag *S.Modx.MissingFault*.

Whenever either adapter can't communicate on the network, fault tolerance is compromised until both MLCs are locked again and functioning properly. At that point, both adapters resume normal operation.

- The MLC periodically runs the QTA diagnostic. If the diagnostic fails for any reason, the application alerts you to the condition via the EtherNet/IP adapter status tag *S.MediaCardx.MissingFault*.

The EtherNet/IP adapter works here as proxy for the MLC diagnostics.

EtherNet/IP network communication is unaffected. The next time power is cycled, however, the MLC doesn't turn on. If the MODULE status indicator stays off or red for an extended period after full system power-up, replace the MLC.

## I/O Module

A QTA locks the I/O module into place on the I/O Base.



You must lock the QTA for the I/O module to turn on. When the QTA is locked, the I/O module is locked mechanically and electrically and enabled for use.

---

**IMPORTANT** A QTA that is positioned in between the locked and unlocked positions can fail to pop out. In this case, the I/O is unlocked. Be sure that it is turned all the way to the locked position.

---

At power-up, if the QTA is locked, the I/O module runs a QTA diagnostic.

- If the diagnostic passes, the I/O module turns on and begins normal operation.
- If the diagnostic fails, the I/O module does not turn on and the status indicators stay off. Replace the I/O module.

During normal operation, the system monitors the position of the QTA via a QTA diagnostic.

- If the I/O module becomes unlocked because the QTA was turned, the I/O module turns off. If necessary, you can remove it. You can also relock the QTA to resume normal operation.
- If the QTA diagnostic fails while the QTA is in the locked position, the application alerts you to the condition. The I/O module continues to operate. However, it doesn't turn on the next time power is cycled.

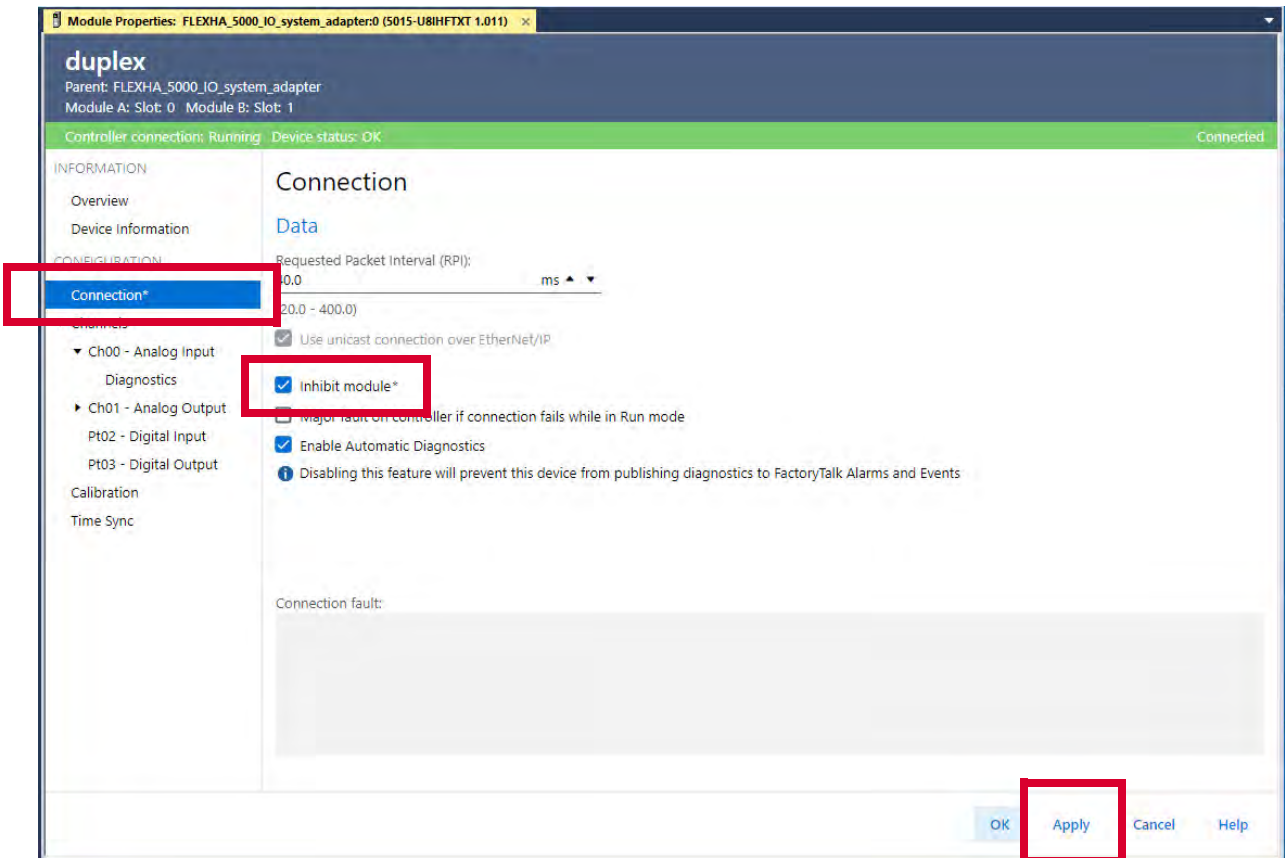
Before you remove a functioning I/O module to troubleshoot the issue and correct it, you must complete the following:

- a. Turn the QTA to the off position, and check the status indicators.
  - If all of the status indicators on the I/O module are off, remove the module and move to [step f](#).
  - If any of the status indicators on the I/O module are not off, move to [step b](#).
- b. Select Inhibit module checkbox in the Module Properties dialog box, and click Apply. Inhibiting the connection to an I/O module impacts how it is used for control in the system. Before you inhibit the connection, make sure that you account for how it impacts the system.

---

**IMPORTANT** The inhibiting process closes the connection to the I/O module. When the connection is closed, control is lost until the connection reopened.

---





- c. Reset the I/O modules on the Device Information view.  
If it's a Duplex pair of I/O modules, reset the module(s) that you want to remove.

Duplex Pair

Module Properties: FLEXHA\_5000\_IO\_system\_adapter:0 (5015-U8IHFTXT 1.011)

**duplex**  
Parent: FLEXHA\_5000\_IO\_system\_adapter  
Module A: Slot: 0 Module B: Slot: 1

Controller connection: Inhibited Device status: OK Connected

INFORMATION

- Overview
- Device Information**

CONFIGURATION

- Connection
- Channels
- Calibration
- Time Sync

**Device Information**

	Module A	Module B
Vendor	Rockwell Automation/Allen-Bradley	Rockwell Automation/Allen-Bradley
Product Type	Multi-Channel Universal	Multi-Channel Universal
Product Name	FLEXHA 5000 Universal Module	FLEXHA 5000 Universal Module
Revision	1.011	1.010
Product Code	5015-U8IHFTXT	5015-U8IHFTXT
Serial Number	014E07C8	014E07C7

	Module A	Module B
Major Fault	None	None
Minor Fault	None	None
Internal State	Unconnected	Unconnected
Configured	Configured	No
Owned	No	No
Module Identity	Match	Match
Protection Mode	None	None

Buttons: Refresh, Reset module A, Reset module B, OK, Apply, Cancel, Help

Simplex Module

Module Properties: FLEXHA\_5000\_IO\_system\_adapter:0 (5015-U8IHFTXT 1.011)

**simplex\_line**  
Parent: FLEXHA\_5000\_IO\_system\_adapter  
Slot: 0

Controller connection: Inhibited Device status: OK Connected

INFORMATION

- Overview
- Device Information**

CONFIGURATION

- Connection
- Channels
- Calibration
- Time Sync

**Device Information**

**Identification**

Vendor: Rockwell Automation/Allen-Bradley  
Product type: Multi-Channel Universal  
Product name: FLEXHA 5000 Universal Module  
Catalog number: 5015-U8IHFTXT  
Series: A  
Revision: 1.011  
Product code: 5015-U8IHFTXT  
Serial number: 014E07C8

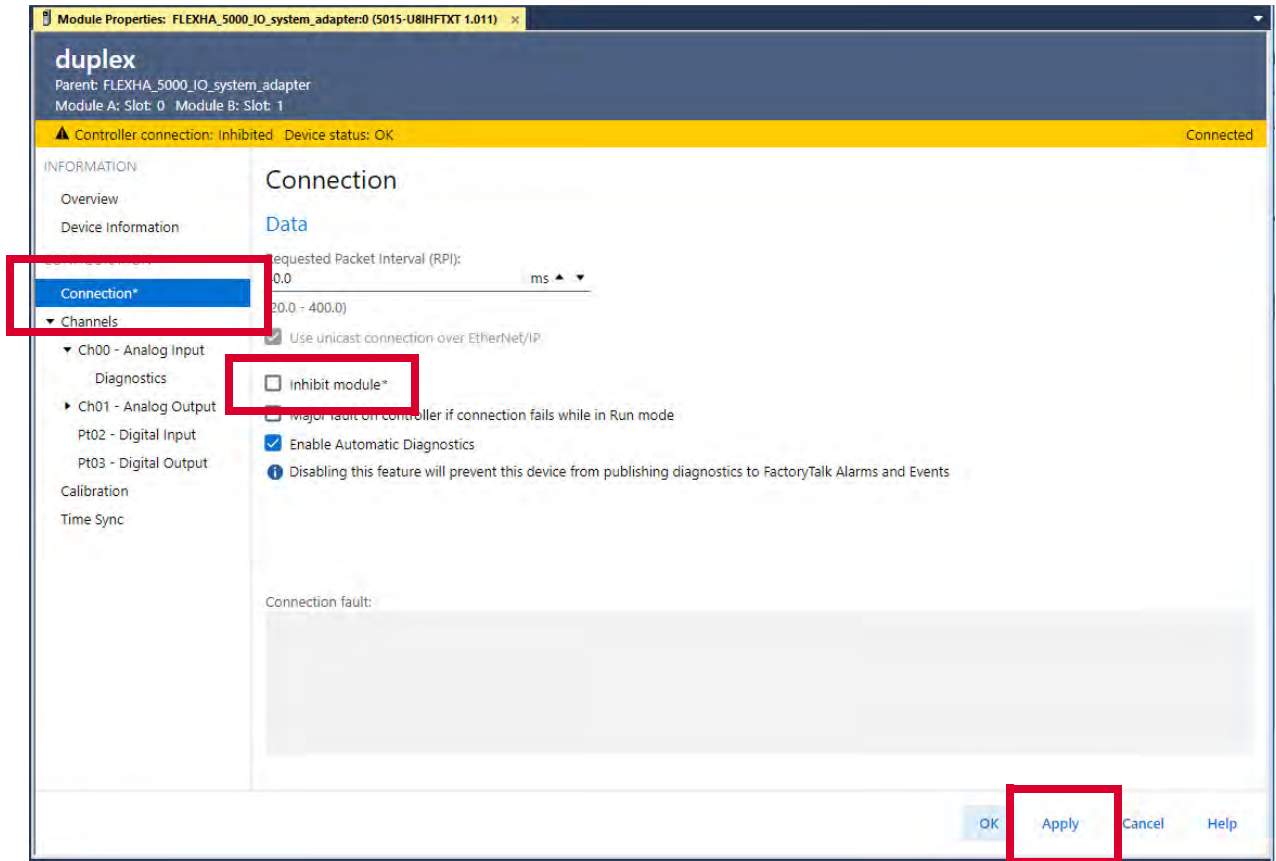
**Status**

Major fault: None  
Minor fault: None  
Internal state: Unconnected  
Configured: Configured  
Owned: No  
Device identity: Match  
Protection mode: None

Buttons: Refresh, Reset device, OK, Apply, Cancel, Help

d. Clear the Inhibit module checkbox, and click Apply.

When connection is re-established and normal operations resume, control resumes on all channels.



e. After the inhibit process, remove the I/O module with status indicators that are not powered. Those modules have a failed QTA diagnostic.

f. If necessary, install a new I/O module.

## Latches on BIM

BIMs lock onto the Adapter Base and I/O Bases via latches on the sides. They function in a manner that is similar to QTAs on other FLEXHA 5000 I/O system components.



The latches on the BIM must lock it in place before power-up or the BIM does not turn on. When the latches are locked, the BIM is locked mechanically and electrically and enabled for use.

At power-up, if the latches are locked, the BIM runs a diagnostic.

- If the diagnostic passes, the BIM turns on and begins normal operation.
- If the diagnostic fails, the BIM does not function. The BIM's MOD status indicator is red. If the MOD status indicator stays red for more than 15 seconds after full system power-up, replace the BIM.

During normal operation, this occurs:

- The system monitors the position of the BIM latches via a diagnostic. This monitoring is important because:
  - If either of the latches becomes unlocked, the BIM continues to function and the MOD status indicator remains green. If power is cycled before the latch is relocked, the BIM doesn't turn back on, and the status indicators stay off after the system power-up. Communication across that BIM's backplane ceases.
  - If both of the latches become unlocked, the BIM turns off and communication across that BIM's backplane ceases. For example, if BIM A turns off, communication across backplane A ceases.

Whenever communication on either backplane stops, fault tolerance is compromised until both BIMs are locked again and functioning properly. At that point, communication occurs on both backplanes.
- The BIM periodically runs the diagnostic. If the diagnostic fails for any reason, the application alerts you to the condition via the EtherNet/IP adapter status tag *S.Baseex.InterfaceInternalFault*.

---

**IMPORTANT** The EtherNet/IP adapter works here as proxy for the BIM diagnostics.

---

Backplane communication is unaffected. The next time power is cycled, the BIM might not turn on.

- If the BIM does turn on, the diagnostic might fail again, the MOD status indicator turns to red, and the BIM doesn't function.
- If the latches are locked and the BIM doesn't turn on, the BIM's MOD status indicator might stay off or might be red. If the MOD status indicator stays off or red for more than 15 seconds after full system power-up, replace the BIM.

## Removal and Insertion Under Power

Because the FLEXHA 5000 I/O system is constituted of individual components, you can remove and insert many components while the system is powered. These components support removal and insertion under power (RIUP).

- Power Conditioners
- EtherNet/IP adapters
- MLCs
- BIMs
- I/O modules
- I/O slot fillers
- SA Power RTB Filler
- End cap
- I/O Bases - You can insert an I/O Base under power if no components are installed. You cannot remove I/O Bases under power.
- Bank Expansion Bases

You must remove power before removing or inserting the remaining components in a FLEXHA 5000 I/O system.

If you use FLEXHA 5000 I/O systems in hazardous location, consider additional factors with respect to power connections before you remove components from the system. Some applications require that installed devices deplete their residual stored energy to specific levels before transporting it into or out of your application.

## Module Inhibiting

Module inhibiting lets you indefinitely suspend a connection between a ControlLogix 5580 controller and a FLEXHA 5000 EtherNet/IP adapter or I/O module without removing that component from the Logix Designer application project. You inhibit the connection on the Module Properties dialog box for the adapter or I/O module in your Logix Designer application project.

---

**IMPORTANT** If you inhibit the connection for the adapter, all of I/O modules that communicate through that adapter are inhibited as well.

---

You can use module inhibiting in these ways:

- You write configuration for the component but inhibit the component to prevent it from communicating with the controller. The controller doesn't establish a connection and the configuration is not sent to the component until the connection is uninhibited.
- A controller has already downloaded configuration to the component, and is exchanging data over the connection between them. In this case, you can inhibit the component and the connection is closed and communication stops.

You can use module inhibiting in these instances:

- You want to update an I/O module, for example, update the module firmware revision. Use this procedure.
  - a. Inhibit the module
  - b. Perform the update.
  - c. Uninhibit the module.
- You use a program that includes an I/O module that you don't possess. You don't want the controller to look for a module that doesn't yet exist. In this case, you can inhibit the module in your program until it physically resides in the proper slot.

---

**IMPORTANT** You cannot inhibit only one adapter in a FLEXHA 5000 I/O system. When you inhibit a connection to an adapter, the connection to the other adapter is also inhibited.

Nor can you inhibit one I/O module in a Duplex Pair. If you inhibit the connection, the connection is closed and communication stops from both I/O modules.

---

## Electronic Keying

Electronic Keying reduces the possibility that you use the wrong device in a FLEXHA 5000 I/O 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, digital 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.

The following Electronic Keying options are available.

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: <ul style="list-style-type: none"> <li>• Same catalog number</li> <li>• Same or higher Major Revision</li> <li>• Minor Revision as follows: <ul style="list-style-type: none"> <li>- If the Major Revision is the same, the Minor Revision must be the same or higher.</li> <li>- If the Major Revision is higher, the Minor Revision can be any number.</li> </ul> </li> </ul>
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. <b>IMPORTANT:</b> This option is not available for Safety applications. <b>ATTENTION:</b> Be extremely cautious when using Disable Keying; if used incorrectly, this option can lead to personal injury or death, property damage, or economic loss. We <b>strongly recommend</b> that you <b>do not use</b> 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.

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

<b>IMPORTANT</b>	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](#).

## Fault and Status Reporting

FLEXHA 5000 EtherNet/IP adapters and I/O modules report fault and status data to the ControlLogix 5580 controller. The data is reported via the module tags in your Logix Designer application project. The following are examples of fault and status data:

- Fault data - The *Ixx.Ch.Fault<sup>(a)</sup>* tag (analog input mode) or *Ixx.Fault<sup>(a)</sup>* (analog output, digital input, and digital output modes) in an I/O module's tags reports whether the channel data is accurate or not. If it is set to 0, the channel data is accurate. If it is set to 1, the channel data is inaccurate.
- Status data - The *I.RunMode* tag in an I/O module's tags reports whether the module is in Run mode. If it is set to 0, the module is idle. If it is set to 1, the module is running.

[Module Tags on page 195](#) lists the module tags that are available for FLEXHA 5000 EtherNet/IP adapters and I/O modules in a Logix Designer application project.

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(a) Where xx represents the channel number.

## FLEXHA 5000 I/O System Operation

This section provides an overview of how a FLEXHA 5000™ I/O system operates.

### Network Topologies

Use a FLEXHA 5000 I/O system in these redundant EtherNet/IP™ network topologies:

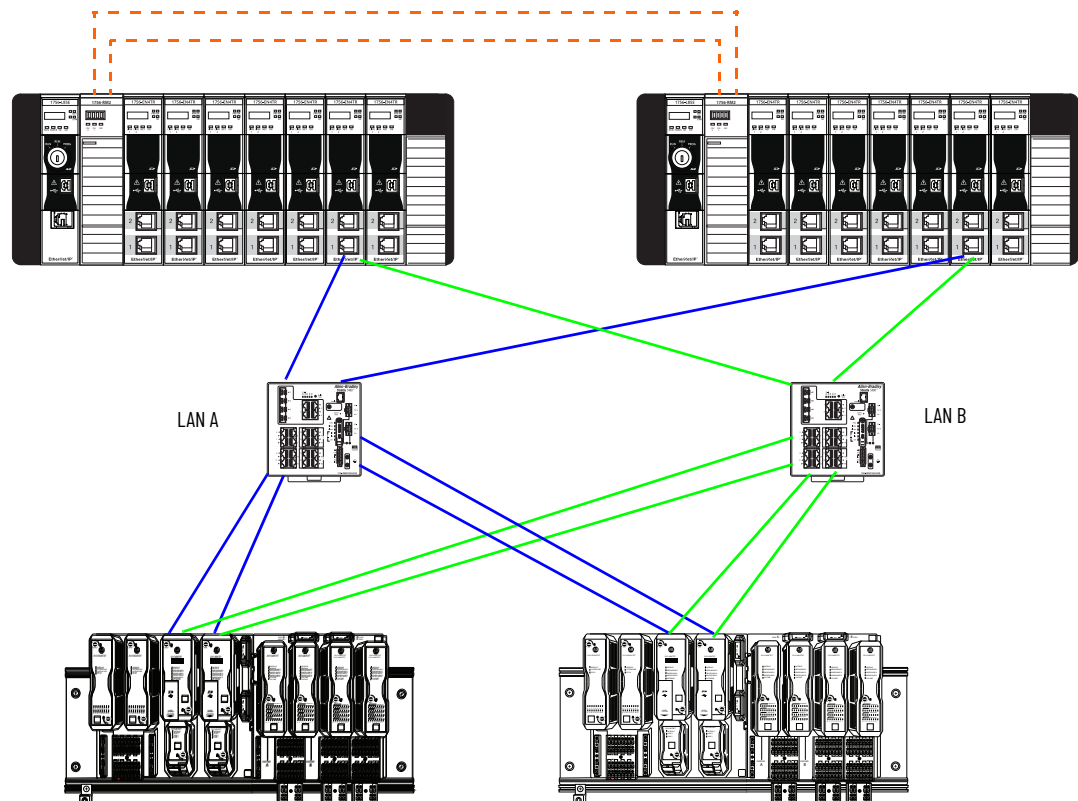
- Parallel Redundancy Protocol (PRP)
- Device Level Ring (DLR)

These topologies provide redundancy on the Data Link Layer of the standard OSI network model.

### PRP Topology

PRP provides high availability in Ethernet networks. To create seamless redundancy, PRP technology sends duplicate frames to two independent network infrastructures that are known as LAN A and LAN B. In this case, the first uncorrupted frame to reach the destination is used and the second duplicate frame is ignored.

Figure 26 - Example FLEXHA 5000 I/O System in High Availability System - PRP Topology



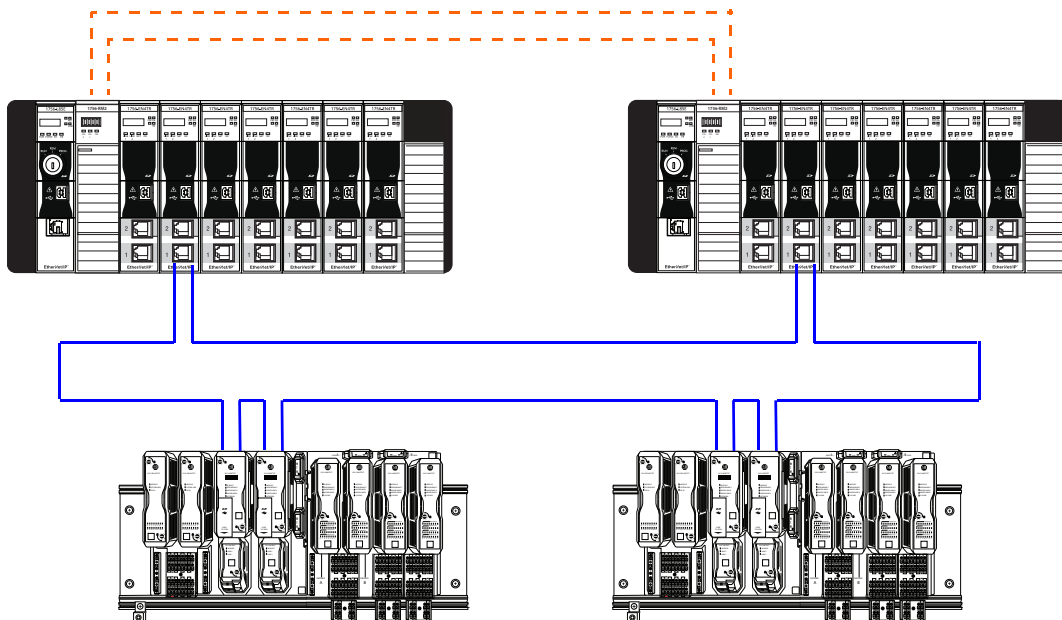
For more information on PRP, see the following:

- EtherNet/IP Parallel Redundancy Protocol Application Technology, publication [ENET-AT006](#)
- High Availability Systems Reference Manual, publication [HIGHAV-RM002](#)

## DLR Topology

A DLR topology provides a means to detect, manage, and recover from single faults in a ring-based network.

Figure 27 - Example FLEXHA 5000 I/O System in High Availability System - DLR Topology



You can't use FLEXHA 5000 I/O systems in indirect DLR, non-converged I/O network topologies. An indirect DLR, non-converged I/O network topology is similar to a direct DLR network topology except that the redundant controller chassis are not connected directly to the DLR network.

For more information on DLR, including indirect DLR, non-converged I/O network topologies, see the following:

- EtherNet/IP Device Level Ring Application Technology, publication [ENET-AT007](#)
- High Availability Systems Reference Manual, publication [HIGHAV-RM002](#)

## Redundant Backplanes

A FLEXHA 5000 I/O system uses redundant backplanes to transfer data and power. The redundancy exists on these parallel backplanes:

- Backplane A
- Backplane B

The use of redundant backplanes establishes fault tolerance. Each backplane supports separate but identical instances of the following:

- Data between the redundant EtherNet/IP adapters and I/O modules across both backplanes.

### IMPORTANT

Remember that [Figure 28](#) shows how the backplanes extend for data transmission. It does not show details about data transmission on each backplane.

Multiple packets are sent across each backplane. For more information on how data is transmitted across the redundant backplanes, see [Concurrent Communication](#).

- System power from redundant Power Conditioners across the redundant backplanes. For more information, see [Power a FLEXHA 5000 I/O System](#).

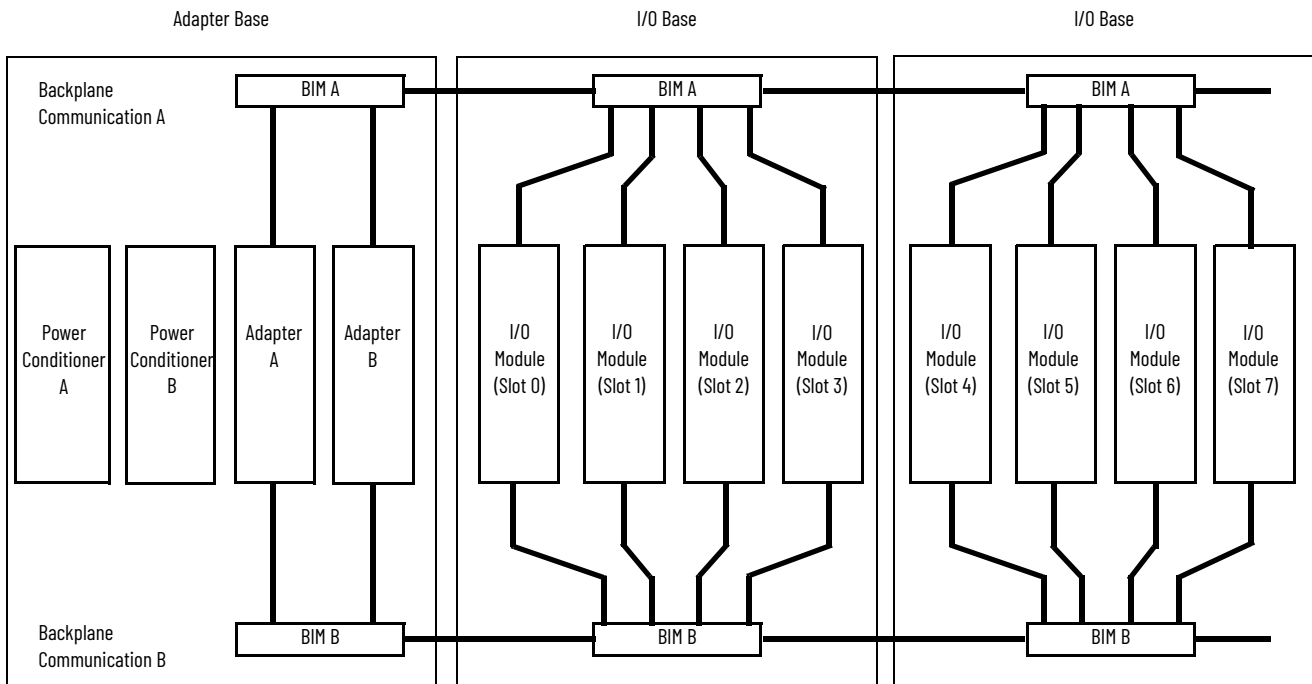
Fault tolerance exists because if one instance of either data or power fails, the other instance of data or power, respectively, lets the system continue to operate as desired.



**IMPORTANT** [Figure 28](#) is a conceptual representation of redundant backplanes A and B and how data is passed along the backplanes.

- The graphic shows Backplanes A and B in only the Adapter Bank. If I/O Banks are used, you must install Bank Expansion Bases and Backplane Extension cables.
- This does not describe how Concurrent Communication occurs in a FLEXHA 5000 I/O system. For more information on Concurrent Communication, see [Concurrent Communication](#).
- MLCs are connected to adapters but are not part of redundant backplanes.

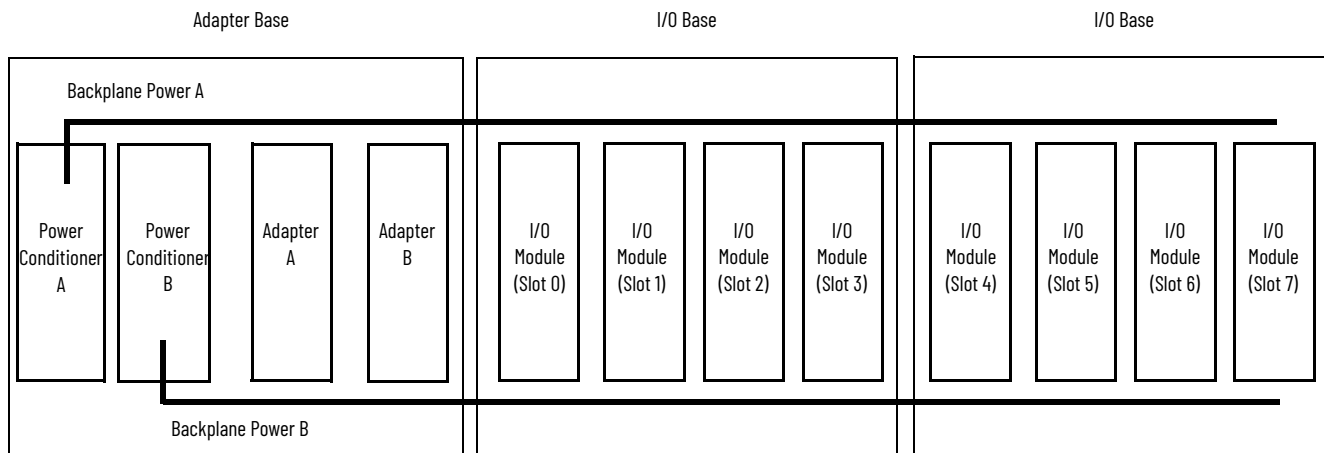
**Figure 28 - Redundant Backplanes A and B in a FLEXHA 5000 I/O System - Data Transmission**



**IMPORTANT** [Figure 29](#) is a conceptual representation of redundant backplanes A and B and how power is passed along the backplanes.

- This graphic shows Backplanes A and B in only the Adapter Bank. If I/O Banks are used, you must install Bank Expansion Bases and Backplane Extension cables.
- MLCs are connected to adapters but are not part of redundant backplanes.

Figure 29 - Redundant Backplanes A and B in a FLEXHA 5000 I/O System - Power Transmission



## Concurrent Communication

Concurrent communication provides for **seamless failover** for any redundant pair of hardware components.

With concurrent communication, data transmission between the ControlLogix® 5580 controllers and the FLEXHA 5000 I/O modules can be completely redundant at the logical and physical levels.

### IMPORTANT

You must configure a 1756-EN4TR EtherNet/IP communication module in each chassis of the ControlLogix redundant chassis that is dedicated to servicing concurrent communication.

For information on where to configure a 1756-EN4TR EtherNet/IP communication module in your Logix Designer application project, see [page 134](#).

## Logical Level

Concurrent communication uses one logical CIP™ connection with two legs to each pair of redundant devices. Duplicate copies of the I/O data are transmitted across both legs. That is, there is one duplicated packet for each redundant device.

Redundant ControlLogix 5580 controllers operate in parallel synchronizing the data. As a result, the same output values occur simultaneously. The controllers open the concurrent communication path to the FLEXHA 5000 I/O modules.

Via a 1756-EN4TR EtherNet/IP communication module, ControlLogix 5580 controllers send duplicate data to the FLEXHA 5000 I/O modules that work as a redundant pair.

Each duplicate is targeted for one of the FLEXHA 5000 I/O modules in the redundant pair. The paired I/O modules receive duplicate data, compare the data, and establish one signal value that is set on the terminal screws.

A similar pattern is followed for input data that is transmitted from the paired FLEXHA 5000 I/O modules to the redundant ControlLogix 5580 controllers. Both of the controllers and I/O modules process the same data in parallel. Consequently, a failure and dropout of one device does not require a switchover and synchronization of the partner device.

## Physical Level

During transmission, the duplicated data passes along physical connections from the 1756-EN4TR EtherNet/IP communication modules and the FLEXHA5000 EtherNet/IP adapter. Physical network redundancy is provided whether the system is operating in a PRP or DLR topology. Thus, the system has increased resiliency.

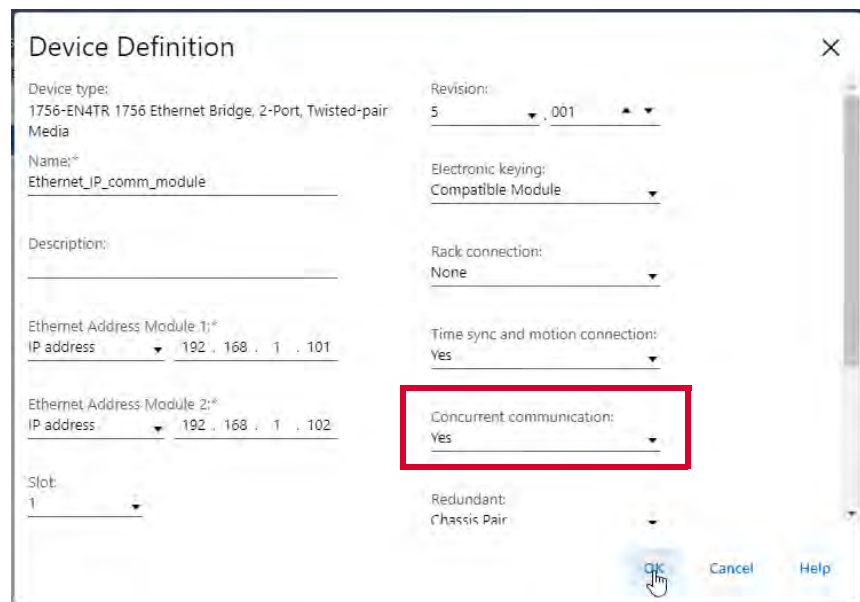
The physical network redundancy is achieved via redundant paths between the 1756-EN4TR EtherNet/IP communication module and the FLEXHA 5000 EtherNet/IP adapter as follows:

- PRP network - Duplicated data at the physical level for each path.
- DLR network - Providing redundant paths.

## Communication Module Configuration

To use concurrent communication with FLEXHA 5000 I/O modules, you must configure the 1756-EN4TR ControlLogix EtherNet/IP communication module on the Device Definition dialog box in your Studio 5000 Logix Designer® application project to use concurrent communication.

**Figure 30 - 1756-EN4TR Communication Module Configuration**



### IMPORTANT

You can configure the 1756-EN4TR EtherNet/IP communication module for concurrent communications, to use with I/O modules such as FLEXHA 5000 I/O modules. Or you can configure the 1756-EN4TR EtherNet/IP communication module for standard I/O, for example, remote 1756 ControlLogix I/O modules. You can only configure the module for one or the other.

If the 1756-EN4TR EtherNet/IP communication module is configured for concurrent communication, you can still use it for class 3 communications, for example, HMI, program upload/download/monitor.

You must disable IP address swapping in the 1756-EN4TR EtherNet/IP communication modules in the redundant chassis pair.

## Concurrent Communication in a PRP Topology

For illustrative purposes, this section shows how data is transmitted from one ControlLogix 5580 controller in a redundant controller pair to a duplex pair of FLEXHA 5000 I/O modules.

In this scenario, concurrent communication transmits data as follows.

1. The ControlLogix 5580 controller establishes concurrent communication to the 1756-EN4TR EtherNet/IP communication module in the same chassis.

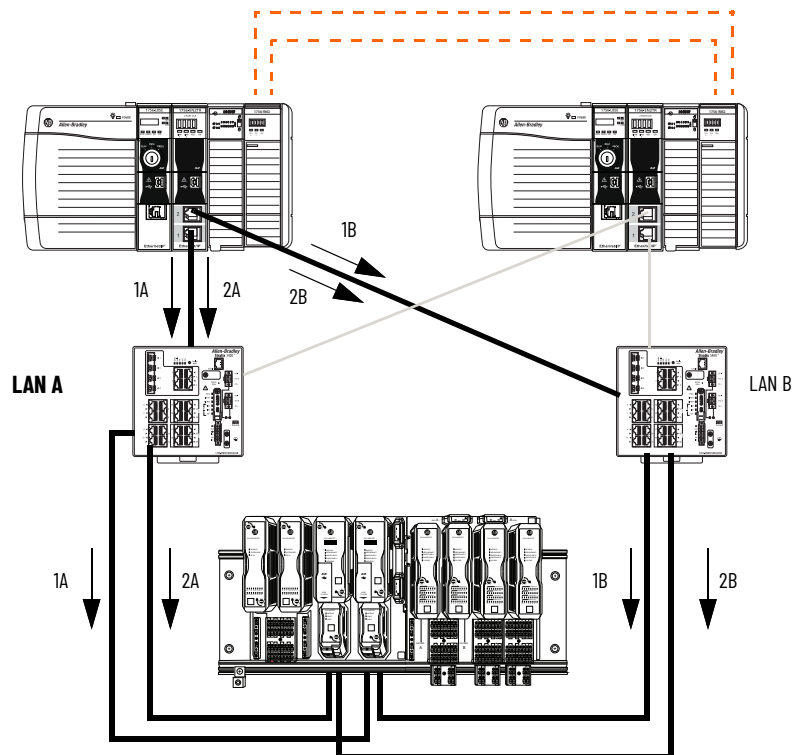
At this point, the communication is not redundant.

2. Redundant communication starts at the 1756-EN4TR EtherNet/IP communication module. The 1756-EN4TR EtherNet/IP communication module opens two legs of the concurrent communication and transmits duplicates of the data across those legs.

Additionally, the 1756-EN4TR EtherNet/IP communication module is connected to a redundant PRP network, that is, LAN A and LAN B. The PRP network redundancy introduces further data duplication.

- Numbers 1A and 2A represent the two legs of the concurrent communication on one physical cable between the 1756-EN4TR EtherNet/IP communication module and the LAN A switch.
  - Numbers 1B and 2B represent the physical duplication of the two legs of the concurrent communication between the 1756-EN4TR EtherNet/IP communication module and the LAN B switch.
3. Duplicate data is transmitted across the two legs, and physical duplication of these legs, to the FLEXHA 5000 EtherNet/IP adapters.

**Figure 31 - Concurrent Communication - PRP Topology**



This section expands on the previous section to show that the same data is transmitted from the secondary ControlLogix 5580 controller in the redundant controller pair to the duplex pair of FLEXHA 5000 I/O modules. Data is transmitted from the secondary controller based on the logic state cross loaded from the primary controller.

In this scenario, concurrent communication transmits data as follows.

1. The ControlLogix 5580 controller establishes concurrent communication to the 1756-EN4TR EtherNet/IP communication module in the same chassis.

At this point, the communication is not redundant.

2. Redundant communication starts at the 1756-EN4TR EtherNet/IP communication module. The 1756-EN4TR EtherNet/IP communication module opens two legs of the concurrent communication and transmits duplicates of the data across those legs.

Additionally, the 1756-EN4TR EtherNet/IP communication module is connected to a redundant PRP network, that is, LAN A and LAN B. The PRP network redundancy introduces further data duplication.

- Numbers 1B' and 2B' represent the two legs of the concurrent communication on one physical cable between the 1756-EN4TR EtherNet/IP communication module and the LAN B switch.
  - Numbers 1A' and 2A' represent the physical duplication of the two legs of the concurrent communication between the 1756-EN4TR EtherNet/IP communication module and the LAN A switch.
3. Duplicate data is transmitted across the two legs, and physical duplication of these legs, to the FLEXHA 5000 EtherNet/IP adapters.

**Figure 32 - Concurrent Communication - PRP Topology (continued)**

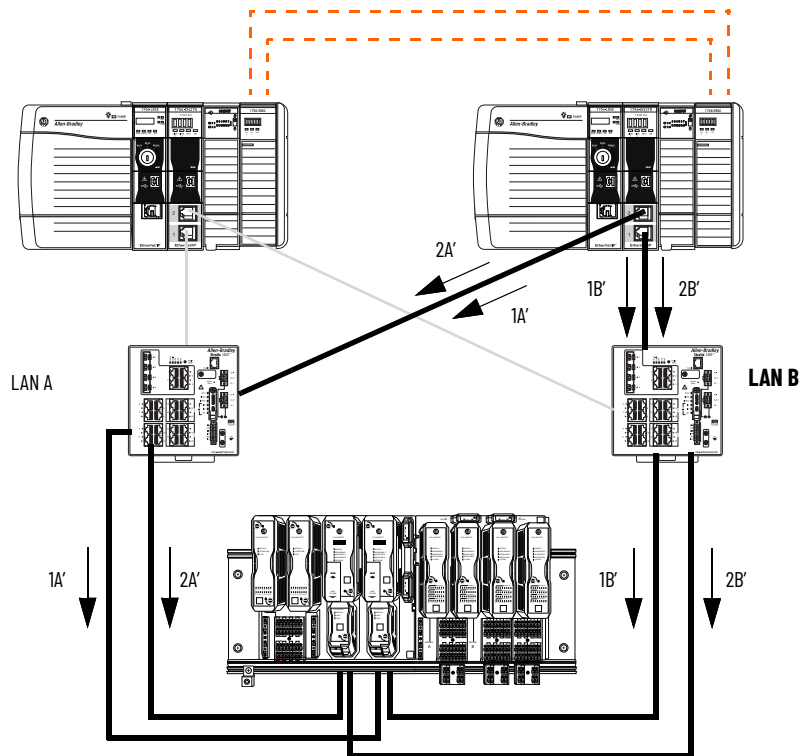
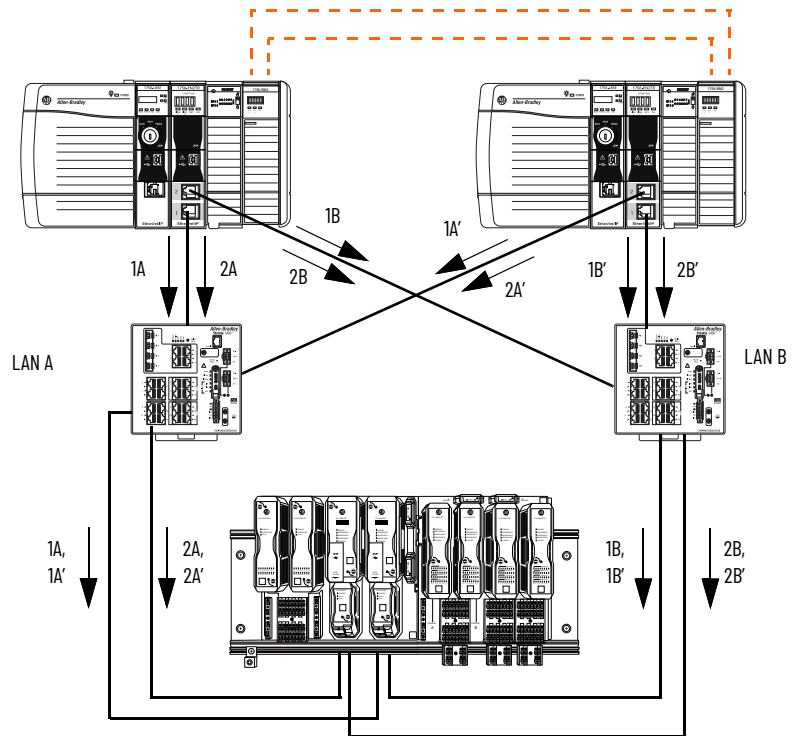


Figure 33 shows how duplicate data is transmitted from each controller across LANs A and B, respectively, simultaneously. That is, this shows what is happening when you consider both of the previous sections.

Figure 33 - Concurrent Communication in PRP Topology



Remember the following:

- Each 1756-EN4TREtherNet/IP communication module in the redundant chassis pair sends duplicated data on each LAN simultaneously.
- Data with the similar designations, for example, 1A and 1A', are the same but from different controllers with the only difference being a small identifier. In this case, it is the prime (') designation.

This occurs because the controllers work as a redundant pair that is synchronized via ControlLogix Redundancy Modules.

- All data transmission starts simultaneously. The duplicated data that reaches the adapters first is what's used in the FLEXHA 5000 I/O system. The other data is disregarded.

When duplicate data arrives at a FLEXHA 5000 EtherNet/IP adapter, the adapter combines the PRP duplicates and accepts the first uncorrupted PRP duplicate. The second PRP duplicate is rejected.

So from each pair of data duplicates 1A/1B, 2A/2B and 1A'/1B', 2A'/2B' become only 1/1', 2/2'.

The FLEXHA 5000 I/O adapters combine the concurrent communication legs' duplicates and only accept the first valid duplicates from the pair of 1/1' and 2/2'. After that, each adapter only processes the single packet.

The FLEXHA 5000 EtherNet/IP adapters then function in the same way as the 1756-EN4TREtherNet/IP communication modules. The FLEXHA 5000 EtherNet/IP adapter transmits duplicated data across two legs of the concurrent communication to the FLEXHA 5000 I/O modules.

Additionally, the backplane physical redundancy establishes additional duplication of the data, in a similar way to how the PRP does it for the network. Each adapter transmits four identical data packets, one to each of two I/O modules across each of the two redundant backplanes.

Figure 34 presents the idea of concurrent backplane communication. Numbers 1, 1' and 2, 2' represent the concurrent connection duplicates. Postfixes A and B are related to physical duplication.

The I/O modules receive repeated data packets. The physical redundancy layer of the slot 0 I/O module combines the duplicates and accepts the first uncorrupted duplicate of 1A, 1B to 1 and 1A', 1B' to 1'. The concurrent communication layer combines the duplicates, accepting the first uncorrupted packets. The 1 and 1' is reduced to 1.

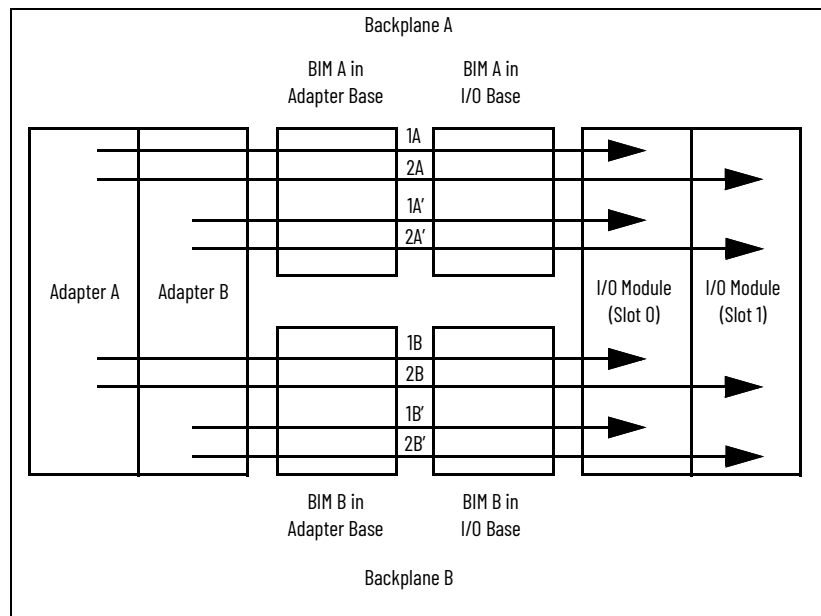
The slot 1 I/O module executes an identical process. The redundant data are reduced to a single instance, that is, 2.

Once one or both I/O modules receive valid data, the data is applied to the terminal.

Figure 34 - Data Transmission in FLEXHA 5000 I/O System

**IMPORTANT:** This graphic shows how data is transmitted from FLEXHA 5000 EtherNet/IP adapters to the I/O module duplex pair. Remember, only one packet is selected per adapter from the network. From there the adapters distribute that packet information as shown.

Adapter	Transmits Across	Number of Data Packets	
		I/O Module (Slot 0)	I/O Module (Slot 1)
A	BIM A/ Backplane A	1	-
	BIM B/ Backplane B	-	1
B	BIM A/ Backplane A	1	-
	BIM B/ Backplane B	-	1
<b>Number of instances of the same data received: 8</b>		4	4



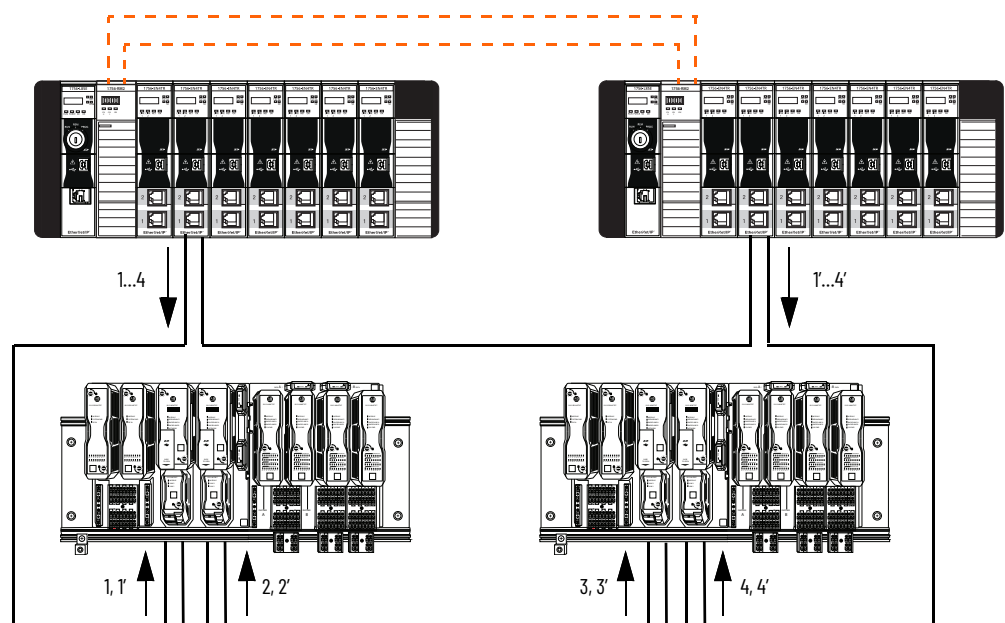
## Concurrent Communication in a DLR Topology

A DLR topology provides a means to detect, manage, and recover from single faults in a ring-based network. [Figure 35](#) shows a DLR network in which redundant ControlLogix 5580 controllers provide HA when they are connected to FLEXHA 5000 I/O systems in a DLR network.

In this scenario, concurrent communication transmits data as follows.

1. The ControlLogix 5580 controller establishes concurrent communication to the 1756-EN4TR EtherNet/IP communication module in the same chassis. At this point, the communication is not redundant.
2. The 1756-EN4TR EtherNet/IP communication module then transmits duplicate data across two legs of the concurrent communication to the FLEXHA 5000 EtherNet/IP adapters. Numbers 1...4 and 1'...4' represents four concurrent communications opened to four I/O modules in two pairs in two separate chassis (1, 2 and 3, 4). Each of these communications has two redundant legs. All this occurs on single cable.

**Figure 35 - Example FLEXHA 5000 I/O System in High Availability System - DLR Topology**



When duplicate data arrives at the FLEXHA 5000 EtherNet/IP adapters, the adapters combine concurrent communication leg duplicates, accepting only the first valid duplicates from the pair—in the first chassis 1/1' and 2/2', and in the second chassis 3/3' and 4/4'.

After that, each adapter only processes the single packet that is targeted for every I/O module in the chassis. It is packets 1 and 2 in first chassis. Packet 1 is targeted to the first I/O in the redundant I/O module pair. Packet 2 is targeted to the second I/O in the redundant IO module pair.

The FLEXHA 5000 EtherNet/IP adapters then function in the same way as the 1756-EN4TR EtherNet/IP communication modules. The FLEXHA 5000 EtherNet/IP adapters transmit duplicated data across two legs of the concurrent communication to the FLEXHA 5000 I/O modules.

Additionally, the backplane physical redundancy establishes additional duplication of the data in a similar way to how the PRP does it for the network. Each adapter transmits four identical data packets, one to each of two I/O modules across each of the two redundant backplanes.



Figure 36 presents the idea of concurrent backplane communication. Numbers 1, 1' and 2, 2' represent the concurrent connection duplicates. Postfixes A and B are related to physical duplication.

The I/O modules receive repeated data packets. The physical redundancy layer of the slot 0 I/O module combines the duplicates and accepts the first uncorrupted duplicate of 1A, 1B become 1. Also, 1A', 1B' become 1'. The concurrent communication layer combines the duplicates, accepting the first uncorrupted packets. The 1 and 1' become 1.

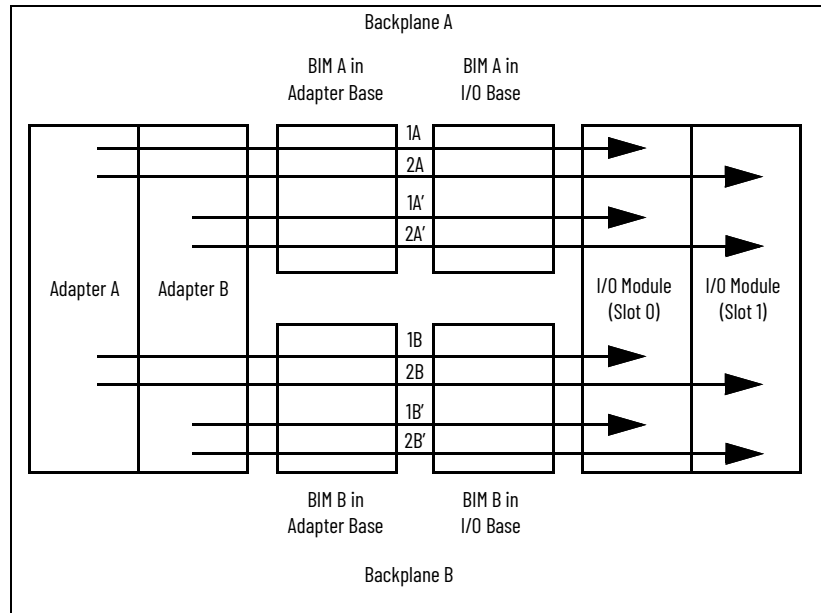
The slot 1 I/O module executes an identical process. The redundant data are reduced to a single instance, that is, 2.

Once one or both I/O modules receive valid data, the data is applied to the terminal.

Figure 36 - Data Transmission in Each FLEXHA 5000 I/O System

**IMPORTANT:** This graphic shows how data is transmitted from FLEXHA 5000 EtherNet/IP adapters to the I/O module duplex pair. Remember, only one packet is selected per adapter from the network. From there the adapters distribute that packet information as shown.

Adapter	Transmits Across	Number of Data Packets	
		I/O Module (Slot 0)	I/O Module (Slot 1)
A	BIM A/ Backplane A	1	-
	BIM B/ Backplane B	-	1
B	BIM A/ Backplane A	1	-
	BIM B/ Backplane B	-	1
<b>Number of instances of the same data received: 8</b>		4	4



## Power a FLEXHA 5000 I/O System

There are two aspects to power a FLEXHA 5000 I/O system, the types of power and the components that you use to deliver that power.

A FLEXHA 5000 I/O system uses these power types:

- MOD Power
- SA Power

---

**IMPORTANT** SELV/PELV power supplies are required for both MOD power and SA power.

---

### MOD Power

MOD power is required in a FLEXHA 5000 I/O system. It powers the system operations.



If you cycle power on a Power Conditioner three times to clear a fault and it still doesn't clear, the Power Conditioner experiences a major nonrecoverable fault (MNRF), and you must replace it.

Separate power supplies provide redundant power to the Power Conditioners. Connect one power supply to the MOD Power RTB A and the other to MOD Power RTB B. We recommend that you use the 1606-XLE240ECRZ power supply for MOD power. Feed each power supply with a separate AC source to maintain redundancy in the event of an AC power failure.

For more information on the power supply, see the 1606-XLE240ERZ and 1606-XLE240ECRZ Power Supply Installation Instructions, publication [1606-IN041](#).

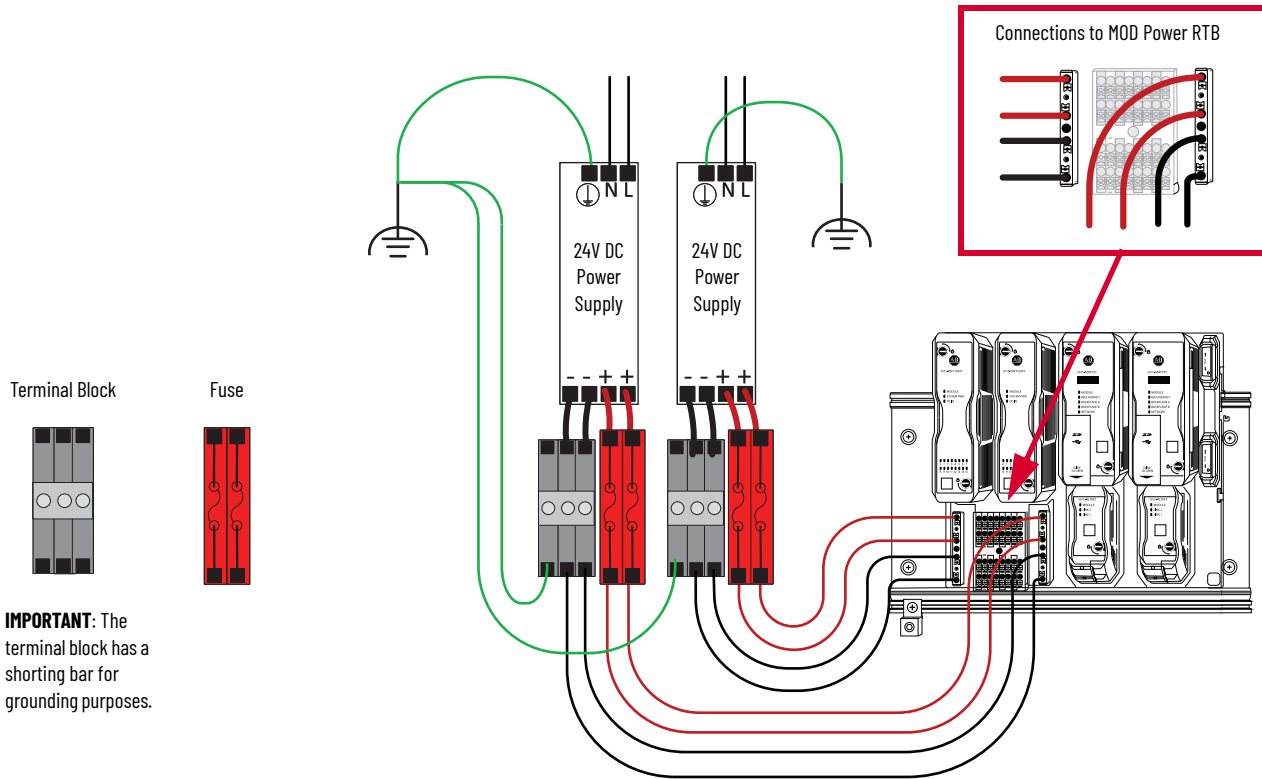
One MOD power connection should be capable of supplying 5.8 A at 20.8...28.8 V DC SELV/PELV for a fully populated system. Fault voltage must be limited to 32 V DC. Thus, either MOD power connection can provide enough power in the event the other MOD power connection fails, and the system can continue to operate as expected.

Power Conditioners are installed on the Adapter Base. Each Power Conditioner derives a conditioned **backplane power** bus from one MOD power connection, to maintain HA if one failure occurs. The backplane power is also known as system power.

Backplane power extends from MOD Power RTB A across backplane A. Backplane power extends across backplane B.

For more information on how to connect MOD power to a FLEXHA 5000 I/O system, including wire specifications, see the FLEXHA 5000 I/O System Installation Instructions, publication [5015-IN001](#).

Figure 37 - MOD Power Connected to FLEXHA 5000 I/O System

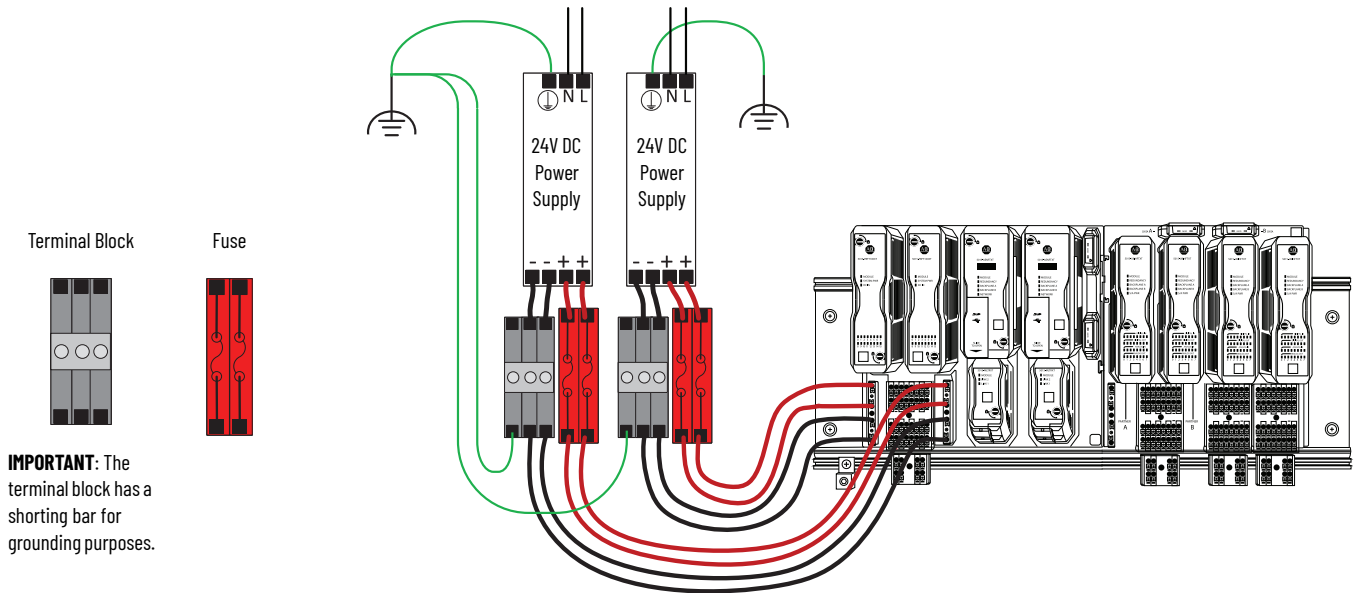


The FLEXHA 5000 I/O system has redundant continuous backplanes, that is, A and B. The backplane power buses extend from the Power Conditioners to the last I/O module in the system. This is the case no matter how many banks exist.

### Backplane Power in a Single Bank

Figure 38 shows backplane power in a FLEXHA 5000 I/O system that only uses an Adapter bank.

Figure 38 - Backplane Power in the Adapter Bank

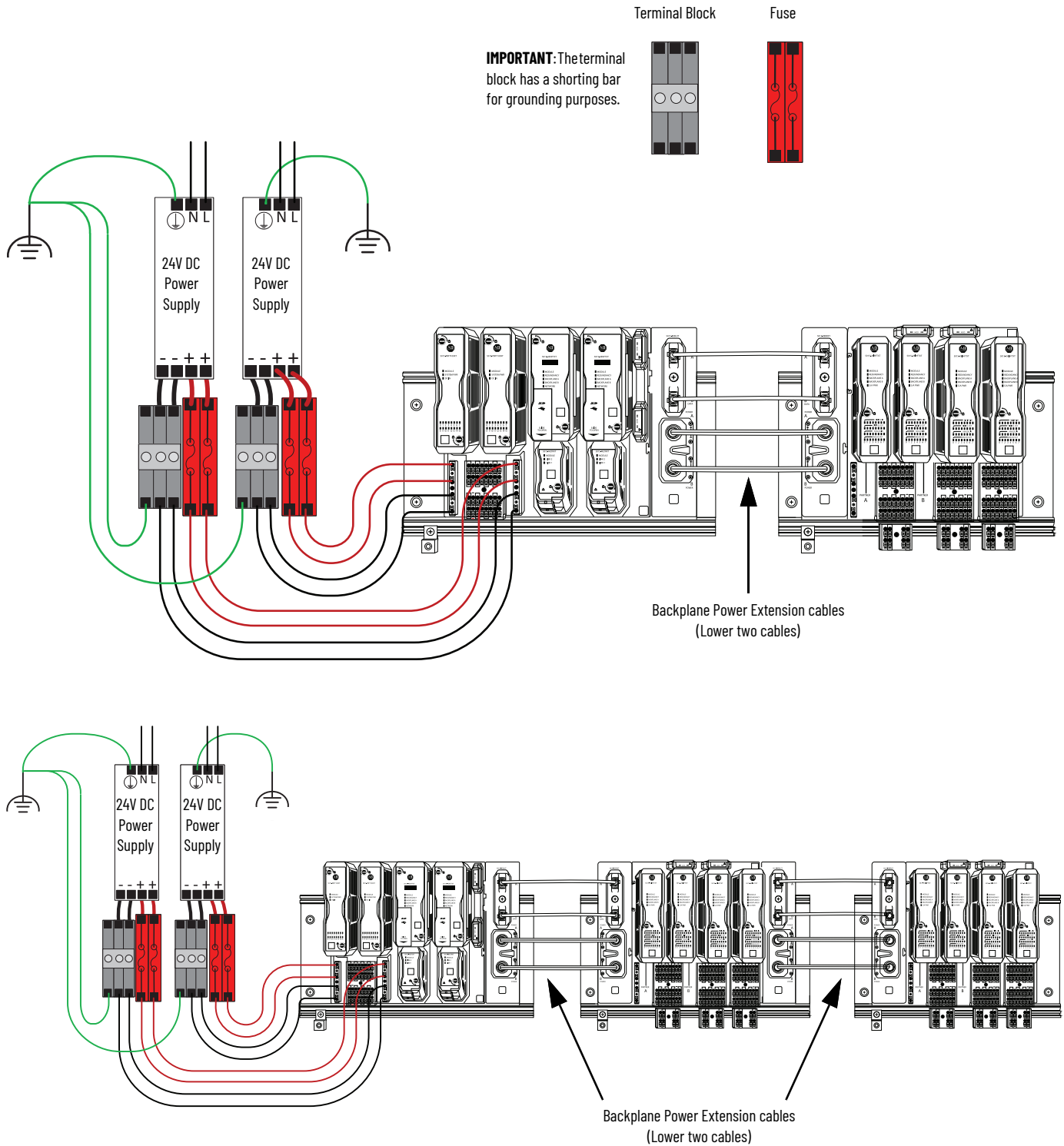


### Pass Backplane Power Across Multiple Banks

The passage of backplane power is not limited to the Adapter Bank. These examples show how backplane power passes along a FLEXHA 5000 I/O system with system power buses that extend across multiple banks.

This example requires a Bank Expansion Base, Left, in the Adapter Bank and a Bank Expansion Base, Right, in the I/O Bank. The Bank Expansion Bases are connected via Backplane Extension cables (Power and Communication). The Adapter Bank can include an I/O Base or not include an I/O Base.

**Figure 39 - Backplane Power Extended To I/O Banks**



## SA Power

SA power is field-side power that is connected to I/O Bases. It powers devices that are connected to the I/O modules.

Use the following to connect SA power to an I/O Base:

- Two 24V DC power supplies - We recommend that you use the 1606-XLE480ECRZ power supplies. Feed each power supply with a separate source of AC power.  
For more information on the power supply, see the 1606-XLE480ERZ and 1606-XLE480ECRZ Power Supply Installation Instructions, publication [1606-IN049](#).
- Field Power Redundancy Devices (FPRD) - We recommend that you use the 1606-XLERED20Y FPRDs in parallel redundant configuration.  
For more information on the power supply, see the 1606-XLERED20Y Power Supply Installation Instructions, publication [1606-IN072](#)  
FPRDs are redundancy modules that you use to build redundant power supply systems. In a FLEXHA 5000 I/O system, two external power supplies are connected to each FPRD. Connect each FPRD to a dedicated fuse that supplies current to the SA Power RTB on the left side of an I/O Base.
- Terminal blocks - We recommend that you use 1492 products.  
For more information, see <https://www.rockwellautomation.com/en-us/products/hardware/allen-bradley/connection-devices/terminal-blocks.html>.
- Fuses - Your application specifics, such as the wire gauge that is used and the size of your system, dictate the fuse that you use.  
We recommend that you use 1492 products. For more information, see <https://www.rockwellautomation.com/en-us/products/hardware/allen-bradley/connection-devices/terminal-blocks.html>.

You install an SA Power RTB on the left side of the I/O Base before you connect SA power. SA power starts at the power RTB and is distributed to the I/O modules that are installed on the I/O Base across an SA power bus. Each I/O module draws power as needed, and the remaining power passes along the rest of the I/O Base.

We recommend that you connect two FPRDs to an SA Power RTB to provide SA power. You can extend SA power from one I/O Base to the next and the SA power bus continues across the next set of I/O modules.

Extend an SA Power bus via either of the following:

- SA Power Jumper between I/O Bases
- A pair of SA Power RTBs that are installed directly next to each other in separate I/O Bases and wired together. In this case, one SA Power RTB is installed at the right side of an I/O Base and the second is installed on the left side of the next I/O Base.

You can also use external power supplies and FPRDs to establish a new SA power bus on the next I/O Base.

The total continuous current draw across an SA power bus must not be more than 20 A, max, at 20.8...28.8V DC SELV/PELV; the fault voltage must be limited to 32V DC.

---

**IMPORTANT** Do not connect the SELV/PELV power that is connected to an I/O Base to anything else in the FLEXHA 5000 I/O system or anything external to the FLEXHA 5000 I/O system.

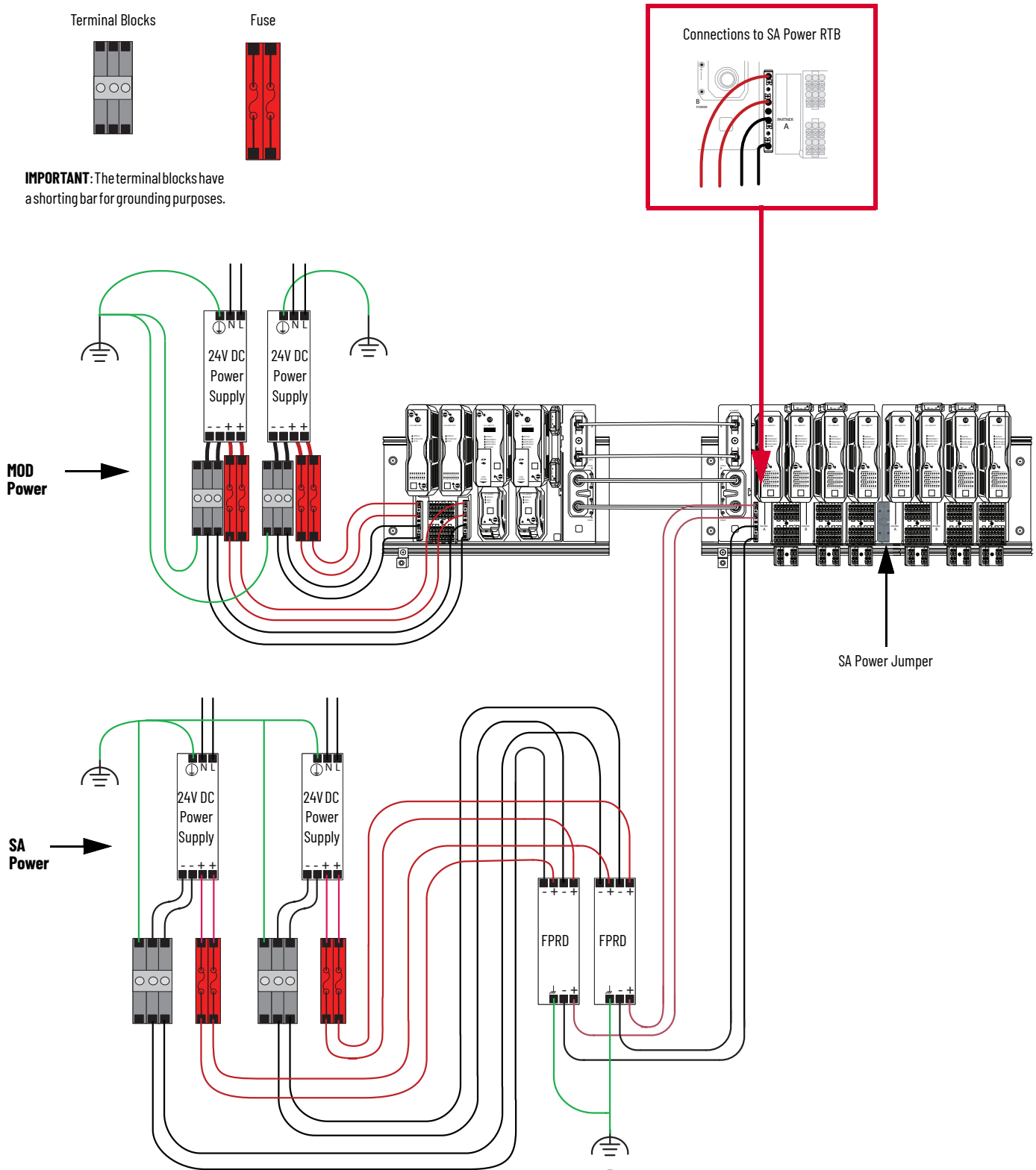
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For more information on how to connect SA power to a FLEXHA 5000 I/O system, including wire specifications, see the FLEXHA 5000 I/O System Installation Instructions, publication [5015-IN001](#).

### SA Power in System That Extends the SA Bus Via an SA Power Jumper

This example shows how to wire SA power to an I/O bank in which the SA Power bus is extended from one I/O Base to the next by using an SA Power Jumper.

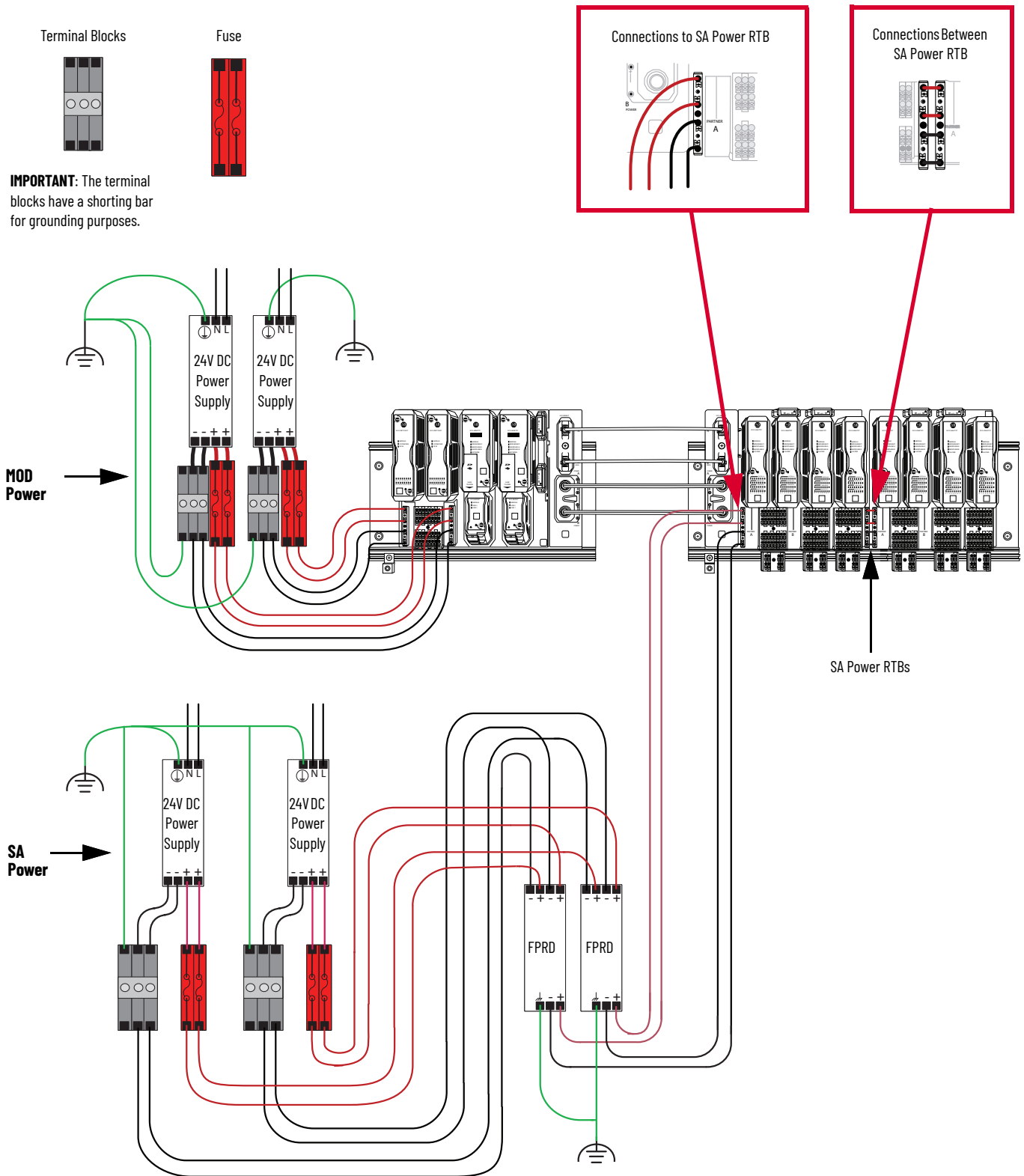
Figure 40 - SA Power Jumpered Across I/O Bases Via Jumper



Wire SA Power in System with That Extends the SA Bus Via Adjacent SA Power RTBs

This example shows how to wire SA power to an I/O bank in which the SA Power bus is extended from one I/O Base to the next by using two adjoining SA Power RTBs. One SA Power RTB is installed on the right side of the first I/O Base. Another SA Power RTB is installed on the left side of the second I/O Base.

Figure 41 - SA Power Jumped Across I/O Bases Via RTBs

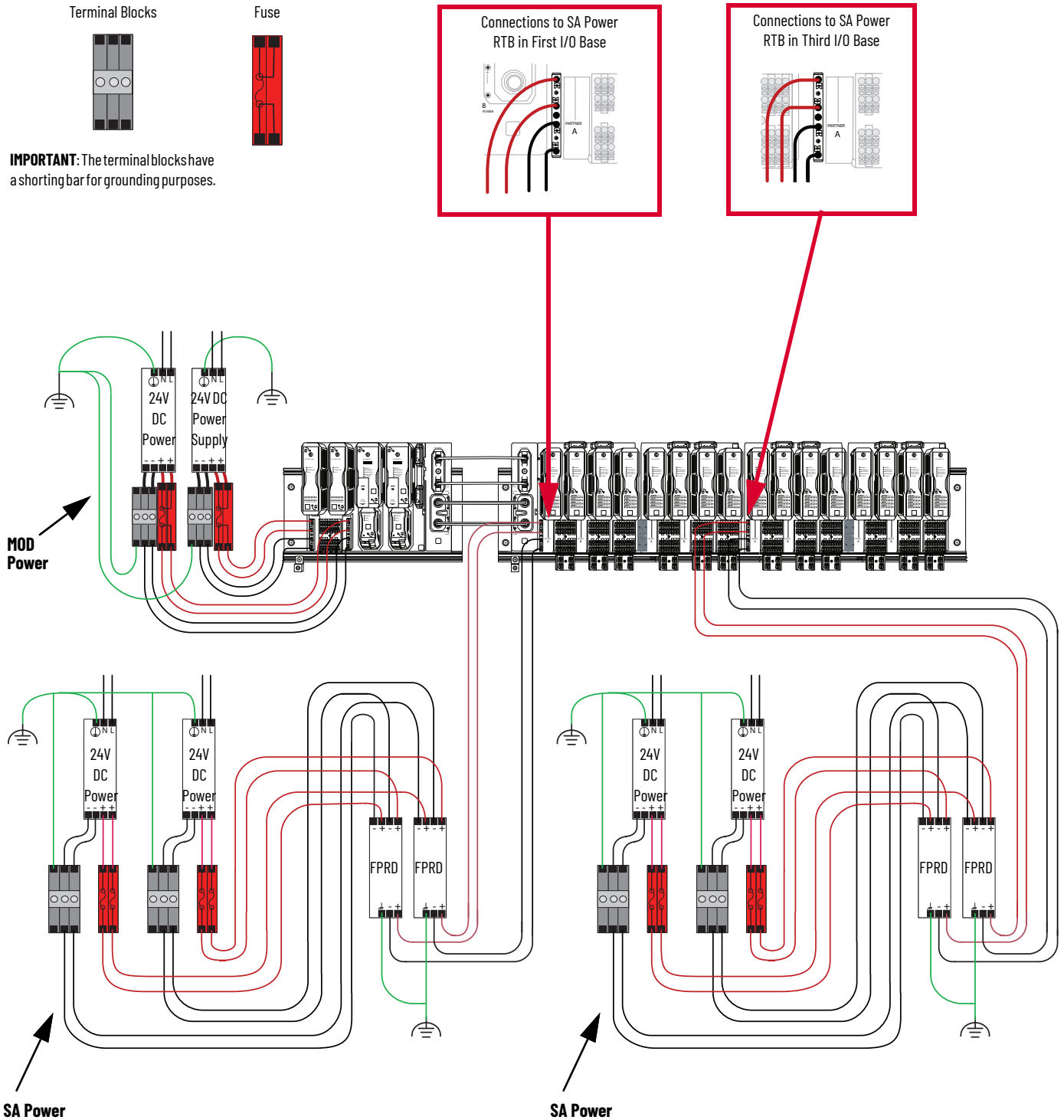




### Wire SA Power On Separate Banks

This example shows how to wire SA power on separate banks. The system has individually fused SA buses. The example requires two pairs of redundant power supplies and FPRDs to make sure there is no current overdraw on either SA Power bus.

Figure 42 - SA Power Without Jumping Power From One Base to Another - Example Two



**Notes:**

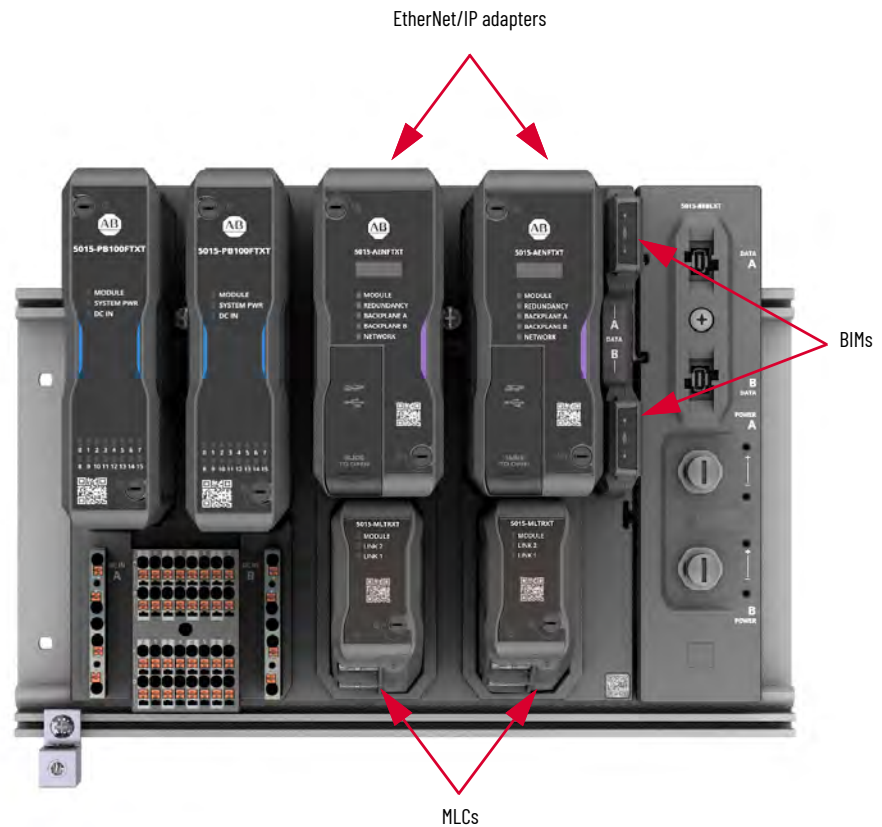
## FLEXHA 5000 I/O System EtherNet/IP Communication Overview

The FLEXHA 5000™ I/O system communicates with other devices, such as ControlLogix® EtherNet/IP™ 1756-EN4TR EtherNet/IP communication modules, over EtherNet/IP network via redundant network hardware.

The following hardware is installed in the Adapter Base to facilitate network communication between the FLEXHA 5000 I/O system and devices on an EtherNet/IP network:

- Redundant EtherNet/IP adapters
- Redundant MLCs (one per adapter)
- Redundant BIMs in the Adapter Base

Figure 43 - EtherNet/IP Communication in a FLEXHA 5000 System



## EtherNet/IP Adapters in High Availability System

The EtherNet/IP adapters function as a Redundant Adapter Pair in a FLEXHA 5000 I/O system. The Redundant Adapter Pair facilitate communication between the FLEXHA 5000 I/O system and other devices across an EtherNet/IP network.

Two adapters, that is, A and B, reside in the Adapter Base. They facilitate communication between the FLEXHA 5000 I/O system and other devices, such as ControlLogix 1756-EN4TR EtherNet/IP communication modules, on an EtherNet/IP network.

As described on [page 11](#), a FLEXHA 5000 I/O system is a fault-tolerant I/O system that you can use with High Availability (HA) controllers, that is, ControlLogix 5580 controllers, to eliminate single points of failure in an industrial automation control system (IACS).

The following are required in a FLEXHA 5000 I/O system to achieve HA:

- Adapter Base
- Redundant EtherNet/IP adapters
- Redundant Power Conditioners
- Redundant MLCs
- Redundant BIMs on Adapter Base
- I/O Base(s)
- Redundant BIMs on I/O Base
- User-defined number of I/O module pairs



You can install a maximum of four I/O modules, that is, two sets of I/O module duplex pairs, in an I/O Base.

The components that are listed above are described in Chapter 1, [FLEXHA 5000 I/O System EtherNet/IP Communication Overview](#).

The redundant adapters participate in the HA architecture as follows:

1. Each of two ControlLogix 5580 controllers send data packets to adapters via 1756-EN4TR EtherNet/IP communication modules, network hardware.
2. The EtherNet/IP adapters use concurrent communication, described on [page 50](#), and physical redundancy, to send multiple, identical data packets across redundant backplanes to the I/O module duplex pair.
3. Redundant BIMs, that is, BIM A and BIM B, facilitate sending duplicate data packets to the I/O modules.
4. The first data packet to reach an I/O module is accepted. The duplicates of the same data packet are ignored, as long as the first data packet is valid and uncorrupted.

There is no time lag if one of the network paths or network devices fails to deliver its data packet. Another duplicated frame is accepted. Thus, there is no switchover time in a FLEXHA 5000 I/O system.

A FLEXHA 5000 I/O system can use these levels of redundancy:

- **Logical level** - Two ControlLogix 5580 controllers in separate chassis are connected to the FLEXHA 5000 I/O module duplex pair via 1756-EN4TR EtherNet/IP communication modules and the FLEXHA 5000 EtherNet/IP adapters by using concurrent communication over the network.  
For more information, see [Concurrent Communication on page 50](#).
- **Physical level** - While DLR offers a means of physical redundancy, we recommend PRP when you want the highest level of physical network redundancy without switchover time at the physical layer if a fault occurs.

For this reason, in a fully redundant logical and physical configuration, each data packet is multiplied by a factor of eight. The logical configuration represents the use of concurrent communication, and the physical configuration represents the use of components in a PRP topology.

This design helps prevent one point of failure causing loss of control. For example, failure at an EtherNet/IP adapter or controller doesn't cause a loss of control. Control is only lost if the second device of the same type fails when the first device is still faulted.

## Adapter Configuration

FLEXHA 5000 EtherNet/IP adapters require these configurations:

- Set the IP addresses - Set the IP address for the adapter A and then use an IP address that is incremented by one for adapter B. For example, if adapter A uses address 192.168.1.10, adapter B must use 192.168.1.11.  
For more information, see [IP Address and Network Mode on page 115](#).
- Set the Network Mode via a rotary switch - The adapters' Network Mode setting must match each other and the network type in which they reside.  
For more information, see [IP Address and Network Mode on page 115](#).
- Configure the adapter in the Logix Designer application project - The adapters' configuration in the Logix Designer application project must match.  
For more information, see Chapter 6, [Configure the FLEXHA 5000 I/O System on page 125](#)

## Requested Packet Interval

The Requested Packet Interval (RPI) is a configurable parameter that defines a rate at which the controller and the adapter exchange adapter status information.

Set the RPI value during initial module configuration and adjust it as necessary after adapter operation has begun. Valid RPI times are 25...750 ms.

To avoid interrupting control, adjust the RPI value when the controller is in Program mode.

## Redundant Adapter Pair

At power-up, the adapters try to establish the Redundant Adapter Pair. Once the pair is established, both adapters can open I/O connections and bridge the I/O packets.

If one of the adapters is later removed or faults, the other adapter continues to bridge the I/O packets. If the adapter has faulted, we recommend that you correct the fault as soon as possible to re-establish redundancy operation.

When the fault is corrected, the adapters try to pair again. When they are successful then both adapters open and bridge I/O traffic.

### Redundant Adapter Pair Device State

When attempting to establish a Redundant Adapter Pair, adapters achieve one of the states that are described in [Table 6 on page 70](#).

**Table 6 - FLEXHA 5000 Adapters - Redundant Adapter Pair Device State**

State Name	Adapter Behavior	Redundancy Status Indicator
Able to Control, Partner is missing	The EtherNet/IP adapter in this state can bridge the I/O traffic. The EtherNet/IP adapter in the "Able to Control" state can't communicate with the other adapter over the backplane. The other adapter is missing or faulted.	Green - Adapter that is Able to Control
Able to Control, Partner is Not Able to Control	The EtherNet/IP adapter in this state can bridge the I/O traffic. The Partner can't open the I/O traffic. Two EtherNet/IP adapters are connected and are trying to establish the Redundant Adapter Pair. This state can be permanent when the Partner EtherNet/IP adapter does not meet the conditions that are needed to pair with the Able to Control adapter. The EtherNet/IP adapter in the Not Able to Control state can't become the Able to Control even if the current Able to Control adapter fails.	<ul style="list-style-type: none"> <li>Green - Adapter that is Able to Control</li> <li>Flashing red - Adapter Partner that is Not Able to Control</li> </ul>
Both Able to Control	Both EtherNet/IP adapters in this state can bridge the I/O traffic. Two EtherNet/IP adapters are connected and successfully paired. <b>IMPORTANT:</b> If one of the adapters in the Both Able to Control state is disconnected from the network, for example, due to cable breaks, then the disconnected adapter enters the Not Able to Control state. The connected adapter then becomes Able to Control, Partner is missing, or Able to Control, Partner is Not Able to Control.	Green
Both Not Able to Control	Neither adapter can bridge the I/O traffic.	Flashing red

Keep the following in mind:

- When the Redundancy status indicator on each adapter is green, both adapters are qualified to the Redundant Adapter Pair. It does not guarantee that the FLEXHA 5000 I/O system is operating in a fully redundant mode.  
For example, the adapters qualify to the Able to Control state when only one BIM is installed in the Adapter Base. Without a second BIM in the Adapter Base, however, there is no redundancy at the physical backplane level.
- A fault on an adapter can cause the device to change from the Able to Control state to Not Able to Control state.
- The adapters use the backplane to communicate and establish the Redundant Adapter Pair. Make sure that at least one BIM is installed in the Adapter base.  
If both BIM modules are missing from the Adapter Base, the adapters experience a Minor Recoverable Fault and go to the Not Able to Control state.
- You can check the Redundant Adapter Pair state on the adapter's webpages.

### Connectivity in the Redundant Adapter Pair States

Table 7 describes how the device state affects the connections that the adapters are allowed to make.

**Table 7 - Redundant Adapter Pair State Connections**

Adapter Pair State	I/O Connections	Messaging to Adapter	Messaging to I/O Modules
Able to Control, Partner is missing	Allowed	Allowed	Allowed
Able to Control, Partner is Not Able to Control	Allowed	Allowed	Allowed
Both Not Able to Control	Not allowed	Allowed	Not allowed
Both Able to Control	Allowed	Allowed	Allowed
Not Able to Control (single adapter)	Not allowed	Allowed	Not allowed

#### EXAMPLE

When both adapters are in the "Able to Control" state, you can open new I/O connections through the adapters or open the diagnostics status connections from a controller to both adapters.

If an adapter transitions to the "Not Able to Control" state for some reason, the adapter drops the I/O connections and diagnostic status connections to the controller.

You can still use Class 3/Unconnected messaging to examine the "Not Able to Control" device status and diagnostics. During this process, the adapter in the "Able to Control" state keeps the I/O and status connections running.

### Required Conditions to Establish Redundant Adapter Pair

To enable Adapter Redundancy, both adapters must behave in the same manner. You must make sure that the adapter meets these conditions for the adapters to pair and, as a result, to open I/O and status connections:

- At minimum, one BIM must be installed in the Adapter Base to open I/O connections. If there are no BIMs in the Adapter Base, the adapters cannot open I/O connections.

**IMPORTANT**

While a FLEXHA 5000 I/O system can operate with only one BIM installed in each base, the system is not redundant when only one BIM is installed. We strongly recommend that you always install two BIMs in the Adapter Base and all I/O Bases.

If you use only one BIM in the bases, install them on the same backplane—A or B. The firmware update is performed across the system backplane from the adapter to the I/O module.

- The EtherNet/IP adapter IP addresses must differ by one with Adapter A being the lower value. Adapter B is incremented by one from the Adapter A value. For example if Adapter A IP address is set to 192.168.1.100, Adapter B must be set to 192.168.1.101.



We recommend that you set static IP addresses for the adapters at system commissioning in either of these methods:

- Use the rotary switches on each adapter.
- Use a DHCP server to get the initial IP addresses and then configure them statically.

We recommend that you use the DHCP server only at initial system commissioning. After control operation has begun, we recommend that you use FactoryTalk® Linx software to set static IP address.

For more information on how to set an adapter's IP address, see [IP Address and Network Mode on page 115](#).

- The EtherNet/IP adapter IP addresses must be on the same network and subnetwork.
- The EtherNet/IP adapters must use the same network mode, that is, DLR or PRP, and be installed in a network topology that matches the setting.

For example, if you install an adapter set for network mode DLR in a system that uses PRP, the system encounters significant issues that you must troubleshoot and resolve before the system can operate properly.

- The pairing results depend on the Ethernet port connectivity.

Adapter State	Pairing Result
Both adapters have at least one Ethernet port that is connected to the network.	Adapters pair and enter the Able to Control state.
Only one adapter has at least one Ethernet port that is connected to the network.	The adapter with the connection enters the Able to Control state. The adapter that is not connected to the network enters the Not Able to Control state. The Qualification process starts when the adapter in the Not Able to Control state is connected to the network.
Neither EtherNet/IP adapter is connected to the network.	The Qualification process does not start until both adapters have at least one Ethernet port that is connected to the network.



### *Redundant Adapter Pair Qualification*

The following triggers cause a Redundant Adapter Pair qualification:

- At least one BIM is installed in the Adapter Base. We recommend that you install both.
- Power up or insert and power up an EtherNet/IP adapter in a FLEXHA 5000 I/O system when another adapter already resides in the system.

In this case, both adapters must have at least one Ethernet port that is connected to the network.

- On an adapter that is completely disconnected from the network, connect at least one Ethernet port to the network.

### *Redundant Adapter Pair Disqualification*

These conditions cause an adapter in the Able to Control state to disqualify and enter the Not Able to Control state:

- Adapter failure, either hardware or firmware.
- Both of the adapter Ethernet ports are disconnected from the network.
- An adapter is removed from the system.
- All BIMs are removed from the Adapter Base.

### *Redundant Adapter Pair Considerations*

Consider the following when working with Redundant Adapter Pairs:

- To trigger EtherNet/IP adapters pairing after the IP address is changed, you must reset both adapters, either manually or via Logix Designer application.
- When adapters are qualified as a Redundant Adapter Pair, you cannot change the adapters' IP addresses.

## Protected Mode

Protected Mode helps prevent access to services that are not required after the adapter is configured and in normal operation. Protected Mode disables disruptive configuration changes. By doing so, Protected Mode helps to reduce the attack surface.

There are two types of Protected Mode:

- Implicit
- Explicit

### *Implicit Protected Mode*

When the EtherNet/IP adapter is in Implicit Protected Mode, it helps prevent the execution of these tasks:

- Changing Ethernet configuration settings, such as port speed.
- Changing IP settings, such as IP address, mask, and DHCP mode.
- Updating the adapter firmware revision.
- Disabling or re-enabling external product ports.
- Performing remote adapter resets.

### *Enter and Exit Implicit Protected Mode*

The adapter enters Implicit Protected Mode as soon as I/O connections are established through (I/O connections) or to it (status connection). The adapter exits Implicit Protected Mode when all I/O connections through or to it (status connection) are stopped.

### *Explicit Protected Mode*

Explicit Protected Mode is enabled at each of the adapters separately. One of the devices can be in Explicit Protected Mode when the second is not. In this case, both adapters display the message: "Explicit Protected Mode Mismatch" on their 4-character display and webpage.

The Explicit Protected Mode mismatch does not stop devices from establishing a Redundant Adapter Pair. Once the Redundant Adapter Pair is established, the message that is listed above no longer appears on the adapters' displays or webpages when both devices' Explicit Protected Mode settings match.

Once the IP address is set, you can use the switches to enable or disable Explicit Protected Mode.

When the adapter is in Explicit Protected Mode, it helps prevent the execution of these tasks:

- Changing Ethernet configuration settings, such as port speed.
- Changing IP settings, such as IP address, mask, and DHCP mode.
- Updating the adapter firmware revision.
- Disabling or re-enabling external product ports.
- Performing remote adapter resets.
- Disabling or enabling the WWW server.
- Disabling or enabling the SNMP server.

### *Enable Explicit Protected Mode*

To enable Explicit Protected Mode on an adapter, complete these steps.

1. Record the adapter's rotary switch settings.
2. Remove the adapter.
3. Set the rotary switches to position '900'.
4. Reinstall the adapter, and wait for the 4-character display to scroll, "Protected Mode – Change Switch Settings".
5. Remove the adapter again.
6. Set the rotary switches back to the rotary switch settings that were recorded in [step 1](#).
7. Reinstall the adapter.

### *Disable Explicit Protected Mode*

To disable the Explicit Protected Mode, complete these steps.

1. Record the adapter's rotary switch settings.
2. Remove the adapter.
3. Set the rotary switches on position '000'.
4. Reinstall the adapter, and wait for the 4-character display to scroll, "Unprotected Mode – Change Switch Settings".
5. Remove the adapter again.
6. Set the rotary switches back to the rotary switch settings that were recorded in [step 1](#).
7. Reinstall the adapter.

The device is now in Unprotected Mode.

Repeat the steps in the other adapter.

## EtherNet/IP Adapter and Backplane Interface Module

The EtherNet/IP adapters and the BIMs facilitate sending data packets in the FLEXHA 5000 I/O system. Keep in mind the following:

- If adapters are operating, a minimum of one BIM must be installed in the Adapter Base.

---

### IMPORTANT

While a FLEXHA 5000 I/O system can operate with only one BIM installed in each base, the system is not redundant when only one BIM is installed. We strongly recommend that you always install two BIMs in the Adapter Base and all I/O Bases.

If you use only one BIM in the bases, install them on the same backplane—A or B. The firmware update is performed across the system backplane from the adapter to the I/O module.

---

- If adapters are operating with only one BIM in the Adapter Base and the BIM is removed, the adapters restart.
- If adapters are operating without BIMs in the Adapter Base and a BIM is installed, the adapters restart.

## Reset the EtherNet/IP Adapter to Factory Default Settings

You can reset an EtherNet/IP adapter to its factory default settings. To reset an adapter, complete these steps.

1. Remove the adapter from the system.
2. Set the IP address rotary switches to value 888.
3. Reinstall the adapter.
4. Wait for the adapter power-up sequence to complete.

When the power-up sequence is complete, the MODULE status indicator starts to blink Red, and the 4-character display scrolls the message: “Reset complete change switch settings”.

5. Remove the adapter.
6. Set the IP address rotary switches to the desired setting.

---

### IMPORTANT

If you do not want to set the IP address via the rotary switches, set them to 999.

After the adapter powers up, set the IP address via one of the other methods, for example, by using a DHCP server.

---

7. Reinstall the adapter

The EtherNet/IP adapter factory default settings are as follows:

- PTP enabled
- All Ethernet ports enabled
- USB port enabled
- All Ethernet ports are set to auto-negotiation
- SNMP server is disabled
- HTTP server is disabled
- Explicit Protected Mode is disabled
- 4-character display enabled
- SD Card is enabled
- A minimum set of open TCP and UDP ports for the required and available services are open. No open ports for unneeded services.

For information on how to disable Explicit Protected mode, see [page 75](#). For more information on how to enable or disable the other settings, see [Chapter 6, Configure the FLEXHA 5000 I/O System on page 125](#).

## EtherNet/IP Adapter Physical Features

Each adapter has these physical features:

- Two QTAs
- 4-character display
- Status indicators
- SD card slot
- USB port
- Mechanical keys
- Network mode switch (side of adapter)
- IP address rotary switches (side of adapter)

### Two Quarter-turn Actuators

QTAs lock the adapter into place on the Adapter Base.



For more information on how to use the QTAs, see [page 36](#).

## 4-character Display

The 4-character display on an adapter uses messages to describe the module channel status conditions. For example, the message *TEST* appears while EtherNet/IP adapter power-up tests are running.



For more information on the 4-character display, see [EtherNet/IP Adapter Status Indicators on page 175](#).

## Status indicators

The adapter uses these status indicators:

- MODULE
- REDUNDANCY
- BACKPLANE A
- BACKPLANE B
- NETWORK
- SD CARD (behind the door)



For more information on the adapter status indicators, see [EtherNet/IP Adapter Status Indicators on page 175](#).

## Secure Digital (SD) Card

The EtherNet/IP adapter uses a Secure Digital (SD) card to store the following:

- Module firmware
- Module configuration
- Fault logs

If you have an issue, you can provide the fault logs to technical support rather than shipping the entire module.

The SD card slot is inside the front panel of the adapter.



The SD card slot is behind the door--not shown here--on the front of the adapter.

The adapter supports the use of these SD cards:

- 1784-SD1 (1 GB)
- 1784-SD2 (2 GB)
- 1784-SDHC8 (8 GB)
- 1784-SDHC32 (32 GB)

You can use third-party SD cards with the adapter. Keep in mind, Rockwell Automation® does not test the use of third-party SD cards with the adapter.

If you use an SD card other than those cards that are available from Rockwell Automation, unexpected results can occur. For example, you could experience data corruption or data loss.

SD cards that are not provided by Rockwell Automation can have different industrial, environmental, and certification ratings as those cards that are available from Rockwell Automation. These cards can have difficulty with survival in the same industrial environments as the industrially rated versions available from Rockwell Automation.



### SD Card Use at Adapter Power-up

When the adapter is powered-up, the adapter non-volatile storage (NVS) configuration data is read and data is used at device power-up.

- If there is no SD card in the adapter, the configuration data is read from the adapter's internal nonvolatile memory.
- If there is an SD card in the adapter, and Explicit Protected Mode is off, the configuration data is read from SD card and next read from internal nonvolatile memory.
  - If configuration data that is read from SD card matches the configuration data that is read from adapter's internal memory, the adapter uses that configuration data.
  - If the configuration data that is read from SD card does not match the configuration data that is read from the adapter's internal memory, the adapter overwrites its internal memory configuration data with the configuration data that is on the SD card data.

### SD Card Use During Adapter Runtime

When an SD card is installed while the adapter is running, the adapter checks the SD card for configuration data.

If there is no configuration data on the SD card, the adapter copies the configuration data from its internal memory to the SD card.

If configuration data is on the SD card, the adapter compares the configuration data that is on the SD card with configuration data that is on the adapter's internal memory.

- If the configuration data that is on the SD card matches the configuration data that is on the adapter's internal nonvolatile memory, the adapter uses that configuration data.
- If the configuration data that is on the SD card does not match the configuration data that is on the adapter's internal nonvolatile memory, the following occur:
  - The adapter continues to operate using the configuration data that is stored on its internal memory.
  - The four-character display shows the message "SD data mismatch".
  - The EtherNet/IP adapter status tag *S.Modx.MemoryCardDataMismatch* changes to 1.

If you want to store the data that is in the adapter's internal memory on the SD card, complete the following tasks:

- a. Remove the SD card.
- b. Clear the card by an external means.
- c. Reinstall the SD card. Then the adapter copies the configuration data from its internal memory to the SD card.

If you want to use the data that is stored on the SD card, complete one of the following tasks:

- Cycle power to the adapter.
- Change a configuration setting via Logix Designer application.

---

#### **IMPORTANT**

If you don't complete these steps before the next power cycle of the adapter, this configuration data that is on the SD card is copied to the adapter with all settings, including the IP address. This can possibly cause an IP address conflict.

---

## USB Port

Use the USB port to complete tasks that only require a temporary connection to the adapter, for example, when you update the firmware.



The USB port is behind the door--not shown here--on the front of the adapter.

## Mechanical Keys

Orange mechanical keys in the back of the adapter insert into the Adapter Base upon initial installation.



For information on how to use the mechanical keys on an adapter, see [Mechanical Keying on page 31](#).

## Network Mode Rotary Switch

Use the network mode rotary switch on the side of the adapter to configure the adapter to function on a DLR or PRP network topology.



For information on how to set the network mode, see [page 123](#).

## IP Address Rotary Switches



You can use rotary switches on the side of the adapter to set the adapter's IP address. For more information on how to use the IP address rotary switches, see [page 116](#).

## Media Landing Card

Redundant MLCs, that is, A and B, are installed in the Adapter Base below the adapters and connect the system to EtherNet/IP networks. The MLCs operate concurrently with, and independently of, each other.

Each MLC has the following:

- Status indicators
- One QTA
- Pair of Ethernet ports

### Status indicators

The MLC uses these status indicators:

- MODULE
- LINK 2
- LINK 1



For more information on the MLC status indicators, see [Media Landing Card Status Indicators on page 179](#).

### Quarter-turn Actuator

The QTA locks the MLC into place on the Adapter Base.



For more information on how to use the QTA, see [page 38](#).

## Backplane Interface Module in Adapter Base

Redundant BIMs, that is, A and B, are installed to the right of the adapters in the Adapter Base and facilitate backplane communication and slot addressing through the FLEXHA 5000 I/O system.

The BIMs operate concurrently with, and independently of, each other. One BIM is dedicated to communication on backplane A and the other is dedicated to communication on backplane B.

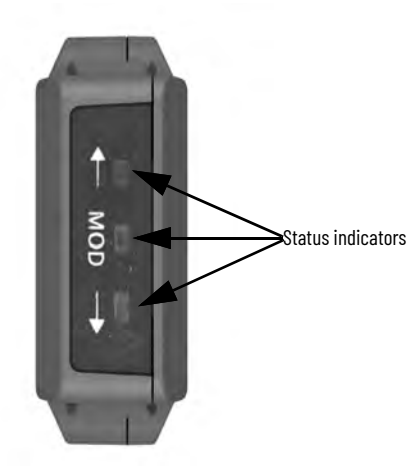
The BIMs in the Adapter Base work with the adjacent BIMs in the first I/O Base installed in the system. For example, the Adapter Base BIM A right status indicator and I/O Base BIM A left status indicator turn green when the bases are connected to each other.

### Status indicators

BIM status indicators show the status of the BIM and the backplane on which it is installed, that is, backplanes A and B, respectively, across the system.

The BIM uses these status indicators:

- MOD (Module Status indicator)
- Left/right arrows



For more information on the BIM status indicators, see [Backplane Interface Module Status Indicators on page 181](#).

## FLEXHA 5000 I/O Modules

### Fault Tolerant Operation

The FLEXHA 5000 I/O System operates with pairs of components, such as, EtherNet/IP™ adapters or Power Conditioners.

When you design your control system to use the FLEXHA 5000 I/O system, you can use I/O modules in one of these ways:

- One I/O module in Simplex mode
- A pair of I/O modules that work in Duplex mode

Decide the layout of your I/O before building your system. You can add more I/O at any time.

### Duplex Configuration Versus Simplex Configuration

#### *Duplex*

- Duplex pair of I/O modules - Two of the same I/O modules that share the same configuration next to each other on the I/O Base.

Configuration is performed once and applies to both I/O modules. Also, the module A in a Duplex pair must be installed in an even-numbered slot.

I/O connections are opened to both I/O modules in a redundant pair. However, connections are made to each I/O module individually. If a connection can't be established with one of the modules, the other still provides control.

Because a duplex pair of I/O modules is connected to the same terminals, if one module fails, the other maintains control.

- Fault tolerant - The system survives one fault per physical pair if one I/O channel, network, backplane, or power source fails. As such, there is no single point of failure.
- A fault on a channel in one Duplex pair does not affect fault tolerance on other modules in the system that are operating normally. Channel faults can occur in different Duplex pairs simultaneously and the system continues to operate.
- Each adapter sends duplicate data to I/O modules across backplanes A and B.
- Each I/O module sends duplicate data to each adapter across backplanes A and B.
- One Duplex RTB is used with both I/O modules in the pair.

#### *Simplex*

- Traditional I/O module operation - If a fault occurs on an I/O channel control is lost. In Simplex, I/O faults are not redundant.

---

**IMPORTANT** An I/O module in Simplex mode sends duplicate data to each adapter.

---

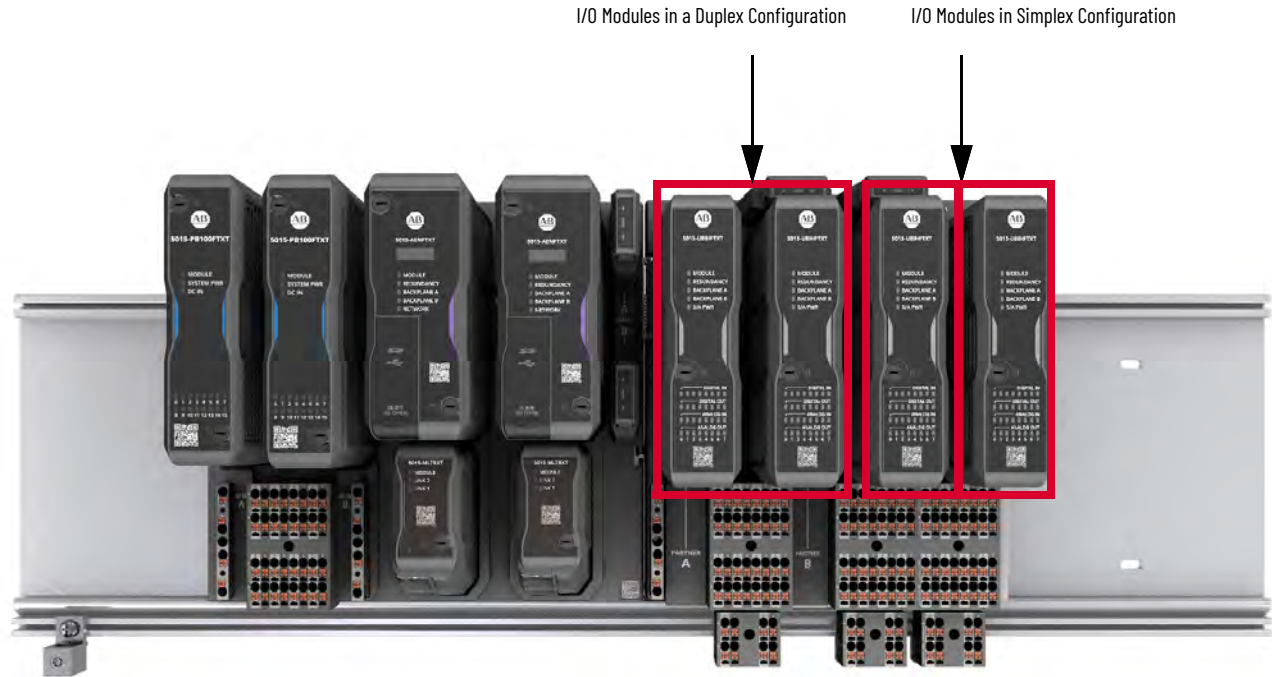
- One I/O module - There is only one module. It is configured for Simplex mode.
- Single point of failure - Fault tolerance is not available in Simplex mode.
- One Simplex RTB is used with each I/O module in Simplex mode.

---

**IMPORTANT** Do not use a Duplex RTB with a pair of I/O modules that are configured for Simplex mode. You must use Simplex RTBs with them.

---

Figure 44 - Example FLEXHA 5000 I/O System with Modules in Duplex Configuration and in Simplex Configuration



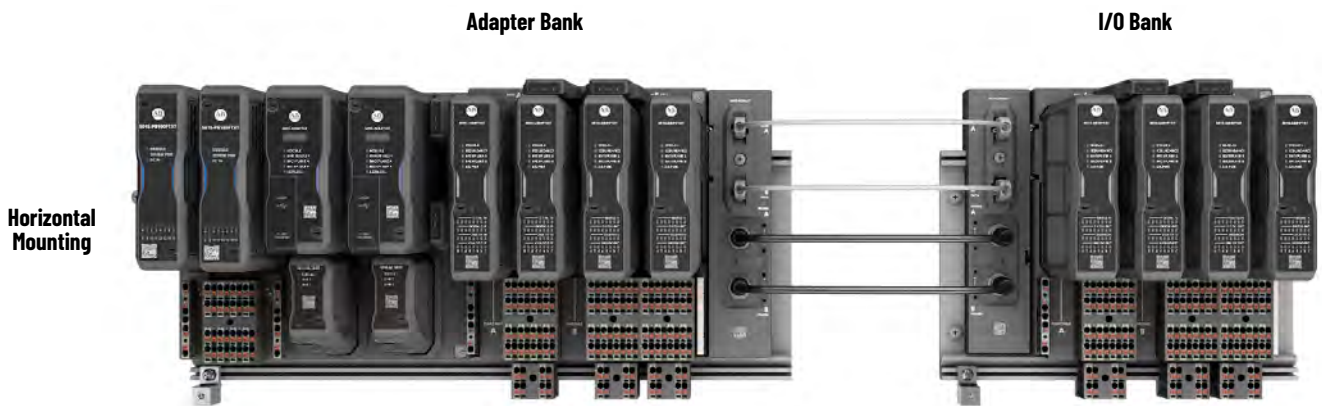
### System Orientation

FLEXHA 5000 I/O systems support these installation orientations:

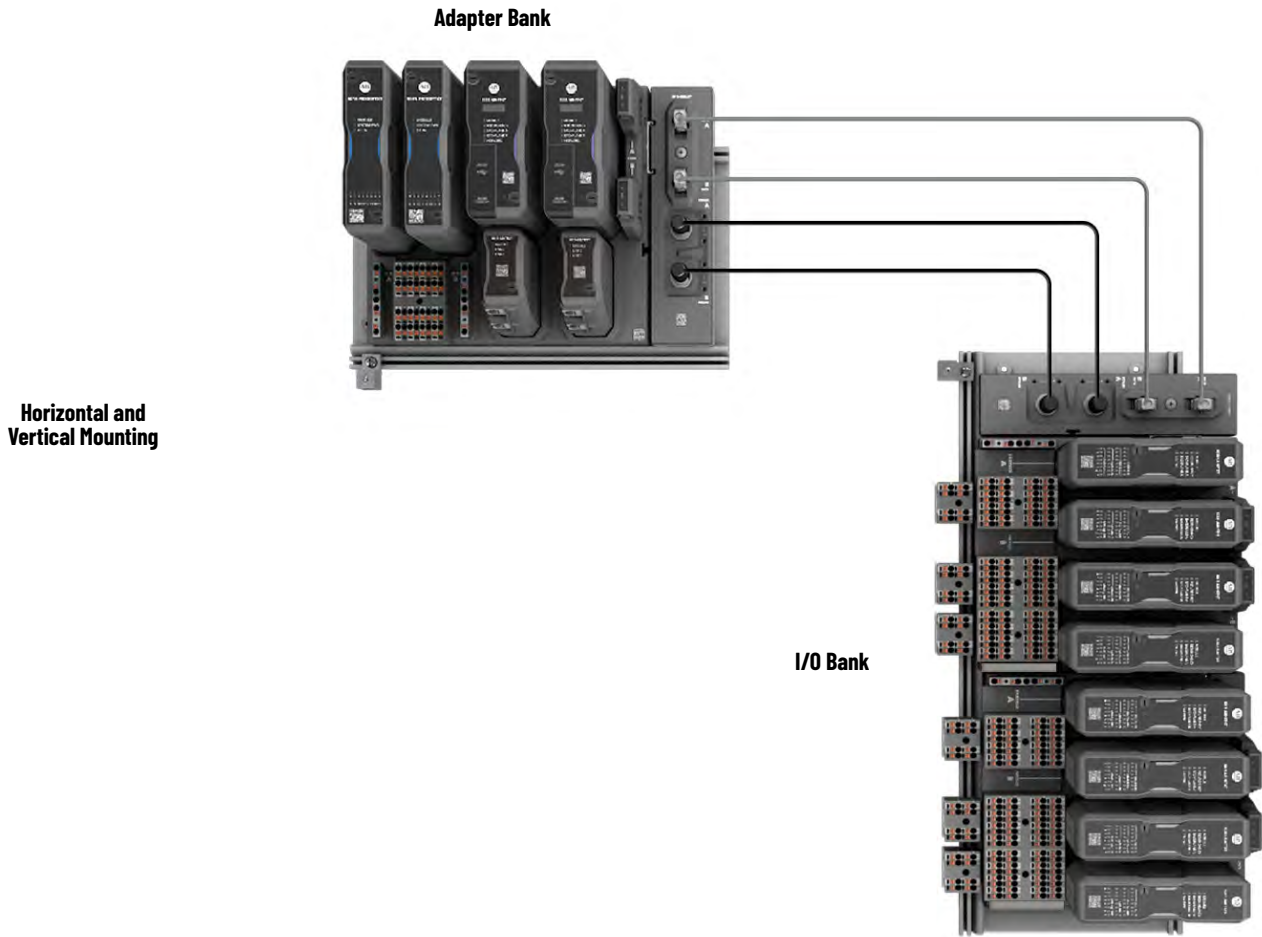
- You must mount the Adapter Base horizontally.
- You can mount I/O Bases horizontally or vertically.

**IMPORTANT** The maximum ambient temperature range differs by orientation. For more information, see the FLEXHA 5000 I/O System Specification Technical Data, publication [5015-TD001](#).

Figure 45 - FLEXHA 5000 I/O System Orientation







## Install I/O Bases in I/O Banks

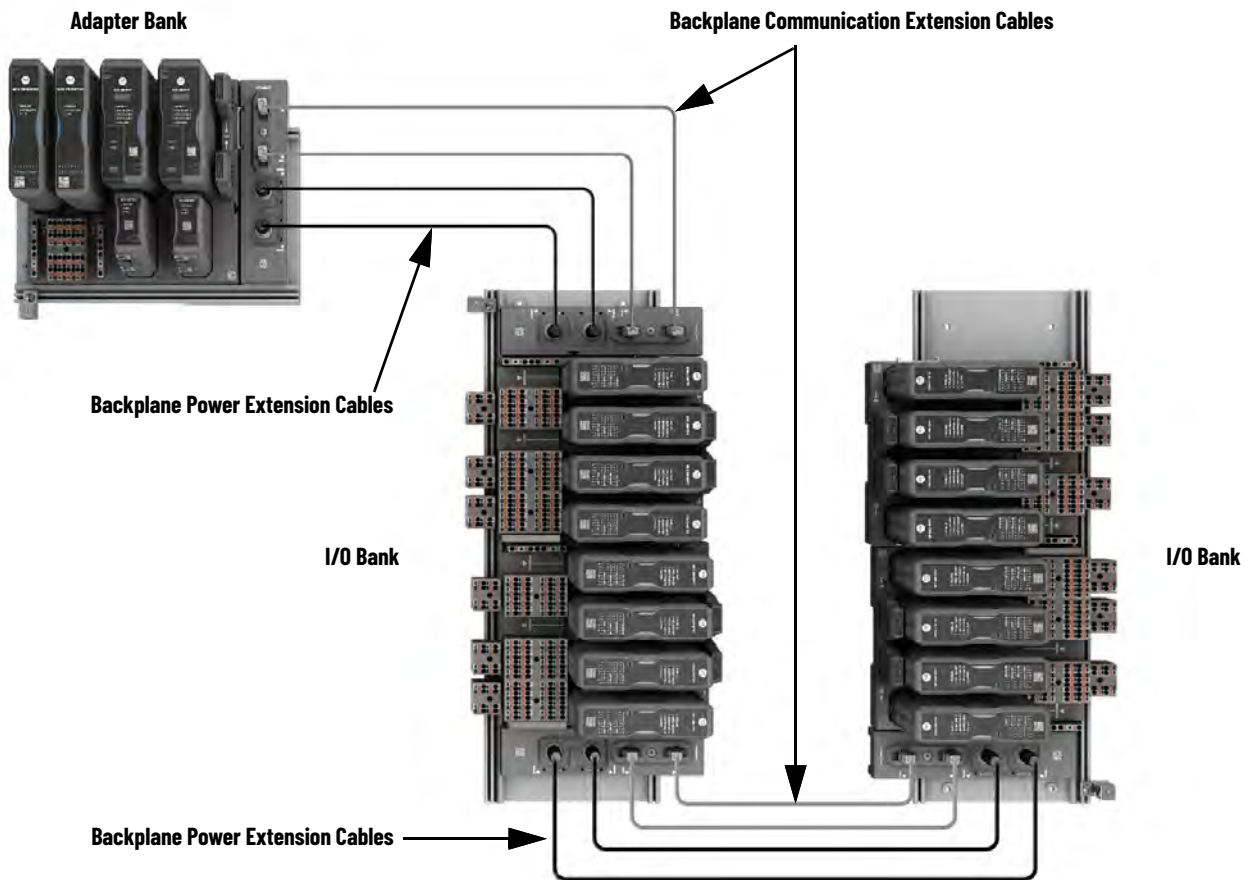
In a FLEXHA 5000 I/O system, you can have up to three banks, an Adapter Bank (required) and two I/O Banks. To connect the banks, you use these:

- Bank Expansion Bases, left
- Bank Expansion Bases, right
- Backplane Communication Extension Cables - You must install two of these cables between bank expansion bases.
- Backplane Power Extension Cables - You must install two of these cables between bank expansion bases.

You must have at least one I/O Base in an I/O Bank.

**EXAMPLE** Note the following in this example:

- The Adapter Bank has no I/O Bases. (I/O Bases are optional on an Adapter Bank.)
- A Bank Expansion Base, Left, is installed directly next to the Adapter Bank. (The Bank Expansion Base, Left, can also be installed directly next to an I/O Base.)
- A Bank Expansion Base, Right, is installed on the first I/O Bank.
- Backplane Communication Extension cables and Backplane Power Extension cables are used to connect to the Adapter Bank to the first I/O Bank, and the first I/O Bank to the second I/O Bank.
- After I/O Bases are installed, a Bank Expansion Base, Left, is installed on the bottom of the first I/O Bank.
- A Bank Expansion Base, Right, is installed on the second I/O Bank.



## Universal I/O Module Modes

The FLEXHA 5000 8-channel Universal I/O module is a fault-tolerant I/O module with eight isolated channels that can individually be configured to function as any of the following:

- Digital inputs
- Digital outputs
- Analog inputs
- Analog outputs

For channels that are configured as analog input or analog output, HART functionality is also available.

The I/O modules reside on an I/O Base, catalog number 5015-A4IOXT, in the FLEXHA 5000 I/O system. You can install the I/O Base on the Adapter Bank or an I/O Bank.

## I/O Module Physical Features

Universal I/O modules have these physical features:

- Module status indicators
- I/O channel status indicators
- QTA
- Mechanical keys

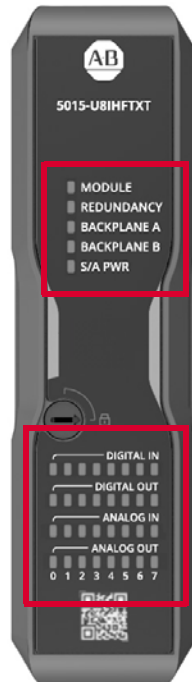
### Status indicators

The Universal I/O module has these module status indicators:

- MODULE
- REDUNDANCY
- BACKPLANE A
- BACKPLANE B
- S/A PWR

The Universal I/O module also has these status indicators:

- DIGITAL IN
- DIGITAL OUT
- ANALOG IN
- ANALOG OUT



For more information on the I/O module status indicators, see [I/O Module Status Indicators on page 183](#).

## Quarter-turn Actuator

A QTA locks the I/O module into place on the I/O Base.



For more information on how to use QTAs with I/O modules, see [page 39](#)

## Mechanical Keys

Orange mechanical keys in the back of the I/O module insert into the I/O Base upon initial installation.



For information on how to use the mechanical keys on an I/O module, see [Mechanical Keying on page 31](#).

## Common Module Features Independent of Mode Configuration

The features that are described in this section are available on a Universal I/O module regardless of what mode you configure individual channels to use.

### Backplane Interface Modules with I/O Modules

Redundant BIMs, that is A and B, are installed above the I/O modules in an I/O Base and facilitate backplane communication.

The BIMs operate concurrently with, and independently of, each other. One BIM on a given Base is dedicated to communication on backplane A and the other BIM in the same base is dedicated to communication on backplane B.

BIMs on an Adapter Base communicate with the BIMs on an adjacent I/O Base. BIMs on adjacent I/O Bases communicate with each other.

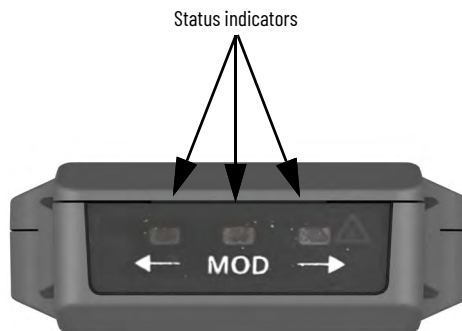
For example, the I/O Base BIM A left status indicator and Adapter Base BIM A right status indicator turn green when the bases are connected to each other.

#### Status indicators

BIM status indicators show the status of the BIM and the backplane on which it is installed, that is, backplanes A and B, respectively, across the system.

The BIM uses these status indicators:

- MOD (Module Status indicator)
- Left/right arrows



For more information on the BIM status indicators, see [Backplane Interface Module Status Indicators on page 181](#).

### Field Power Current

For Universal I/O modules, individual channels can source current based on the mode type for which they are configured:

- Analog input - An I/O channel can source a maximum field power current of 50 mA.
- Analog output - An I/O channel can source a maximum field power current of 25 mA.
- Digital input - An I/O channel can source a maximum field power current of 30 mA.
- Digital output - An I/O channel can source a maximum field power current of 100 mA.

## Requested Packet Interval

The Requested Packet Interval (RPI) is a configurable parameter that defines a rate at which the owner-controller and the I/O module exchange data. Set the RPI value during initial module configuration and adjust it as necessary after module operation has begun.

Valid RPI times vary slightly based on how the I/O module is used.

- In Simplex mode - 10...400 ms
- In Duplex mode - 20...400 ms

## Module Data Quality Reporting

FLEXHA 5000 I/O modules indicate the quality of channel data that is returned to the controller. Data quality represents accuracy. Levels of data quality are reported via module input tags.

These inputs indicate the level of data quality.

- ***Ixx.Ch.Fault*** (analog input mode) or ***Ixx.Fault*** (analog output, digital input, and digital output modes)- This tag indicates that the reported point data is inaccurate and cannot be trusted for use in your application. Do not use the reported channel data for control.

If the tag is set to 1, you cannot trust the data reported. You must troubleshoot the module to correct the cause of the inaccuracy.

- ***Ixx.Ch.Uncertain*** (analog input mode) or ***Ixx.Uncertain*** (analog output, digital input, and digital output modes)- 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 channel 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.

Once the condition that causes the *Uncertain* tag to change to 1 is removed, the tag automatically resets to 0.

---

### IMPORTANT

- Depending on the fault's cause, once the condition that causes the *Fault* tag to change to 1 is removed, you may need to reset the module. For more information on how to reset the module, see [Fault Reset on page 98](#).
  - When a fault occurs, the channel transitions to a safe state until the fault is cleared.
  - In some system configurations, the tag is not reset immediately after the condition is removed. The tag typically resets after a small delay.
  - The Logix Designer application controls the tags. You cannot change the status of the tags.
- 



We **strongly recommend** that you monitor the tags in your program to make sure that the application is operating as expected with accurate channel input data.

## Over Temperature Detection

The Over Temperature Detection feature indicates that the temperature of the conditions within which the module is operating is higher than the module operating limits.

- When the *OverTemperature* tag is set to 1, the *Uncertain* tag is also set to 1.
- When an Over Temperature condition exists, it is reported as follows:
  - Simplex module - Input tag *I.OverTemperature* = 1
  - Duplex module - Input tag *I.Modx.OverTemperature* = 1
  - Analog input mode also uses the input tag *Ixx.Ch.OverTemperature* = 1
  - Analog output mode also uses input tag *Ixx.OverTemperature* = 1

## Critical Temperature Detection

The Critical Temperature Detection feature indicates that the temperature of the conditions within which the module is operating is outside the allowable operating conditions.

Temperatures outside the allowed operating conditions include temperatures that are above and are below the normal range.

When a Critical Temperature condition exists, it is reported as follows:

- Simplex module:
  - Module-level input tag *I.CriticalTemperature* = 1
  - Module-level input tag *I.InternalFault* = 1
- Duplex module:
  - Module-level input tag *I.Modx.CriticalTemperature* = 1
  - Analog input mode input tag *Ixx.Ch.Fault* = 1
  - Analog output, digital input, and digital output mode input tag *Ixx.Fault* = 1

In a Critical Temperature condition, the module or channel with the fault continues to operate for as long as possible. There is no transition to the safe state.

## Module Configured for Simplex Mode

When you remove an I/O module that is in Simplex mode, control of the devices is lost. Control resumes after the power-up sequence completes when you reinsert the I/O module or replace it with another module that has the same configuration.

## Module in a Duplex Pair

When you remove an I/O module in a duplex pair, any control that the module perform transitions to the partner module. There is a time that is associated with the control switchover.



## Fault Reaction Time

The fault reaction time varies based on channel configuration

### *Simplex Mode Configuration*

Channels on I/O modules that are configured for Simplex Mode have a fault reaction time of 20 ms.

In this case, the fault reaction time is the time that it takes for a channel to transition from a fault occurring to the channel entering the safe state. For example, if the value that is applied to an analog output doesn't match the Output Readback within the fault reaction time, a fault is declared and 20 ms later, the channel enters the safe state.

### *Duplex Mode Configuration*

If a channel in a Duplex Pair faults, the partner channel on the other module in the pair takes over control. The maximum time that it takes for the transition to occur is 100 ms.

When a module in a Duplex Pair faults, control on an analog input channel transitions to the partner module. When this happens, the analog input data does not update for a fixed period.

The period is also known as the settling time.

Line Noise Filter Selection	Typical Settling Time <sup>(1)</sup>
10 Hz	900 ms
20 Hz	510 ms
50 Hz	390 ms

(1) These are typical times. Specific application conditions can cause shorter or longer settling times.

The same conditions exist when a Duplex Pair recovers. When a faulted module recovers, it pairs with the other module. When the faulted module resumes control, the analog input data does not update for a fixed period.

Line Noise Filter Selection	Typical Settling Time <sup>(1)</sup>
10 Hz	1190 ms
20 Hz	800 ms
50 Hz	680 ms

(1) These are typical times. Specific application conditions can cause shorter or longer settling times.

## Fault Reset

When a channel fault occurs on the I/O module, you **cannot** reset the channel individually. You must reset the entire I/O module to clear a channel fault.

The module configuration determines how the module reset affects your control system.

- **Simplex mode** - Connections are broken to the module. Control is lost for all channels on the module until the module powers back up and connections are restored.
- **Duplex mode** - If you only reset the module in the Duplex pair with the channel fault, the partner module assumes control. After the module that had the fault powers up, it pairs with the partner again. This **only applies when you use the QTA** to reset the module.

If you reset both modules in the pair, connections are broken to both modules, and control is lost on all channels on both of the modules.

The method of resetting the module dictates whether only one module in the pair is reset or both of the modules in the pair are reset.

Reset a module via one of these methods:

- Quarter-turn actuator
- Logix Designer application



Before you reset an I/O module, determine the cause of the fault and resolve the issue or the fault will recur after the module is reset.

For more information on how to reset an I/O module, see [Reset I/O Modules on page 237](#).

## Control Loop Update Rate

Module output channels can deliver screw-to-screw updates in a standard control loop as fast as the following:

- Module in Simplex mode - 65 ms
- Module in a Duplex pair - 115 ms

## Bumpless Communication

If a fault occurs on a channel, that channel holds last state and continuously sends the last recorded data value until control resumes. This transmission of stale data, that is, the last recorded data value, does not cause the controller to drop the connection to the I/O module or affect communication.

## Field Power Loss Detection

If SA Power is lost from a module, a channel fault occurs and is indicated as follows based on the channel mode:

- Analog input - *Ixx.Ch.FieldPowerOff* input tag for all channels
- Analog output, digital input, and digital output - *Ixx.FieldPowerOff* input tags for all channels

## Disable or Enable a Channel

You can disable or enable a channel in your Logix Designer application project in the Module Properties dialog box via the view of all configured channels or a specific channel's view.

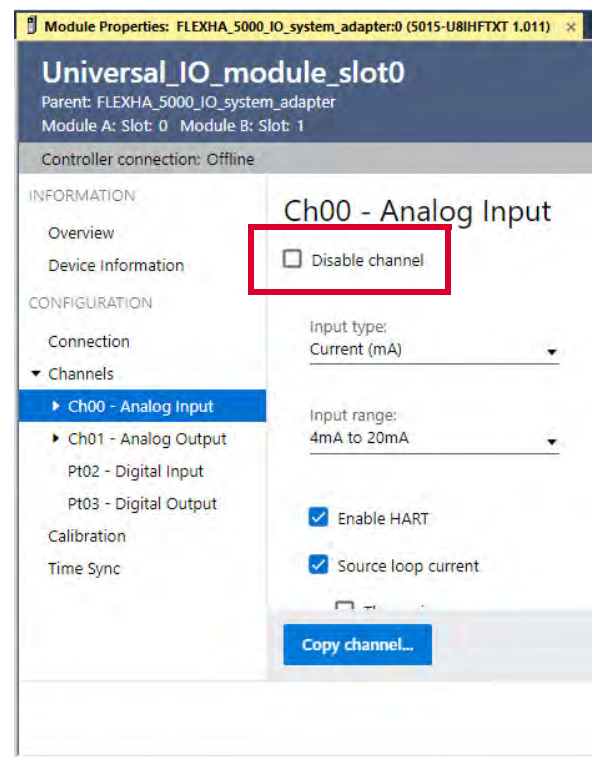
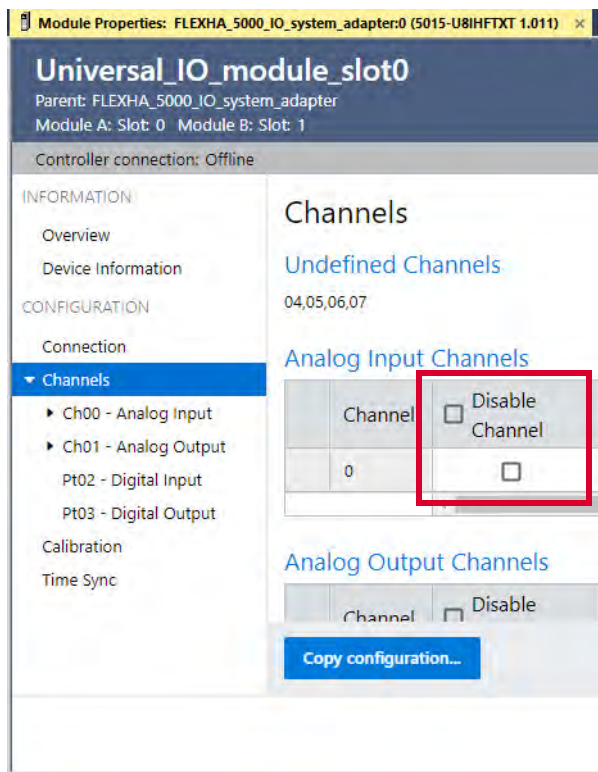
To enable the channel, clear the Disable Channel checkbox, and click Apply or OK. Conversely, to the disable the channel, select the Disable Channel checkbox, and click Apply or OK.

### IMPORTANT

You can only disable or enable the channel as follows:

- Offline - Configure the project and download it to the controller.
- Online - If the connection to the I/O module is first inhibited, the channel is enabled or disabled, and the connection is uninhibited.

You cannot disable or enable a channel if the project is running and a connection is open to the I/O module.



## Digital Input Features

The features that are described in this section are available on a Universal I/O module channel that is configured as a digital input.

### Input Filters

You can increase the time that it takes for a digital input to transition from Off to On and On to Off. The increase in time is a delay of the signal from the module to the controller. The increase in the time to transition from one state to another improves noise immunity within a signal.

We recommend you use the input filters to optimize I/O module performance in environments with high electrical noise.

These filter times are available:

- 0  $\mu$ s (default)
- 100  $\mu$ s
- 200  $\mu$ s
- 500  $\mu$ s
- 1 ms
- 2 ms
- 5 ms
- 10 ms
- 20 ms
- 50 ms

### Input Thresholds

You can configure thresholds that determine the digital input state based on a comparison of the current input voltage to the threshold.

The rising thresholds are as follows:

- Open-wire condition to Off state
- Off state to Indeterminate
- Indeterminate to On state
- On state to Short Circuit condition

The falling thresholds are as follows:

- Short Circuit to On state
- On state to Indeterminate
- Indeterminate to Off state
- Off state to Open Wire condition

For example, if you set the On to Short Circuit threshold at 21 volts, when a digital input voltage reaches 21V DC, it transitions from the On state to a faulted state because a Short Circuit condition occurs.

---

**IMPORTANT**

Default thresholds are configured for use with recommended line load resistors. When setting custom user thresholds, each module sinks up to 2.5 mA. When a module drops out of a Duplex pair, current limiting changes from 5 mA to 2.5 mA. User thresholds must account for this change.

---

## Digital Output Features

The features that are described in this section are available on a Universal I/O module channel that is configured as a digital output.

### Output Load Parameters

These load conditions apply to digital outputs:

- Minimum load = 10 mA in Simplex mode; 20 mA in Duplex mode
- Capacitive load = 1  $\mu$ F, max
- Inductive load = 2.2 mH, max

For all inductive loads, you need an additional, external suppression device, Rockwell Automation catalog number 1492-J3DF. If an output controls inductive devices, such as relays, motor starters, solenoids, or motors, the suppression device, Rockwell Automation catalog number 1492-J3DF, should be added directly across the coil of the inductive device.

### Output States

Digital outputs are enabled when the module is in Run Mode. The outputs are off when the module enters Program Mode or a communication fault occurs.

### Output Faults

These conditions trigger channel faults on digital outputs.

**Table 8 - Digital Output Faults**

Condition	Indication in Logix Designer Application Module Tags
Disabled	<i>Ixx.Fault</i> input tag = 1
Readback Mismatch	<i>Ixx.Fault</i> input tag = 1
SA Power Loss	<i>Ixx.Fault</i> input tag = 1
Internal Fault	<ul style="list-style-type: none"> <li>• Simplex - <i>I.InternalFault</i> module-level input tag = 1</li> <li>• Duplex - <i>I.Modx.InternalFault</i> module-level input tag = 1</li> </ul>

### Output Delay Times

Digital output state transitions can experience a delay time that is a combination of firmware and hardware delay plus the RPI. The time is different if the digital out is on a module that is configured for Simplex mode or is part of a Duplex pair.

Maximum output delay times are as follows:

- Time: Off to On
  - Simplex = 12.2 ms + RPI
  - Duplex = 22.2 ms + RPI
- Time: On to Off
  - Simplex = 10.1 ms + RPI
  - Duplex = 20.1 ms + RPI

### Readback

Digital outputs return Readback values to the controller. The Readback value is the actual data value for the channel and not what it was commanded to be.

The Readback value is either On or Off. This data is indicated in the *Ixx.Readback* input tag and is sent at the RPI.

## Analog Inputs and Outputs Common Features

### Readback Mismatch

The digital output must validate that the output value that is applied to the output matches the Readback value within the Fault Reaction Time or a fault occurs.

The features that are described in this section are available on a Universal I/O module channel that is configured as an analog input or output.

### Operating Range

Analog I/O channels operate in a 4 mA...20 mA range.

### Channel Scaling

When you scale an analog I/O channel, you select two points that represent signal units, that is, a Low Signal and a High Signal. You also select two points that represent engineering units, that is, Low Engineering and High Engineering.

The Low Signal point equates to the Low Engineering point and the High Signal point matches the High Engineering point.

Scaling lets you configure the module to return data to the controller in signal units or in engineering units (listed as Percent of Full Scale in the Logix Designer application). By default, the data is returned in Percent of Full Scale.

Because analog I/O channels have an input range of 4...20 mA, consider the following:

- To receive values in signal units, configure the module as follows:
  - Low Signal = 4 mA
  - High Signal = 20 mA
  - Low Engineering = 4 EU
  - High Engineering = 20 EU
- To receive values in Percent of Full Scale (default setting), configure the module as follows:
  - Low Signal = 4 mA
  - High Signal = 20 mA
  - Low Engineering = 0% (default units on Module Properties dialog box)
  - High Engineering = 100% (default units on Module Properties dialog box)

---

**IMPORTANT** You cannot change the Channel Scaling values with a connection open.

---

The returned value is indicated in the *Ixx.Ch.Data* input tag for analog inputs and *Ixx.Data* input tag for analog outputs. Where xx represents the channel number.

**Table 9 - Data Values Represented in Engineering Units**

Current	Engineering Units Value	Value in <i>Ixx.Ch.Data</i> or <i>Ixx.Data</i> tags
0.0 mA	-25%	-25.00
3.0 mA	-6%	-6.00
4.0 mA	0.0%	0.00
12.0 mA	50.0%	50.00
20.0 mA	100.0%	100.00
23.0 mA	118.75%	118.75

## Channel Faults

The following conditions trigger the channel fault bit:

- Analog inputs (channel input tag *Ixx.Ch.fault* = 1)
  - Disabled
  - Underrange
  - Overrange
  - Open Wire
  - Short Circuit
  - Field Power Loss
  - Internal Fault
  - Critical Temperature
- Analog outputs (channel input tag *Ixx.Fault* = 1)
  - Disabled
  - No Load
  - Short Circuit
  - Field Power Loss
  - Output Readback Mismatch
  - Internal Fault
  - Critical Temperature

## Channel Accuracy at 25 °C (77 °F)

Analog I/O channels measure current signals at 25 °C (77 °F) with the following degree of accuracy:

- Analog inputs: 0.15% of range
- Analog outputs: 0.1% of range

The accuracy is guaranteed when the I/O channel is within the normal operating range of 4 mA...20 mA and includes non-linearity, gain, and offset.

## Channel Accuracy at Full Temperature Range

Analog I/O channels measure current signals over the full operating temperature of the module with the following degrees of accuracy:

- Analog inputs: 0.3% of range
- Analog outputs: 0.4% of range

The accuracy is guaranteed when the I/O channel is within the normal operating range of 4 mA...20 mA. This includes temperature drift errors.

## Rolling Timestamp of Data

The rolling timestamp is a continuously running 16-bit rolling timestamp that counts in milliseconds from 0...32,767 ms. The rolling timestamp value is reported as follows:

- *Analog inputs:* `Ixx.Ch.RollingTimestamp` input tag
- *Analog outputs:* `Ixx.RollingTimestamp` input tag

Timestamp values are updated as follows:

- **Input channels** - The channel updates the rolling timestamp data at the time inputs are sampled. The controller program may use the last two rolling timestamp values to calculate the amount of time between the samples.
- **Output channels** - The channel updates the rolling timestamp data at the time the readback is sampled.

## Floating Point Data Format

The analog I/O channels return data to the controller in the IEEE 754 32-bit floating point data format. In your Logix Designer application, the data type is REAL.

The floating point data format lets you change the data representation of the selected channel. Although the full range of the module does not change, you can scale your module to represent I/O data in specific terms for your application.

For more information on scaling, see [Channel Scaling on page 102](#).

## Channel Scan Time

The analog I/O channels have these scan times:

- Simplex mode: 10 ms
- Duplex mode: 20 ms



## Underrange and Overrange Alarms

Analog I/O channels provide underrange and overrange alarms

### *Analog Inputs*

Analog inputs trigger Underrange or Overrange alarm when the channel data value is outside the supported range.

- If the channel data value is  $\leq 1.0$  mA, the input experiences an Underrange condition.
- If the channel data value is  $\geq 23.0$  mA, the input experiences an Overrange condition.

When Underrange and Overrange conditions are present on analog inputs, these input tags change to 1:

- *Ixx.Ch.Underrange*
- *Ixx.Ch.Overrange*
- *Ixx.Ch.Fault*

### *Analog Outputs*

Analog outputs trigger Underrange or Overrange alarm when the data value that the controller provides commands the output signal to a value outside the supported physical range.

- If the commanded value is  $\leq 2.0$  mA, the output experiences an Underrange condition and the output is limited to 2.0 mA.
- If the commanded value is  $\geq 23.0$  mA, the output experiences an Overrange condition and the output is limited to 23.0 mA.

When Underrange and Overrange conditions are present on analog outputs, these input tags change to 1:

- *Ixx.Underrange*
- *Ixx.Overrange*
- *Ixx.Fault*
- *Ixx.Uncertain*

## HART Functionality

Redundant ControlLogix® 5580 controllers can connect to your process via the Highway Addressable Remote Transducer (HART) functionality that is available when you configure a channel on the I/O module for analog input or analog output mode.

HART is enabled by default on channels that are configured for analog input or analog output mode.

Analog input channels receive signals from process value transmitters and convert them to corresponding measurement values for use in the ControlLogix 5580 controllers. For example, use in temperature, flow, pressure, or pH conditions.

Analog output channels provide current or voltage output signals that adjust the settings of valves and other devices in accord with desired process behavior.

Instruments that support the HART protocol let one field device complete the following:

- Measure several process parameters
- Provide status and diagnostics information
- Support remote configuration and troubleshooting

Channels that are configured for analog input or output mode implement the Producer/Consumer network communication model for both the channel and the HART device that is attached to it. This communication is an intelligent data exchange between channels/HART devices and other system devices in which each channel/HART device produces data without first being polled.

---

**IMPORTANT** HART messages are not fault tolerant.

---

### *HART Communication*

The HART field communication protocol is widely accepted in industry as a standard for digitally enhanced 4...20 mA communication with smart (microprocessor-based) field devices. A digital signal is superimposed on the 4...20 mA current loop to provide two means of communication from the device.

The 4...20 mA analog channel lets the primary process variable be communicated at the fastest possible rate while the digital channel communicates multiple process variables, data quality, and device status. The HART protocol lets these simultaneous communication channels be used in a complementary fashion.

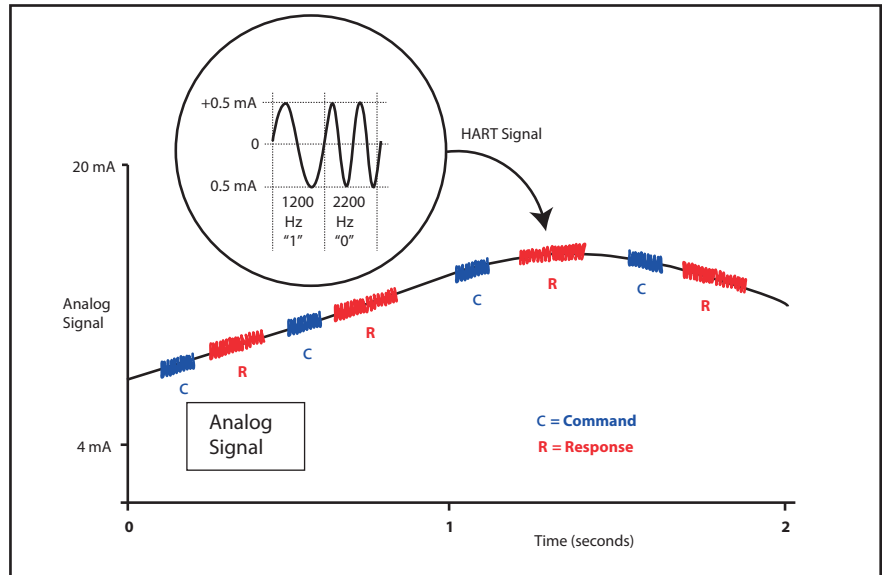
[Figure 46](#) shows information about the HART protocol.

Figure 46 - HART Protocol

HART protocol supports two-way digital communication, complements traditional 4...20 mA analog signals, and includes these features:

- Predefined commands
  - Universal command
  - Common practice
  - Device specific
- Large installed base
- Worldwide support

**IMPORTANT:** This figure is from the HART Communication Protocol Specifications, April 2001, Revision 6.0, HART Communication Foundation. All Rights Reserved.



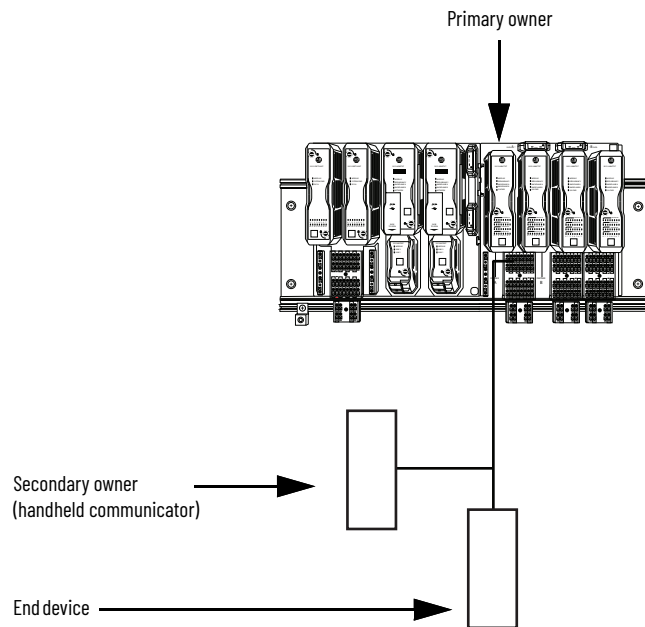
FLEXHA 5000 I/O analog input and output modes support the HART protocol and perform these operations:

- Conversion of 4...20 mA analog signals to digital numeric values in engineering units (such as kg, m, or percent) that are used in a ControlLogix 5580 controller.
- Conversion of digital numeric values in engineering units to 4...20 mA analog signals to control process devices.
- Producer/Consumer network communication model directly to each HART device.
- Automatic collection of dynamic process data from the connected HART device. For example, temperature, pressure, flow, or valve position.
- Automatic collection of device-specific variables from the connected HART device.
- Execution of commands through Logix Designer application using input and output tags.
- Facilitation of configuration and troubleshooting of the HART field device from your control room using FDT/DTM supported software.

With the FLEXHA 5000 I/O analog input and output modes, both the controller and software can access field device data for device maintenance and management.

The FLEXHA 5000 I/O analog input and output modes support command-response communication protocol in a point-to-point wiring architecture.

The FLEXHA 5000 I/O analog input and output modes are the primary owner device and continuously obtain information from the connected HART devices. The secondary owner can be used for device maintenance, for example, a handheld communicator, as indicated here.



Most 4...20 mA transmitters are available with a HART protocol interface. The type of data available depends on the type of instrument.

An example application is a HART enabled mass flowmeter. The standard mA signal from the flowmeter provides one primary measurement - flow. The mA signal with HART provides more process information. The mA signal that represents flow is still available. The HART configuration of the flowmeter can be set to communicate primary variable (PV), secondary variable (SV), tertiary variable (TV), and quaternary variable (QV). These values can represent mass flow, static pressure, temperature, total flow, and other conditions.

Dynamic variables, device-specific variables, device status, and command execution are all available through input and output controller tags in the Logix Designer application.

Device status information is also provided through HART.

HART connectivity provides all this information with no changes to the existing 4...20 mA wiring.

FDT/DTM technology through HART connectivity is supported and also provides remote configuration and troubleshooting of HART devices through software.

When you configure a channel for analog input or output mode HART is enabled by default. Disable or reenable it in the I/O module's Module Properties page.

**Analog Input Mode**

Module Properties: FLEXHA\_EtherNet\_IP\_adapter:0 (5015-U8IHFTXT 1.001)

### FLEXHA\_Duplex\_pair\_1

Parent: FLEXHA\_EtherNet\_IP\_adapter  
Module A: Slot: 0 Module B: Slot: 1

Controller connection: Offline

INFORMATION

- Overview
- Device Information

CONFIGURATION

- Connection
- Channels
  - ▶ Ch00 - Analog Input
  - ▶ Ch01 - Analog Output
  - Pt02 - Digital Input
  - Pt03 - Digital Output
- Calibration
- Time Sync

#### Ch00 - Analog Input

- Disable channel
- Input type: Current (mA)
- Input range: 4mA to 20mA
- Enable HART
- Source loop current
- Three wire sensor

**Analog Output Mode**

Module Properties: FLEXHA\_EtherNet\_IP\_adapter:0 (5015-U8IHFTXT 1.001)

### FLEXHA\_Duplex\_pair\_1

Parent: FLEXHA\_EtherNet\_IP\_adapter  
Module A: Slot: 0 Module B: Slot: 1

Controller connection: Offline

INFORMATION

- Overview
- Device Information

CONFIGURATION

- Connection
- Channels
  - ▶ Ch00 - Analog Input
  - ▶ Ch01 - Analog Output
  - Pt02 - Digital Input
  - Pt03 - Digital Output
- Calibration
- Time Sync

#### Ch01 - Analog Output

- Disable channel
- Output type: Current (mA)
- Output range: 4mA to 20mA
- Enable HART
- Channel offset: 0.0 %
- Hold for initialization

## Analog Input Features

The features that are described in this section are available on a Universal I/O module channel that is configured as an analog input.

### Open Wire Detection

Open Wire detection detects when a wire is disconnected from the channel. You must enable Open Wire detection in the module configuration.

Additionally, if a signal wire is connected but the current on the wire is less than 1 mA, it is considered an Open Wire condition.

Possible causes of open wire conditions are:

- A wire is disconnected from the I/O RTB terminal.
- A wire is disconnected from a field device that is connected to the channel.
- A break or open in one of the conductors in a cable.

When an open wire condition exists, the following occurs:

- Channel status indicator for that channel goes red
- The channel diagnostics dialog box available in your Logix Designer application project indicates the condition exists.
- Module tags change as follows:
  - Ixx.Ch.Fault = 1
  - Ixx.Ch.OpenWire = 1

### Overcurrent Protection

The overcurrent protection feature protects analog inputs from damage that is caused by too much current on the input. The inputs are protected against currents up to 25 mA. When an overcurrent condition occurs, the input is turned off.

### Line Noise Filter

The line noise filter removes line noise on the analog input signal. This is also known as noise immunity. The line noise filter is a low-pass filter that attenuates the input signal at the specified frequency and above.

These line noise filter frequencies are available:

- 10 Hz (greatest noise attenuation)
- 20 Hz
- 50 Hz (default)

The line noise filter smooths input data noise transients on the channel. The value specifies the time constant for a lag on the input. The input is 63% of the input data step change.

The line noise filter frequency determines how quickly the step change reaches the 63% settled value. The lower the frequency, the longer it takes to get to 63%. The maximum step change is from 4 mA to 20 mA.

This table lists the settling time to reach the 63% settled value.

Filter Frequency	Settling Time
10 Hz	425 ms + (2 x RPI)
20 Hz	245 ms + (2 x RPI)
50 Hz	125 ms + (2 x RPI)

### *Stopband*

The Stopband is the region of spectrum where the filter is not intended to pass data. In analog input mode, the Stopband begins at ~1 Hz below the filter setting. For example, the 10 Hz filter has a Stopband of 9 Hz and above

### *Corner Frequency*

The Corner Frequency is a percentage of the line noise filter. It is ~25% of the filter value.

**Table 10 - Line Noise Filter**

Filter Frequency	Stopband	Corner Frequency
10 Hz	9 Hz and above	~2.5 Hz
20 Hz	19 Hz and above	~5.0 Hz
50 Hz (default)	49 Hz and above	~12.0 Hz

There is a relationship between a Line Filter setting and the RPI rate.

- If you want greater noise suppression at the selected Line Filter frequency, you use a slower input sample rate.
- If you want a faster input sample rate at the selected Line Filter frequency, the noise suppression is lesser.

## Analog Output Features

The features that are described in this section are available on a Universal I/O module channel that is configured as an analog output.

### No Load Detection

No load detection detects when a signal wire is disconnected from the channel or the RTB. Additionally, if a signal wire is connected but the current on the wire is less than 1 mA, it is considered a no load condition.

- Channel status indicator for that channel goes red.
- The channel diagnostics dialog box available in your Logix Designer application project indicates the condition exists.
- Module tags change as follows:
  - `Ixx.Fault = 1`
  - `Ixx.NoLoad = 1`

### Output States

Analog outputs are controlled when the module is in Run Mode. The outputs are turned off when the module enters Program Mode or a communication fault occurs.

### Output Load Parameters

These load conditions apply to analog outputs:

- Resistive load = 0...500  $\Omega$

### Readback

Analog outputs return a Readback value to the controller. The readback value is the actual data value for the channel and not what it was commanded to be.

The Readback value is indicated in the `Ixx.Data` input tag in Engineering Units. It's sent at the RPI.

### Readback Mismatch

Analog outputs must validate that the output value that is applied to the output is within a defined tolerance of the Readback value within the Fault Reaction Time or a Readback Mismatch fault occurs.

The tolerance that is applied varies based on if the requested output value was changed by more than 0.5% of full-scale within the Fault Reaction Time.

- < 0.5% Change Requested: 1% Tolerance of Full Scale Range (0.2 mA) versus Actual
- > 0.5% Change Requested: 10% Tolerance of Full Scale Range (2.0 mA) versus Actual

If the analog output is on a module that is part of a Duplex pair, a Readback Mismatch Fault causes the faulted channel to drop out of the output pair. The partner channel then takes sole control of the output.

### Duplex States

If an analog output is on a module that is part of a Duplex pair, the output coordinates the migration to the Off state when a fault occurs or the module enters Program Mode with their partner module.



## Forcing

Use a force to override data that your logic either uses or produces.

- Test and debug your logic.
- Temporarily maintain normal system operations when an input device has failed.

Use forces only as a temporary measure. They are not intended to be a permanent part of your application.

Make sure that you understand the following before using forces.



**ATTENTION:** Forcing can cause unexpected machine motion that could injure personnel. Before you use a force, determine how the force affects your machine or process and keep personnel away from the machine area.

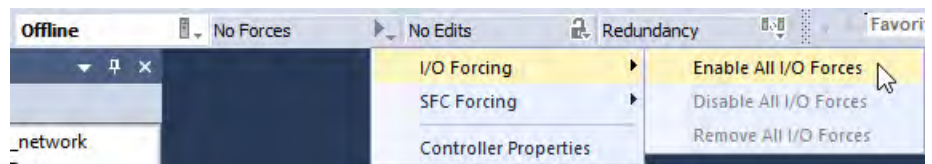
- Enabling I/O or SFC forces causes your machine or process to go to another state or phase.
- Removing forces can still leave forces in the enabled state.
- If forces are enabled and you install a force, the new force immediately takes effect.

### Enable Forces

For a force to take effect, you enable forces. You can only enable and disable forces at the controller level.

- You can enable I/O forces and Sequential Function Chart (SFC) forces separately or simultaneously.
- You cannot enable or disable forces for a specific module, tag collection, or tag element.

Enable forces from the Controller Overview toolbar in the Logix Designer application project.



### Disable or Remove a Force

To stop the effect of a force and let your project execute as programmed, disable or remove the force.

- You can disable or remove I/O and SFC forces simultaneously or separately.
- When you remove a force on an alias tag, you also remove the force on the base tag.



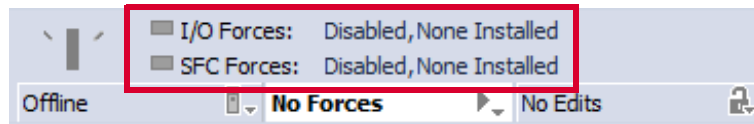
**ATTENTION:** Changes to forces can cause unexpected machine motion that could injure personnel. Before you disable or remove forces, determine how the change affects your machine or process and keep personnel away from the machine area.

## Check Force Status

Before you use a force, determine the status of forces for the controller.

The Controller Overview toolbar indicates the status of forces. It indicates the status of I/O forces and SFC forces separately.

To determine the status of	Use any of the following
I/O forces	<ul style="list-style-type: none"> <li>Forces Controller Overview toolbar</li> <li>GSV instruction</li> </ul>
SFC forces	Controller Overview toolbar



Status	Means
Enabled	<ul style="list-style-type: none"> <li>If the project contains any forces of this type, they are overriding your logic.</li> <li>If you add a force of this type, the new force immediately takes effect</li> </ul>
Disabled	Forces of this type are inactive. If the project contains any forces of this type, they are not overriding your logic.
Installed	At least one force of this type exists in the project.
None Installed	No forces of this type exist in the project.

This example indicates how to use a GSV instruction to get the status of forces. For the purposes of this example, Force\_Status is a DINT tag.



To determine the following	Examine this bit	For this value
Forces are installed	0	1
No forces are installed	0	0
Forces are enabled	1	1
Forces are disabled	1	0

## Connect to the EtherNet/IP Network

You must set IP addresses on the redundant EtherNet/IP™ adapters in a FLEXHA 5000™ I/O system for them to operate on the network.

### IP Address and Network Mode

When an EtherNet/IP adapter is in the out-of-box state, the following apply:

- The adapter does not have an IP address.
- The rotary switches on the adapter are set to 999.
- The adapter is DHCP-enabled.  
That is, the adapter is configured to obtain an IP address via a DHCP server if one is available.
- You can change the adapter configuration so that you are not required to set an IP address each time that power is cycled.  
After the adapter has an IP address, disable DHCP. With DHCP disabled, the adapter uses the same IP address after power is cycled.
- If you do not disable DHCP after the initial adapter setup, after subsequent power-ups, the adapter issues requests for an IP address via DHCP until an IP address is set.
- The network mode rotary switch is not set for either of these modes:
  - DLR
  - PRP

If the network mode rotary switch is not set, the following occur:

- Both Ethernet ports on the MLC that is associated with the adapter are inactive.
- The adapter's MODULE status indicator flashing red to indicate a Major Recoverable Fault.
- The adapter's 4-character display scrolls the message: Set Mode Switch.
- The adapter uses Address Collision Detection to indicate with the MODULE status indicator if the assigned IP address is already used.

You must set the IP address for both EtherNet/IP adapters.

---

**IMPORTANT** The EtherNet/IP adapter IP addresses must differ by one. Set the IP address for the EtherNet/IP adapter A and then use an IP address that is incremented by one for EtherNet/IP adapter B. For example, if EtherNet/IP adapter A uses address 192.168.1.12, EtherNet/IP adapter B must use 192.168.1.13.

If you change EtherNet/IP adapter A's IP address to a new value, be sure to change EtherNet/IP adapter B's IP address to a value that is incremented by one. Repeat the steps in this section to update the IP address on EtherNet/IP adapter B.

If you change EtherNet/IP adapter A's IP address to a new value and do not update EtherNet/IP adapter B's address as necessary, the adapters will not establish the Redundant Pair.

---

You can use any of these options to set the IP address:

- EtherNet/IP Address Commissioning Tool
- FactoryTalk® Linx Network Browser software
- BOOTP/DHCP tool
- DHCP server
- Rotary switches

## Set the IP Address with the EtherNet/IP Address Commissioning Tool

The EtherNet/IP Address Commissioning tool can perform the following with the EtherNet/IP adapter:

- Assign the IP address, subnets, and other parameters to BOOTP and DHCP enabled devices.
- Change the EtherNet/IP adapter operation between dynamic mode, where it initiates BOOTP/DHCP requests, to static mode, where BOOTP/DHCP requests are disabled and communications settings that are saved in the EtherNet/IP adapter nonvolatile memory are used.

You can use the EtherNet/IP Address Commissioning Tool when the adapter powers up in the out-of-box state as defined on [page 115](#).

On power-up, the adapter initiates a BOOTP/DHCP request on the EtherNet/IP network to obtain an IP address and other parameters. The request includes the adapter's MAC ID.

If the EtherNet/IP adapter does not receive a response in an appropriate amount of time, it waits for a period and then retries the request. After each failed attempt, the retries become less frequent. The EtherNet/IP adapter resets or loses its IP address assignment when powered down, unless its settings are modified to change it out of dynamic BOOTP/DHCP mode to static mode. In static mode, IP settings are stored in the adapter's nonvolatile memory and BOOTP/DHCP requests are not sent out on future power cycles.

### IMPORTANT

Before you start the EtherNet/IP Address Commissioning Tool, remember make sure that you have the hardware (MAC) address of the device.

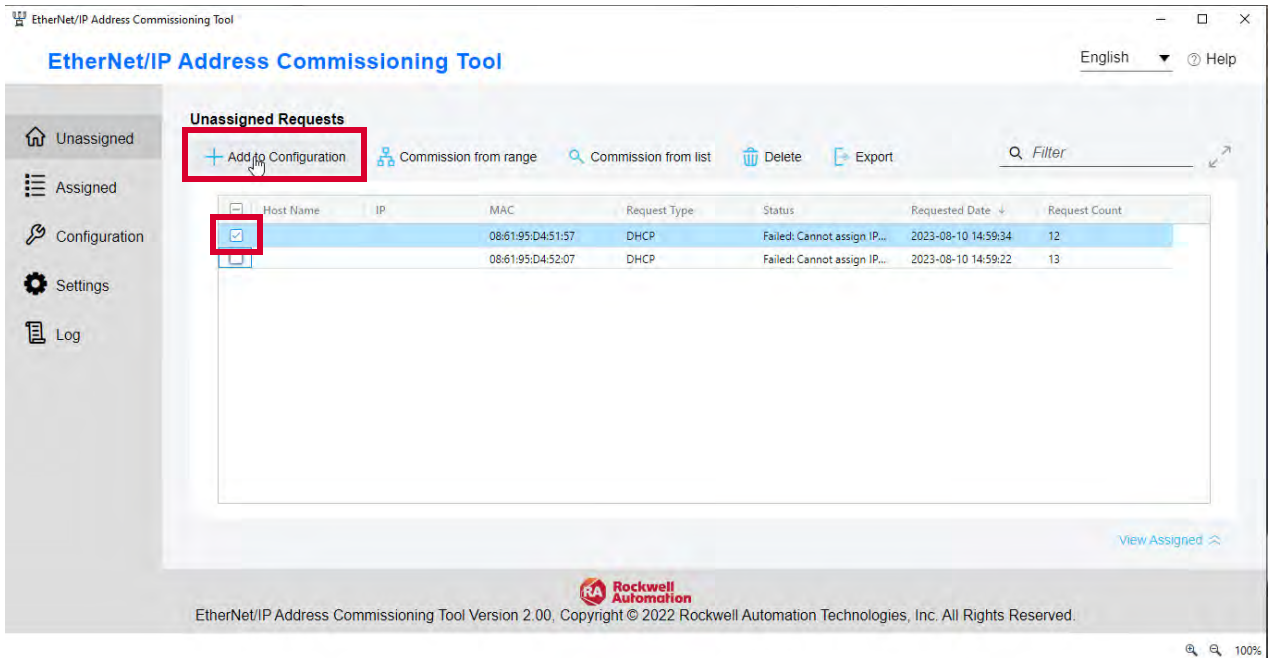
The hardware address is on a sticker on the side of the device and has a format similar to: 00-00-BC-14-55-35

## Configure the Tool

1. Confirm that the device is connected to the network.
2. Open the tool via Start > Rockwell Software > EtherNet IP Address Commissioning Tool.
3. Select the network interface card for your workstation.
4. Open Settings to define how the tool operates.



5. Click the Unassigned Requests tab to see the MAC ID of your EtherNet/IP adapter as it sends requests on the network for an IP address.
6. Click the row of the EtherNet/IP adapter, and click Add to Configuration.



- Assign an IP address, and click OK.

**Add Item**

[Link to existing item in configuration list](#)

Host name \_\_\_\_\_

IP  
192 . 168 . 1 . 3

MAC  
08:61:95:D4:51:57

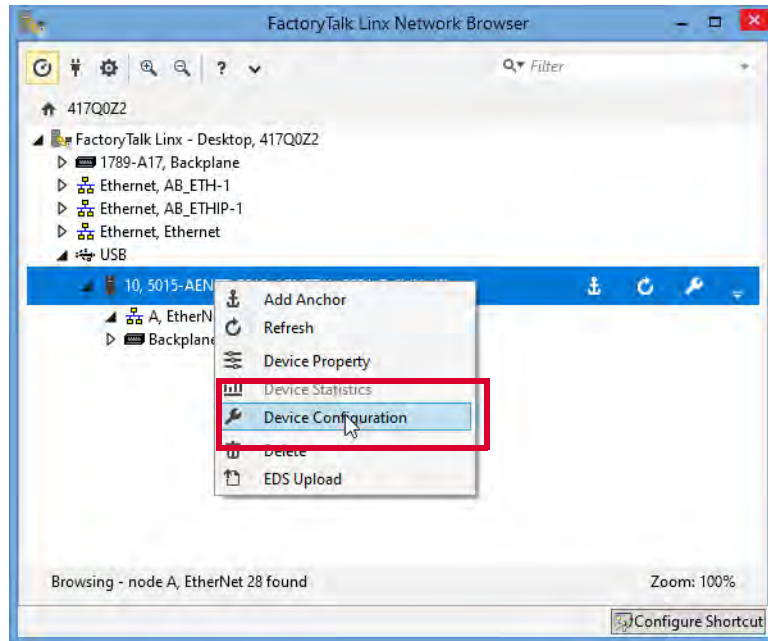
Description  
\_\_\_\_\_

- Repeat the steps to assign an IP address to the partner EtherNet/IP adapter. The IP address on the partner EtherNet/IP adapter must match the IP address on the first adapter but incremented by one. For example, if the first EtherNet/IP adapter uses address 192.168.1.20, the partner adapter must use address 192.168.1.21.

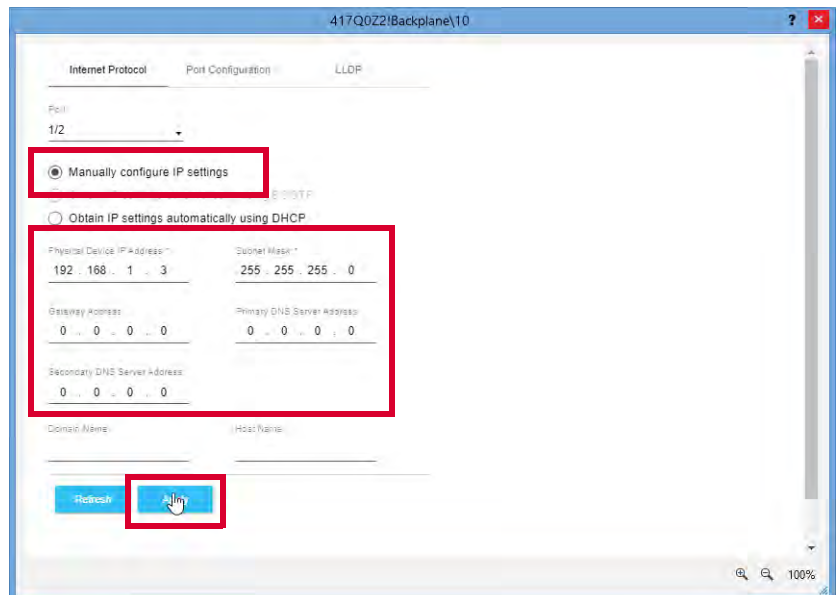
## Set the IP Address with FactoryTalk Linx Software

To use FactoryTalk Linx software to set the IP address, follow these steps.

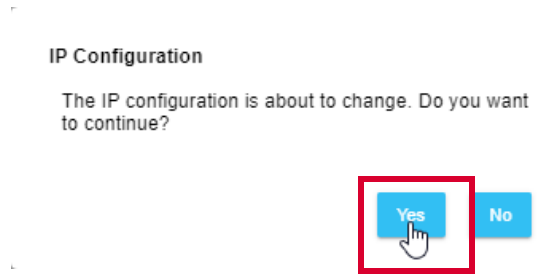
1. Connect to the USB port on the EtherNet/IP adapter.
2. Open the FactoryTalk Linx Network Browser and browse to the EtherNet/IP adapter.
3. Right-click on the EtherNet/IP adapter and click Device Configuration.



4. On the Device Configuration dialog box, complete these steps:
  - a. Select Manually configure IP address setting.
  - b. Complete the IP address and other fields as necessary.
  - c. Click Apply.



- When prompted, confirm that you want to assign the IP address.



- Repeat the steps to assign an IP address to the partner EtherNet/IP adapter.

The IP address on the partner EtherNet/IP adapter must match the IP address on the first adapter but incremented by one. For example, if the first EtherNet/IP adapter uses address 192.168.1.20, the partner adapter must use address 192.168.1.21.

## Set the IP Address with the BOOTP/DHCP Tool

The BOOTP/DHCP tool is a standalone server that you can use to set an IP address. The BOOTP/DHCP tool sets an IP address and other TCP parameters.

You can use the BOOTP/DHCP tool to set the IP address when the device powers up in the out-of-box state. The out-of-box state would assume the rotary switches, if present on the device, are not set to a valid IP address, and the device is DHCP enabled.

You can use the BOOTP/DHCP tool when the adapter powers up in the out-of-box state as defined on [page 115](#).

At power-up, the adapter initiates a BOOTP/DHCP request on the EtherNet/IP network to obtain an IP address and other parameters. The request includes the adapter's MAC ID.

### IMPORTANT

Before you start the BOOTP/DHCP tool, remember the following:

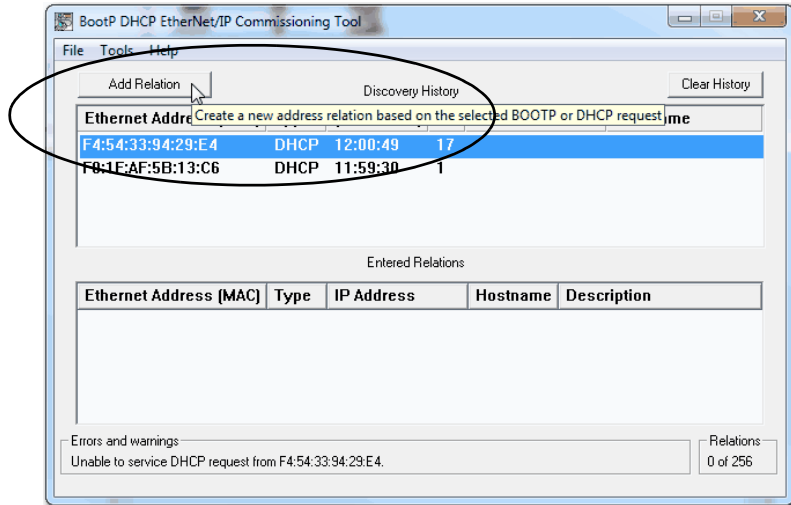
- Make sure that you have the hardware (MAC) address of the device. The hardware address is on a sticker on the side of the device and has a format similar to the following:  
00-00-BC-14-55-35
- Make sure that the workstation that you use to set the IP address has only one connection to the EtherNet/IP™ network on which the device resides. The BOOTP/DHCP tool can fail to work if your workstation has multiple connections to the EtherNet/IP network.

To set the IP address with BOOTP/DHCP tool, complete these steps.

1. Confirm that the device is connected to the network.
2. Open the BOOTP/DHCP tool via Start > Rockwell Software® > BOOTP-DHCP Tool > BOOTP-DHCP Tool.

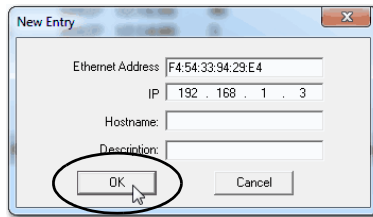
The MAC ID of the device appears in the Request History window.

3. Select the appropriate device and click Add to Relation List.



The New Entry dialog box appears.

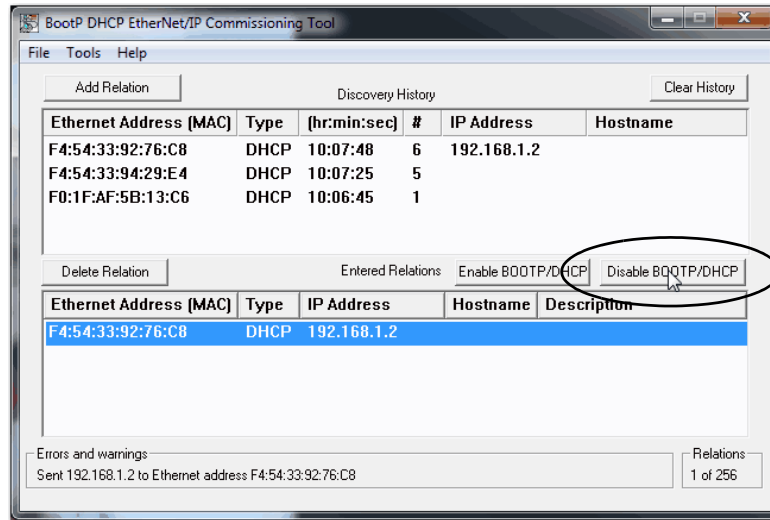
4. Type an IP address, Hostname, and Description for the device.  
Hostname and Description are optional.



5. Click OK.
6. To assign this configuration on the device, wait for the device to appear in the Relation List panel and select it.



## 7. Click Disable BOOTP/DHCP.



The device now uses the assigned configuration and does not issue BOOTP or DHCP requests after power is cycled on the controller.

**IMPORTANT**

Remember the following:

- If you do not click Disable BOOTP/DHCP, on future power cycles, the current IP configuration is cleared and the controller sends DHCP requests again.
- If you click Disable BOOTP/DHCP and it does not disable BOOTP/DHCP, you can use RSLinx® Classic software to disable BOOTP/DHCP.

## Set the IP Address with a DHCP Server

Because the EtherNet/IP adapter is DHCP-enabled in the out-of-box condition, you can use a DHCP server to set the IP address.

The DHCP server automatically assigns IP addresses to client stations logging on to a TCP/IP network. DHCP is based on BOOTP and maintains some backward compatibility.



**ATTENTION:** You can use a DHCP server that is configured to always assign the same IP address to specific devices when they appear on the EtherNet/IP network and request an IP address.

If your system does not use a DHCP server that assigns the same IP address for specific devices, we strongly recommend that you assign the device a fixed IP address. Do not set the IP address dynamically.

That is, do not use the Obtain IP settings automatically by using DHCP.

When a device uses Obtain IP settings automatically by using DHCP, the IP address for that device is cleared with each power cycle. If the same IP address is not automatically assigned to the device when it requests a new IP address, the device can be assigned another IP address than what was used before cycling power.

The use of a new IP address can result in such issues as a Duplicate IP address condition or configuration faults because the IP address differs from what is stored in a controller project.

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

Additionally, if the adapters do not use IP addresses that are within one of each other, for example, 192.168.1.20 and 192.168.1.21, they will not establish the Redundant Pair.

## Set the IP Address with the Rotary Switches

If the network uses 192.168.1.x, we recommend that you use the rotary switches to set the last octet of the network IP address. Valid numbers range from 001...254.

To use the rotary switches to set the IP address, use an RA 1492-N90 or equivalent-sized screwdriver to turn the switches to the appropriate numbers before you install the adapter.

The leftmost switch represents the first digit in the octet, the middle switch represents the second digit, and the right-most switch represents the third digit.



At power-up, the adapter reads the rotary switches to determine if they are set to a valid number for the last octet of the IP address. If the settings are a valid number, these conditions result:

- IP address = 192.168.1.xxx (where xxx represents the switch settings)
- Subnet mask = 255.255.255.0
- Gateway address = 192.168.1.1
- The adapter does not have an assigned host name, nor does it use any Domain Name System

If you use the rotary switches to set the IP address, the IP address remains the same whenever power is cycled to the system, as long as the switch settings are not changed.

## Reset the IP Address to the Factory Default Value

After adapter operation begins, you can reset the IP address to its factory default value. To reset the IP address, complete the steps that are described on [page 76](#).

## Set the Network Mode

You must set the network mode rotary switch on the adapter before installing it.

You set the network mode based on the type of network on which the adapter operates. These switch positions set the network mode:

- DLR
- PRP

Any other position is invalid. If the switch is set to an invalid position, an error message alerts you to the invalid setting after power-up. You must remove the adapter to reset the position before reinstalling it.

Out-of-the-box, the rotary switch is not set to either DLR or PRP.

---

**IMPORTANT** It is of **critical importance** that you do not install an EtherNet/IP adapter set for DLR network mode in a PRP network topology. For more information on network topologies, see [Network Topologies on page 47](#).

If you install an adapter with the DLR network mode setting in a system that uses PRP, there can be significant consequences. Also, an adapter set to DLR mode can send data packets that are addressed to the adapter onto the PRP network with consequence for the adapter and other devices that are installed on the network.

---

Use an RA1492-N90 or equivalent-sized screwdriver to turn the rotary switch to the desired value before installation.



---

**IMPORTANT** You must set the same network mode switch position for both EtherNet/IP adapters.

If the switch positions do not match, the following occurs at power-up:

- The adapters do not pair.
- One of the adapters takes control and can bridge I/O traffic. The Redundancy status indicator is green. Finally, the message *Able to Control, Partner is Not Able to Control* scrolls across the 4-character display on the front of the adapter.
- The other adapter does not take control and cannot bridge I/O traffic. The Redundancy status indicator flashes red. Finally, the message *Not Able to Control* scrolls across the 4-character display on the front of the adapter.

In this scenario, complete these steps.

1. Remove the adapter with the wrong network mode setting.
2. Set the network mode rotary switch to the correct position.
3. Reinstall the adapter.

Once the newly inserted adapter powers up and the adapters pair with each, they enter the *Both Able to Control* state, and their respective Redundancy status indicators are solid green.

---

## Change the Network Mode

After EtherNet/IP adapter operation begins, you can change the network mode. To change the network mode, complete these steps.

1. Remove the adapter from the system.
2. Change the rotary switch to the desired network mode.
3. Reinstall the adapter into the system.

---

**IMPORTANT** If you change the network mode on one adapter, you must change the network mode on the other adapter. Repeat the steps in this section to change the network mode on the other adapter.

---

## Configure the FLEXHA 5000 I/O System

### Update Firmware Revisions

Before you configure the system, we recommend that you confirm that your FLEXHA 5000™ I/O system components use the desired firmware revisions.

You can update the firmware on these FLEXHA 5000 I/O system devices:

- I/O modules
- EtherNet/IP™ adapters
- Power Conditioners
- BIMs
- MLCs

When you update the firmware on the adapter, the firmware on the associated Power Conditioners, BIMs, and MLCs are automatically updated.

To update the firmware revisions on FLEXHA 5000 I/O system components, you use ControlFLASH Plus™ software, version 5.00.00 or later.

### Update I/O Module Firmware

FLEXHA 5000 I/O modules ship with firmware revision 1.010 installed. Firmware revision 1.010 has limited functionality. You must update them to firmware revision 1.011 or later, before you can use them. We recommend that you update the I/O module's firmware revision before you install it in the control system.

If an I/O module is part of a Duplex pair, update the firmware revision in a separate system from the one that is used to control the application. To update the firmware revision for an I/O module in an operating system, you must inhibit the connection to the module. When you inhibit the connection to a Duplex pair, connections to both modules are broken and control is temporarily lost.

But if you remove one of the I/O modules in the Duplex pair to update the firmware revision, the partner I/O module can maintain control. Verify that the partner I/O module is operating correctly before you remove the first I/O module to update its firmware revision.

After the I/O module is reinstalled, powered up and resumes operation as part of the Duplex pair, you can remove the partner I/O module to update its firmware. This process lets you maintain control while still updating the firmware revision on both I/O modules.

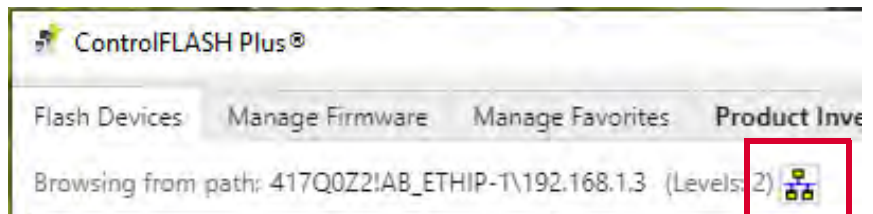
If an I/O module is used in Simplex mode, it's not as important to remove it and update the firmware revision in a separate system because whether you remove it or inhibit the connection to the I/O module, the connections are broken and control is temporarily lost.

To update an I/O module's firmware revision, the separate system must have the following:

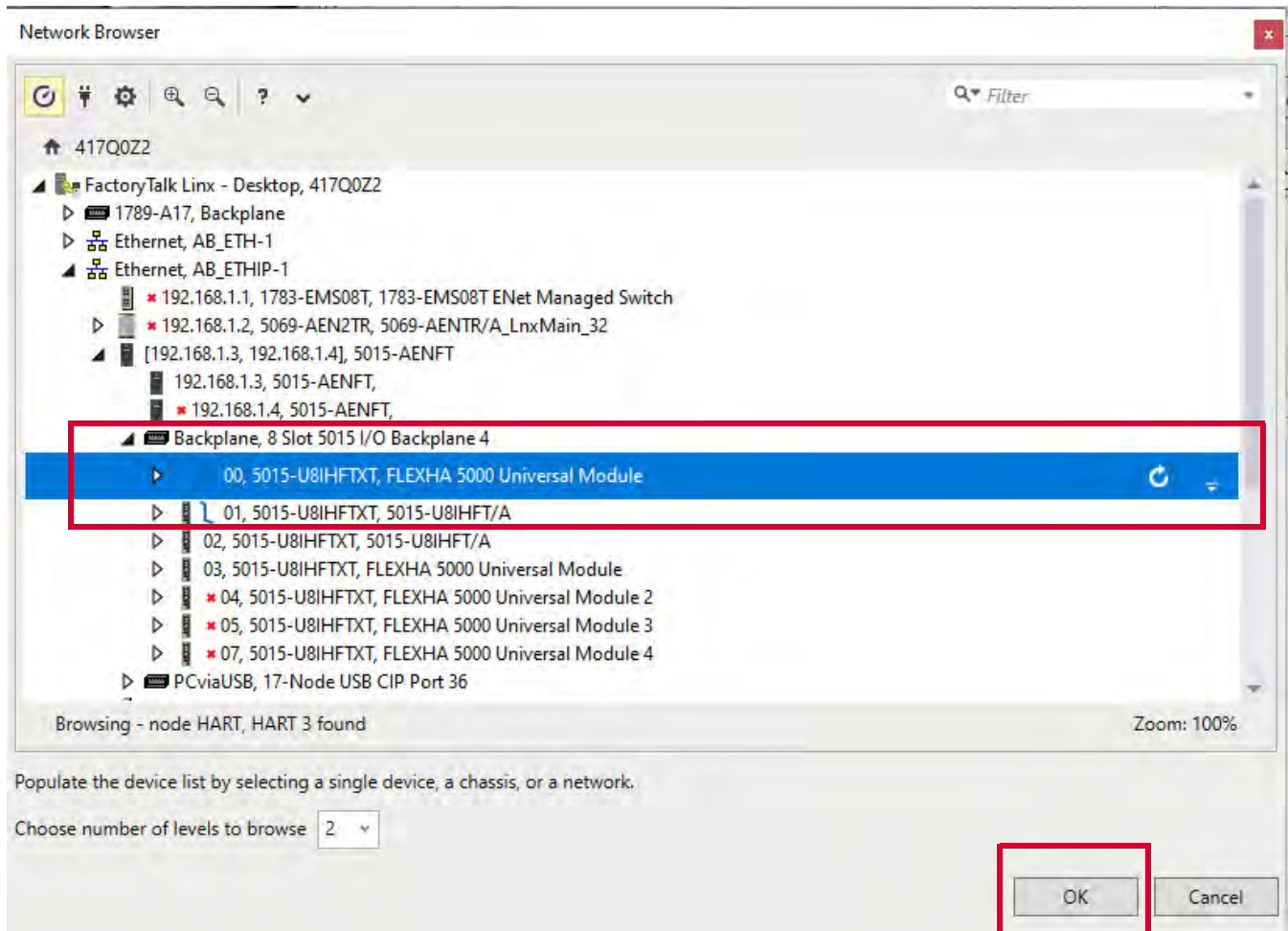
- **Adapter Base** with at least one of each of the following installed:
  - Power Conditioner
  - Adapter with MLC
  - BIM
- **I/O Base** with a BIM installed

Complete these tasks.

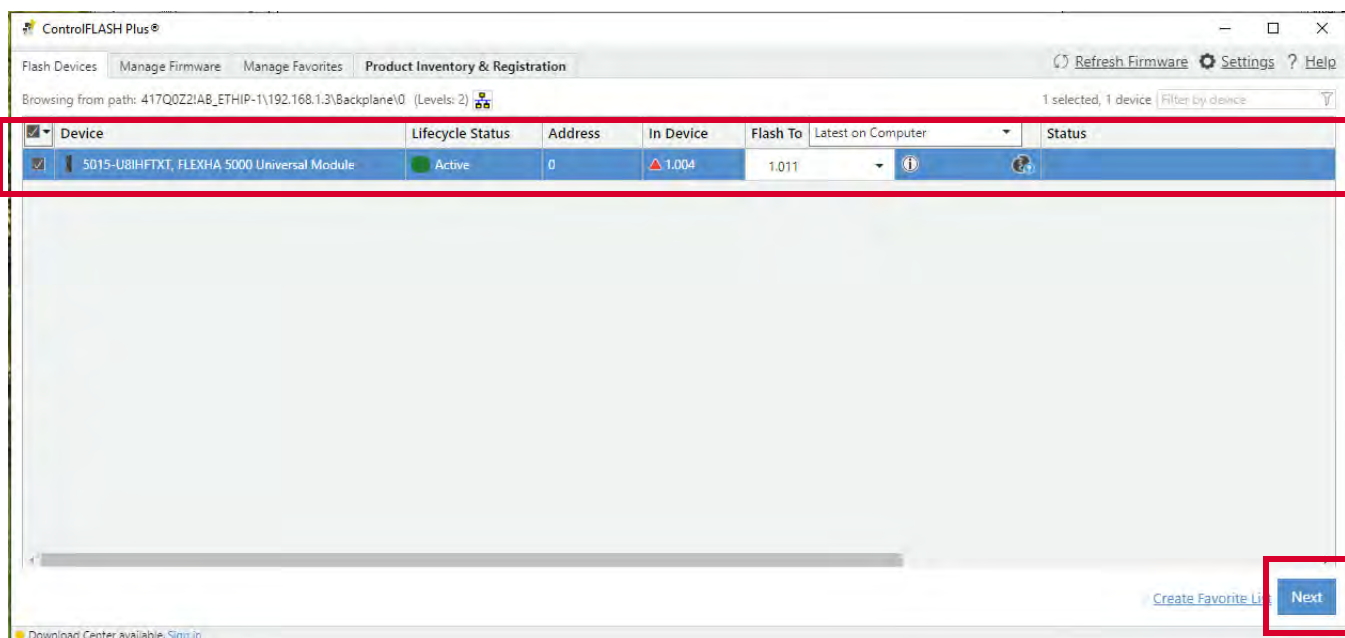
1. Make sure that the I/O module is in a separate system.
2. Connect to the I/O module via one of the Ethernet ports on the MLC that is associated with an EtherNet/IP adapter or the USB port on the adapter.
3. Open the ControlFLASH Plus tool.
4. Open the tool via Search > ControlFLASH Plus.
5. Browse to the I/O module.



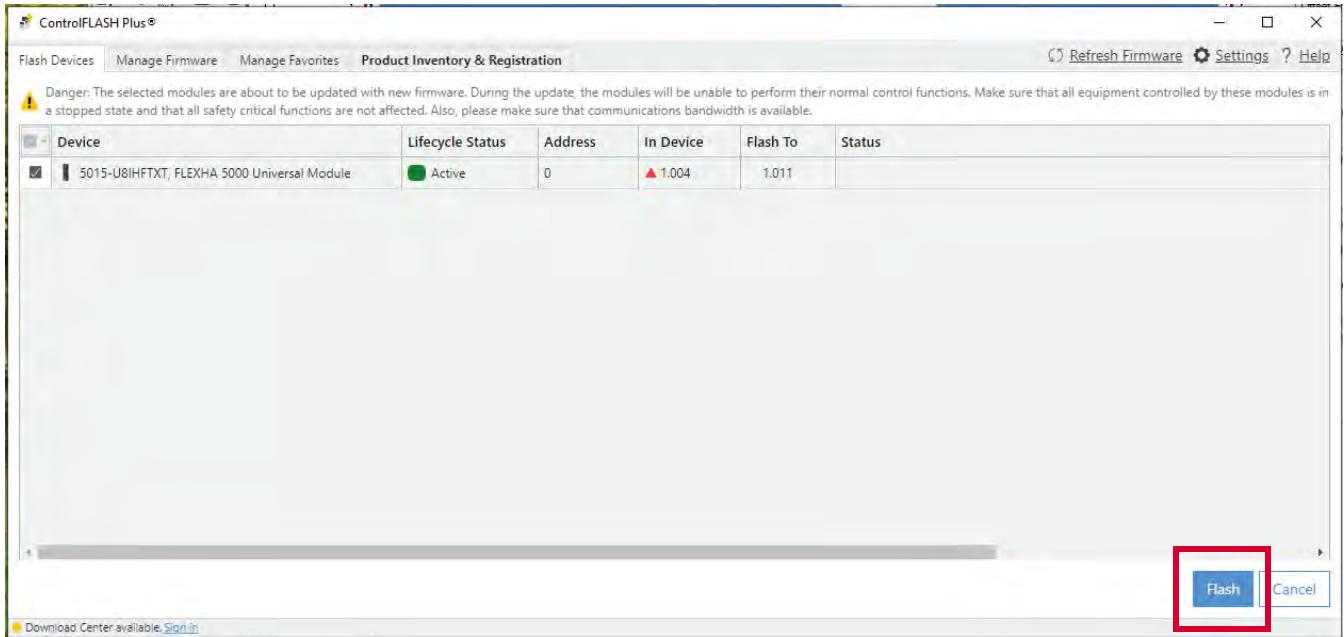
6. Choose the I/O module that must be updated and click OK.



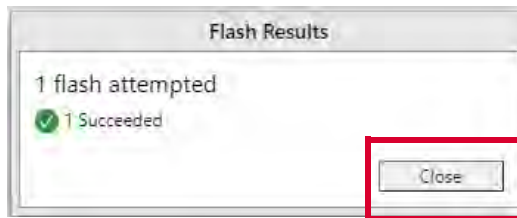
7. Choose the I/O module, and click Next.



8. Click Flash.



9. When the update is successful, click Close on the Flash Results dialog box.



- 10. Click Done.
- 11. Close the ControlFLASH Plus tool.
- 12. Remove the I/O modules and use them in a control system.



## Update EtherNet/IP Adapters

Before you update the EtherNet/IP adapters' firmware revision, consider the following:

- You update the firmware revision on one adapter at a time.

---

**IMPORTANT** If you have only one EtherNet/IP adapter in the system, when you update the firmware revision, it updates the firmware revision on Power Conditioners and BIMs.  
But only the MLC that is associated with the EtherNet/IP adapter gets its firmware revision updated, not both MLCs.

---

- You can't update the firmware revision on an adapter if the Redundant Adapter Pair is in Protected Mode, either Implicit or Explicit.

For more information on Protected Mode, see [page 74](#).

- It doesn't matter which adapter in the Redundant Adapter Pair that you update first. When you begin the firmware revision update, the adapter switches to the Not Able to Control state when the update begins.

For more information on the Not Able to Control state, see [page 70](#).

- If you have two adapters in the system, when you update each adapter, that adapter automatically updates the Power Conditioners, BIMs and the MLC that is associated with the adapter.

For example, when you update the firmware revision on Adapter A, the firmware revisions on these devices are automatically updated:

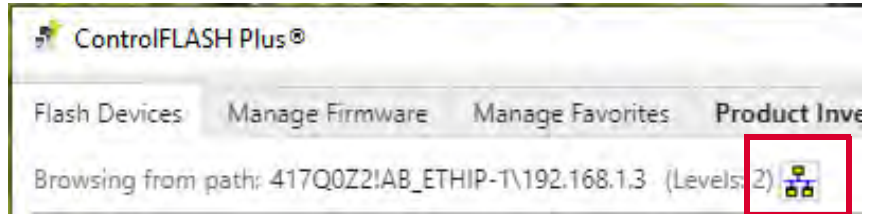
- BIM A in the Adapter Base and BIM A in the I/O Base(s)
- Power Conditioner A
- MLC A

- If you have only one EtherNet/IP adapter in the system, when you update that adapter, it updates the firmware revision on all BIMs and Power Conditioners--A and B. But it only updates the MLC that is associated with the adapter.

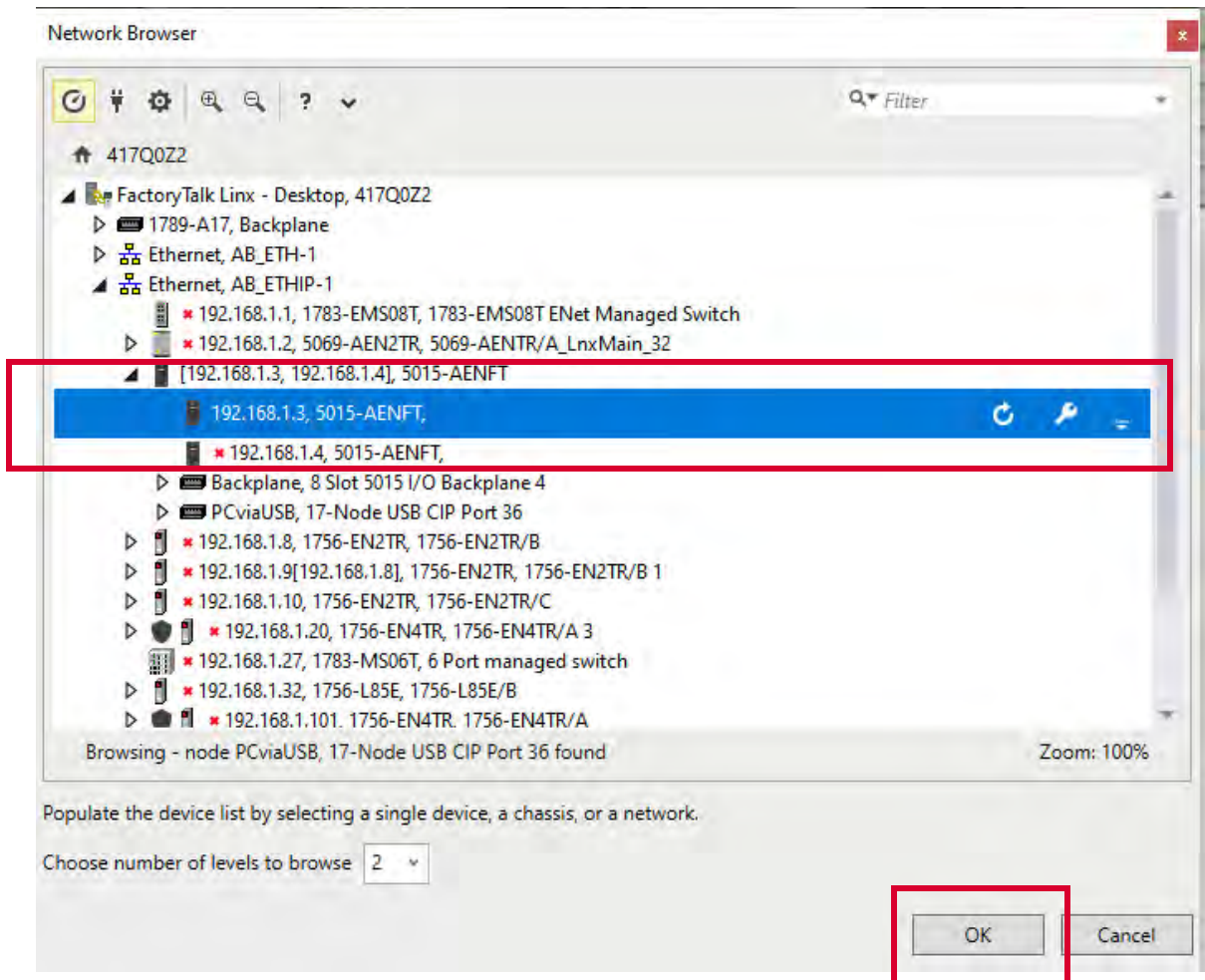
- During the firmware update process, fault tolerance is compromised because the adapter cannot operate on the EtherNet/IP network. The partner adapter maintains control. However, if the partner adapter stops communicating on the network, for example, an Ethernet cable is disconnected, all control is lost. Control resumes when either of the adapters returns to the Able to Control state.

Complete these steps.

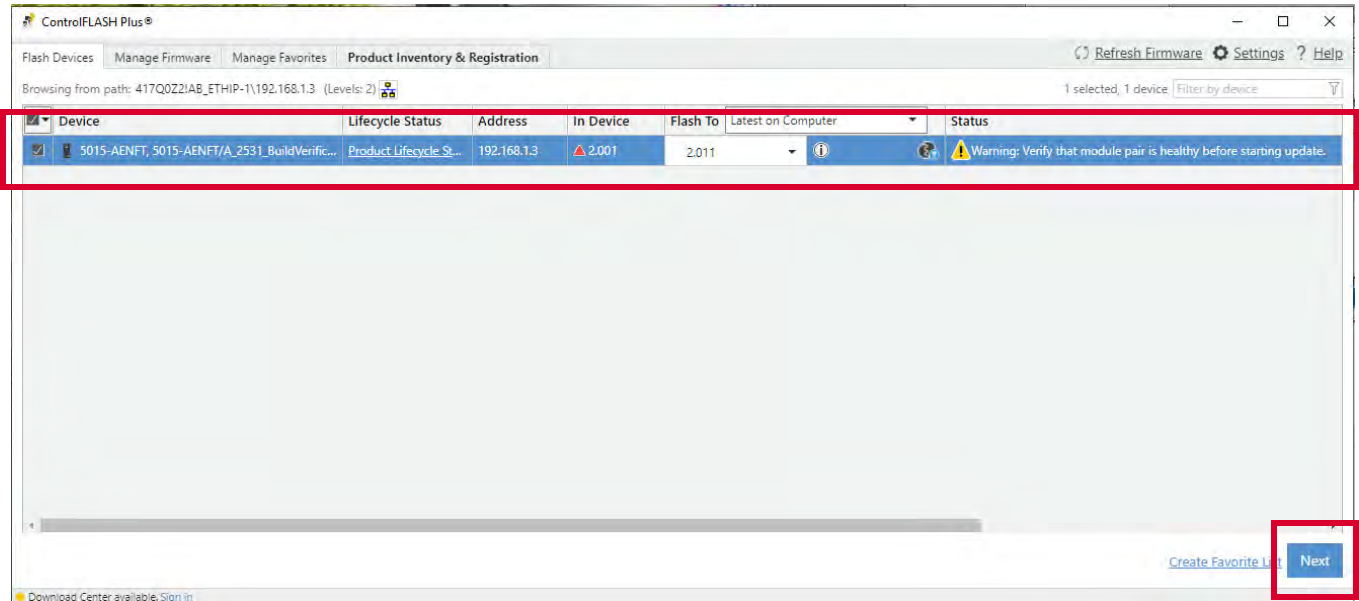
1. Make sure that the Logix Designer application project is in Program mode.
2. Connect to the first adapter via one of the Ethernet ports on the associated MLC or the USB port on the adapter.
3. Open the ControlFLASH Plus tool.
4. Open the tool via Search > ControlFLASH Plus.
5. Browse to the device.



6. Choose the adapter that must be updated and click OK.



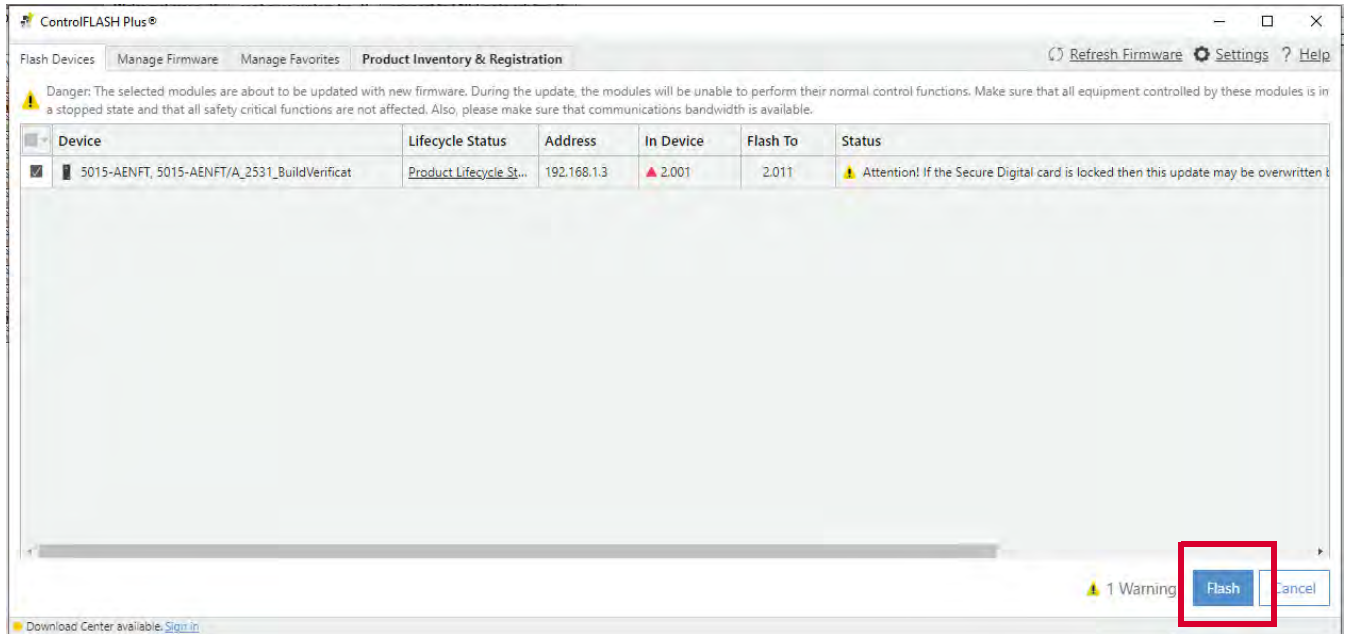
## 7. Choose the adapter and click Next.



## 8. If a Warning Dialog box appears, click Close.



9. Click Flash.



10. When the update is successful, click Close on the Flash Results dialog box.



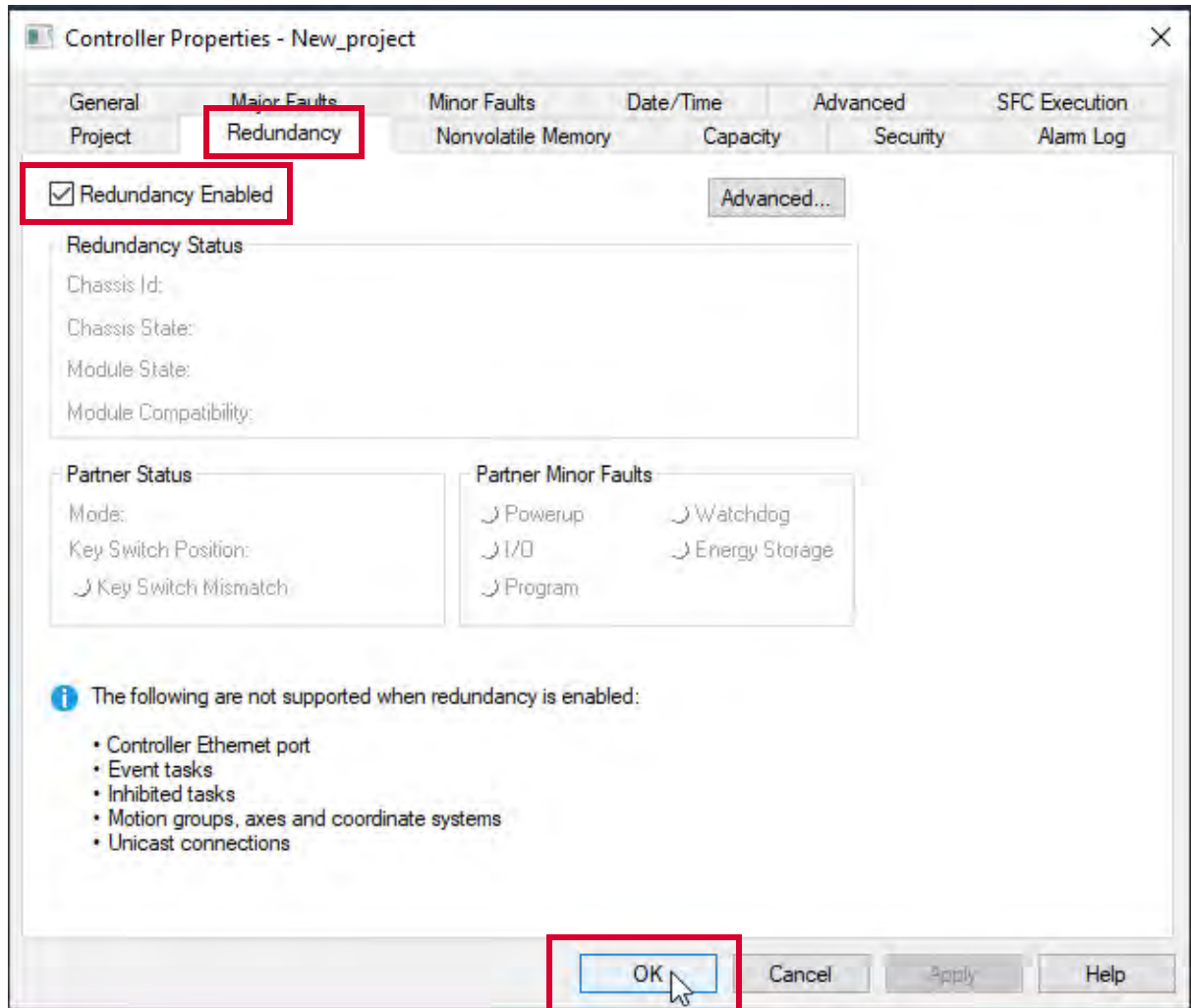
11. Click Done.
12. Close the ControlFLASH Plus tool.
13. Disconnect from the first adapter via one of the Ethernet ports on the associated MLC or the USB port on the adapter.
14. Wait for the adapter that was updated to complete the power-up sequence, resume normal operation and is in the Able to Control state.
15. Repeat the steps to update the firmware revision on the other adapter.

## Create a New Logix Designer Application Project

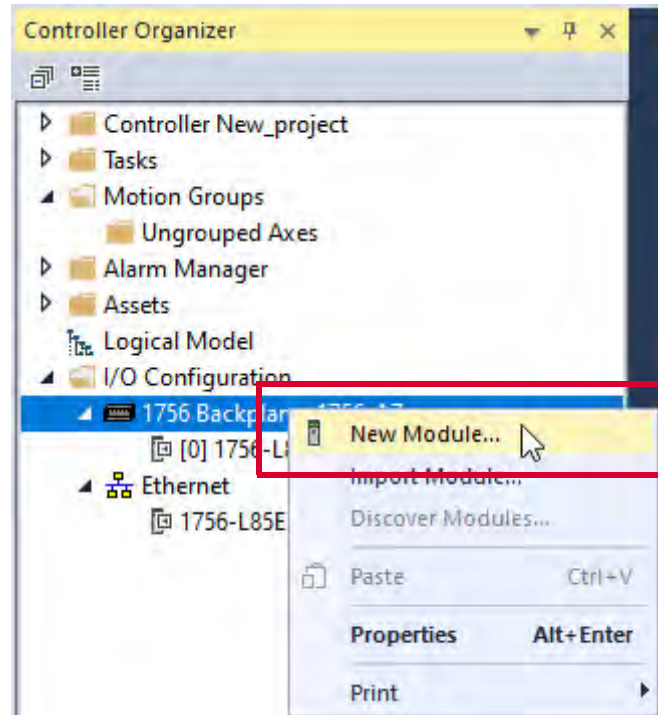
To configure FLEXHA 5000 I/O modules, you must create a Logix Designer application project that uses a ControlLogix® 5580 controller.

We recommend that you choose a redundant controller configuration for your system when it uses FLEXHA 5000 I/O modules. On the Controller Properties dialog box, complete these tasks to enable redundancy in the project:

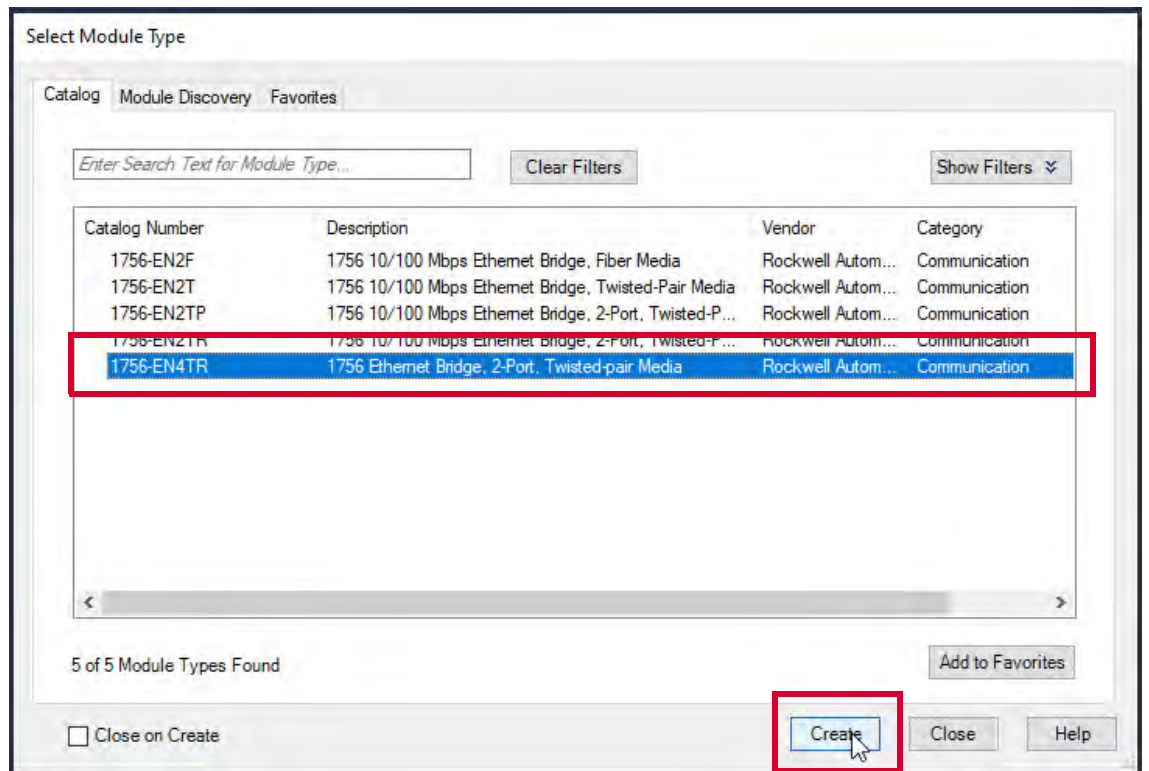
1. Click the Redundancy tab.
2. Select Redundancy Enabled.
3. Click OK.



- In the I/O configuration tree, right-click on the 1756 Backplane and choose New Module.



- On the Select Module Type dialog box, choose the 1756-EN4TR module and click Create.



6. On the Device Definition dialog box, set all parameters for the module and click OK.  
At minimum, you must define the following:
  - Name
  - Ethernet Address Module 1
  - Ethernet Address Module 2 (required because the application is using ControlLogix Redundancy)  
The IP address on Module 2 must be the same as Module 1 but incremented by one.
  - Revision - Must be 5.001 or greater
  - Concurrent communication - Must be Yes
  - Network mode - Device Level Ring (DLR) or Parallel Redundancy Protocol (PRP)  
Failure to choose the correct network mode can result in issues when the system goes online.  
This field is not shown below. You must scroll down see it.

**Device Definition**

Device type:  
1756-EN4TR 1756 Ethernet Bridge, 2-Port, Twisted-pair  
Media

Name:\*  
Ethernet\_IP\_comm\_module

Description:

Ethernet Address Module 1:\*  
IP address 192 . 168 . 1 . 101

Ethernet Address Module 2:\*  
IP address 192 . 168 . 1 . 102

Slot:  
1

Revision:  
5 . 001

Electronic keying:  
Compatible Module

Rack connection:  
None

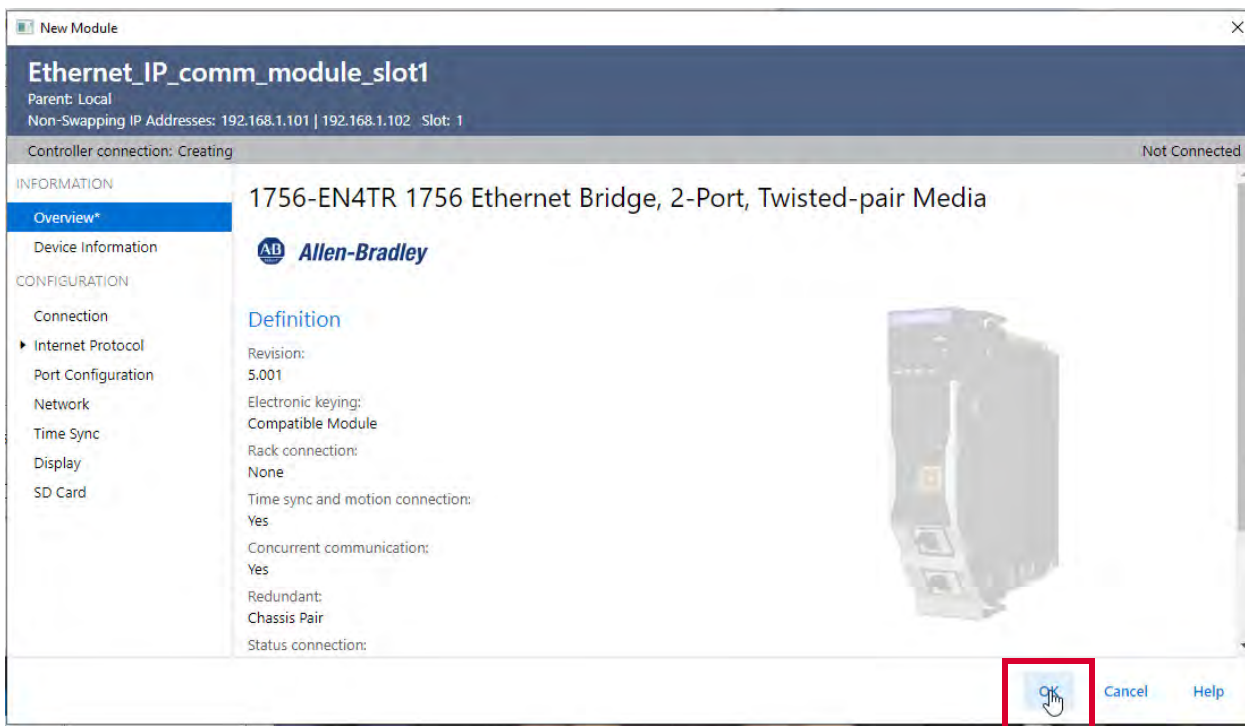
Time sync and motion connection:  
Yes

Concurrent communication:  
Yes

Redundant:  
Chassis Pair

OK Cancel Help

7. Click OK on the New Module dialog box.





## Create a New Module

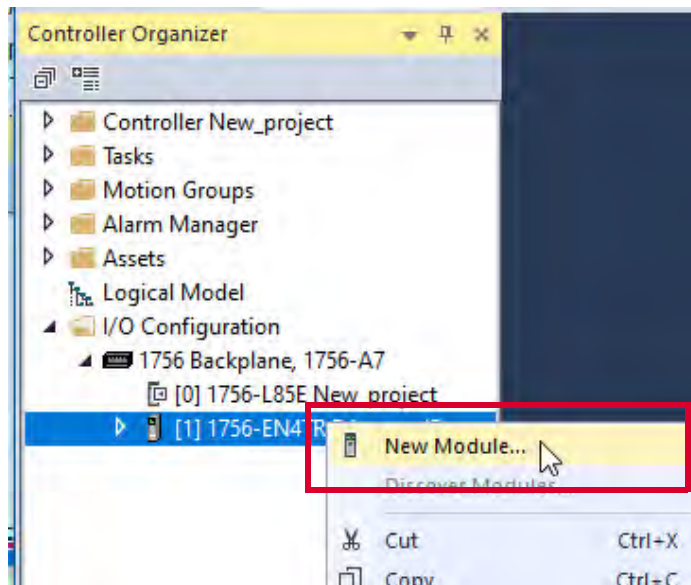
After you create a Logix Designer application project and add a 1756-EN4TR ControlLogix EtherNet/IP communication module to the project, you can use these methods to add FLEXHA 5000 I/O modules to the project:

- [New Module](#)
- [Discover Modules](#)

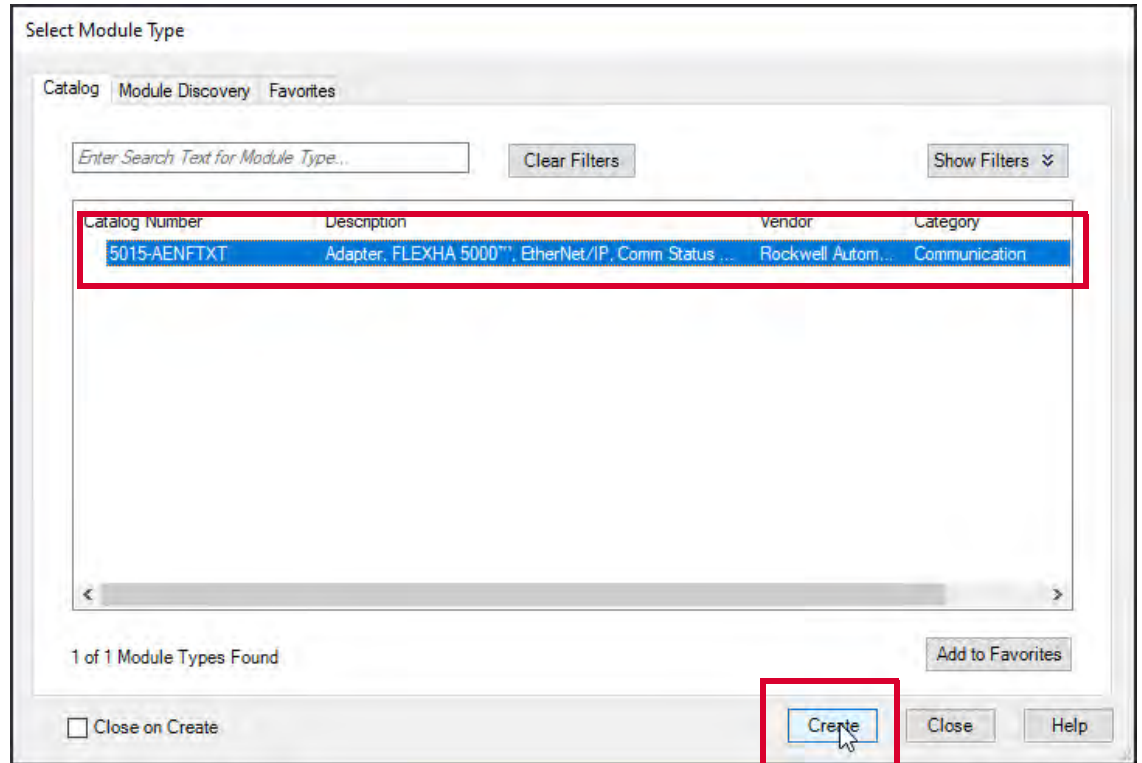
### New Module

To use the New Module method with FLEX 5000 I/O modules, complete these steps.

1. Right-click the 1756-EN4TR EtherNet/IP communication module and choose New Module.



2. Select the 5015-AENFTXT EtherNet/IP adapter and click Create.



- On the Device Definition dialog box, define the adapter and click OK.

Remember the following:

- When you set the Module A IP address, the Module B IP address is automatically set to the same value plus one.
- The firmware revision matches that of the adapter.
- The Network mode must match the network topology to which the system is connection, that is Device Level Ring (DLR) or Parallel Redundancy Protocol (PRP).

Failure to choose the correct network mode can result in issues when the system goes online.

- Chassis size must accommodate at least the number of I/O slots that are used in the system.

The screenshot shows the 'Device definition' dialog box with the following fields and values:

- Device type:** 5015-AENFTXT Adapter, FLEXHA 5000™, EtherNet/IP, Comm Status LEDs, Diagnostic Module, Fault Tolerant Capable and XT
- Name:** FLEXHA\_5000\_IO\_system\_adapter
- Description:** (empty)
- Ethernet address: Module A:** IP address 192.168.1.3
- Ethernet address: Module B:** IP address 192.168.1.4
- Series:** A
- Revision:** 2, 011
- Electronic keying:** Compatible Module
- Connection:** Status
- Network mode:** Parallel Redundancy Protocol (...)
- Chassis size:** 8

A red box highlights the 'OK' button at the bottom right of the dialog.

- Click Yes on the Apply changes? dialog box.

The screenshot shows the 'Apply changes?' dialog box with the following content:

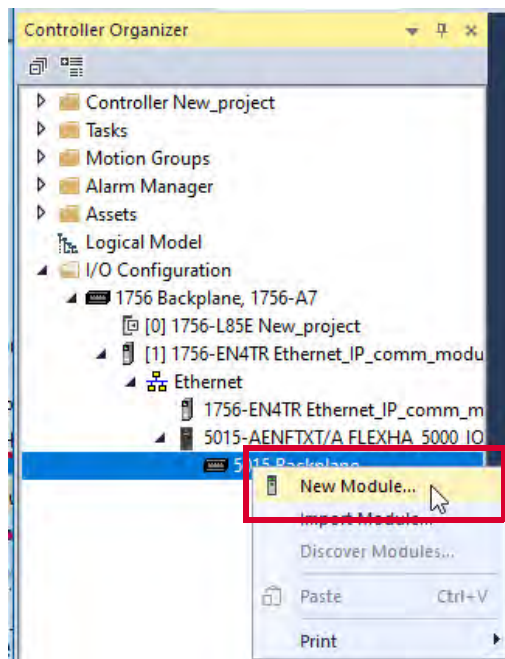
- Warning icon:** A yellow triangle with an exclamation mark.
- Title:** Apply changes?
- Message:** These changes will cause module data types and properties to change. Data will be set to default values unless it can be recovered from the existing module properties. Verify module properties before applying changes.
- Question:** Change module definition?

A red box highlights the 'Yes' button at the bottom right of the dialog.

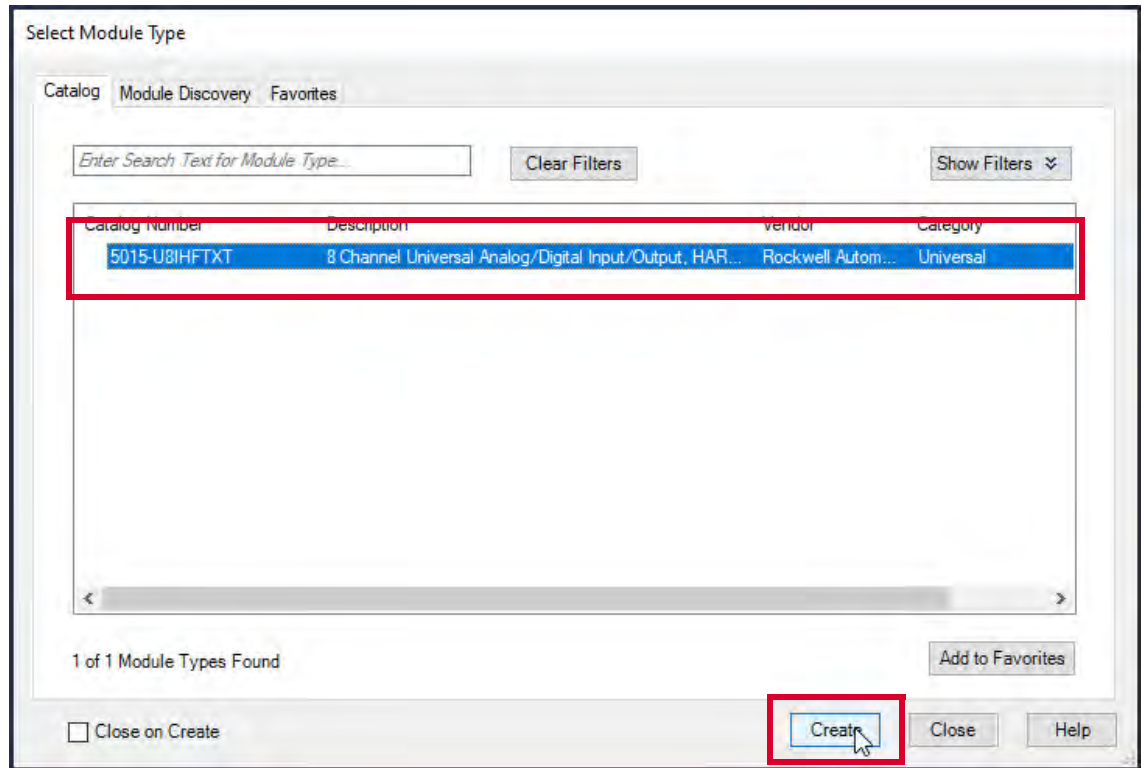
5. When the New Module dialog box appears, you can complete one of these tasks:
  - Click OK to use the default configuration, as shown.
  - Click individual categories to edit the module configuration.



6. Right-click the 5015 Backplane and choose New Module.



7. Select the I/O module and click Create.



8. On the Device Definition dialog box, configure these categories:

- Overview
- Channel Assignments

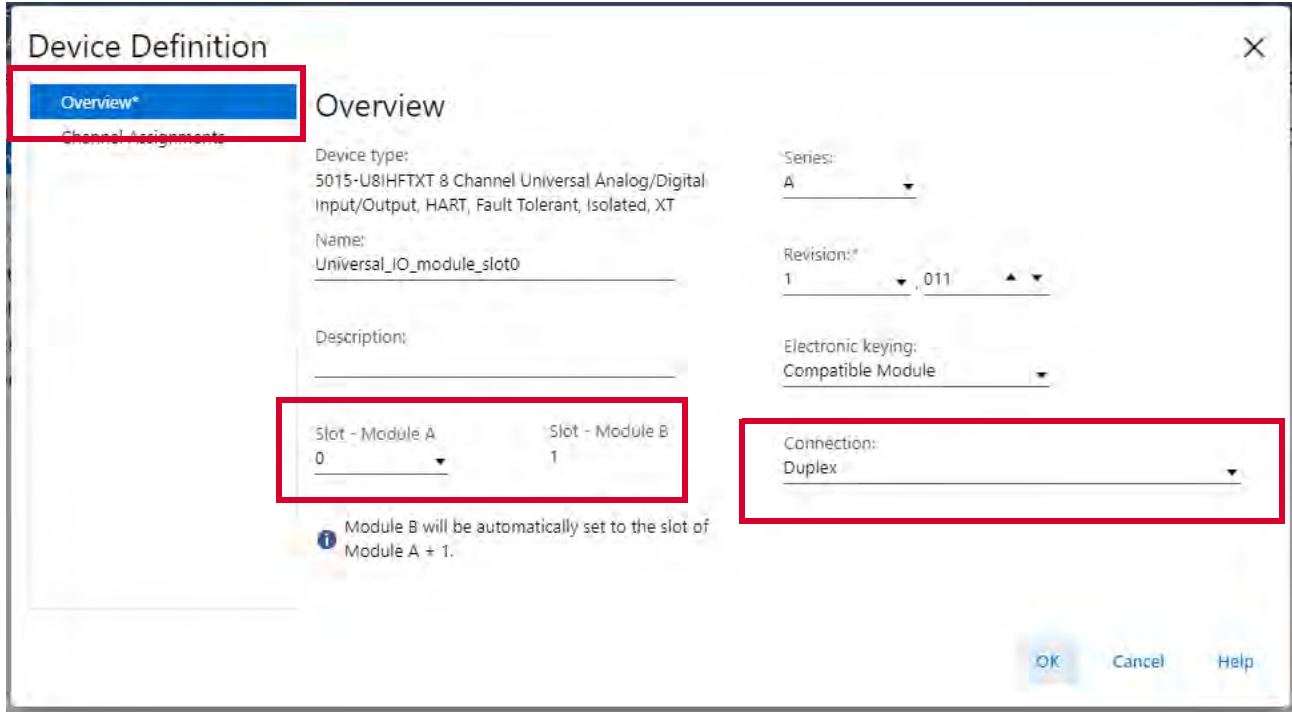
9. On the Overview category, name the I/O module and change other parameters as needed.

**IMPORTANT** The Connection parameter determines whether you are configuring a Duplex pair of I/O modules or a Simplex I/O module.

- Duplex pair

When you choose Connection - Duplex, the configuration is performed once and applies to both modules in the pair, that is, Module A and Module B.

Module A always resides in slot 0 or an even-numbered slot. Module B always resides in an odd-numbered slot.



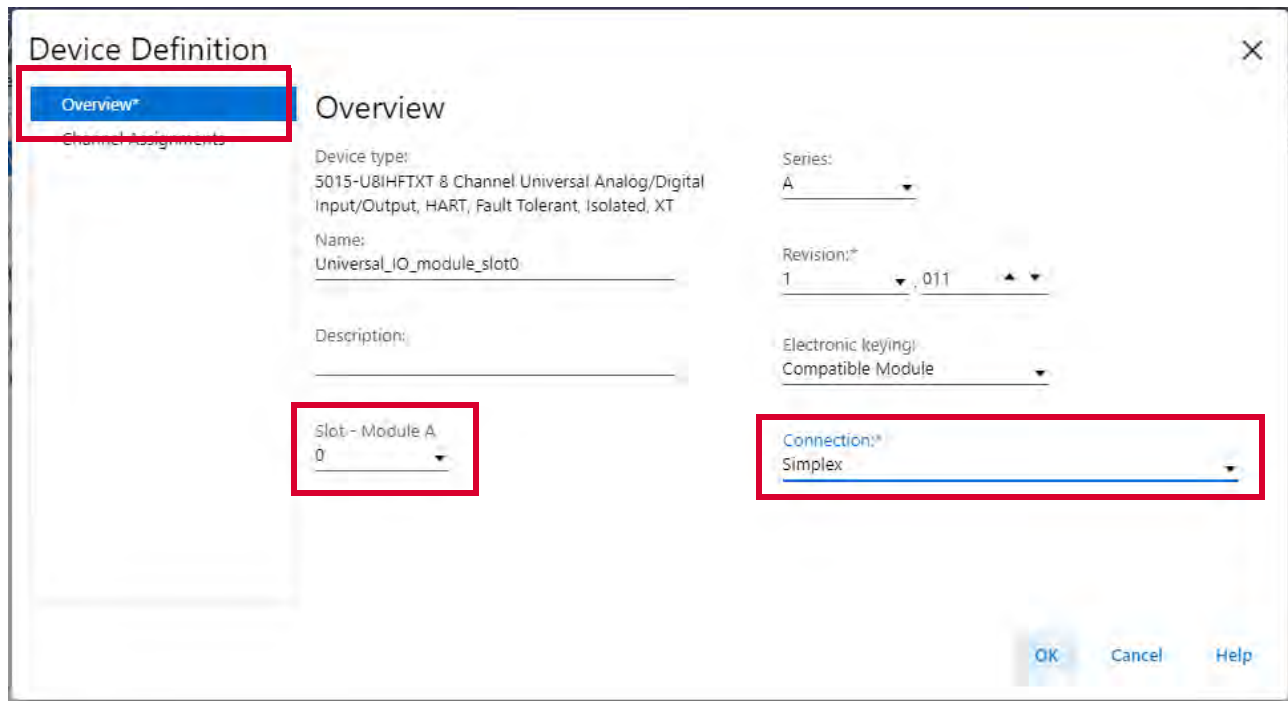
- Simplex module

When you choose Connection - Simplex, the configuration only applies to the module that is in the slot number that is part of the device definition. In this example, it's the module in slot 0.

**IMPORTANT**

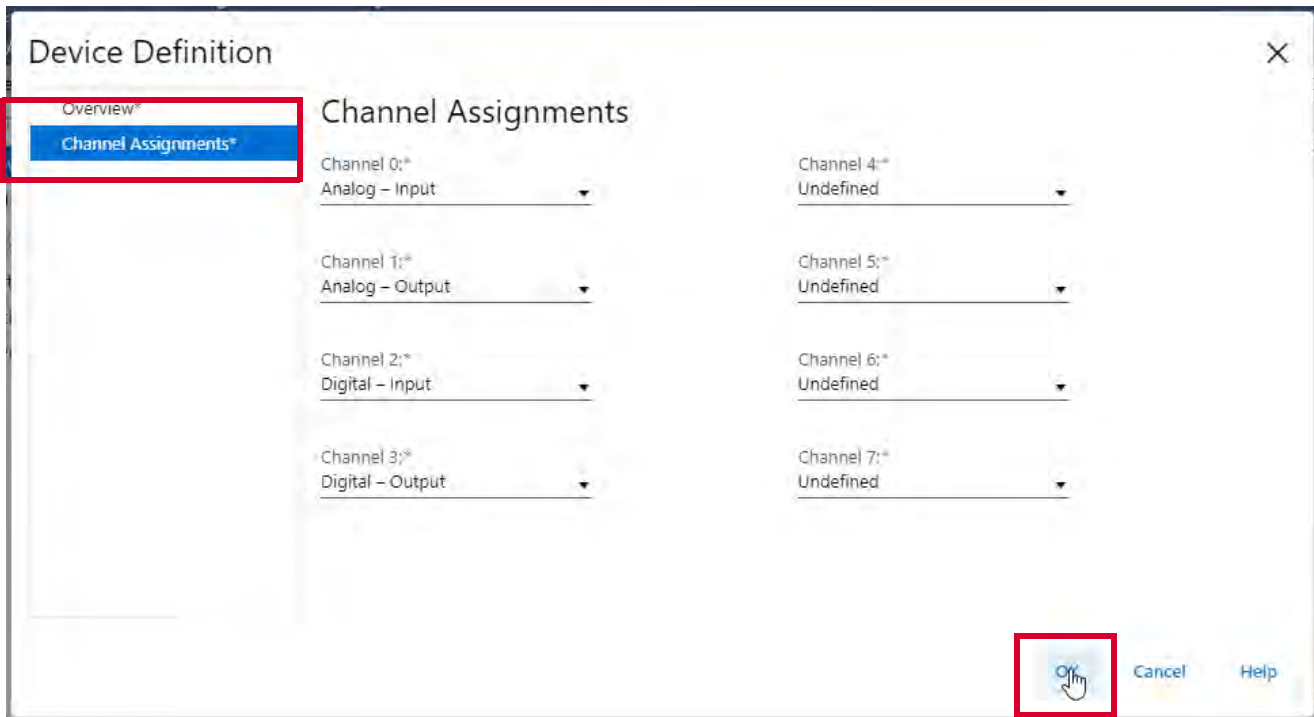
While Duplex pairs always use pairs of slots, for example, slots 0 and 1 or slots 2 and 3, Simplex modules can reside in any slot.

If you assign a Simplex module to a slot, the other slot in that pair can only be used for another Simplex module or an I/O Slot filler. For example, if you add a Simplex module to slot 0, you cannot start a Duplex pair in slot 1. You must use a Simplex module or I/O slot filler in slot 1, and you can then add a Duplex pair beginning in slot 2.



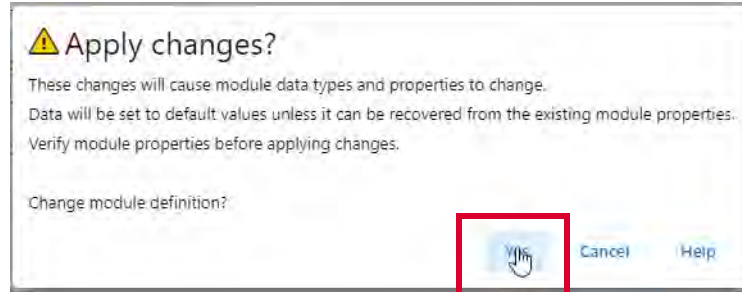
10. On the Channel Assignments category, configure each channel and click OK.
- With the Universal I/O module, you can set each channel to one of these types:
- Analog - Input
  - Analog - Output
  - Digital - Input
  - Digital - Output

You can also leave channels undefined. When they are undefined, channels are in an inert state and does not update produce/consume data for the channel. If you only require four channels, leaving the other four channels undefined does not use communications bandwidth. However, it allows for expansion in the future.





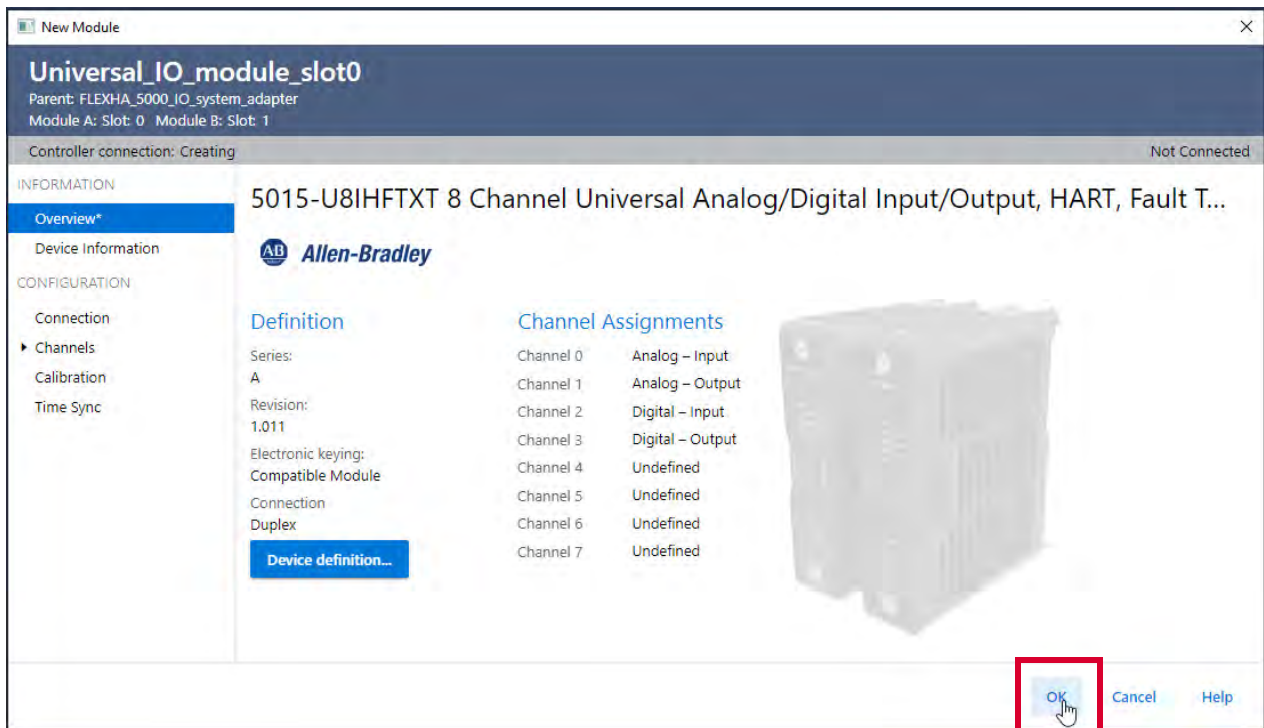
11. Click Yes on the Apply changes? dialog box.



12. When the New Module dialog box appears, complete one of these tasks:

- Click OK to use the default configuration, as shown.
- Click individual categories to edit the module configuration.

For more information on how to configure individual categories, see [Edit the I/O Module Configuration on page 160](#).



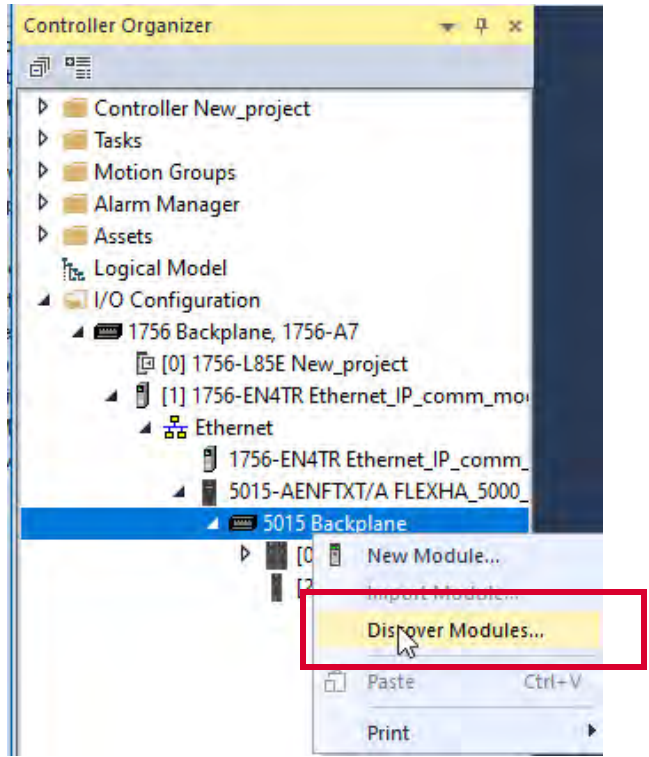
To add more FLEXHA 5000 I/O modules via the New Modules method, complete the steps in this section.

## Discover Modules

To add I/O modules to the Logix Designer application project while it's online, use the Discover Modules option.

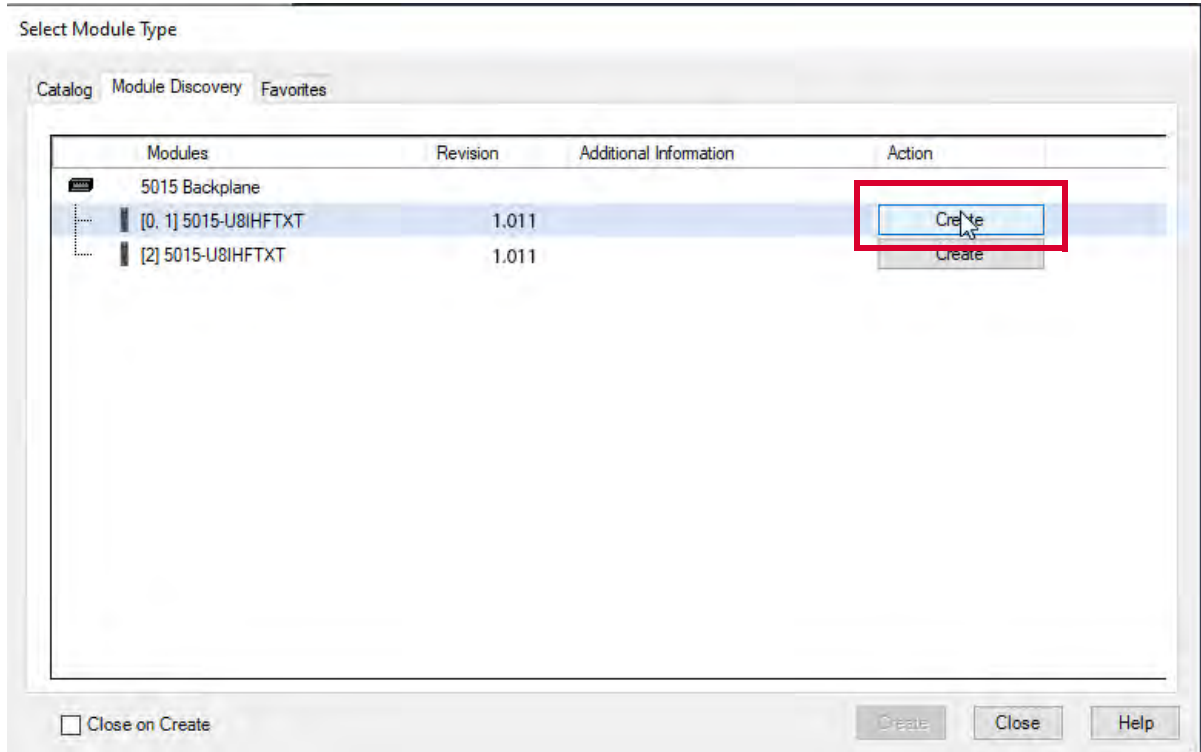
To use the Discover Modules method with local I/O modules, complete these steps.

1. Go online with your Logix Designer application.
2. Right-click the 5015 Backplane and choose Discover Modules.



The Logix Designer application automatically detects available modules that are connected to the backplane.

3. At the Select Module Type window, click Create to add the discovered module to your project.



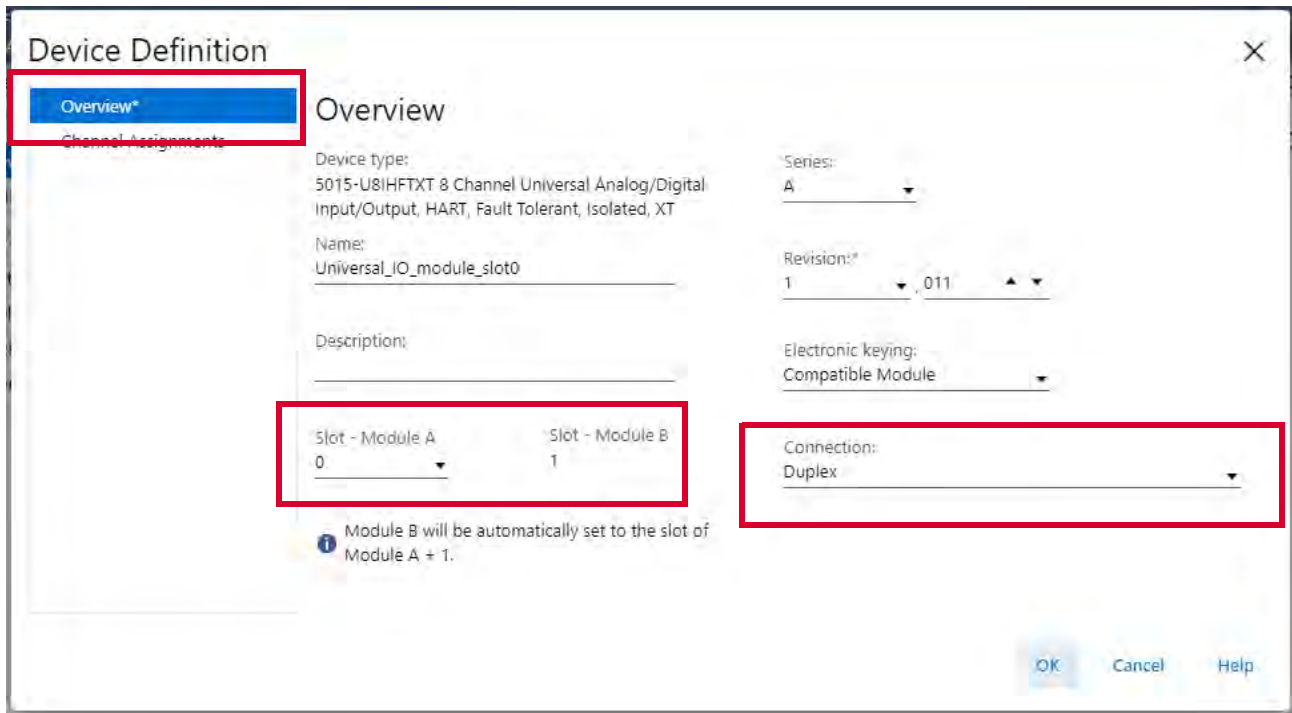
4. On the Device Definition dialog box, configure these categories:
  - Overview
  - Channel Assignments
5. On the Overview category, name the I/O module and change other parameters as needed.

**IMPORTANT** The Connection parameter determines whether you are configuring a Duplex pair of I/O modules or a Simplex I/O module.

- Duplex pair

When you choose Connection - Duplex, the configuration is performed once and applies to both modules in the pair, that is, Module A and Module B.

Module A always resides in slot 0 or an even-numbered slot. Module B always resides in an odd-numbered slot.



- Simplex module

When you choose Connection - Simplex, the configuration only applies to the module that is in the slot number that is part of the device definition. In this example, it's the module in slot 0.

**IMPORTANT**

While Duplex pairs always use pairs of slots, for example, slots 0 and 1 or slots 2 and 3, Simplex modules can reside in any slot.

If you assign a Simplex module to a slot, the other slot in that pair can only be used for another Simplex module or an I/O Slot filler. For example, if you add a Simplex module to slot 0, you cannot start a Duplex pair in slot 1. You must use a Simplex module or I/O slot filler in slot 1, and you can then add a Duplex pair beginning in slot 2.

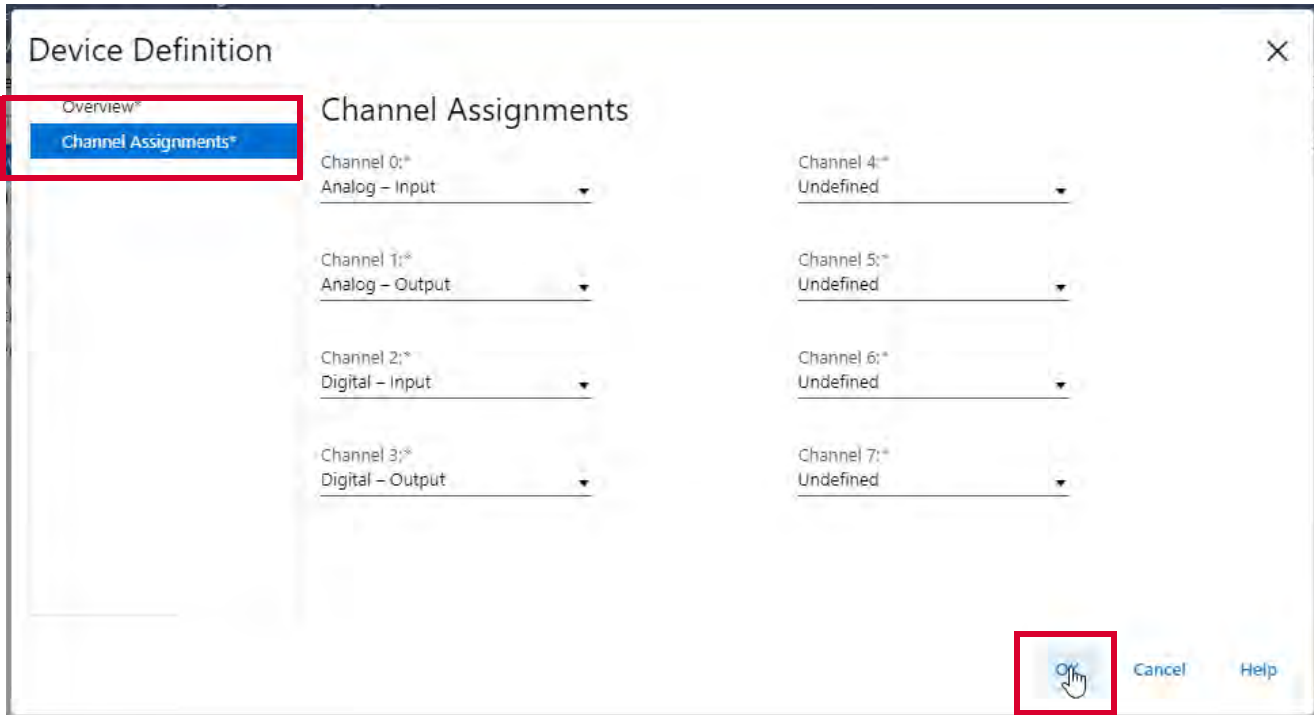
The screenshot shows the 'Device Definition' dialog box with the 'Overview' tab selected. The 'Slot - Module A' dropdown is set to '0'. The 'Connection:' dropdown is set to 'Simplex'. Other fields include 'Device type: 5015-UBIHFTXT 8 Channel Universal Analog/Digital Input/Output, HART, Fault Tolerant, Isolated, XT', 'Series: A', 'Revision: 1,011', and 'Electronic keying: Compatible Module'. Buttons for 'OK', 'Cancel', and 'Help' are visible at the bottom right.

6. On the Channel Assignments category, configure each channel and click OK.
 

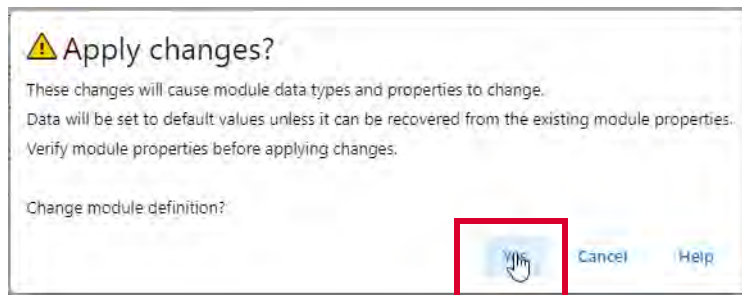
With the Universal I/O module, you can set each channel to one of these types:

  - Analog - Input
  - Analog - Output
  - Digital - Input
  - Digital - Output

You can also leave channels undefined. When they are undefined, channels are in an inert state and does not update produce/consume data for the channel. If you only require four channels, leaving the other four channels undefined does not use communications bandwidth. However, it allows for expansion in the future.

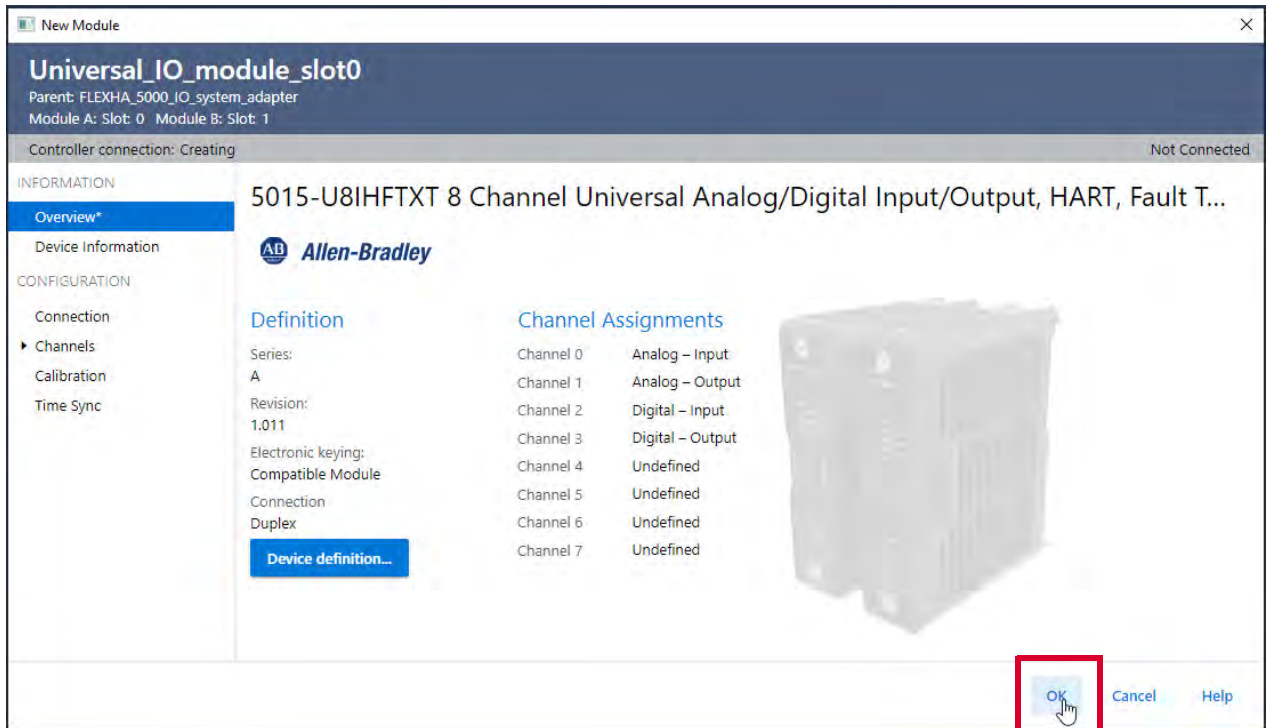


7. Click Yes on the Apply changes? dialog box.



8. When the New Module dialog box appears, complete one of these tasks:
  - Click OK to use the default configuration, as shown.
  - Click individual categories to edit the module configuration.

For more information on how to configure individual categories, see [Edit the I/O Module Configuration on page 160](#).



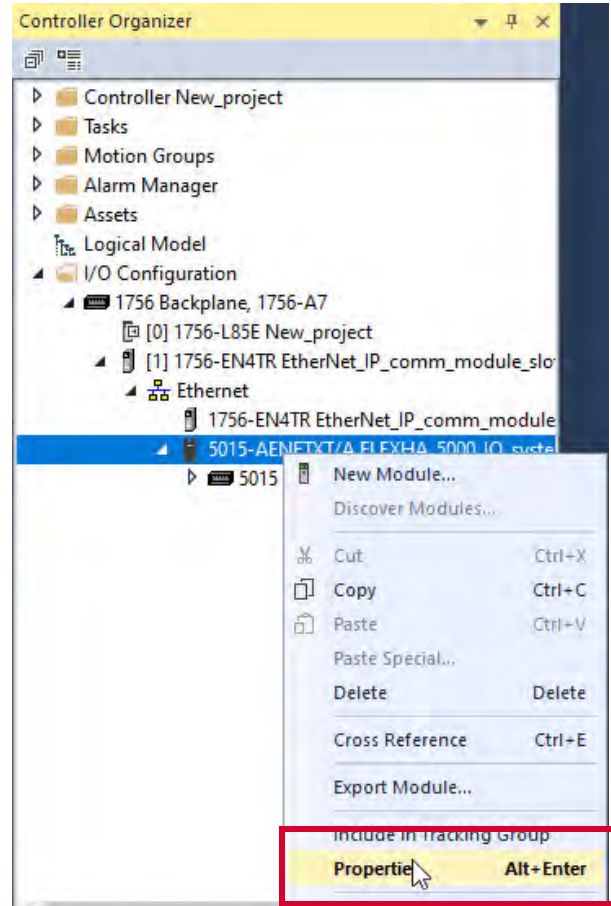
To add more FLEXHA 5000 I/O modules via the Discover Modules method, complete the steps in this section.

## Edit the EtherNet/IP Adapter Configuration

You can edit the adapter's configuration when you add the adapter to the project or after it's been added.

Because the default configuration parameters were chosen in section [Create a New Logix Designer Application Project](#) beginning on [page 133](#), this section shows how to edit the adapter's configuration after it's been added.

1. Right-click on the FLEXHA 5000 EtherNet/IP adapter and choose Properties.



These Configuration views apply to the FLEXHA 5000 EtherNet/IP adapter's configuration.

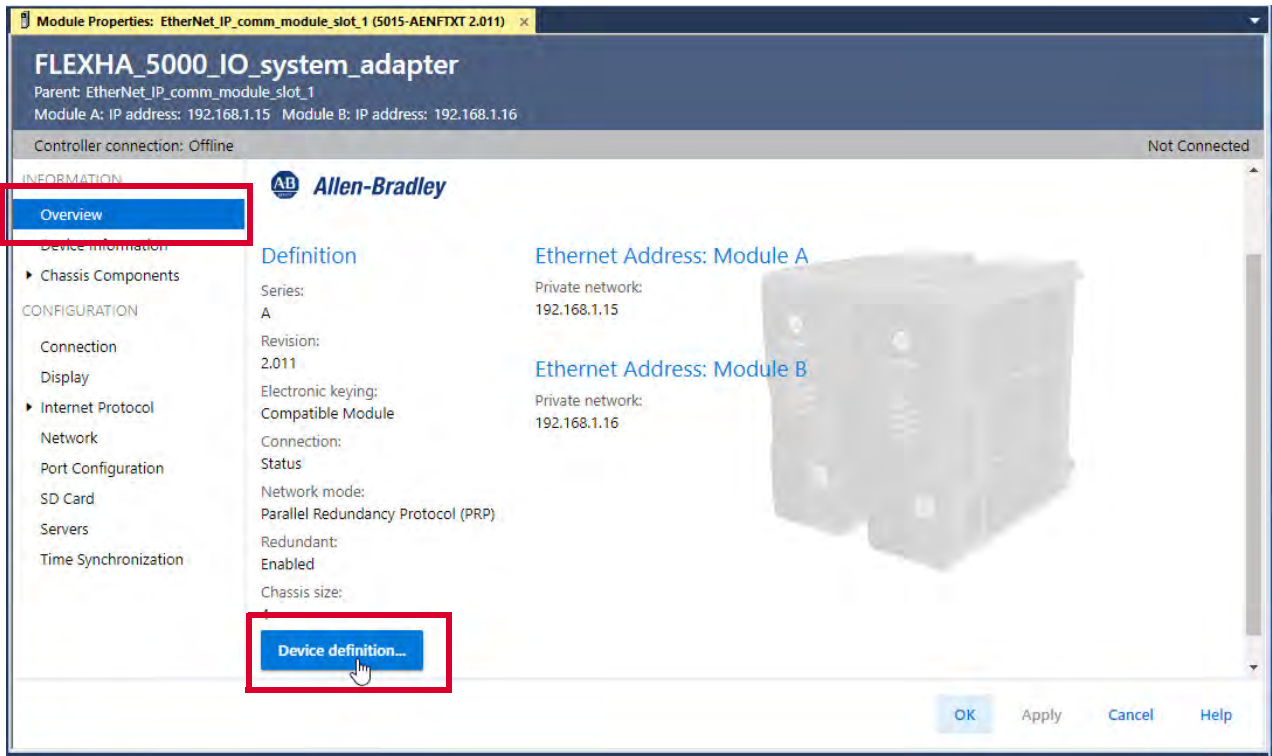
- [Overview](#)
- [Connection View](#)



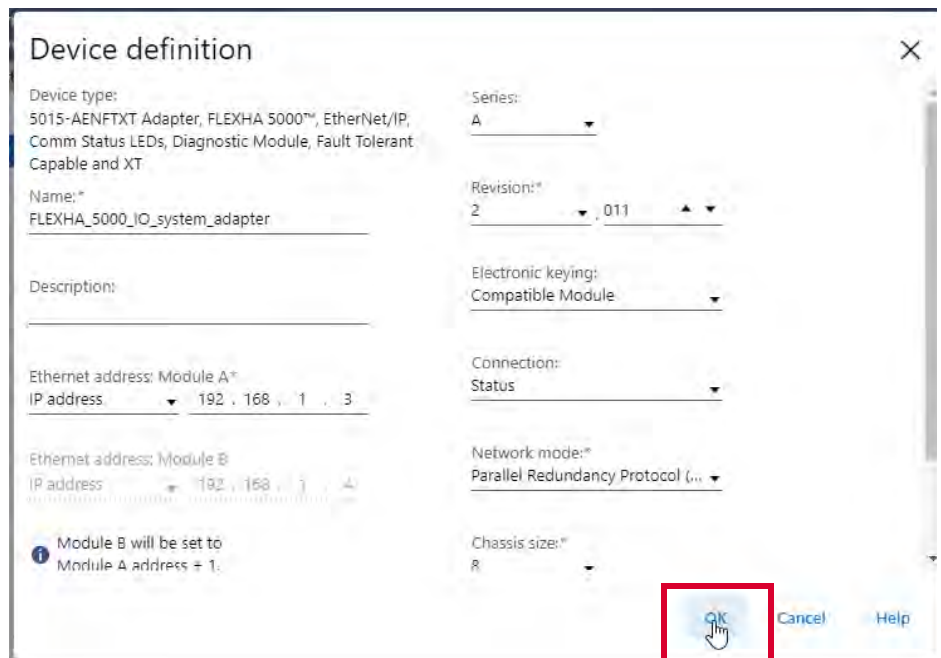
## Overview

Access the device definition from the Overview category.

1. To change the adapter's definition, click Device definition . . .



2. Change the device definition as needed and click OK.



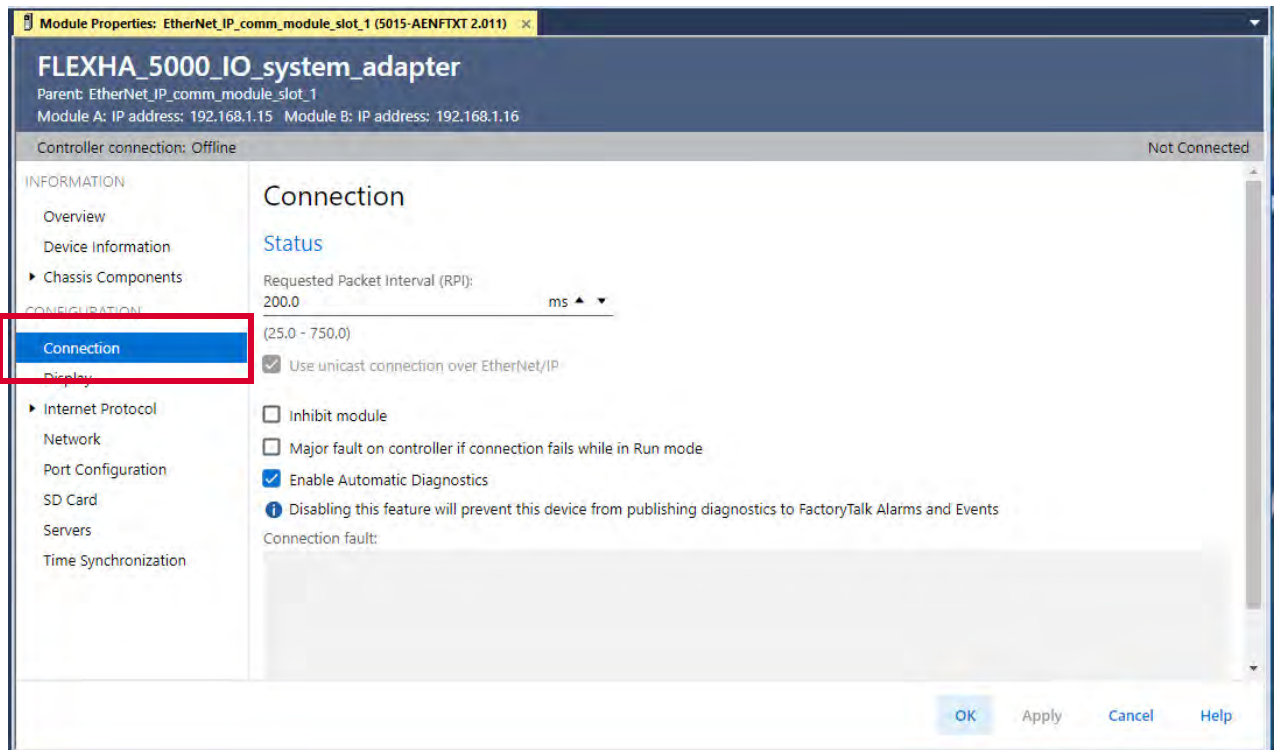
The remaining configurable categories are accessible under the CONFIGURATION section.

## Connection View

This view shows the connection configuration options for the adapter.

Complete these tasks:

- Set the RPI.  
The RPI sets the time interval at which status information is exchanged with the adapter.
- Inhibit the module, if necessary.  
When the module is inhibited, the connection to the controller is closed until you uninhibit the module.
- Choose whether a major fault occurs on the controller if the connection to the adapter fails in Run Mode.
- Enable Automatic Diagnostics, if necessary.



## Display View

This view shows the types of messages that appear on the 4-character display.

**IMPORTANT** You must be online to use this view.

The screenshot shows the configuration window for the FLEXHA 5000 IO system adapter. The window title is "Module Properties: Ethernet\_IP\_comm\_module\_slot1 (5015-AENFTXT 2.011)". The main title is "FLEXHA\_5000\_IO\_system\_adapter". Below the title, it shows "Parent: Ethernet\_IP\_comm\_module\_slot1" and "Module A: IP address: 192.168.1.3 Module B: IP address: 192.168.1.4". The status bar indicates "Controller connection: Running Device status: OK" and "Connected".

The left sidebar is divided into "INFORMATION" and "CONFIGURATION" sections. Under "CONFIGURATION", the "Display" option is highlighted with a red box. Other options include "Connection", "Internet Protocol", "IP Module A", "IP Module B", "Network", "Port Configuration", "SD Card", "Servers", and "Time Synchronization".

The main area is titled "Display" and contains the following settings:

- Show non-system messages on LCD
- Display network configuration messages
- Display uncategorized messages\*

Below these settings is a table with the following data:

	Module A	Module B
Non-system Messages	Enabled	Enabled
Network Configuration Messages	Enabled	Enabled
Uncategorized Messages	Enabled	Enabled

Below the table, there is an information icon and the text: "System message will always be displayed and cannot be disabled." At the bottom of the main area, there are "Refresh" and "Set" buttons. At the very bottom of the window, there are "OK", "Apply", "Cancel", and "Help" buttons.

## Network View

This view shows network information for each module. Refresh the data or reset the counters on the modules.

**IMPORTANT** You must be online to use this view.

**FLEXHA\_5000\_IO\_system\_adapter**  
 Parent: Ethernet\_IP\_comm\_module\_slot1  
 Module A: IP address: 192.168.1.3 Module B: IP address: 192.168.1.4

Controller connection: Running Device status: OK Connected

**Network**

	Module A	Module B
Network Mode	Parallel Redundancy Protocol (PRP)	Parallel Redundancy Protocol (PRP)
Last PRP Fault Timestamp		
- Port A	None	1969-12-31-19:10:29.236_498_300(UTC)
- Port B	1969-12-31-19:18:25.885_509_298(UTC-05:00)	1969-12-31-19:06:32.236_781_170(UTC)
Diagnostics for Other PRP Nodes		
- Address	5C:88:16:F1:89:30	5C:88:16:F1:89:30
- Node Type	Double Attached	Double Attached
- Port A	Active	Active
- Port B	Inactive	Inactive

Refresh Reset counters Module A Reset counters Module B

OK Apply Cancel Help

## Port Configuration View

This view shows the port configuration information for the ports on each adapter. Use this view to change port configuration.

**IMPORTANT** You must be online to use this view.

**FLEXHA\_5000\_IO\_system\_adapter**  
 Parent: Ethernet\_IP\_comm\_module\_slot1  
 Module A: IP address: 192.168.1.3 Module B: IP address: 192.168.1.4  
 Controller connection: Running Device status: OK Connected

**Port Configuration**

Module	Port	Enable	Link Status	Auto-Negotiate	Speed Selected	Current
Module A	1	<input checked="" type="checkbox"/>	Active	<input checked="" type="checkbox"/>		100 Mbps
Module A	2	<input checked="" type="checkbox"/>	Inactive	<input checked="" type="checkbox"/>		
Module B	1	<input checked="" type="checkbox"/>	Active	<input checked="" type="checkbox"/>		100 Mbps
Module B	2	<input checked="" type="checkbox"/>	Inactive	<input checked="" type="checkbox"/>		

Enable Module A USB  
 Enable Module B USB

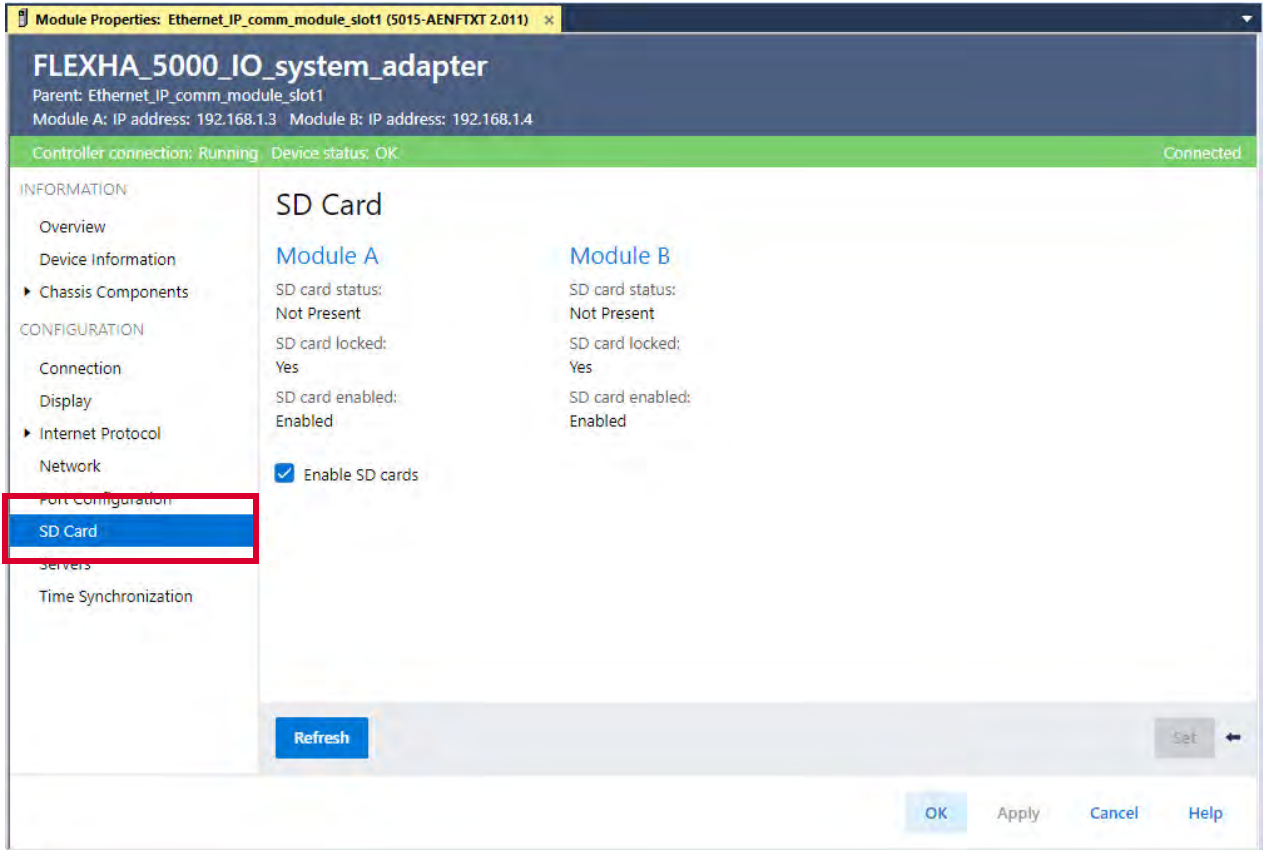
**Refresh** **Set**

OK Apply Cancel Help

## SD Card View

This view shows the SD card information for the card in each module. Enable or disable the SD cards and refresh the data.

**IMPORTANT** You must be online to use this view.



## Servers View

This view shows the network server information. Configure network server options. The servers are disabled by default. You must enable them to use the adapter's diagnostic webpages.

**IMPORTANT** You must be online to use this view.

The screenshot displays the configuration interface for the FLEXHA 5000 IO system adapter. The window title is "Module Properties: Ethernet\_IP\_comm\_module\_slot1 (5015-AENFTXT 2.011)". The main header shows "FLEXHA\_5000\_IO\_system\_adapter" with parent and module IP addresses. A green status bar indicates "Controller connection: Running" and "Device status: OK" with a "Connected" label.

The left sidebar contains a navigation menu with sections for INFORMATION and CONFIGURATION. The "Servers" option is highlighted in blue and enclosed in a red box.

The main content area is titled "Servers" and contains a table with the following data:

	Enable	Name	Port	Protocol	Status	
					Module A	Module B
-	<input type="checkbox"/>	Simple Network Management Protocol (SNMP)	161	UDP	Disabled	Disabled
+	<input checked="" type="checkbox"/>	Hypertext Transfer Protocol (HTTP)	80	TCP	Disabled	Disabled

At the bottom of the interface, there is a "Refresh" button, a "Test" button with a right-pointing arrow, and a row of buttons: "OK", "Apply", "Cancel", and "Help".

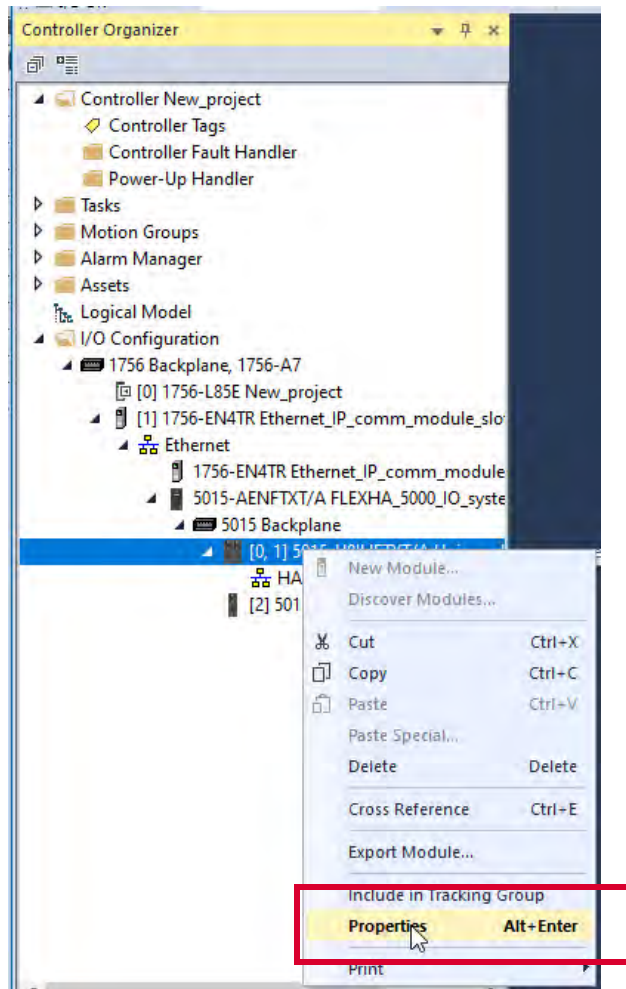
## Edit the I/O Module Configuration

Edit an I/O module's configuration when you add the module to the project or after it's been added.

Because the default configuration parameters were chosen in section [Create a New Module](#) beginning on [page 137](#), this section shows how to edit the I/O module's configuration after it's been added.

**IMPORTANT** Remember, if you change the configuration for a Duplex pair, the new configuration is applied to both I/O modules in the pair. Some of the fields in the Module Properties appear to be configurable but are non-functional. They are planned for future use. For more information, see the FLEXHA 5000 I/O System release notes that are available at the Product Compatibility and Download Center (PCDC) at [rok.auto/pcdc](http://rok.auto/pcdc).

1. Right-click on the FLEXHA 5000 I/O module and choose Properties.





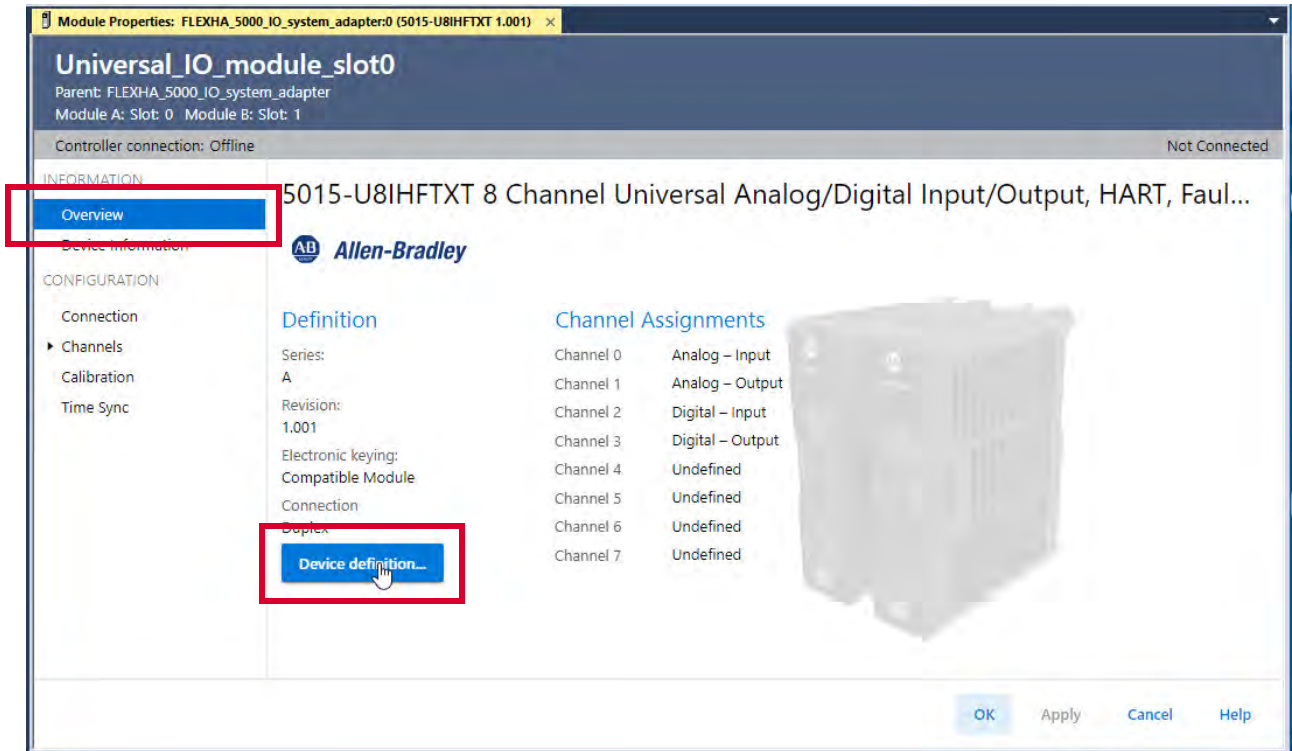
These Configuration categories apply to the FLEXHA 5000 I/O module's configuration.

- [Overview](#)
- [Connection View](#)

## Overview

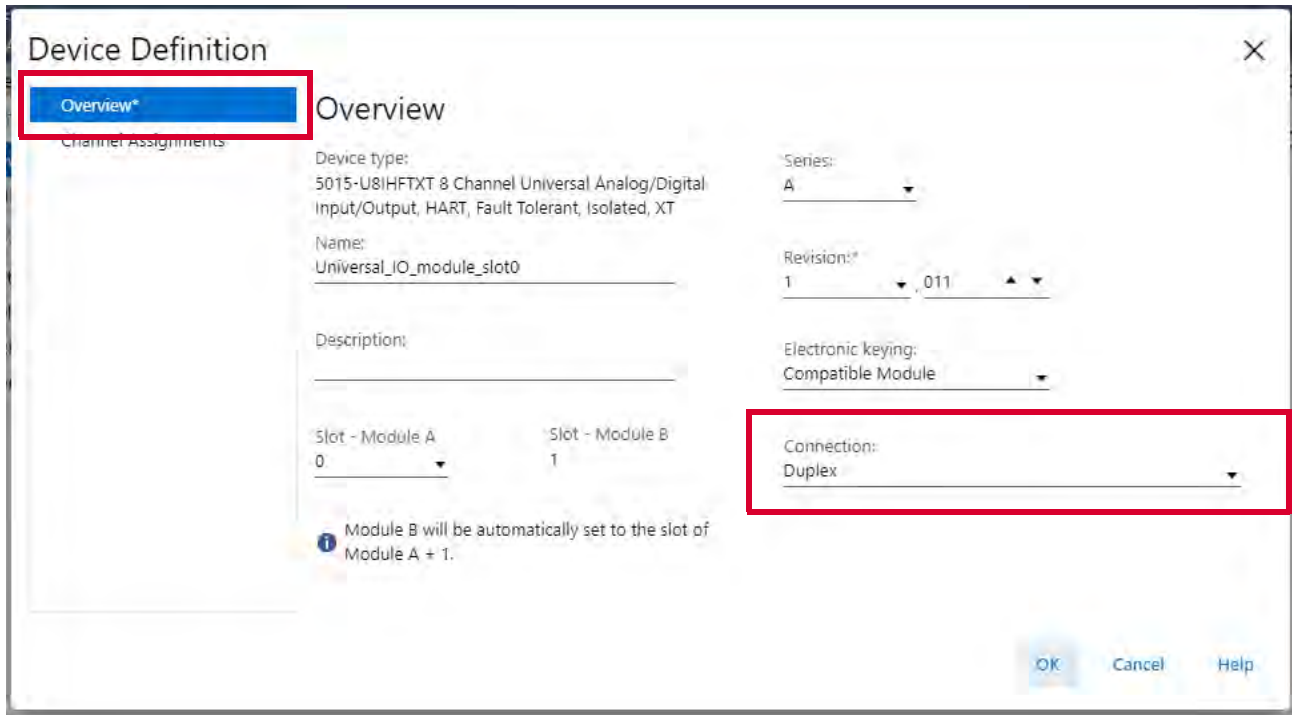
Access the device definition from the Overview category.

1. To change the I/O module's definition, click Device definition . . .

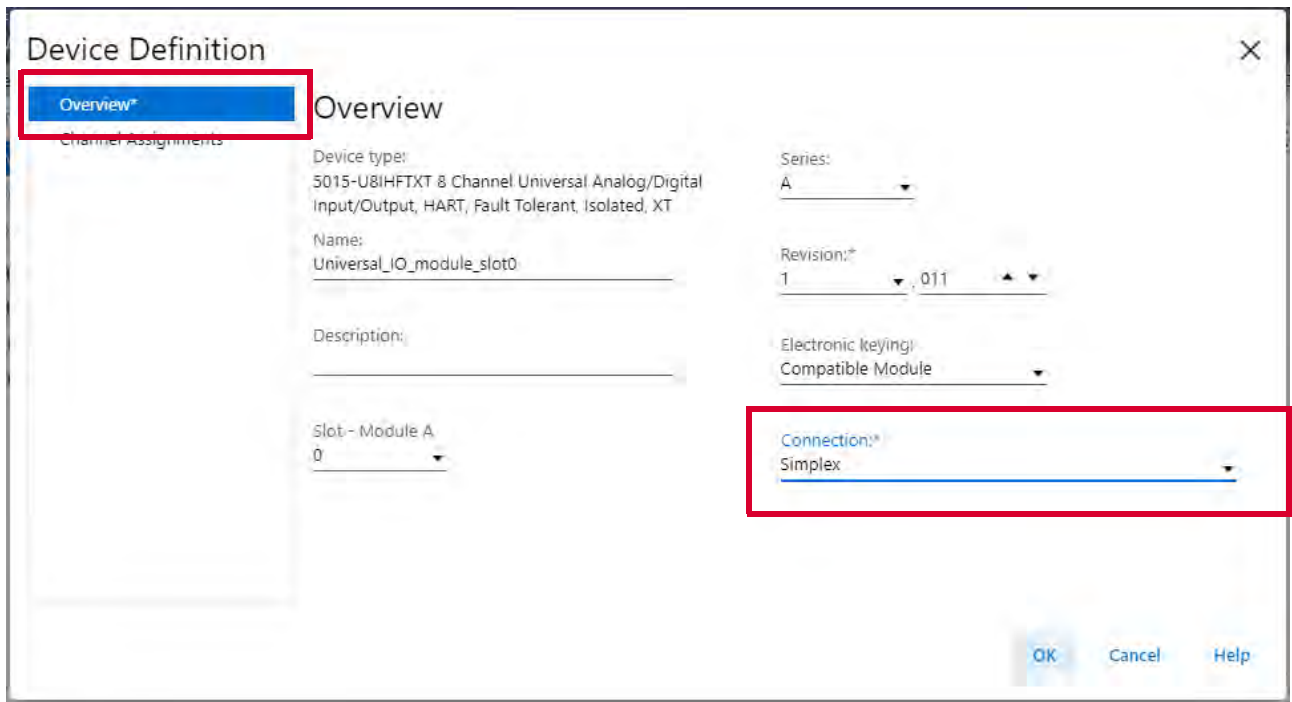


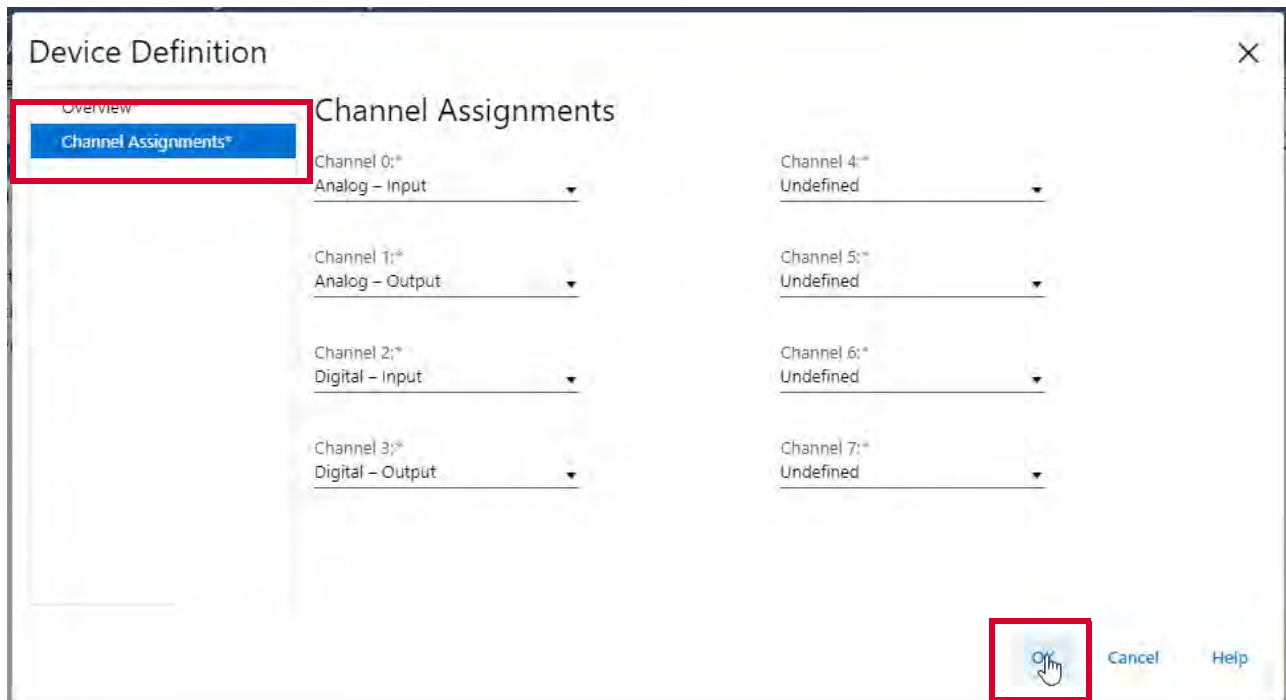
2. Change the device definition as needed and click OK.

### Duplex Pair



### Simplex Module





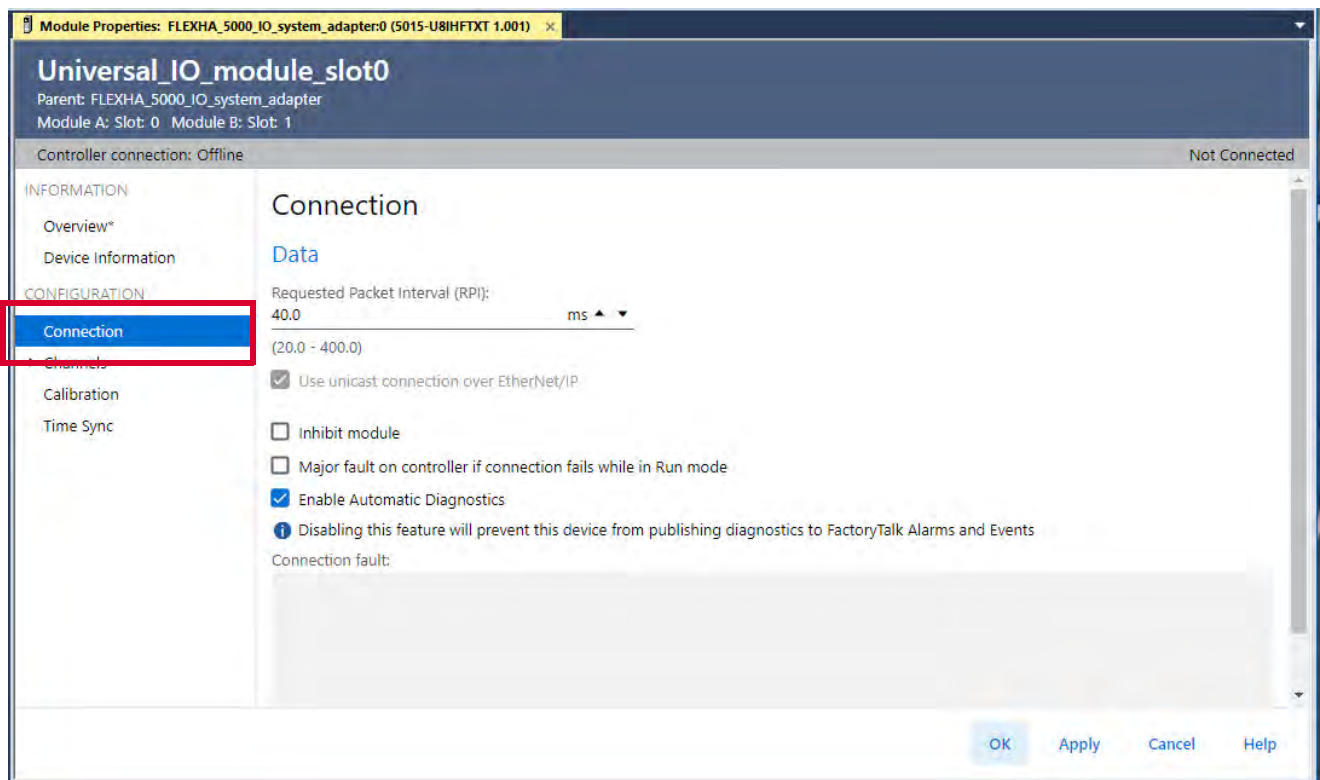
The remaining configurable fields are accessible under the CONFIGURATION section.

## Connection View

This view shows the connection configuration options for the module.

Complete these tasks:

- Set the RPI.  
Valid RPI times vary slightly based on how the I/O module is used.
  - In Simplex mode - 10...400 ms
  - In Duplex mode - 20...400 ms
- Inhibit the module - When the module is inhibited, the connection to the controller is closed until you uninhibit the module.
- Configure the I/O module so that a Major Fault occurs on the controller if the connection fails in Run Mode.
- Enable Automatic Diagnostics

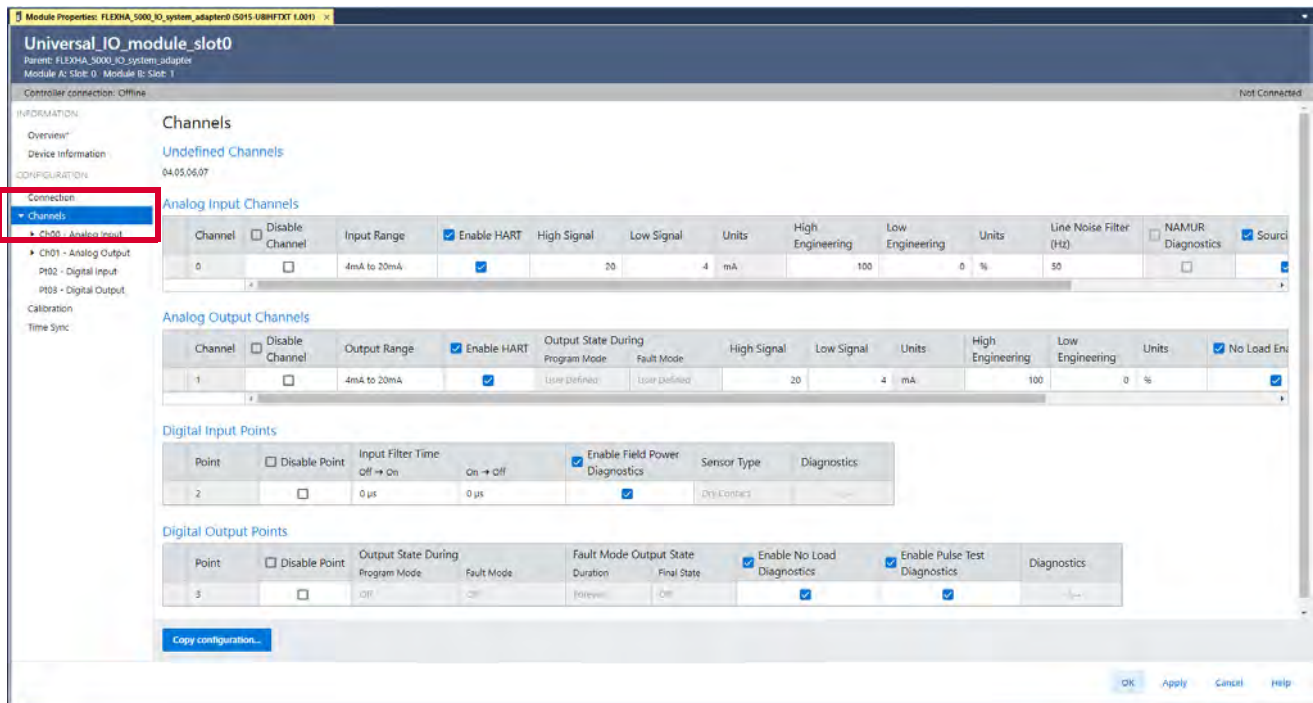


## Channels View

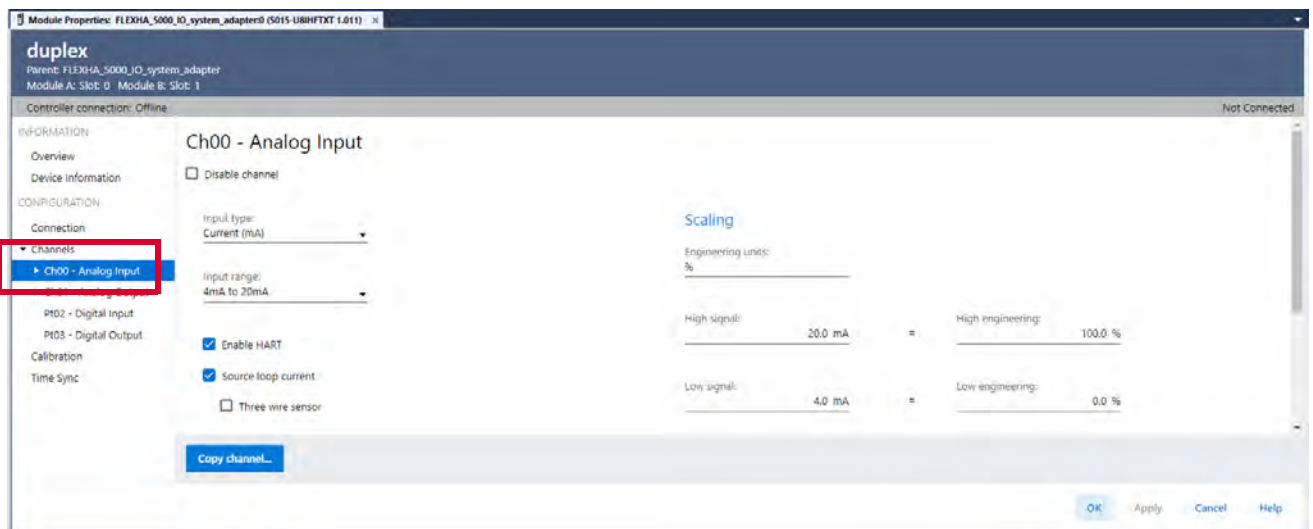
This view shows channel configuration information.

Complete one of these tasks:

- To see the configuration for all channels at once, click Channels, and edit them as needed from one screen.



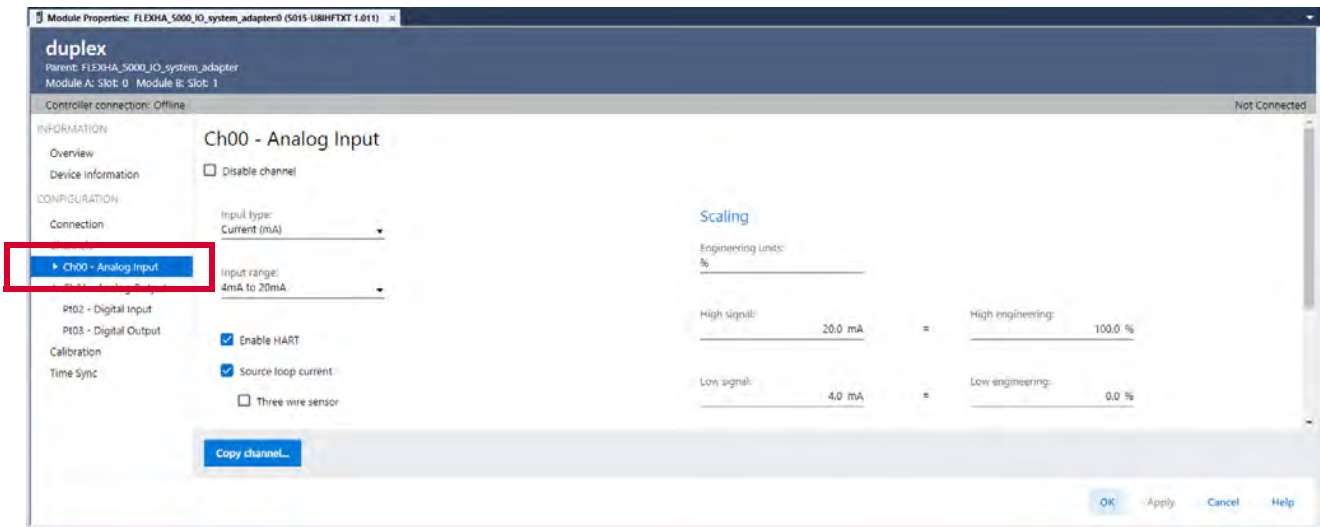
- To configure specific channels, expand the Channels View and configure those channels from the screen.



### Analog Input Mode

The following parameters are available in analog input mode configuration:

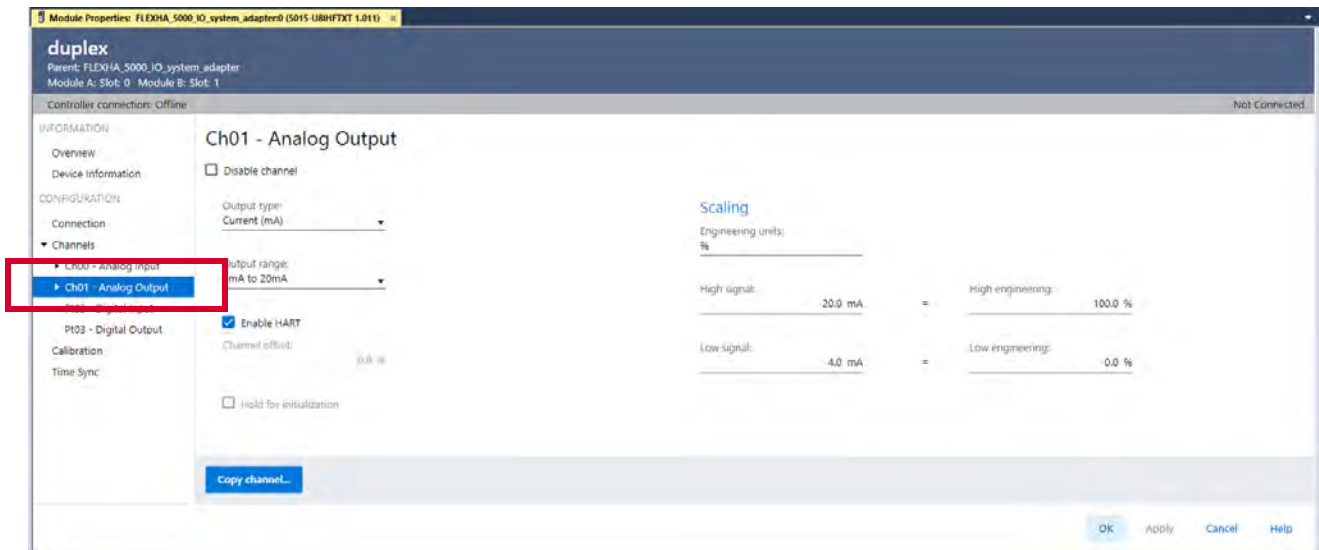
- Disable channel
- Input type
- Input range
- Enable HART
- Source loop current
  - Three wire sensor
- Scaling
  - Engineering units
  - High signal = High engineering
  - Low signal = Low engineering
- Line noise filter



## Analog Output Mode

The following parameters are available in analog output mode configuration:

- Disable channel
- Output type
- Output range
- Enable HART
- Scaling
  - Engineering units
  - High signal = High engineering
  - Low signal = Low engineering



### Digital Input Mode

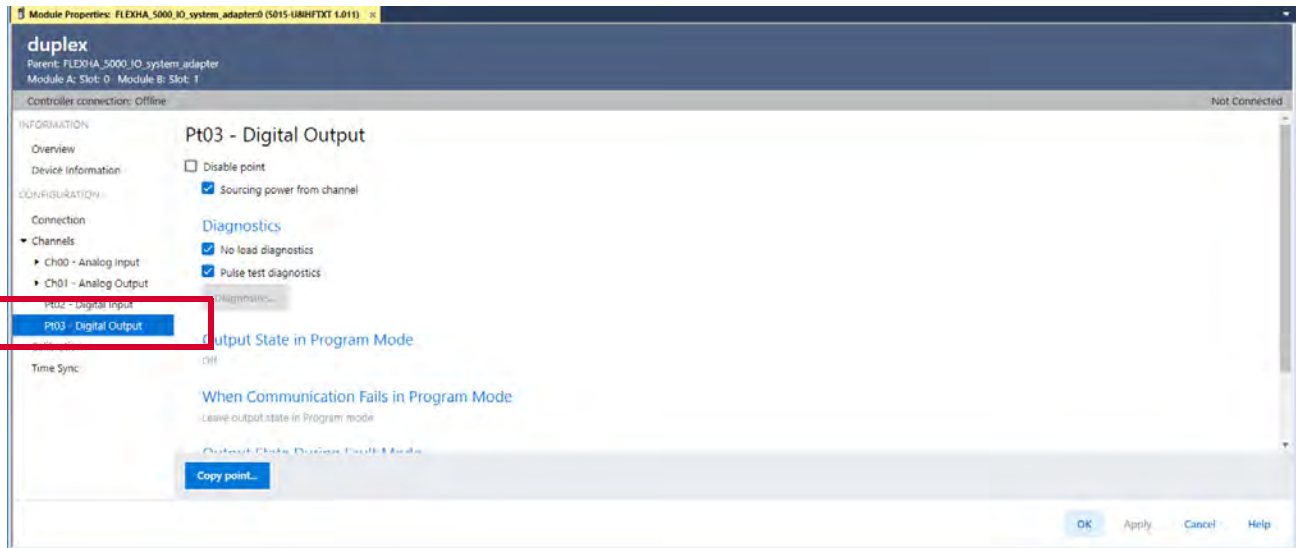
- Disable point
- Input filters
  - Off to On filter time
  - On to Off filter time
- Field Power Diagnostics
- Thresholds



### Digital Output Mode

- Disable point
- Sourcing power from channel

This channel view shows the No Load and Pulse Test diagnostics. The diagnostics are not available. They don't work when you enable them.





## View the Module Tags

When you create a module, the Logix Designer application creates a set of tags that you can view in the Tag Editor. Each configured feature on your module has a distinct tag that is available for use in the controller program logic.

For more information on module tags, see [Module Tags on page 195](#).

**Notes:**

## Troubleshoot Your FLEXHA 5000 I/O System

You can use the following to troubleshoot issues with your FLEXHA 5000™ I/O system:

- Status Indicators
- Logix Designer application
- EtherNet/IP™ Adapter Diagnostics webpages

### Status Indicators

These components in a FLEXHA 5000 I/O system have status indicators:

#### Power Conditioner Status Indicators

The status indicators on a Power Conditioner function as follows:

- MODULE, SYSTEM PWR, DC IN in combination
- Diagnostic input channels from dry contacts



The Power Conditioners are paired to make sure that the system remains powered if one fails. As a result, you must consider the status indicator states on the Power Conditioners in combination with each other. For more information, see [Table 11 on page 172](#).

Both Power Conditioners monitor each Diagnostic Input. As a result, the diagnostic input status indicators on both Power Conditioners should match. If they don't match, you should troubleshoot the system. For more information, see [Table 12 on page 174](#).

Table 11 describes the combination of the MODULE, SYSTEM PWR, and DC IN status indicators on Power Conditioners.

**Table 11 - Power Conditioner Status Indicators - MODULE, SYSTEM PWR, and DC IN Combination**

Indicator State Combination			Description	Recommended Action
Indicator	Power Conditioner A	Power Conditioner B		
MODULE	Green	Green	Backplane power is operating normally.	None
SYSTEM PWR	Green	Green		
DC IN	Green	Green		
MODULE	Green	Red	Backplane power A is operating normally. Power Conditioner B has experienced an unrecoverable fault, MOD Power B, and backplane power B are out of range.	Check all devices and connections that are used to provide power to Power Conditioner B and resolve any issues. The devices include the external power supply and power RTB that is installed below Power Conditioner B.
SYSTEM PWR	Green	Red		
DC IN	Green	Red		
MODULE	Red	Green	Backplane power B is operating normally. Power Conditioner A has experienced an unrecoverable fault, MOD Power A, and backplane power A are out of range.	Check all devices and connections that are used to provide power to Power Conditioner A and resolve any issues. The devices include the external power supply and power RTB that is installed below Power Conditioner A.
SYSTEM PWR	Red	Green		
DC IN	Red	Green		
MODULE	Red	Green	Power Conditioner A has an unrecoverable fault, and the backplane power A output is out of range.	Inspect backplane A for a short. If no short exists, replace the Power Conditioner.
SYSTEM PWR	Red	Green		
DC IN	Green	Green		
MODULE	Green	Red	Power Conditioner B has an unrecoverable fault, and the backplane power B output is out of range.	Inspect backplane B for a short. If no short exists, replace the Power Conditioner.
SYSTEM PWR	Green	Red		
DC IN	Green	Green		
MODULE	Green	Off	Power Conditioner B is not powered or is unlocked. As a result, backplane power B is missing.	Complete these steps. 1. Check all devices and connections that are used to provide power to Power Conditioner B, and resolve any issues. The devices include the power supply, wiring, and power RTB. 2. Check that there is proper voltage at the power RTB. 3. Check that the QTAs are locked. If none of the above actions restore power, replace Power Conditioner B.
SYSTEM PWR	Green	Off		
DC IN	Green	Off		
MODULE	Off	Green	Power Conditioner A is not powered or is unlocked. As a result, backplane power A is missing.	Complete these steps. 1. Check all devices and connections that are used to provide power to Power Conditioner A, and resolve any issues. The devices include the power supply, wiring, and power RTB. 2. Check that there is proper voltage at the power RTB. 3. Check that the QTAs are locked. If none of the above actions restore power, replace Power Conditioner A.
SYSTEM PWR	Off	Green		
DC IN	Off	Green		
MODULE	Flashing green	Green	Power Conditioner A lost its connection to the Adapter Base before pairing. MOD Power A and Backplane A are within range and operational.	Complete these steps: 1. Reset Power Conditioner A. 2. If resetting Power Conditioner A does not solve the issue, cycle power to Power Conditioner A. Before you cycle power to the Power Conditioner, consider how that action might affect your system. 3. If steps 1 and 2 do not resolve the issue, replace Power Conditioner A.
SYSTEM PWR	Green	Green		
DC IN	Green	Green		

Table 11 - Power Conditioner Status Indicators - MODULE, SYSTEM PWR, and DC IN Combination

Indicator State Combination			Description	Recommended Action
Indicator	Power Conditioner A	Power Conditioner B		
MODULE	Green	Flashing green	Power Conditioner B lost its connection to the Adapter Base before pairing. MOD Power B and Backplane B are within range and operational.	Complete these steps: <ol style="list-style-type: none"> <li>1. Reset Power Conditioner B.</li> <li>2. If resetting Power Conditioner B does not solve the issue, cycle power to Power Conditioner B. Before you cycle power to the Power Conditioner, consider how that action might affect your system.</li> <li>3. If steps 1 and 2 do not resolve the issue, replace Power Conditioner B.</li> </ol>
SYSTEM PWR	Green	Green		
DC IN	Green	Green		
MODULE	Flashing green	Flashing green	The Power Conditioners are present and MOD power is present at each one. But the adapters are missing.	Complete these steps: <ul style="list-style-type: none"> <li>• If the EtherNet/IP adapters are missing, install them.</li> <li>• If EtherNet/IP adapters are installed:               <ol style="list-style-type: none"> <li>a. Reset each EtherNet IP adapter.</li> <li>b. If <a href="#">step a</a> does not resolve the issue, cycle power to EtherNet IP adapter A.</li> <li>c. If <a href="#">step a</a> and <a href="#">step b</a> do not resolve the issue, cycle power to EtherNet IP adapter B.</li> <li>4. If <a href="#">step a</a>, <a href="#">step b</a> and <a href="#">step c</a> do not resolve the issue, replace EtherNet IP adapters A and B.</li> </ol> </li> </ul>
SYSTEM PWR	Green	Green		
DC IN	Green	Green		
MODULE	Flashing red	Green	Power Conditioners A and B have different firmware revisions from each other.	Update the firmware revision on one of the Power Conditioners to match the firmware revision on the other. You update the Power Conditioners via an EtherNet/IP adapter firmware update. For more information, see <a href="#">page 129</a> .
SYSTEM PWR	Green	Green		
DC IN	Green	Green		
MODULE	Green	Flashing red	Power Conditioners A and B have different firmware revisions from each other.	Update the firmware revision on one of the Power Conditioners to match the firmware revision on the other. You update the Power Conditioners via an EtherNet/IP adapter firmware update. For more information, see <a href="#">page 129</a> .
SYSTEM PWR	Green	Green		
DC IN	Green	Green		
MODULE	Red	Green	Power Conditioner A has a fault and MOD power input is out of range.	Any of these tasks: <ul style="list-style-type: none"> <li>• Check that there is proper voltage at the MOD power RTB.</li> <li>• Confirm that the input wiring to the MOD Power RTBs is the correct length and size.</li> <li>• Check all devices and connections that are used to provide power to Power Conditioner A and resolve any issues. The devices include the external power supply and power RTB that is installed below Power Conditioner A.</li> </ul>
SYSTEM PWR	Green	Green		
DC IN	Red	Green		
MODULE	Green	Red	Power Conditioner B has a fault and MOD power input is out of range.	Any of these tasks: <ul style="list-style-type: none"> <li>• Check that there is proper voltage at the MOD power RTB.</li> <li>• Confirm that the input wiring to the MOD Power RTBs is the correct length and size.</li> <li>• Check all devices and connections that are used to provide power to Power Conditioner B and resolve any issues. The devices include the external power supply and power RTB that is installed below Power Conditioner B.</li> </ul>
SYSTEM PWR	Green	Green		
DC IN	Green	Red		

[Table 12](#) describes the diagnostic input status indicators on a Power Conditioner.

**Table 12 - Power Conditioner Status Indicators - Diagnostic Inputs**

Indicator State Combination		Description	Recommended Action
Power Conditioner A	Power Conditioner B		
Off	Off	The channel is off or the input was not received on both Power Conditioners.	One of these tasks: <ul style="list-style-type: none"> <li>If the input is off and the indication is correct, no action.</li> <li>If the status indicator is erroneously off, any of these tasks:                             <ul style="list-style-type: none"> <li>Check the wiring for bad connections or open circuits and correct, if necessary.</li> <li>Check that the diagnostic RTB is seated properly and correct if it is not seated properly.</li> <li>Replace diagnostic input RTB, if necessary.</li> <li>Move wiring to an available channel, as a possible short-term solution.</li> <li>Replace both Power Conditioners, if necessary.</li> </ul> </li> </ul>
Yellow	Yellow	Both Power Conditioners have received the input and the channel is on.	One of these tasks: <ul style="list-style-type: none"> <li>If the input is on and the indication has been received properly, no action.</li> <li>If the status indicator is erroneously on, any of these tasks:                             <ul style="list-style-type: none"> <li>Check for shorts in the wiring at the diagnostic input RTB and wiring out to the status indicator contact and correct, if necessary.</li> <li>Move wiring to an available channel, as a possible short-term solution.</li> <li>Replace both Power Conditioners, if necessary.</li> </ul> </li> </ul>
Yellow	Off	Power Conditioner A and Power Conditioner B are showing a discrepancy in status indication.	One of these tasks: <ul style="list-style-type: none"> <li>Move wiring to an available channel, as a possible short-term solution.</li> <li>Determine which Power Conditioner is reporting incorrectly by checking the indicator contact, and replace the Power Conditioner that is reporting incorrectly.</li> </ul>
Off	Yellow		

## EtherNet/IP Adapter Status Indicators

The adapter uses these status indicators:

- 4-character color display
- MODULE
- REDUNDANCY
- BACKPLANE A
- BACKPLANE B
- NETWORK
- SD CARD (behind the door)



[Table 13](#) describes the MODULE channel status on an adapter.

**Table 13 - EtherNet/IP Adapter - Messages on 4-character Display**

Message Type	Example Messages on 4-character Display	Description	Recommended Action
TEST	TEST	Message appears while power-up tests run.	None
PASS	PASS	Message appears when power-up tests complete successfully.	None
Embedded software revision	Rev 2.003	Message appears once, after the power-up tests complete successfully.	None
OK	OK	The first message in the scrolling message display. Message scrolls continuously during operation.	None
Port Down	Link 2 - Port Down	Message appears when the Ethernet cable is disconnected from an EtherNet/IP port or the other end of a cable that is connected to the MLC is disconnected from the network. Message scrolls continuously during operation.	Connect any cable that is disconnected.
Port Rate/Duplex State	Port 1 - 1Gb/FULL	The current port rate and Duplex state. Message scrolls continuously during operation. If operating at 100 Mb, full-duplex, the message shows 100/FULL.	None
IP Address	192.168.1.101	The IP address of the adapter. Message scrolls continuously during operation.	None

**Table 13 - EtherNet/IP Adapter - Messages on 4-character Display**

Message Type	Example Messages on 4-character Display	Description	Recommended Action
Link Disabled	Port 2 - Link Disabled	Message appears when you have disabled an EtherNet/IP port. Message scrolls continuously during operation.	If the port should be enabled, enable it.
Duplicate IP	Duplicate IP - 00:00:BC:02:34:B4	Message appears when the adapter detects a device with the same IP address on the network. The message shows the MAC ID of the device with the duplicate IP address. Message scrolls continuously during operation.	Change the adapter IP address to the correct IP address.
Fault	Cycle power to unit	Message appears, and scrolls continuously, during a fault.	Remove and reinsert the adapter.
	Module Fault - Power Cycle or Reset Module	Message appears when the adapter enters major nonrecoverable fault.	Remove and reinsert the adapter.
	Missing Vendor Certificate - Contact Tech Support	Message appears when the Vendor Certificate is detected to be invalid.	Contact Rockwell Automation Technical Support.
	Identity Mismatch - Contact Tech Support	Message appears when Identity is detected as not matching.	The adapter's internal nonvolatile memory is corrupted. Contact Rockwell Automation Technical Support.
Firmware Upgrade	Flash in progress	Message appears when firmware update is in progress	Wait for upgrade to complete.
Rotary Switch	SET MODE SWITCH	Message appears at power-up and the Mode switch is set in an invalid position, that is, to some position other than DLR or PRP.	Remove the adapter and change the network mode rotary switch to the correct position.
SD Card	SD card fault	Message appears when data cannot be saved to the SD card due to insufficient space available or when the adapter detects SD card errors.	Replace the SD card with a card that has sufficient available space.
	SD data mismatch	Message appears when an SD card data mismatch is detected. This occurs if an SD card is inserted while the adapter is running and the SD card contains a configuration that differs from what is stored in the adapter.	Complete one of these tasks: <ul style="list-style-type: none"> <li>Remove the SD card.</li> <li>Cycle power to the adapter or reset it.</li> <li>Change a configuration setting on the adapter via software.</li> </ul>
	SD card locked	Message appears when data cannot be saved to the SD card because the SD card is locked.	Complete these steps. <ol style="list-style-type: none"> <li>Remove the SD card.</li> <li>Unlock the SD card.</li> <li>Reinstall the SD card.</li> </ol>
	No SD card	Message appears when there is no SD card for save or restore.	Insert an SD card.
	SD data corrupted	Message appears when invalid configuration data or firmware data is detected on the SD card.	Clear the SD card.
	Wrong SD card format	Message appears when the SD card file system is not supported.	Replace the SD card.
Temperature Warning	Over Temperature	Message appears when over temperature is detected.	Determine the cause of the over temperature condition and correct it.
	Critical Temperature	Message appears when a critical temperature is detected.	Determine the cause of the critical temperature condition and correct it.
	CPU Temperature Fault	Message appears when the EtherNet/IP adapter restarts from an Extreme-temperature fault.	Make sure that the cause of the extreme temperature condition is resolved.
BIM module missing	Backplane Interface Module missing	Message appears when the adapter detects that both BIMs are missing from the Adapter Base.	Insert at least one BIM into the Adapter Base.
Protected Mode	Explicit Protected Mode Mismatch	Message appears when one adapter is in the Explicit Protected mode and the other adapter is not. In this case, both adapters display the message "Explicit Protected Mode Mismatch". The message also appears on the adapter webpage.	One of these tasks: <ul style="list-style-type: none"> <li>Enable Explicit Protected Mode on both adapters.</li> <li>Disable Explicit Protected Mode on both adapters.</li> </ul> For more information on Explicit Protected Mode, see <a href="#">page 74</a> .
USB	USB Disabled	Only at power-up	Enable the USB port, if necessary.



[Table 14](#) describes the MODULE channel status indicators on an EtherNet/IP adapter.

**Table 14 - EtherNet/IP Adapter - MODULE Status Indicator**

Indicator State	Description	Recommended Action
Off	One of the following:	
	<ul style="list-style-type: none"> <li>The adapter has no power.</li> </ul>	Turn on power.
	<ul style="list-style-type: none"> <li>The adapter is unlocked.</li> </ul>	Lock the adapter. Both QTAs must be fully locked.
Green	The adapter is operating normally.	None
Flashing red	One of the following:	
	<ul style="list-style-type: none"> <li>The adapter has a recoverable fault.</li> </ul>	Remove and reinsert the adapter.
	<ul style="list-style-type: none"> <li>A firmware update is in progress on the adapter. An adapter firmware update also updates these components in the Adapter Base and I/O Base(s):               <ul style="list-style-type: none"> <li>Power Conditioners (all that are installed)</li> <li>BIMs (all that are installed in the system)</li> <li>MLC (only the MLC that is associated with the adapter)</li> </ul> </li> </ul>	Wait for the firmware update to complete. If the update can't complete, cycle power to the adapter and run the firmware update again when the adapter is back online. If the update is executed in a fully redundant system, the second adapter maintains the IO connections.
	<ul style="list-style-type: none"> <li>The adapter is powered up and is in the factory default state. That is, the adapter does not have an IP address and the network mode switch is not set to DLR or PRP.</li> </ul>	Assign an IP address to the adapter and set the network mode switch to a valid position.
Red	The adapter has a nonrecoverable fault.	Unlock and relock the adapter's QTAs. Doing so resets the adapter while the partner adapter maintains control. If the status indicator remains red after the reinserted adapter completes the power-up sequence, replace the adapter.

[Table 15](#) describes the REDUNDANCY channel status indicators on an EtherNet/IP adapter.

**Table 15 - EtherNet/IP Adapter - REDUNDANCY Status Indicator**

Indicator State	Description	Recommended Action
Off	One of the following:	
	<ul style="list-style-type: none"> <li>The adapter has no power.</li> </ul>	Connect power or, if it is already connected, turn on power.
	<ul style="list-style-type: none"> <li>The adapter is unlocked.</li> </ul>	Lock the adapter. Both QTAs must be fully locked.
Both adapters are green	The adapter is paired with its partner and can bridge I/O traffic.	None
Both adapters are flashing red	The adapter cannot bridge I/O traffic and is attempting to pair with its partner.	Wait for the pairing processing to complete. If the REDUNDANCY status indicators remain flashing red, the required conditions do not exist for the adapters to pair. Correct the conditions so the adapters can pair and bridge I/O traffic. Redundant adapter pair if they are both functioning properly, that is, no fault on either adapter.
Different states for different EtherNet/IP adapters simultaneously	<ul style="list-style-type: none"> <li>One EtherNet/IP adapter: Green - The adapter is not paired with its partner but is bridging I/O traffic. The EtherNet/IP adapter is attempting to pair with its partner.</li> </ul>	Wait for the issue with the other adapter to be resolved.
	<ul style="list-style-type: none"> <li>Other EtherNet/IP adapter: Flashing red - The adapter is faulted.</li> </ul>	Correct the fault on the adapter or replace the adapter.

[Table 16](#) describes the BACKPLANE A or BACKPLANE B status indicators on an EtherNet/IP adapter.

**Table 16 - EtherNet/IP Adapter - BACKPLANE A or BACKPLANE B Status Indicators**

Indicator State	Description	Recommended Action
Off	One of the following:	
	• The adapter is not powered.	Turn on power.
	• The adapter is unlocked.	Lock the adapter. Both QTAs must be fully locked.
Green	The backplane is connected.	None
Red	There are no connections on the backplane.	Check the status of the BIM that is associated with the backplane that has no connections. If there is no BIM, insert one. If the BIM is not working, replace it.

[Table 17](#) describes the NETWORK status indicator on an EtherNet/IP adapter.

**Table 17 - EtherNet/IP Adapter - NETWORK Status Indicator**

Indicator State	Description	Recommended Action
Off	One of the following:	
	• The adapter is not powered.	Turn on power.
	• The adapter is powered but does not have an IP address.	Assign an IP address to the adapter.
	• The adapter is unlocked.	Lock the adapter. Both QTAs must be fully locked.
Flashing green	The adapter has an IP address but no I/O connections are present.	Configure or uninhibit the I/O connections in Logix Designer application.
Green	The adapter has an IP address and I/O connections are present.	None
Flashing red	The adapter has an IP address that is configured, and a connection for which this device is the target has timed out. The network status indicator transitions to green only when all timed out connections are re-established.	Diagnose network and network devices. We recommend these tasks: <ul style="list-style-type: none"> <li>• Check for cable breaks or disconnections between the adapter and the network.</li> <li>• Check for performance overloads, for example, network switches that are at bandwidth capacity.</li> <li>• Check the network settings on the ControlLogix® 5580 controller and other devices between the controller and the adapter.</li> <li>• Check for faults on other device in the connection path, and, if they exist, resolve any conditions that cause the faults.</li> </ul>
Red	The adapter has a duplicate IP address with another device on the network.	One of these tasks: <ul style="list-style-type: none"> <li>• Change the IP address on the adapter if it is wrong. Depending on the configuration, you can change the IP address via software or rotary switches. Remove the adapter to change the rotary switches.</li> <li>• Change the IP address on the other device with the same IP address if the adapter IP address is correct.</li> </ul>
Flashing green/red	The adapter is performing power-up testing.	Wait for the power-up sequence to finish.

[Table 18](#) describes the SD CARD status indicator on an EtherNet/IP adapter. The SD card status indicator is behind the door.

**Table 18 - EtherNet/IP Adapter - SD CARD Status Indicator**

Indicator State	Description	Recommended Action
Off	No activity on the card	None If necessary, you can remove the card without impact to system operation.
Flashing green	The adapter is reading from or writing to the SD card.	Let the read/write complete without interruption.
Green		<b>IMPORTANT:</b> Do not remove the SD card while the adapter is reading from or writing to it. If you interrupt the read/write, data corruption or loss can occur.
Flashing red	The SD Card does not have a valid file system.	Remove the card, clear it of any data, and re-insert it.
Red	The adapter does not recognize the SD card.	Replace the card.

## Media Landing Card Status Indicators

The MLC uses these status indicators:

- MODULE
- LINK 2
- LINK 1



[Table 19](#) describes the MODULE status indicator on an MLC.

**Table 19 - MLC - MODULE Status Indicator**

Indicator State	Description	Recommended Action
Off	One of the following:	<b>IMPORTANT:</b> If the EtherNet/IP adapter is not installed above the MLC, install it. The MLC does not power without the adapter installed. One of these tasks: <ul style="list-style-type: none"> <li>• If the system is not powered, turn on power to the system and wait for the power-up sequence to complete.</li> <li>• If the system is powered, make sure that the MLC is installed properly.</li> </ul>
	<ul style="list-style-type: none"> <li>• The MLC has no power.</li> </ul>	
Green	The MLC is operating normally.	None
Flashing red	The MLC has a recoverable fault.	Unlock and relock the MLC.
Red	The MLC has a nonrecoverable fault.	Cycle power to the MLC. To turn off power to the MLC, unlock the QTA. Relock the QTA and the MLC begins the power-up sequence. If the status indicator remains red after power-up completes, replace the adapter or MLC.

Table 20 describes the LINK 1 or LINK 2 status indicator on an MLC.

**Table 20 - MLC - LINK 1 or LINK 2 Status Indicator**

Indicator State	Description	Recommended Action
Off	One of the following:	
	<ul style="list-style-type: none"> <li>The MLC is not powered.</li> </ul>	If there is no power to the device, complete one of these tasks: <ul style="list-style-type: none"> <li>If the system is not powered, wait until the system is powered.</li> <li>If the system is powered, verify that the MLC is properly installed in the base. The best way to check if the MLC is properly installed is as follows.                             <ol style="list-style-type: none"> <li>Unlock the MLC's QTA to turn it off.</li> <li>Disconnect any Ethernet cable that is connected it.</li> <li>Remove the MLC.</li> <li>Reinstall it.</li> <li>Plug in the Ethernet cables.</li> </ol> </li> </ul>
	<ul style="list-style-type: none"> <li>The MLC is unlocked.</li> </ul>	Lock the MLC.
	<ul style="list-style-type: none"> <li>The RJ45 cable is not properly seated in the MLC or connected devices.</li> </ul>	Verify that the RJ45 cables are properly seated in the MLC and connected devices.
	<ul style="list-style-type: none"> <li>No RJ45 cable is connected to the MLC or a cable is connected to the MLC but the other end of it is not connected to another device.</li> </ul>	If there is power to the MLC, make all required connections.
Flashing green	<ul style="list-style-type: none"> <li>If the adapter is used in a DLR network, one of these conditions exists:                             <ul style="list-style-type: none"> <li>The adapter is the active ring supervisor in a DLR network, and the ring is not broken. That is, the supervisor blocks traffic on link B.</li> <li>The adapter is the active ring supervisor in a DLR network, and has detected a rapid ring fault.</li> </ul> </li> </ul>	Complete these tasks: <ol style="list-style-type: none"> <li>Check the adapter module properties dialog box in Logix Designer application for network properties.</li> <li>If both links are active and a rapid ring fault is present, clear the rapid ring faults.</li> <li>If the issue persists troubleshoot the source of rapid ring fault.</li> </ol>
	An RJ45 cable is connected to the MLC and the other end is connected to another device as expected.	None
Flashing red	One of the following:	
	<ul style="list-style-type: none"> <li>If both LINK status indicators are flashing red, the network settings are set to PRP and cables of the PRP network are mismatched. That is, B is put to A port and A is put to the B port.</li> </ul>	Change the cable connections.
	<ul style="list-style-type: none"> <li>If only one LINK status indicator is flashing red and the device is in PRP mode, a PRP fault exists.</li> </ul>	Troubleshoot the PRP fault and correct it.
	<ul style="list-style-type: none"> <li>The network is experiencing other issues.</li> </ul>	Troubleshoot the network.

## Backplane Interface Module Status Indicators

Every Adapter Base and I/O Base has two BIMs installed in it. One is dedicated to activity on backplane A and the other is dedicated to activity on backplane B.

BIM status indicators show the status of the BIM and the backplane on which it is installed. That is, backplanes A and B, respectively, across the system. Each BIM works with the BIMs on adjacent bases.

For example, the Adapter Base BIM A right status indicator and I/O Base BIM A left status indicator turn green when the bases are connected together.

- If a backplane was connected, but then disconnected, the right/left status indicators turn red.
- If the backplane never connects after power-up, the right/left status indicators stay off.

The center status indicator, that is, MOD, stops flashing green and turns steady green when the BIM has completed addressing the populated slots in the associated backplane. The BIM uses these status indicators:

- MOD (Module status indicator)
- Left/right arrows



[Table 21](#) describes the left or right arrow status indicators on the BIM.

**Table 21 - BIM - Left or Right Arrow Status Indicator**

Indicator State	Description	Recommended Action
Off	<ul style="list-style-type: none"> <li>Left arrow - There is not a BIM to the left. The left arrow is always off when the BIM is in the Adapter Base.</li> <li>Right arrow - There is not a BIM to the right. The right arrow is always off when the BIM is in the last I/O Base.</li> </ul>	One of these tasks: <ul style="list-style-type: none"> <li>If the partner BIM status indicator is on, remove and reinstall the BIM.</li> <li>If the partner BIM status indicator is not on, check the connection between the BIMs.                             <ul style="list-style-type: none"> <li>If the I/O Bases are connected in the same bank, tighten screws on the bases to make sure that bases are flat against the mounting plate and the communication connector between them is properly mated.</li> <li>If the I/O Bases are connected across banks, replace Backplane Expansion Base, Right or Backplane Expansion Base, Left, or Backplane Communication Extension cables between Adapter and I/O Bases or between I/O Bases.</li> </ul> </li> </ul>
Green	The backplane connection is operating normally. That is, the BIM is communicating with BIMs to its right and/or left.	None
Red	One of the following: <ul style="list-style-type: none"> <li>The backplane link was established but now is missing.</li> </ul>	Troubleshoot the system to see why the connection is missing and resolve the issue.
	<ul style="list-style-type: none"> <li>Left or right arrow only - The backplane link was established but has dropped for one of the following reasons:                             <ul style="list-style-type: none"> <li>Faulty BIM on the adjacent base.</li> <li>Faulty or disconnected Backplane Communication Extension cable.</li> <li>Faulty Bank Expansion Base, Left or Right.</li> <li>Faulty I/O Base.</li> <li>Faulty Adapter Base</li> </ul> </li> </ul>	Troubleshoot the components and correct any issues that you find.

[Table 22](#) describes the MOD status indicator on the BIM.

**Table 22 - BIM - MOD Status Indicator**

Indicator State	Description	Recommended Action
Off	The BIM has no power or is not properly installed.	One of these tasks: <ul style="list-style-type: none"> <li>Turn on power. If power is present and the BIM is installed correctly, but the indicator is still off, replace the BIM.</li> <li>Install the BIM properly. This might require you to remove the BIM and reinstall it.</li> <li>Check any Bank Expansion Base or Backplane Power Extension cables in the system to verify that they are connected properly.</li> </ul>
Green	The BIM is operating normally.	None
Flashing green	The BIM does not have its slot address range.	One of these tasks: <ul style="list-style-type: none"> <li>During system power-up, wait for the BIM to get its address range.</li> <li>After system power-up is complete, troubleshoot the system to determine why the BIM does not have the address range and resolve the issue. For example, there might not be connectivity between the BIM and the base such that the BIM can't communicate with BIMs in previous bases. If the left-most BIM (in the Adapter Base) doesn't have its slot address range, replace the BIM.</li> </ul>
Red	The BIM experienced a nonrecoverable fault.	One of these tasks: <ul style="list-style-type: none"> <li>If the status indicator is red after a failed firmware revision updated, retry the update. If the indicator remains red, replace the BIM.</li> <li>If the status indicator is red and a firmware revision update didn't fail first, remove and reinsert the BIM to cycle power to it. If the status indicator remains red after power-up completes, replace the BIM.</li> </ul>
Flashing red	One of the following: <ul style="list-style-type: none"> <li>A firmware update is in process on the BIM.</li> <li>If no firmware update is in process, the BIM has experienced a recoverable fault.</li> </ul>	One of these tasks: <ul style="list-style-type: none"> <li>If a firmware update is in process, wait for the ControlFLASH Plus™ tool to indicate that it is complete.</li> <li>If a firmware update is not in process, remove and reinsert the BIM to cycle power to it. If the status indicator continues to flash red after power-up, replace the BIM.</li> </ul>

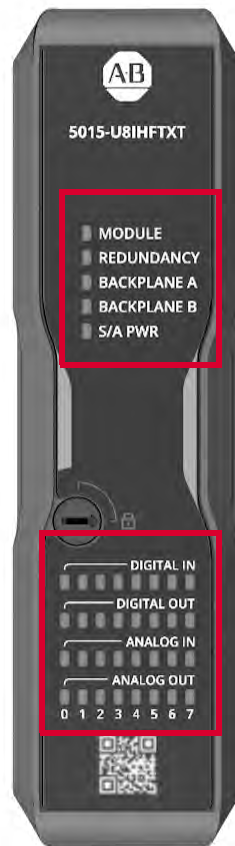
## I/O Module Status Indicators

The Universal I/O module has these module status indicators:

- MODULE
- REDUNDANCY
- BACKPLANE A
- BACKPLANE B
- S/A PWR

The Universal I/O module also has these channel status indicators:

- DIGITAL IN
- DIGITAL OUT
- ANALOG IN
- ANALOG OUT



[Table 23](#) describes the MODULE status indicator on a 5015-U8IHFTXT I/O module.

**Table 23 - 5015-U8IHFTXT I/O Module - MODULE Status Indicator**

Indicator State	Description	Recommended Action
Off	One of the following:	
	<ul style="list-style-type: none"> <li>The module has no power.</li> <li>The module is unlocked.</li> </ul>	Turn on power. Lock the module.
Flashing green	One of the following:	
	<ul style="list-style-type: none"> <li>The module is waiting for a connection from the controller.</li> </ul>	Either of these tasks: <ul style="list-style-type: none"> <li>Check to see if the controller can see the adapter and the I/O module in the backplane. If so, wait for normal operation to begin.</li> <li>Make sure that the connection is not inhibited.</li> </ul>
	<ul style="list-style-type: none"> <li>The module cannot participate in the connection from the controller.</li> <li>The module is in Program Mode.</li> </ul>	Any of these tasks: <ul style="list-style-type: none"> <li>Check the connection status information on the Device Properties dialog box in the Logix Designer application project.</li> <li>Confirm that the controller connection with the adapter or I/O module is made. For example, a connection isn't made if there is an Electronic Keying mismatch or unsupported connection point.</li> </ul> If necessary, change to Run or Remote Run mode.
Green	The module is operating normally and has at least one I/O connection established.	None
Flashing red	One of the following:	
	<ul style="list-style-type: none"> <li>The module has a major recoverable fault.</li> <li>A firmware update is in process on the module.</li> </ul>	Caused by one of the following: <ul style="list-style-type: none"> <li>Connection loss occurred - In this case, check for a connection loss and, once found, address it in upstream devices.</li> <li>Firmware Flash Update is Required - In this case, flash update the firmware on the module.</li> </ul> Wait for the firmware update to complete.
Red	The I/O module has a nonrecoverable fault.	Unlock and relock the module's QTA to cycle power. If the status indicator remains red after module power-up completes, replace the I/O module.

[Table 24](#) describes the REDUNDANCY status indicator on a 5015-U8IHFTXT I/O module.

**Table 24 - 5015-U8IHFTXT I/O Module - REDUNDANCY Status Indicator**

Indicator State	Description	Recommended Action	
Off	One of the following:		
	<ul style="list-style-type: none"> <li>The module has no power.</li> <li>The module is operating normally in Simplex configuration.</li> <li>The MODULE status indicator on this module is in the flashing red or red state.</li> <li>The module is unlocked.</li> </ul>	Turn on power. None Take the appropriate action for a flashing red or red state on the MODULE status indicator as described in <a href="#">Table 23</a> . Lock the module.	
	Green	The module is operating normally in a Duplex configuration. In this case, the partner might or might not be paired with the module.	None
	Flashing red	The module cannot pair with a Duplex partner.	One of these tasks: <ul style="list-style-type: none"> <li>Confirm that the partner is installed and properly configured.</li> <li>If both I/O modules in the pair are installed properly, check the configuration to confirm that the module catalog numbers and module revisions match and that you are using a Duplex RTB.</li> </ul> If any of those factors is not incorrect, make appropriate changes.



[Table 25](#) describes the BACKPLANE A or BACKPLANE B status indicators on a 5015-U8IHFTXT I/O module.

**Table 25 - 5015-U8IHFTXT I/O Module - BACKPLANE A or BACKPLANE B Status Indicators**

Indicator State	Description	Recommended Action
Off	One of the following:	
	• The module has no power.	Turn on power.
	• The module is unlocked.	Lock the module.
Green	There are connections on the backplane to the module.	None
Red	There are no connections on the backplane to the module.	Verify that the BIMs above the module have green MOD status indicators. If so, unlock and relock the module's QTA to cycle power to it.

[Table 26](#) describes the S/A PWR status indicator on a 5015-U8IHFTXT I/O module.

**Table 26 - 5015-U8IHFTXT I/O Module - S/A PWR Status Indicator**

Indicator State	Description	Recommended Action
Off	One of the following:	
	• The module has no power.	Turn on power.
	• The module is unlocked.	Lock the module.
	• The SA power voltage is below the operating range or is not present.	Check SA power connections.
Green	The SA power voltage is within the operating range.	None
Red	The SA power voltage is outside the operating range.	Check SA power supply voltage and make necessary changes so it is within the operating range.

[Table 27](#) describes the DIGITAL IN and DIGITAL OUT status indicators on a 5015-U8IHFTXT I/O module.

**IMPORTANT** This status indicator is only used for channels that are configured to operate as digital inputs or digital outputs.

**Table 27 - 5015-U8IHFTXT I/O Module - DIGITAL IN and DIGITAL OUT Status Indicator**

Indicator State	Description	Recommended Action
Off	One of the following:	
	• The module has no power.	Turn on power.
	• The module is unlocked.	Lock the module.
	• The channel is off.	One of these tasks: <ul style="list-style-type: none"> <li>• If the channel should be on, troubleshoot the system to resolve the issue.</li> <li>• If the channel should not be on, for example, because it's not configured to function as a digital input or output, no action is necessary.</li> </ul>
Yellow	The input or output is on.	None
Flashing red	One of the following:	
	• The input is in the indeterminate state.	Verify the indeterminate threshold configuration based on the selected line/load resistors.
	• SA Power is missing from the channel.	Connect SA Power.
Red	If the module is wired for Simplex, the channel has an internal fault and is in the safe state.	1. Check the <i>I.InternalFault</i> tag = 1 (simplex) or <i>I.Modx.InternalFault</i> tag = 1 (duplex).
	If the module is wired for Duplex, the channel has an internal fault and the partner is operating the channel.	2. If present, cycle power to the I/O module.
	The channel has detected an external field wiring fault. For example, the following conditions can cause the fault: <ul style="list-style-type: none"> <li>• Short Circuit</li> <li>• Open Wire (digital inputs)</li> <li>• No Load (digital output)</li> </ul>	Troubleshoot your wiring and resolve the issue

Table 28 describes the ANALOG IN and ANALOG OUT status indicators on a 5015-U8IHFTXT I/O module.

**IMPORTANT** This status indicator is only used for channels that are configured to operate as analog input or analog outputs.

**Table 28 - 5015-U8IHFTXT I/O Module - ANALOG IN and ANALOG OUT Status Indicator**

Indicator State	Description	Recommended Action
Off	One of the following:	
	• The module has no power.	Turn on power.
	• The module is unlocked.	Lock the module.
	• The channel is off.	One of these tasks: <ul style="list-style-type: none"> <li>• If the channel should be on, troubleshoot the system to resolve the issue.</li> <li>• If the channel should not be on, for example, because it's not configured to function as an analog input or output, no action is necessary.</li> </ul>
Yellow	The channel is configured and operating normally.	None
Flashing red	One of the following:	
	• SA Power is missing from the channel.	Connect SA Power.
	• The channel is waiting for a valid signal.	Verify the wiring.
Red	If the module is wired for Simplex, the channel has an internal fault and is in the safe state.	Troubleshoot the internal fault and resolve the issue.
	If the module is wired for Duplex, the channel has an internal fault and the partner is operating the channel.	
	The channel has detected an external field wiring fault. For example, the following conditions can cause the fault: <ul style="list-style-type: none"> <li>• Short Circuit</li> <li>• Open Wire (analog inputs)</li> <li>• No Load (analog output)</li> </ul>	Troubleshoot your wiring and resolve the issue

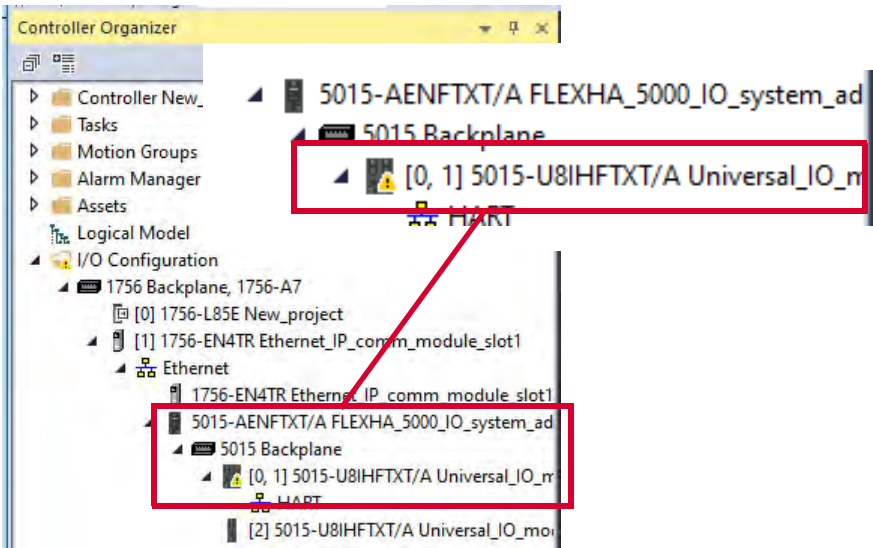
# Logix Designer Application

Fault conditions are reported in these ways:

- [Warning Signal in the I/O Configuration Tree](#)
- [Status and Fault Information on the Module Properties Dialog Box](#)
- [Logix Designer Application Tag](#)

## Warning Signal in the I/O Configuration Tree

A warning icon appears in the I/O Configuration tree when a fault occurs.



## Status and Fault Information on the Module Properties Dialog Box

The Logix Designer application’s Module Properties dialog box provides a series of views. The number and types of views varies by device type.

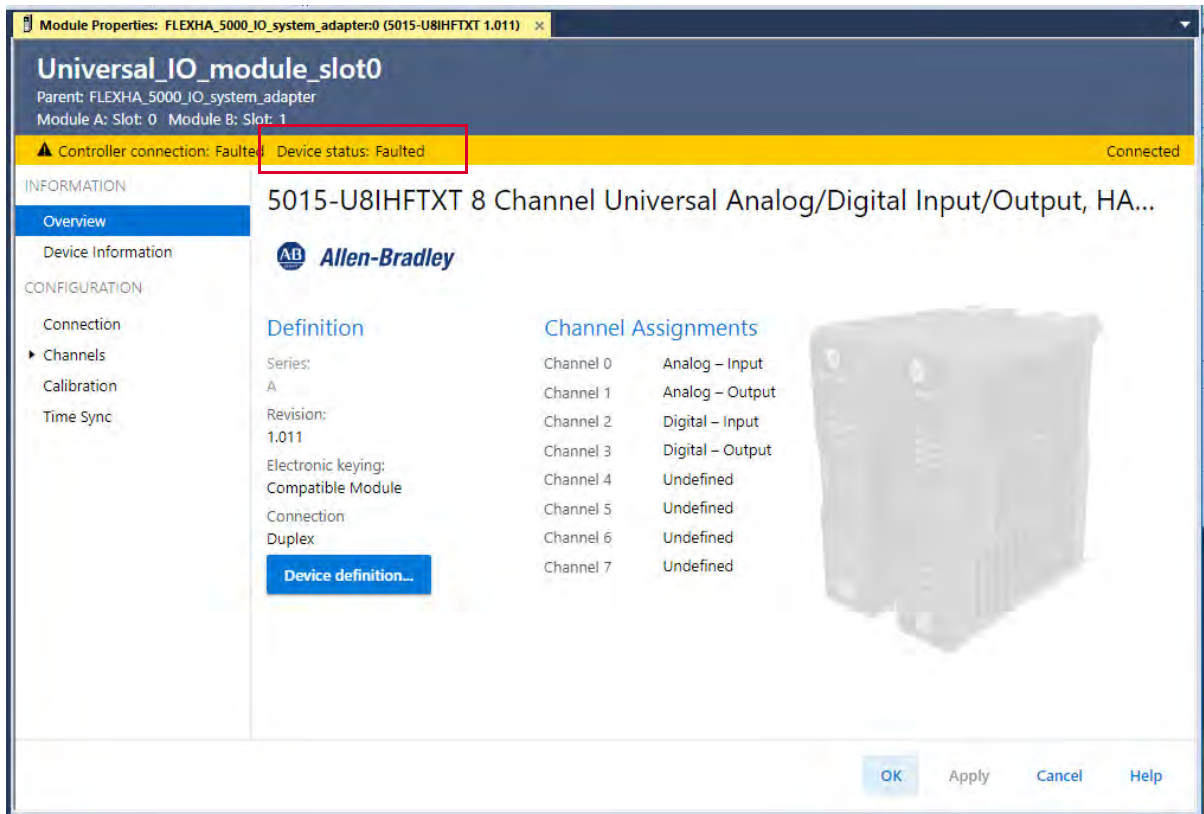
The following are ways to monitor the state of a module for faults:

- [Device Status](#)
- [Fault Description on Device Information View](#)
- [Fault Description on Connection View](#)
- [Channel Diagnostics](#)

The FLEXHA 5000 EtherNet/IP adapter and I/O modules provide some of the same views, for example, Overview, and have some views that are unique to their device type.

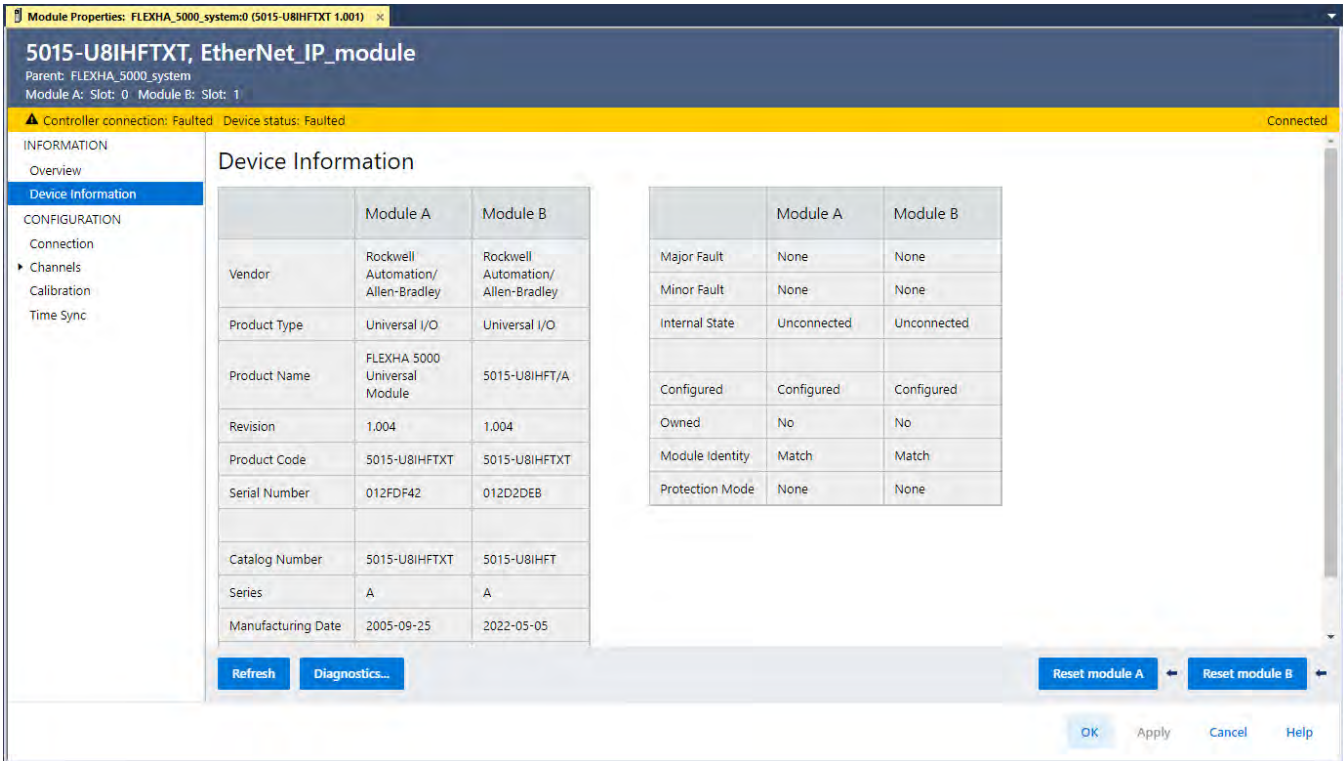
### Device Status

When the Logix Designer application project is online, the device status appears. You see this status no matter what Information or Configuration view is active.



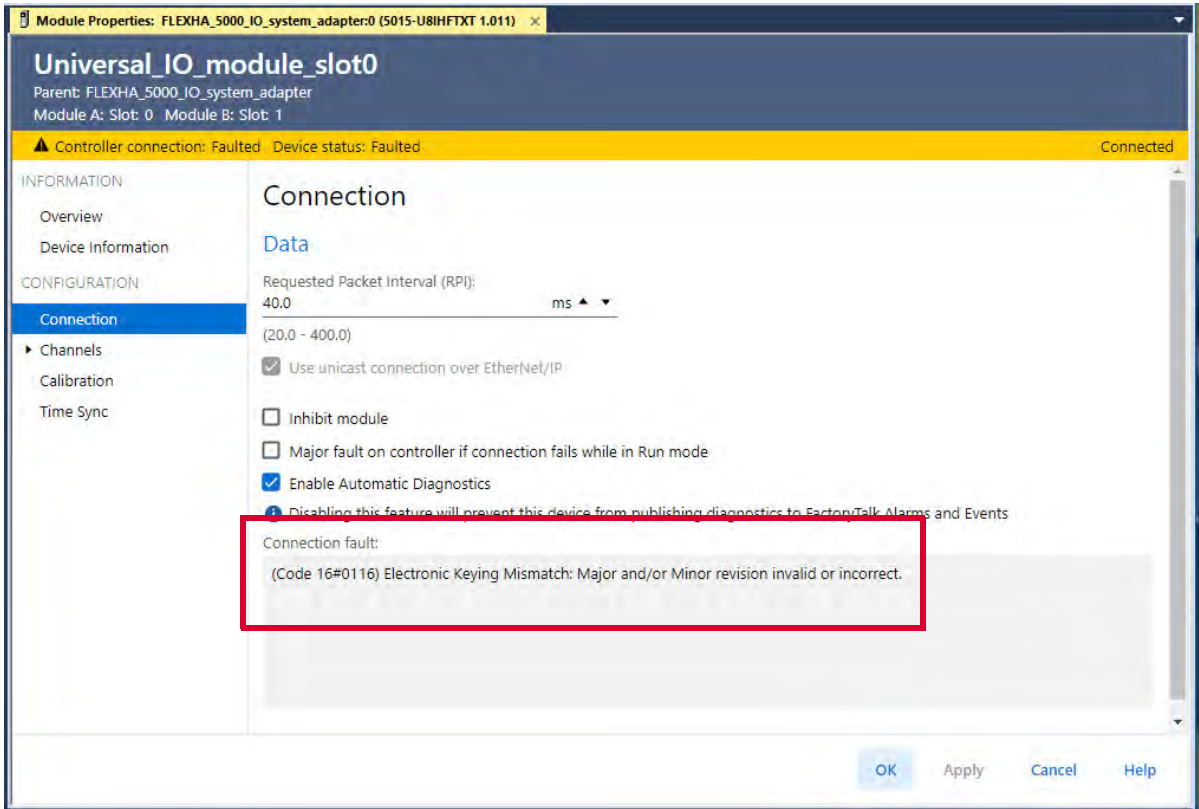
### Fault Description on Device Information View

A fault description is listed on the Device Information view.



### Fault Description on Connection View

A fault description that includes an error code is listed on the Connection view.

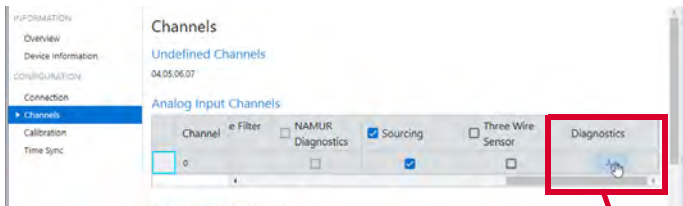


### Channel Diagnostics

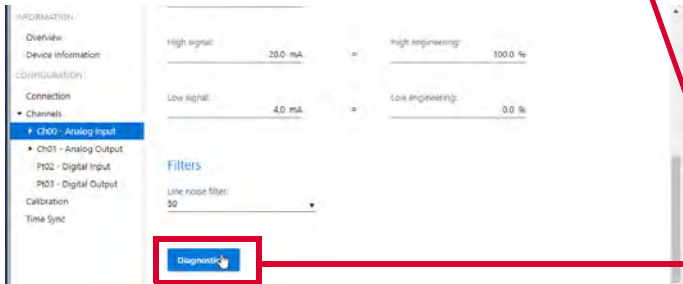
Channel diagnostics are accessible from the parent-level Channels view, individual channel view or Diagnostics view. You can only access channel diagnostics when the **project is online**.

Use channel diagnostics to monitor channel operating conditions and to troubleshoot issues with the channel. The fields on the channel diagnostics dialog box vary based on channel type configuration.

These screens show how to access the channel diagnostics for a channel operating in Analog Input mode.



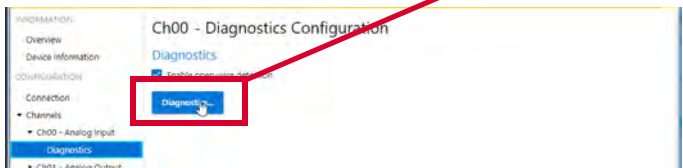
**IMPORTANT:** Some of the diagnostics shown in the screen below are currently non-functional. They are planned for future use.



Ch00 Diagnostics

	Module A	Module B
Fault Exists	None	None
Data Uncertain	No	No
Open Wire	None	None
Open Wire Timestamp	None	None
Short Circuit	None	None
Short Circuit Timestamp	None	None
Over Temperature	Normal	Normal
Over Temperature Timestamp	None	None
Critical Temperature	False	False
Critical Temperature Timestamp	None	None
Field Power	Present	Present

Help Retry Close



For more information on the diagnostics that are available for a FLEXHA 5000 I/O system, see [Diagnostic Information on page 223](#).

## Logix Designer Application Tag

Fault conditions are indicated in the controller tags.

**IMPORTANT** When you use the FLEXHA 5000 8-channel Universal I/O module, firmware revision 1.011, some fault conditions are detected but not specified in your Studio 5000 Logix Designer® application project. When the fault occurs, it's only indicated in the `lxx.Ch.Fault` (analog input mode) or `lxx.Fault` (analog output, digital input, and digital output modes) tag.

When a Fault tag goes to 1 but no specific condition's tag goes to 1, you must troubleshoot the application for any possible cause to resolve the issue and resume normal operation.

Figure 47 - Fault Indication in Controller Tags

Name	Value	Data Type
▶ FLEXHA_5000_IO_system_adapter:0:C00	{...}	AB:5000
▶ FLEXHA_5000_IO_system_adapter:0:C01	{...}	AB:5000
▶ FLEXHA_5000_IO_system_adapter:0:C02	{...}	AB:5000
▶ FLEXHA_5000_IO_system_adapter:0:C03	{...}	AB:5000
▲ FLEXHA_5000_IO_system_adapter:0:I	{...}	AB:5000
FLEXHA_5000_IO_system_adapter:0:I.RunMode	0	BOOL
FLEXHA_5000_IO_system_adapter:0:I.ConnectionFaulted	1	BOOL
FLEXHA_5000_IO_system_adapter:0:I.DiagnosticActive	1	BOOL
FLEXHA_5000_IO_system_adapter:0:I.CIPSyncValid	1	BOOL
FLEXHA_5000_IO_system_adapter:0:I.CIPSyncTimeout	0	BOOL
FLEXHA_5000_IO_system_adapter:0:I.ModAFault	0	BOOL
FLEXHA_5000_IO_system_adapter:0:I.ModBFault	1	BOOL
▶ FLEXHA_5000_IO_system_adapter:0:I.DiagnosticSequenceCount	26	SINT
▶ FLEXHA_5000_IO_system_adapter:0:I.ModA	{...}	AB:5000
▶ FLEXHA_5000_IO_system_adapter:0:I.ModB	{...}	AB:5000
▲ FLEXHA_5000_IO_system_adapter:0:I00	{...}	CHANN
▲ FLEXHA_5000_IO_system_adapter:0:I00.Ch	{...}	CHANN
FLEXHA_5000_IO_system_adapter:0:I00.Ch.Fault	1	BOOL

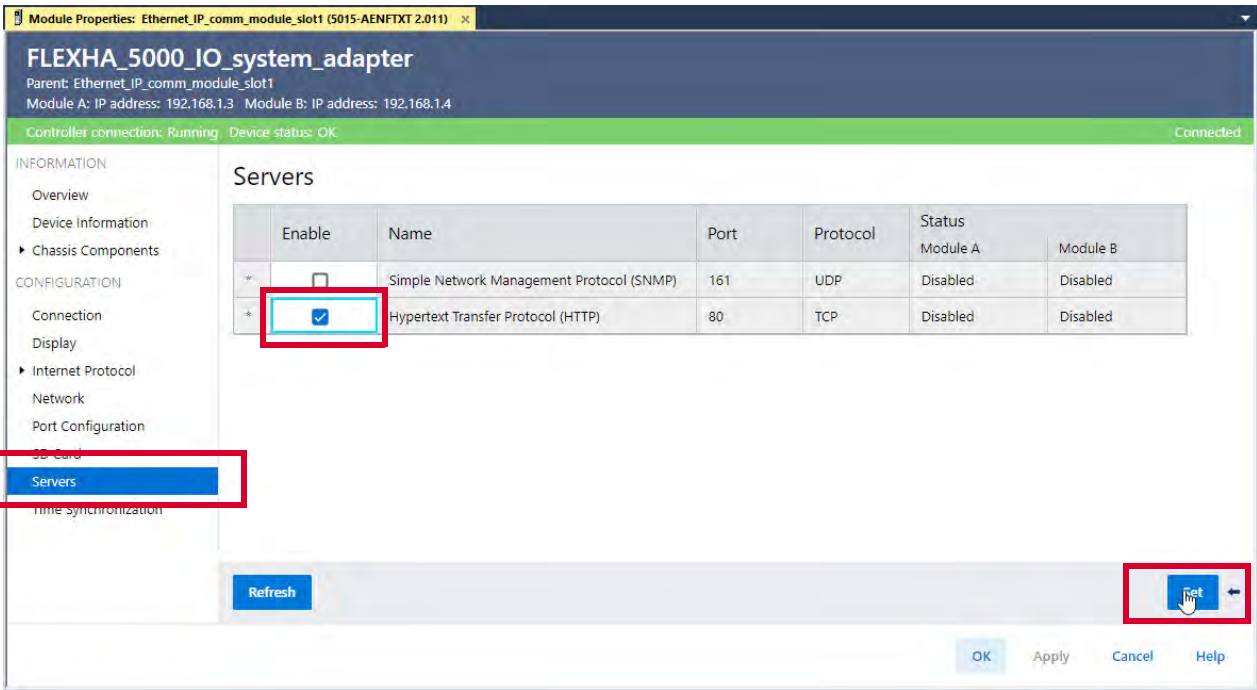
For more information on how to use controller tags, see [Module Tags on page 195](#).



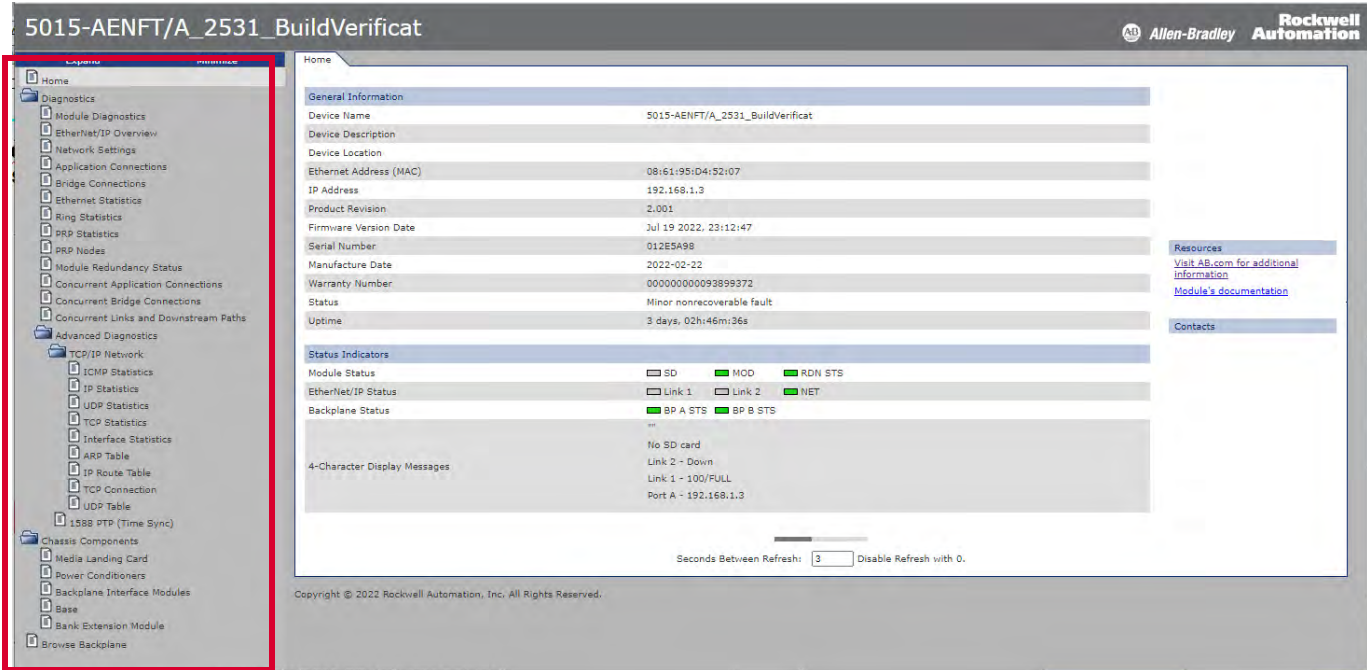
# EtherNet/IP Adapter Diagnostic Webpages

FLEXHA 5000 EtherNet/IP adapters provide diagnostic pages that you can use when troubleshooting your system.

You must make sure that the HTTP server is enabled to use the diagnostic webpages. You must be online to enable the server.



The first webpage is the Home page. Links on the side of the screen let you access information about the application.



**Notes:**

## Module Tags

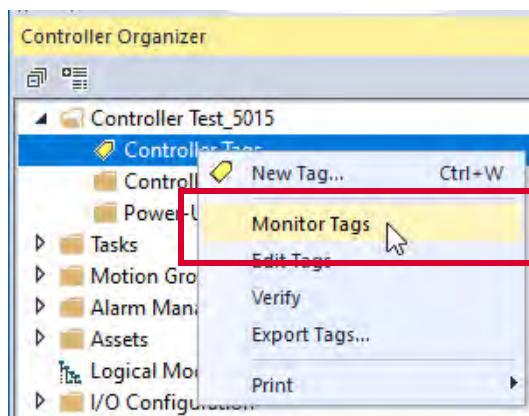
Module tags are created when you add a module to the Studio 5000 Logix Designer® application project.

The set of module tags that are associated with the Universal I/O module depends on the module configuration.

### Access the Tags

View tags in the Tag Editor.

1. Open the Logix Designer application project.
2. Right-click Controller Tags and choose Monitor Tags.



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

The screenshot shows the 'Controller Tags - New\_project(controller)' window. The 'Scope' is set to 'New\_project' and 'Show' is set to 'All Tags'. The table below lists the tags and their properties.

Name	Value	Data Type
▲ FLEXHA_5000_IO_system_adapter:0:C00	{...}	AB:5000_AI1_
▲ FLEXHA_5000_IO_system_adapter:0:C00.Ch	{...}	AB:5000_AI_F
▶ FLEXHA_5000_IO_system_adapter:0:C00.Ch.SensorType	0	SINT
▶ FLEXHA_5000_IO_system_adapter:0:C00.Ch.LineNoiseFilter	4	SINT
FLEXHA_5000_IO_system_adapter:0:C00.Ch.ThreeWireSensor	0	BOOL
FLEXHA_5000_IO_system_adapter:0:C00.Ch.OpenWireEn	1	BOOL
FLEXHA_5000_IO_system_adapter:0:C00.Ch.Disable	0	BOOL
FLEXHA_5000_IO_system_adapter:0:C00.Ch.Sourcing	1	BOOL
▶ FLEXHA_5000_IO_system_adapter:0:C00.Ch.TenOhmOffset	0	INT
FLEXHA_5000_IO_system_adapter:0:C00.Ch.LowSignal	4.0	REAL
FLEXHA_5000_IO_system_adapter:0:C00.Ch.HighSignal	20.0	REAL
FLEXHA_5000_IO_system_adapter:0:C00.Ch.LowEngineering	0.0	REAL
FLEXHA_5000_IO_system_adapter:0:C00.Ch.HighEngineering	100.0	REAL

## Automatic Diagnostics

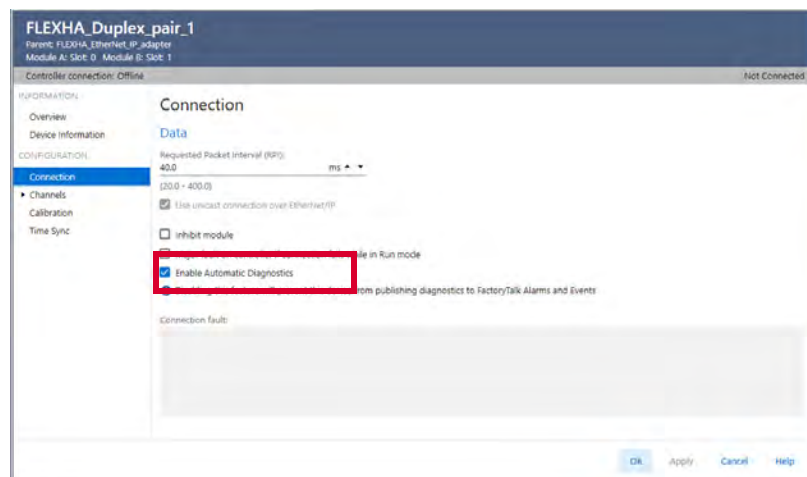
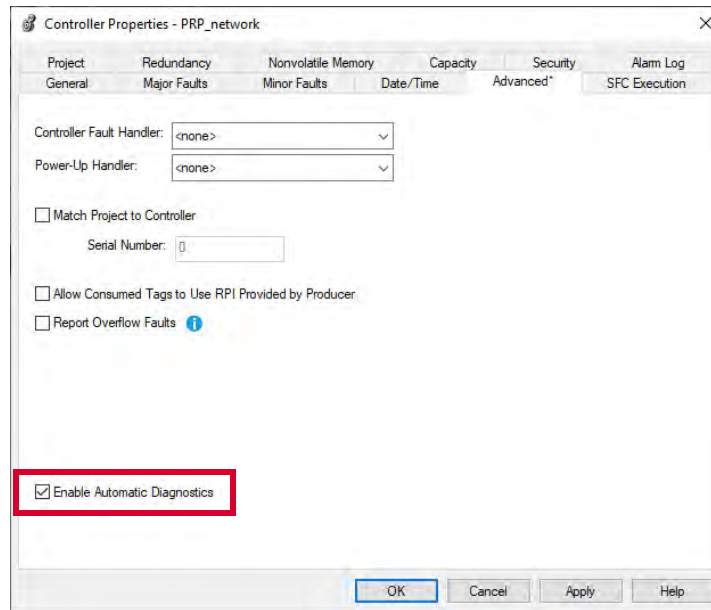
Automatic Diagnostics is a system-level feature in ControlLogix® 5580 controllers that send diagnostic information to the following with zero programming:

- FactoryTalk® View Site Edition (SE) client, version 12.00.00 or greater on standalone machine level HMIs and other clients
- PanelView™ 5000 terminals, version 8 or greater

The diagnostics include relevant information, such as:

- Device name in the Logix Designer application project
- Catalog number
- Product type
- Descriptive message of device description conditions and state events

Automatic Diagnostics are not application-specific and are enabled by default in Logix Designer application projects. Disable and reenables the feature while online or offline for the ControlLogix controller, FLEXHA 5000 EtherNet/IP™ adapter, and FLEXHA 5000 I/O modules.



## Automatic Diagnostics in FLEXHA 5000 I/O System

In a FLEXHA 5000™ I/O system, some status and input tags are Automatic Diagnostics. When a condition occurs that causes the tag value to transition to 1, the automatic diagnostic is triggered. There are varying levels of Automatic Diagnostics.

**Table 29 - Automatic Diagnostic Levels**

Level	Description
DIAG1	This level is used when the condition that is represented by the tag is in the diagnostic state the DiagnosticActive and channel Fault is true. A change to or from the diagnostic state results in the Diagnostic Sequence Count being incremented.
DIAG2	This level is used with threshold diagnostics. It's triggered based on a counter or rate reaching a limit. The DiagnosticSequenceCount is incremented when either of the following occurs: <ul style="list-style-type: none"> <li>• A limit is reached.</li> <li>• The counter or rate falls below the limit.</li> </ul> The Channel Fault and the DiagnosticActive are held true while the value is at or above the threshold.
DIAG3	This level is used with diagnostic and produced channel fault tags. A change to or from the diagnostic state does not result in the Diagnostic Sequence Count being incremented. However, if there are conditions that can cause the fault indication that is not detailed by other tags, then the tag acts as level DIAG1 and the Diagnostic Sequence Count is incremented.
DIAG4	This level is used when the condition that the tag represents is in a diagnostic state that makes the DiagnosticActive true. A change to or from the diagnostic state results in the Diagnostic Sequence Count being incremented. <b>IMPORTANT:</b> This value doesn't trigger a Channel Fault.
DIAG5	This level is used when the condition that the tag represents is in a diagnostic state that does not impact the DiagnosticActive nor the DiagnosticSequenceCount. This condition also does not trigger the Channel Fault.
DSC Rollup	Not a diagnostic level but related to them. The Diagnostic Sequence Count (DSC) increments when either of the following occurs: <ul style="list-style-type: none"> <li>• Each time a distinct diagnostic condition occurs.</li> <li>• Each time a distinct diagnostic condition transfers from detected to not detected.</li> </ul> The count value wraps from 255 (-1)...1. A value of zero is only present after a product reset.

For example, if analog channel data is beneath the underrange threshold, a channel fault occurs. For an analog input channel, the *Ixx.Ch.Underrange* input tag value goes to 1. For an analog output channel, the *Ixx.Underrange*. In both cases, the controller sends a message to the HMI device that indicates the type of fault and the channel on which it exists.

Automatic Diagnostics are available on the following:

- 5015-AENFTXT and 1756-EN4TR EtherNet/IP adapters - Status tags
- Universal I/O module channel modes - Status tags and input tags

### *Automatic Diagnostics Can Indicate That Fault Tolerance is Compromised*

Some of the FLEXHA 5000 I/O module tags that trigger Automatic Diagnostics indicate fault tolerance availability. For example, the 5015-AENFTXT adapter status tag *S.Modx.MissingFault* tag goes to 1 when one of the adapters in a Redundant Pair is not available.

When the loss of an adapter from a Redundant Pair occurs, fault tolerance is compromised. The partner adapter maintains control. However, if a second fault occurs that impairs the functioning adapter, control is lost. Not only does the application alert you to this condition via the adapter *S.Modx.MissingFault* status tag, but also the Automatic Diagnostics alerts you to the condition on an HMI.

When the missing EtherNet/IP adapter resumes operation and pairs with the other adapter in the Redundant Pair, the *S.Modx.MissingFault* tag returns to zero.

## Adapter Tag Name Conventions

Module tag names use defined naming conventions. The conventions for FLEXHA5000 EtherNet/IP adapter status tags are described in the example tag:

Example tag name = *FLEXHA\_5000\_IO\_system\_adapter:S.xxx*

- Adapter name = FLEXHA\_5000\_IO\_system\_adapter
- Tag type = S (that is, status)
- Tag function = Data; in this case, the xxx represents different degrees of granularity. For example:
  - *FLEXHA\_5000\_IO\_system\_adapter:S.RunMode* tag indicates if the controller is in Run mode or not.
  - *FLEXHA\_5000\_IO\_system\_adapter:S.ModA.RunMode* tag indicates if module A in a Duplex pair is running or not.

## 5015-AENFTXT Adapter Status Tags

This section describes the FLEXHA 5000 EtherNet/IP adapter status tags. For the most part, the same status tags are generated whether the adapter is used in a PRP or DLR topology.

The list of tags that are created depends on the Connection choice in the Device Definition. [Table 30](#) shows the adapter status tags for an redundant adapter pair.



Throughout the table, Mod and Module refer to the EtherNet/IP adapter.

**Table 30 – FLEXHA 5000 EtherNet/IP Adapter Status Tags**

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostic
S.RunMode	BOOL	Controller's operating state	<ul style="list-style-type: none"> <li>• 0 = Idle</li> <li>• 1 = Run</li> </ul>	—
S.ConnectionFaulted	BOOL	Indicates if a connection is running. The adapter sets this tag to 0 when not faulted. If the module is faulted or present, the tag to 1.	<ul style="list-style-type: none"> <li>• 0 = Connection running</li> <li>• 1 = Connection not running</li> </ul>	DIAG5
S.DiagnosticActive	BOOL	Indicates if any diagnostics are active, as listed in the Automatic Diagnostics column.	<ul style="list-style-type: none"> <li>• 0 = No diagnostics are active</li> <li>• 1 = One or more diagnostics are active</li> </ul>	—
S.CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master.	<ul style="list-style-type: none"> <li>• 0 = CIP Sync™ is not available</li> <li>• 1 = CIP Sync is available</li> </ul>	—
S.CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but is not now due to a timeout.	<ul style="list-style-type: none"> <li>• 0 = A valid time master has not timed out</li> <li>• 1 = A valid time master was detected on the network, 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.</li> </ul>	—
S.ModAFault	BOOL	Indicates if Module A of the duplex pair is not participating in the connection (for example, missing, faulted, incompatible partner). Any of the following can cause this fault: <ul style="list-style-type: none"> <li>• ModAMissing</li> <li>• ModAProductTypeFault</li> <li>• ModARevisionFault</li> <li>• ModALinkFault</li> <li>• MediaCardAFault</li> </ul>	<ul style="list-style-type: none"> <li>• 0 = Module A is participating in the connection</li> <li>• 1 = Module A is not participating in the connection</li> </ul>	—
S.ModBFault	BOOL	Indicates if Module B of the duplex pair is not participating in the connection (for example, missing, faulted, incompatible partner). Any of the following can cause this fault: <ul style="list-style-type: none"> <li>• ModBMissing</li> <li>• ModBProductTypeFault</li> <li>• ModBRevisionFault</li> <li>• ModBLinkFault</li> <li>• MediaCardBFault</li> </ul>	<ul style="list-style-type: none"> <li>• 0 = Module B is participating in the connection</li> <li>• 1 = Module B is not participating in the connection</li> </ul>	—

Table 30 - FLEXHA 5000 EtherNet/IP Adapter Status Tags

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostic
S.DiagnosticSequenceCount (DSC)	SINT	Increments for each time a diagnostic condition is detected, and when a diagnostic condition transitions from detected to not detected. Set to zero by product reset or power cycle. Wraps from 255 (-1)...1 skipping zero.	-128...+127 The value of 0 is skipped except during module powerup.	DSC
S.BackplaneCompositionFault	BOOL	Indicates if the backplane has been constructed in a way that it violates system design rules. For example, more than two Bank Expansion Bases, Left or Right, or more than six I/O Bases, with BIMs, are installed.	<ul style="list-style-type: none"> <li>0 = The backplane is installed properly</li> <li>1 = The backplane has been constructed in a way that violates the design rules</li> </ul>	DIAG4
S.SystemPowerALoadShareFault	BOOL	Indicates if an issue with System Power A was detected during load share periodic diagnostics.	<ul style="list-style-type: none"> <li>0 = System Power A is running correctly</li> <li>1 = An issue was detected with System Power A Removal or failure of System Power B could result in system failure.</li> </ul>	DIAG4
S.SystemPowerBLoadShareFault	BOOL	Indicates if an issue with System Power B was detected during load share periodic diagnostics.	<ul style="list-style-type: none"> <li>0 = System Power B is running correctly</li> <li>1 = An issue was detected with System Power B Removal or failure of System Power A could result in system failure.</li> </ul>	DIAG4
S.RevisionsDifferent	BOOL	Indicates if two paired modules have differences between any of the following: <ul style="list-style-type: none"> <li>• Vendor ID</li> <li>• Device Type</li> <li>• Product Code</li> <li>• Major Revision</li> <li>• Minor Revision</li> </ul>	<ul style="list-style-type: none"> <li>0 = One of the following: <ul style="list-style-type: none"> <li>- Only one is present</li> <li>- Two modules are present but are not paired</li> <li>- Two modules are paired modules and have no differences</li> </ul> </li> <li>1 = Two modules are paired and have at least one difference</li> </ul>	—
S.Modx.RunMode <sup>(1)</sup>	BOOL	Module's operating state	<ul style="list-style-type: none"> <li>0 = Idle</li> <li>1 = Run</li> </ul>	—
S.Modx.DiagnosticActive	BOOL	Indicates if any diagnostics are active.	<ul style="list-style-type: none"> <li>0 = No diagnostics active</li> <li>1 = One or more diagnostics are active</li> </ul>	DSC Rollup
S.Modx.CIPSyncValid	BOOL	Indicates if the module is synced with a 1588 master.	<ul style="list-style-type: none"> <li>0 = CIP Sync is not available</li> <li>1 = CIP Sync is available</li> </ul>	—
S.Modx.CIPSyncTimeout	BOOL	Indicates if a CIP Sync timeout has occurred.	<ul style="list-style-type: none"> <li>0 = No CIP Sync timeout has occurred</li> <li>1 = CIP Sync timeout has occurred</li> </ul>	—
S.Modx.DiagnosticSequenceCount	SINT	Increments for each time a diagnostic condition is detected, and when a diagnostic condition transitions from detected to not detected. Set to zero by product reset or power cycle. Wraps from 255 (-1)...1 skipping zero.	-128...+127 The value of 0 is skipped except during module powerup.	DSC
S.Modx.MissingFault	BOOL	Indicates if the module is missing.	<ul style="list-style-type: none"> <li>0 = Module is not missing</li> <li>1 = Module is missing</li> </ul>	DIAG4
S.Modx.ProductTypeFault	BOOL	Indicates if the module cannot pair due to keying mismatch of anything but revision.	<ul style="list-style-type: none"> <li>0 = Module can pair</li> <li>1 = Module cannot pair</li> </ul>	DIAG4
S.Modx.RevisionFault	BOOL	Indicates if the module cannot pair due to Revision conflict.	<ul style="list-style-type: none"> <li>0 = Module can pair</li> <li>1 = Module cannot pair</li> </ul>	DIAG4
S.Modx.LinkFault	BOOL	Indicates if a fault exists on the Ethernet link. Possible causes include: <ul style="list-style-type: none"> <li>• All cables are disconnected.</li> <li>• The MLC is missing.</li> </ul>	<ul style="list-style-type: none"> <li>0 = A link fault does not exist</li> <li>1 = A link fault exists For duplex pairs, the module cannot pair because it cannot establish an Ethernet link.</li> </ul>	DIAG4
S.Modx.BackplaneAFault	BOOL	Indicates if the module can communicate on Backplane A, that is, via BIM A.	<ul style="list-style-type: none"> <li>0 = The module can communicate on Backplane A</li> <li>1 = The module cannot communicate on Backplane A</li> </ul>	DIAG4

Table 30 - FLEXHA 5000 EtherNet/IP Adapter Status Tags

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostic
S.Modx.BackplaneBFault	BOOL	Indicates if the module can communicate on Backplane B, that is, via BIM B.	<ul style="list-style-type: none"> <li>0 = The module can communicate on Backplane B</li> <li>1 = The module cannot communicate on Backplane B</li> </ul>	DIAG4
S.Modx.SystemPowerAFault	BOOL	Indicates if MOD Power RTB A is providing power and that the power is within the required range.	<ul style="list-style-type: none"> <li>0 = System power that the MOD Power RTB A provides is normal.</li> <li>1 = System power that MOD Power RTB A provides is not detected or is outside the required range</li> </ul>	DIAG4
S.Modx.SystemPowerBFault	BOOL	Indicates if MOD Power RTB B is providing power and that the power is within the required range.	<ul style="list-style-type: none"> <li>0 = System power is that the MOD Power RTB B provides is normal.</li> <li>1 = System power that MOD Power RTB B provides is not detected or is outside the required range</li> </ul>	DIAG4
S.Modx.Portx.Fault <sup>(2)</sup>	BOOL	Indicates that no cable is connected to the port, and it is not intentionally disabled.	<ul style="list-style-type: none"> <li>0 = No fault present; Ethernet cable is connected</li> <li>1 = Fault present; Ethernet cable is not connected</li> </ul>	DIAG3
S.Modx.Portx.Uncertain	BOOL	Indicates the link auto negotiation status.	<ul style="list-style-type: none"> <li>0 = No fault is present; link auto negotiation is working</li> <li>1 = Fault present; link auto negotiation failed</li> </ul>	—
S.Modx.Portx.Connected	BOOL	Indicates if an Ethernet cable is connected to the Ethernet port.	<ul style="list-style-type: none"> <li>0 = Ethernet cable is not connected</li> <li>1 = Ethernet cable is connected</li> </ul>	—
S.Modx.Portx.FullDuplex	BOOL	Indicates if the Ethernet port is operating in Full Duplex.	<ul style="list-style-type: none"> <li>0 = The Ethernet port is not operating in Full Duplex</li> <li>1 = The Ethernet port is operating in Full Duplex</li> </ul>	—
S.Modx.Portx.AutonegotiationStatus	SINT	Indicates the status of the link auto-negotiation	<ul style="list-style-type: none"> <li>0 = Auto-negotiation in progress.</li> <li>1 = Auto-negotiation and speed detection failed</li> <li>2 = Auto negotiation failed but detected speed. Duplex was defaulted.</li> <li>3 = Successfully negotiated speed and duplex.</li> <li>4 = Auto-negotiation was not attempted. Forced speed and duplex.</li> </ul>	—
S.Modx.Portx.Speed	INT	Indicates the Ethernet port's communication rate.	<ul style="list-style-type: none"> <li>0 = 10 Mbps</li> <li>1 = 100 Mbps</li> <li>2 = 1 Gbps</li> </ul>	—
S.Modx.TCPConnections	INT	The number of TCP/IP connections currently open to the adapter.	Varies	—
S.Modx.CIPConnections	INT	The number of CIP™ connections currently open to and through the adapter. The two legs of a concurrent connection count as one CIP connection.	Varies	—
S.Modx.CIPLostPackets	DINT	A running sum of the number of missed I/O packets.	Varies	—
S.Modx.CIPTimeouts	DINT	A running count of the number of connections that time out, both those to and through the adapter.	Varies	—
S.Modx.HMIPacketRate	DINT	The number of Class 3 packets and unconnected packets that are sent and received by the device in the previous second.	Varies	—
S.Modx.IOPacketRate	DINT	The number of I/O packets that were transmitted or received by the adapter in the previous second.	Varies	—



Table 30 - FLEXHA 5000 EtherNet/IP Adapter Status Tags

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostic
S.Modx.EthernetErrors	DINT	The sum over both Ethernet ports on the EtherNet/IP adapter of the following Ethernet Link object values: <ul style="list-style-type: none"> <li>• In Discards</li> <li>• In Errors</li> <li>• In Unknown Protos</li> <li>• Out Discards</li> <li>• Out Errors</li> <li>• Alignment Errors</li> <li>• FCS Errors</li> <li>• Single Collisions</li> <li>• Multiple Collisions</li> <li>• SQE Test Errors</li> <li>• Deferred Transmissions</li> <li>• Late Collisions</li> <li>• Excessive Collisions</li> <li>• MAC Transmit Errors</li> <li>• Carrier Sense Errors</li> <li>• Frame Too Long</li> <li>• MAC Receive Errors</li> </ul>	Varies	—
S.Modx.CPUUtilization	INT	The percentage of the adapter's CPU capacity that is most important to the performance of communication of packets by the adapter.	0 (0%)...1000 (100%)	—
S.Modx.DLRNetworkState <b>IMPORTANT:</b> This tag is only generated when the FLEXHA 5000 EtherNet/IP adapter is configured for the DLR Network mode.	SINT	The current state of the DLR network.	<ul style="list-style-type: none"> <li>• 0 = Normal (or PRP)</li> <li>• 1 = Ring Fault</li> <li>• 2 = Unexpected Loop Detected</li> <li>• 3 = Partial Network Fault</li> <li>• 4 = Rapid Fault/Restore Cycle</li> </ul>	—
S.Modx.DLRSupervisorState <b>IMPORTANT:</b> This tag is only generated when the FLEXHA 5000 EtherNet/IP adapter is configured for the DLR Network mode.	SINT	The current state of the Ring Supervisor Status on the DLR network.	<ul style="list-style-type: none"> <li>• 0 = Module is functioning as a backup</li> <li>• 1 = Module is functioning as the active ring supervisor</li> <li>• 2 = Module is functioning as a normal ring node</li> <li>• 3 = Module is operating in a non-DLR topology (such as PRP)</li> <li>• 4 = Module cannot support the current ring parameters (Beacon Interval and Beacon Timeout)</li> </ul>	—
S.Modx.MemoryCardFault	BOOL	Indicates if an SD card fault has occurred for any of these reasons: <ul style="list-style-type: none"> <li>• SD card is not present</li> <li>• SD card is not properly formatted</li> <li>• SD card does not have sufficient space to store configuration data and firmware</li> </ul>	<ul style="list-style-type: none"> <li>• 0 = SD card is not faulted</li> <li>• 1 = SD card is faulted</li> </ul>	DIAG4
S.Modx.MemoryCardDataMismatch	BOOL	Indicates if the adapter's configuration and firmware revision matches the data on the SD card.	<ul style="list-style-type: none"> <li>• 0 = Adapter's configuration and firmware revision match what's on the SD card</li> <li>• 1 = Adapter's configuration and firmware revision don't match what's on the SD card</li> </ul>	DIAG4
S.Modx.OverTemperature	BOOL	Indicates if the adapter temperature is higher than its rated operating limits.	<ul style="list-style-type: none"> <li>• 0 = Adapter temperature is within its rated operating limits</li> <li>• 1 = Adapter temperature is outside its rated operating limits</li> </ul>	DIAG4

Table 30 - FLEXHA 5000 EtherNet/IP Adapter Status Tags

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostic
S.Modx.CriticalTemperature	BOOL	Indicates if the adapter temperature is above the critical temperature limit for proper operation and might shut down without further warning.	<ul style="list-style-type: none"> <li>0 = Adapter temperature is below the critical temperature limit for proper operation</li> <li>1 = Adapter temperature is above the critical temperature limit for proper operation</li> </ul>	DIAG4
S.Modx.InternalFault	BOOL	Indicates if at least one of the adapter's internal diagnostics has detected a fault.	<ul style="list-style-type: none"> <li>0 = No internal fault detected</li> <li>1 = At least one internal diagnostic indicates that an internal issue exists on the product.</li> </ul>	DIAG4
S.Modx.DLREnabled <b>IMPORTANT:</b> This tag is only generated when the FLEXHA 5000 EtherNet/IP adapter is configured for the DLR Network mode.	BOOL	Indicates whether the adapter is in DLR mode.	<ul style="list-style-type: none"> <li>0 = Adapter is not in DLR mode</li> <li>1 = Adapter is in DLR mode</li> </ul>	—
S.Modx.DLRModeFault <b>IMPORTANT:</b> This tag is only generated when the FLEXHA 5000 EtherNet/IP adapter is configured for the DLR Network mode.	BOOL	Indicates that the adapter's configuration in the Logix Designer application project is for DLR mode but the rotary switches on the adapter are not configured for DLR mode.	<ul style="list-style-type: none"> <li>0 = Configuration is correct; the module properties configuration matches the rotary switch setting</li> <li>1 = Configuration on the module properties dialog box is not the same as the rotary switches</li> </ul>	DIAG5
S.Modx.PRPPort1Fault <b>IMPORTANT:</b> This tag is only generated when the FLEXHA 5000 EtherNet/IP adapter is configured for the PRP Network mode.	BOOL	Indicates the state of PRP activity on Link 1.	<ul style="list-style-type: none"> <li>0 = PRP activity is normal on Ethernet port 1</li> <li>1 = One of these conditions is true for Ethernet port 1: <ul style="list-style-type: none"> <li>No PRP activity has been seen on port 1 for 3 seconds, but some PRP activity has been seen on the port 2</li> <li>Another node's ports were Active/Inactive or Inactive/Active during the last second</li> <li>The wrong LAN Count has incremented in the last second</li> </ul> </li> </ul>	DIAG4
S.Modx.PRPPort2Fault <b>IMPORTANT:</b> This tag is only generated when the FLEXHA 5000 EtherNet/IP adapter is configured for the PRP Network mode.	BOOL	Indicates the state of PRP activity on Link 2.	<ul style="list-style-type: none"> <li>0 = PRP activity is normal on Ethernet port 2</li> <li>1 = One of these conditions is true for Ethernet port 2: <ul style="list-style-type: none"> <li>No PRP activity has been seen on port 2 for 3 seconds, but some PRP activity has been seen on the port 1</li> <li>Another node's ports were Active/Inactive or Inactive/Active during the last second</li> <li>The wrong LAN Count has incremented in the last second</li> </ul> </li> </ul>	DIAG4

Table 30 - FLEXHA 5000 EtherNet/IP Adapter Status Tags

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostic
S.Modx.PRPModeFault <b>IMPORTANT:</b> This tag is only generated when the FLEXHA 5000 EtherNet/IP adapter is configured for the PRP Network mode.	BOOL	Indicates that the adapter's configuration in the Logix Designer application project is for PRP mode but the rotary switches on the adapter are not configured for PRP mode.	<ul style="list-style-type: none"> <li>0 = Configuration is correct; the module properties configuration matches the rotary switch setting</li> <li>1 = Configuration on the module properties dialog box is not the same as the rotary switches</li> </ul>	DIAG5
S.Modx.PRPEnabled <b>IMPORTANT:</b> This tag is only generated when the FLEXHA 5000 EtherNet/IP adapter is configured for the PRP Network mode.	BOOL	Indicates whether the adapter is in PRP mode.	<ul style="list-style-type: none"> <li>0 = Adapter is not in PRP mode</li> <li>1 = Adapter is in PRP mode</li> </ul>	—
S.Modx.HardwareConfigMismatch	BOOL	Indicates whether the adapter's current hardware configuration matches the currently operating configuration. If the hardware configuration does not match the currently operating configuration, it's because the rotary switches were changed while the adapter is operating.	<ul style="list-style-type: none"> <li>0 = The current hardware configuration matches the currently operating configuration.</li> <li>1 = The hardware configuration options do not match the currently operating configuration. Changes occurred during operation.</li> </ul>	DIAG4
S.Modx.ConcurrentConnectionsLostPackets	DINT	Indicates the number of concurrent connection packets that have been missed (not received).	Varies	—
S.Modx.LocalClockOffset	LINT	The offset in nanoseconds from the local clock to the system time. This value updates when a PTP update is received.	Varies	—
S.Modx.LocalClockOffsetTimestamp	LINT	The time when the Local Clock Offset was most recently sampled. This value is initially zero and the first time stamp occurs when the module synchronizes with the master clock.	Varies	—
S.Modx.GrandMasterClockID	SINT[8]	The EUI-64 Identity of the CIP Sync Grand Master clock to which the adapter's synced.		—
S.Basex.Fault <sup>(3)</sup>	BOOL	Roll-up of all BIMs (InterfaceA and InterfaceB) with Fault or CriticalTemperature tags set.	<ul style="list-style-type: none"> <li>0 = Neither InterfaceA nor InterfaceB has a Fault or Overtemperature.</li> <li>1 = Either InterfaceA or InterfaceB has a Fault and/or Overtemperature.</li> </ul>	Channel Rollup
S.Basex.Uncertain	BOOL	Standard roll-up of Interface A and Interface B issues. The S.Basex. tags represent the interfaces, that is, BIMs.		—
S.Basex.InternalFault	BOOL	Indicates if any internal issues were detected on the Base.	<ul style="list-style-type: none"> <li>0 = No internal issues detected</li> <li>1 = An internal issue has been detected</li> </ul>	DIAG1
S.Basex.InterfaceAFault	BOOL	BIM A is not present or faulted, while BIM B is functioning correctly.	<ul style="list-style-type: none"> <li>0 = BIMs A and B, respectively, have the same Status value, that is, 0 or 1.</li> <li>1 = BIM A is Status = 0, and BIM B is Status = 1.</li> </ul>	DIAG1
S.Basex.InterfaceAStatus	BOOL	Indicates if BIM A is present and functioning normally.	<ul style="list-style-type: none"> <li>0 = BIM A is not present or not functioning normally. Possible causes include the loss of power or data connection between Bank Expansion Bases that are next to the base.</li> <li>1 = BIM A is functioning normally</li> </ul>	—
S.Basex.InterfaceAOverTemperature	BOOL	Indicates if the BIM A temperature is higher than its rated operating limits.	<ul style="list-style-type: none"> <li>0 = BIM A temperature is within its rated operating limits</li> <li>1 = BIM A temperature is outside its rated operating limits</li> </ul>	DIAG4

Table 30 - FLEXHA 5000 EtherNet/IP Adapter Status Tags

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostic
S.Baseex.InterfaceACriticalTemperature	BOOL	Indicates if the BIM A temperature is above the critical temperature limit for proper operation and might shut down without further warning.	<ul style="list-style-type: none"> <li>0 = BIM A temperature is below the critical temperature limit for proper operation</li> <li>1 = BIM A temperature is above the critical temperature limit for proper operation</li> </ul>	DIAG1
S.Baseex.InterfaceAInternalFault	BOOL	Indicates if any of the internal diagnostics on BIM A have detected an issue on BIM A. The tag is also set if an OverTemperature, CriticalTemperature, or SystemPowerFault condition exists.	<ul style="list-style-type: none"> <li>0 = No internal issues detected</li> <li>1 = At least one internal diagnostic indicates that an issue exists on BIM A.</li> </ul>	DIAG1
S.Baseex.InterfaceASystemPowerAFault	BOOL	Indicates the state of BIM A's system power A.	<ul style="list-style-type: none"> <li>0 = BIM A's system power A is working normally.</li> <li>1 = BIM A's system power A is not detected or is outside the rated operating limits.</li> </ul>	DIAG1
S.Baseex.InterfaceASystemPowerBFault	BOOL	Indicates the state of BIM A's system power B.	<ul style="list-style-type: none"> <li>0 = BIM A's system power B is working normally.</li> <li>1 = BIM A's system power B is not detected or is outside the rated operating limits.</li> </ul>	DIAG1
S.Baseex.InterfaceBFault	BOOL	BIM B is not present or faulted, while BIM A is functioning correctly.	<ul style="list-style-type: none"> <li>0 = BIMs A and B, respectively, have the same Status value, that is, 0 or 1.</li> <li>1 = BIM B is Status = 0, and BIM A is Status = 1.</li> </ul>	DIAG1
S.Baseex.InterfaceBStatus	BOOL	Indicates if BIM B is present and functioning normally.	<ul style="list-style-type: none"> <li>0 = BIM B is not present or not functioning normally. Possible causes include the loss of power or data connection between Bank Expansion Bases that are next to the base.</li> <li>1 = BIM B is functioning normally</li> </ul>	—
S.Baseex.InterfaceBOverTemperature	BOOL	Indicates if the BIM B temperature is higher than its rated operating limits.	<ul style="list-style-type: none"> <li>0 = BIM B temperature is within its rated operating limits</li> <li>1 = BIM B temperature is outside its rated operating limits</li> </ul>	DIAG4
S.Baseex.InterfaceBCriticalTemperature	BOOL	Indicates if the BIM B temperature is above the critical temperature limit for proper operation and might shut down without further warning.	<ul style="list-style-type: none"> <li>0 = BIM B temperature is below the critical temperature limit for proper operation</li> <li>1 = BIM B temperature is above the critical temperature limit for proper operation</li> </ul>	DIAG1
S.Baseex.InterfaceBInternalFault	BOOL	Indicates if any of the internal diagnostics on BIM B have detected an issue on BIM B.	<ul style="list-style-type: none"> <li>0 = No internal issues detected</li> <li>1 = At least one internal diagnostic indicates that an issue exists on BIM B.</li> </ul>	DIAG1
S.Baseex.InterfaceBSystemPowerAFault	BOOL	Indicates the state of BIM B's system power A.	<ul style="list-style-type: none"> <li>0 = BIM B's system power A is working normally.</li> <li>1 = BIM B's system power A is not detected or is outside the rated operating limits.</li> </ul>	DIAG1
S.Baseex.InterfaceBSystemPowerBFault	BOOL	Indicates the state of BIM B's system power B.	<ul style="list-style-type: none"> <li>0 = BIM B's system power B is working normally.</li> <li>1 = BIM B's system power B is not detected or is outside the rated operating limits.</li> </ul>	DIAG1
S.MediaCardx.Fault <sup>(4)</sup>	BOOL	Standard roll-up of Critical Temperature, MissingFault and any undetailed issues, such as, MLC missing or experiencing an internal fault		Channel Rollup
S.MediaCardx.Uncertain	BOOL	Standard roll-up of OverTemperature of the MLC		—
S.MediaCardx.OverTemperature	BOOL	Indicates if the MLC temperature is higher than its rated operating limits.	<ul style="list-style-type: none"> <li>0 = MLC temperature is within its rated operating limits</li> <li>1 = MLC temperature is outside its rated operating limits</li> </ul>	DIAG4

Table 30 - FLEXHA 5000 EtherNet/IP Adapter Status Tags

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostic
S.MediaCardx.CriticalTemperature	BOOL	Indicates if the MLC temperature is above the critical temperature limit for proper operation and might shut down without further warning.	<ul style="list-style-type: none"> <li>0 = MLC temperature is below the critical temperature limit for proper operation</li> <li>1 = MLC temperature is above the critical temperature limit for proper operation</li> </ul>	DIAG1
S.MediaCardx.InternalFault	BOOL	Indicates if at least one of the MLC's internal diagnostics have detected a fault.	<ul style="list-style-type: none"> <li>0 = No internal fault detected</li> <li>1 = At least one internal diagnostic indicates that an internal issue exists on the MLC.</li> </ul>	DIAG1
S.MediaCardx.MissingFault	BOOL	Indicates if the MLC is missing.	<ul style="list-style-type: none"> <li>0 = MLC is not detected</li> <li>1 = MLC is detected</li> </ul>	DIAG1
S.MediaCardx.ProductTypeFault	BOOL	Indicates if the MLC is compatible with the partner MLC, for example, if they have the same firmware revision.	<ul style="list-style-type: none"> <li>0 = MLC is compatible</li> <li>1 = MLC is incompatible</li> </ul>	DIAG1
S.PowerConditionerx.Fault <sup>(5)</sup>	BOOL	Standard roll-up of Critical Temperature and any undetailed issues, such as, an internal fault		Channel Rollup
S.PowerConditionerx.Uncertain	BOOL	Standard roll-up of OverTemperature of the Power Conditioner		—
S.PowerConditionerx.OverTemperature	BOOL	Indicates if the Power Conditioner temperature is higher than its rated operating limits.	<ul style="list-style-type: none"> <li>0 = Power Conditioner temperature is within its rated operating limits</li> <li>1 = Power Conditioner temperature is outside its rated operating limits</li> </ul>	DIAG4
S.PowerConditionerx.CriticalTemperature	BOOL	Indicates if the Power Conditioner temperature is above the critical temperature limit for proper operation and might shut down without further warning.	<ul style="list-style-type: none"> <li>0 = Power Conditioner temperature is below the critical temperature limit for proper operation</li> <li>1 = Power Conditioner temperature is above the critical temperature limit for proper operation</li> </ul>	DIAG1
S.PowerConditionerx.InternalFault	BOOL	Indicates if at least one of the Power Conditioner's internal diagnostics have detected a fault.	<ul style="list-style-type: none"> <li>0 = No internal fault detected</li> <li>1 = At least one internal diagnostic indicates that an internal issue exists on the Power Conditioner</li> </ul>	DIAG1
S.PowerConditionerx.SystemPowerFault	BOOL	Indicates if system power fault exists, such as, from an undervoltage or overvoltage condition, on the Power Conditioner.	<ul style="list-style-type: none"> <li>0 = No fault exists on the Power Conditioner</li> <li>1 = Fault exists on the Power Conditioner</li> </ul>	DIAG1
S.PowerConditionerx.MissingFault	BOOL	Indicates if the Power Conditioner is missing.	<ul style="list-style-type: none"> <li>0 = Power Conditioner is not detected</li> <li>1 = Power Conditioner is detected</li> </ul>	DIAG1
S.PowerConditionerData.PtxxData <sup>(6)</sup>	BOOL	Indicates the channel data.	Varies	—

(1) The x in tags that use Modx represents Module A or B. The same tags that contain Modx are generated for both adapters. This applies in any tag that uses Modx.

(2) The x in tags that use Portx represents Ethernet port 1 or 2. The same tags that contain Portx are generated for both ports on an adapter. This applies to any tag that uses Portx.

(3) The x in tags that use S.Base<sub>x</sub> represent each base. The Adapter Base is 0. The first I/O Base is 1. The numbers increment up to 6 to represent all of the I/O Bases. This applies to any tag that uses Base<sub>x</sub>.

(4) The x in tags that use S.MediaCard<sub>x</sub> represents MLC A or B. The same tags that contain S.MediaCard<sub>x</sub> are generated for both MLCs. This applies to any tag that uses S.MediaCard<sub>x</sub>.

(5) The x in tags that use S.PowerConditioner<sub>x</sub> represents Power Conditioner A or B. The same tags that contain S.PowerConditioner<sub>x</sub> are generated for both Power Conditioners. This applies to any tag that uses S.PowerConditioner<sub>x</sub>.

(6) The xx in the PowerConditionerData.PtxxData tag represents the channel number.

## 1756-EN4TR Module Tags

This section describes the 1756-EN4TR ControlLogix EtherNet/IP communication module status tags. For the most part, the same status tags are generated whether the module is used in a PRP or DLR topology.

The tags that are dependent on the Network Mode that is chosen during the Device Definition are marked as such in [Table 31](#).

**Table 31 - 1756-EN4TR ControlLogix EtherNet/IP Communication Module Status Tags - PRP Topology**

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostics
S.RunMode	BOOL	Controller's operating state	<ul style="list-style-type: none"> <li>0 = Idle</li> <li>1 = Run</li> </ul>	—
S.ConnectionFaulted	BOOL	Indicates if a connection is running.	<ul style="list-style-type: none"> <li>0 = Connection running</li> <li>1 = Connection not running</li> </ul>	DIAG5
S.DiagnosticActive	BOOL	Indicates if any diagnostics are active.	<ul style="list-style-type: none"> <li>0 = No diagnostics active</li> <li>1 = One or more diagnostics are active</li> </ul>	—
S.CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master.	<ul style="list-style-type: none"> <li>0 = CIP Sync is not available</li> <li>1 = CIP Sync is available</li> </ul>	—
S.CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but is not now due to a timeout.	<ul style="list-style-type: none"> <li>0 = A valid time master has not timed out</li> <li>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.</li> </ul>	—
S.ModAFault	BOOL	Indicates if Module A of the duplex pair is not participating in the connection (missing, faulted, incompatible partner). Any of the following can cause this fault: <ul style="list-style-type: none"> <li>ModAMissing</li> <li>ModAProductTypeFault</li> <li>ModARevisionFault</li> <li>ModALinkFault</li> </ul>	<ul style="list-style-type: none"> <li>0 = Module A is participating in the connection</li> <li>1 = Module A is not participating in the connection</li> </ul> Possible causes are that the module is missing, faulted, or an incompatible partner	Module Rollup
S.ModBFault	BOOL	Indicates if Module B of the duplex pair is not participating in the connection (missing, faulted, incompatible partner). Any of the following can cause this fault: <ul style="list-style-type: none"> <li>ModBMissing</li> <li>ModBProductTypeFault</li> <li>ModBRevisionFault</li> <li>ModBLinkFault</li> </ul>	<ul style="list-style-type: none"> <li>0 = Module B is participating in the connection</li> <li>1 = Module B is not participating in the connection</li> </ul> Possible causes are that the module is missing, faulted, or an incompatible partner	Module Rollup
S.DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected. Set to zero by product reset or power cycle. Wraps from 255 (-1)...1 skipping zero.	-128...+127 The value of 0 is skipped except during module powerup.	DSC
S.Modx.Run Mode	BOOL	Module's operating state	<ul style="list-style-type: none"> <li>0 = Idle</li> <li>1 = Run</li> </ul>	—
S.Modx.DiagnosticActive	BOOL	Indicates if any diagnostics are active.	<ul style="list-style-type: none"> <li>0 = No diagnostics active</li> <li>1 = One or more diagnostics are active</li> </ul>	—
S.Modx.CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master.	<ul style="list-style-type: none"> <li>0 = CIP Sync is not available</li> <li>1 = CIP Sync is available</li> </ul>	—
S.Modx.CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but is not now due to a timeout.	<ul style="list-style-type: none"> <li>0 = A valid time master has not timed out</li> <li>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.</li> </ul>	—
S.Modx.DiagnosticSequenceCount	SINT	Increments for each time a distinct diagnostic condition is detected, and when a distinct diagnostic condition transitions from detected to not detected. Set to zero by product reset or power cycle. Wraps from 255 (-1)...1 skipping zero.	-128...+127 The value of 0 is skipped except during module powerup.	DSC

Table 31 - 1756-EN4TR ControlLogix EtherNet/IP Communication Module Status Tags - PRP Topology

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostics
S.Modx.MissingFault	BOOL	Indicates if the module is missing.	<ul style="list-style-type: none"> <li>0 = Module is not missing</li> <li>1 = Module is missing</li> </ul>	DIAG4
S.Modx.ProductTypeFault	BOOL	Indicates if the module cannot synchronize due to keying mismatch of anything but revision.	<ul style="list-style-type: none"> <li>0 = Module can synchronize</li> <li>1 = Module cannot synchronize</li> </ul>	DIAG4
S.Modx.RevisionFault	BOOL	Indicates if the module cannot synchronize due to Revision conflict.	<ul style="list-style-type: none"> <li>0 = Module can synchronize</li> <li>1 = Module cannot synchronize</li> </ul>	DIAG4
S.Modx.SecurityModeFault	BOOL	A secure I/O connection exists, preventing the 1756-EN4TR ControlLogix EtherNet/IP communication module from qualifying.	<ul style="list-style-type: none"> <li>0 = No secure I/O connection exists and the 1756-EN4TR communication module can qualify</li> <li>1 = A secure I/O connection exists and the 1756-EN4TR communication module can't qualify</li> </ul>	DIAG4
S.Modx.ConnectionModeFault	BOOL	The 1756-EN4TR ControlLogix EtherNet/IP communication modules cannot synchronize because of one of the following: <ul style="list-style-type: none"> <li>The primary communication module is configured for concurrent connections, but the secondary communication module is configured for IP swapping</li> <li>The primary communication module is configured for non-concurrent connections, but the secondary is configured for non-IP swapping.</li> </ul>	<ul style="list-style-type: none"> <li>0 = No fault exists</li> <li>1 = A fault exists</li> </ul>	DIAG4
S.Modx.LinkFault	BOOL	Indicates if a fault exists on the Ethernet link.	<ul style="list-style-type: none"> <li>0 = A link fault does not exist</li> <li>1 = A link fault exists</li> </ul>	DIAG4
S.Modx.ExternalDisqualificationFault	BOOL	The redundant chassis pair is disqualified due to an external condition that is not related to the 1756-EN4TR ControlLogix EtherNet/IP communication modules.	<ul style="list-style-type: none"> <li>0 = The redundant chassis pair is not disqualified. It is operating normally.</li> <li>1 = The redundant chassis pair is disqualified.</li> </ul>	DIAG4
S.Modx.RedundantConnectionFault	BOOL	One or more concurrent connections are experiencing a partial fault to one of the adapters.	<ul style="list-style-type: none"> <li>0 = No partial faults exist</li> <li>1 = Partial fault exists</li> </ul>	DIAG4
S.Modx.Portx.Fault	BOOL	No cable is connected to the port, and it is not intentionally disabled.	<ul style="list-style-type: none"> <li>0 = No fault has occurred</li> <li>1 = Fault has occurred</li> </ul>	DIAG3
S.Modx.Portx.Uncertain	BOOL	Indicates the link auto negotiation status.	<ul style="list-style-type: none"> <li>0 = No fault is present; link auto negotiation is working</li> <li>1 = Fault present; link auto negotiation failed</li> </ul>	—
S.Modx.Portx.Connected	BOOL	Indicates if an Ethernet cable is connected to the Ethernet port.	<ul style="list-style-type: none"> <li>0 = Ethernet cable is not connected, causing fault</li> <li>1 = Ethernet cable is connected</li> </ul>	—
S.Modx.Portx.FullDuplex	BOOL	Indicates if the Ethernet port is operating in Full Duplex.	<ul style="list-style-type: none"> <li>0 = The Ethernet port is not operating in Full Duplex</li> <li>1 = The Ethernet port is operating in Full Duplex</li> </ul>	—
S.Modx.Portx.AutonegotiationStatus	SINT	Indicates the status of the link auto-negotiation	<ul style="list-style-type: none"> <li>0 = Auto-negotiation in progress.</li> <li>1 = Auto-negotiation and speed detection failed</li> <li>2 = Auto negotiation failed but detected speed. Duplex was defaulted.</li> <li>3 = Successfully negotiated speed and duplex.</li> <li>4 = Auto-negotiation was not attempted. Forced speed and duplex.</li> </ul>	—
S.Modx.Portx.Speed	INT	Indicates the Ethernet port's communication rate.	<ul style="list-style-type: none"> <li>0 = 10 Mbps</li> <li>1 = 100 Mbps</li> <li>2 = 1 Gbps</li> </ul>	—
S.Modx.TCPConnections	INT	The number of TCP/IP connections currently open to the module.	Varies	—

Table 31 - 1756-EN4TR ControlLogix EtherNet/IP Communication Module Status Tags - PRP Topology

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostics
S.Modx.CIPConnections	INT	The number of CIP connections currently open to and through the module. The two legs of a concurrent connection count as one CIP connection.	Varies	—
S.Modx.CIPLostPackets	DINT	A running sum of the number of missed I/O packets.	Varies	—
S.Modx.CIPTimeouts	DINT	A running count of the number of connections that time out, both originated and targeted, and both those to and through the module.	Varies	—
S.Modx.HMIPacketRate	DINT	The number of Class 3 packets and unconnected packets that are sent and received by the device in the previous second.	Varies	—
S.Modx.IOPacketRate	DINT	The number of I/O packets that were transmitted or received by the module in the previous second.	Varies	—
S.Modx.EthernetErrors	DINT	The sum over both Ethernet ports on the EtherNet/IP adapter of these Ethernet Link object values: <ul style="list-style-type: none"> <li>• In Discards</li> <li>• In Errors</li> <li>• In Unknown Protos</li> <li>• Out Discards</li> <li>• Out Errors</li> <li>• Alignment Errors</li> <li>• FCS Errors</li> <li>• Single Collisions</li> <li>• Multiple Collisions</li> <li>• SQE Test Errors</li> <li>• Deferred Transmissions</li> <li>• Late Collisions</li> <li>• Excessive Collisions</li> <li>• MAC Transmit Errors</li> <li>• Carrier Sense Errors</li> <li>• Frame Too Long</li> <li>• MAC Receive Errors</li> </ul>	Varies	—
S.Modx.CPUUtilization	INT	The percentage of the adapter's CPU capacity that is most important to the performance of communication of packets by the adapter.	0 (0%)...1000 (100%)	—
S.Modx.ConcurrentConnectionsLostPackets	DINT	Indicates the number of concurrent connection packets that have been lost.	Varies	—
S.Modx.MemoryCardFault	BOOL	Indicates if an SD card fault has occurred for any of these reasons: <ul style="list-style-type: none"> <li>• SD card is not present</li> <li>• SD card is not properly formatted</li> <li>• SD care does not have sufficient space free to store configuration data and firmware</li> </ul>	<ul style="list-style-type: none"> <li>• 0 = SD card is not faulted</li> <li>• 1 = SD card is faulted</li> </ul>	DIAG4
S.Modx.MemoryCardDataMismatch	BOOL	Indicates if the module's configuration and firmware revision matches the data on the SD card.	<ul style="list-style-type: none"> <li>• 0 = Module's configuration and firmware revision match what's on the SD card</li> <li>• 1 = Module's configuration and firmware revision don't match what's on the SD card</li> </ul>	DIAG4
S.Modx.OverTemperature	BOOL	Indicates if the module temperature is higher than its rated operating limits.	<ul style="list-style-type: none"> <li>• 0 = Module temperature is within its rated operating limits</li> <li>• 1 = Module temperature is outside its rated operating limits</li> </ul>	DIAG4
S.Modx.CriticalTemperature	BOOL	Indicates if the module temperature is above the critical temperature limit for proper operation and might shut down without further warning.	<ul style="list-style-type: none"> <li>• 0 = Module temperature is below the critical temperature limit for proper operation</li> <li>• 1 = Module temperature is above the critical temperature limit for proper operation</li> </ul>	DIAG4
S.Modx.DLREnabled <b>IMPORTANT:</b> This tag is only generated when the 1756-EN4TR EtherNet/IP communication module is configured for the DLR Network mode.	BOOL	Indicates whether the module is in DLR mode.	<ul style="list-style-type: none"> <li>• 0 = Module is not in DLR mode</li> <li>• 1 = Module is in DLR mode</li> </ul>	—



Table 31 - 1756-EN4TR ControlLogix EtherNet/IP Communication Module Status Tags - PRP Topology

Tag Name	Data Type	Description	Valid Values	Automatic Diagnostics
S.Modx.DLRModeFault <b>IMPORTANT:</b> This tag is only generated when the 1756-EN4TR EtherNet/IP communication module is configured for the DLR Network mode.	BOOL	Indicates that the module's configuration in the Logix Designer application project is for DLR mode but the rotary switches on the module are not configured for DLR mode.	<ul style="list-style-type: none"> <li>0 = Configuration is correct; the module properties configuration matches the rotary switch setting</li> <li>1 = Configuration on the module properties dialog box is not the same as the rotary switches</li> </ul>	DIAG5
S.Modx.PRPPort1Fault <b>IMPORTANT:</b> This tag is only generated when the 1756-EN4TR EtherNet/IP communication module is configured for the PRP Network mode.	BOOL	Indicates the state of PRP activity on Link 1.	<ul style="list-style-type: none"> <li>0 = PRP activity is normal on Ethernet port 1</li> <li>1 = One of these conditions is true for Ethernet port 1: <ul style="list-style-type: none"> <li>No PRP activity has been seen on port 1 for three seconds, but some PRP activity has been seen on the port 2</li> <li>Another node's ports were Active/Inactive or Inactive/Active during the last second</li> <li>The wrong LAN Count has incremented in the last second</li> </ul> </li> </ul>	DIAG4
S.Modx.PRPPort2Fault <b>IMPORTANT:</b> This tag is only generated when the 1756-EN4TR EtherNet/IP communication module is configured for the PRP Network mode.	BOOL	Indicates the state of PRP activity on Link 2.	<ul style="list-style-type: none"> <li>0 = PRP activity is normal on Ethernet port 2</li> <li>1 = One of these conditions is true for Ethernet port 2: <ul style="list-style-type: none"> <li>No PRP activity has been seen on port 2 for three seconds, but some PRP activity has been seen on the port 1</li> <li>Another node's ports were Active/Inactive or Inactive/Active during the last second</li> <li>The wrong LAN Count has incremented in the last second</li> </ul> </li> </ul>	DIAG4
S.Modx.PRPModeFault <b>IMPORTANT:</b> This tag is only generated when the 1756-EN4TR EtherNet/IP communication module is configured for the PRP Network mode.	BOOL	Indicates whether the module is in DLR mode.	<ul style="list-style-type: none"> <li>0 = Module is not in DLR mode</li> <li>1 = Module is in DLR mode</li> </ul>	DIAG5
S.Modx.PRPEntered <b>IMPORTANT:</b> This tag is only generated when the 1756-EN4TR EtherNet/IP communication module is configured for the PRP Network mode.	BOOL	Indicates whether the module is in PRP mode.	<ul style="list-style-type: none"> <li>0 = Module is not in PRP mode</li> <li>1 = Module is in PRP mode</li> </ul>	—
S.Modx.LocalClockOffset	LINT	The offset in nanoseconds from the local clock to the system time. This value updates when a PTP update is received.	Varies	—
S.Modx.LocalClockOffsetTimestamp	LINT	The time when the Local Clock Offset was most recently sampled. This value is initially zero and the first time stamp occurs when the module synchronizes with the master clock.	Varies	—
S.Modx.GrandMasterClockID[8]	SINT[8]	The EUI-64 Identity of the CIP Sync Grand Master clock to which the adapter's synced to.	Need more information	—

## I/O Tag Types

These types of tags are available with FLEXHA 5000 I/O modules:

- Configuration (C)
- Input (I)
- Output (O)

## I/O Tag Name Conventions

The module tag names use defined naming conventions. The conventions are described in the example tag:

Example tag name = FLEXHA\_5000\_IO\_system\_adapter:2:C06.LowSignal

- *FLEXHA\_5000\_IO\_system\_adapter* = name of the FLEXHA 5000 EtherNet/IP adapter
- 2 = I/O module slot number
- C = tag type
- 06 = module channel number
- *LowSignal* = parameter

## I/O Tag Name Organization

Traditionally, the Logix Designer application organizes I/O tag types by module at the parent level. All of a module's Configuration, Input, and/or Output tags are grouped under one parent.

With FLEXHA 5000 I/O modules, the Logix Designer application organizes I/O tag types by the channel at the parent level. All of a channel's Configuration, Input, and/or Output tags are grouped under one parent.

## 5015-U8IHFTXT Module Tags Module-level Input Tags

Module-level input tags apply regardless of what mode in which a channel is operating. However, there are differences in the module-level tags for a Duplex Pair of I/O modules compared to a Simplex I/O module.

- More tags are created for a Duplex Pair of I/O modules.
- The naming scheme is different with some tags because the attribute can apply to individual modules in a Duplex Pair. For example, the following tag names represent an internal fault:
  - Duplex Pair - I.ModA.InternalFault (Internal fault on module A in the pair)
  - Simplex I/O module - I.InternalFault

### Module-level Input Tags - Duplex Pair

[Table 32](#) lists the module-level input tags for a Duplex Pair.

**Table 32 - 5015-U8IHFTXT - Module-level input Tags (Duplex Pair)**

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
I.RunMode	BOOL	Module's operating state	<ul style="list-style-type: none"> <li>• 0 = Idle</li> <li>• 1 = Run</li> </ul>	—
I.ConnectionFaulted	BOOL	Indicates if a connection is faulted. The module sets this tag to 0 when not faulted. If the module is faulted, it changes the tag to 1.	<ul style="list-style-type: none"> <li>• 0 = Connection is not faulted; it can be running, never opened, or closed normally.</li> <li>• 1 = Connection is faulted and not running; it was open and closed due to an issue.</li> </ul>	DIAG5
I.DiagnosticActive	BOOL	Indicates if any diagnostics are active.	<ul style="list-style-type: none"> <li>• 0 = No diagnostics are active</li> <li>• 1 = One or more diagnostics are active</li> </ul>	—
I.CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master.	<ul style="list-style-type: none"> <li>• 0 = CIP Sync is not available</li> <li>• 1 = CIP Sync is available</li> </ul>	—
I.CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but is not now due to a timeout.	<ul style="list-style-type: none"> <li>• 0 = A valid time master has not timed out</li> <li>• 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.</li> </ul>	—
I.ModAFault	BOOL	Indicates if Module A of the duplex pair is not participating in the connection (missing, faulted, incompatible partner). The diagnostic fields that are normally generated by this module are cleared when the fault occurs.	<ul style="list-style-type: none"> <li>• 0 = Module A is participating in the connection</li> <li>• 1 = Module A is not participating in the connection</li> </ul> Possible causes are that the module is missing, faulted, or an incompatible partner.	—
I.ModBFault	BOOL	Indicates if Module B of the duplex pair is not participating in the connection (missing, faulted, incompatible partner, etc.). The diagnostic fields that are normally generated by this module are cleared when the fault occurs.	<ul style="list-style-type: none"> <li>• 0 = Module B is participating in the connection</li> <li>• 1 = Module B is not participating in the connection</li> </ul> Possible causes are that the module is missing, faulted, or an incompatible partner.	—
I.DiagnosticSequenceCount	SINT	Increments at each RPI, regardless of diagnostic conditions. Set to zero by product reset or power cycle. Wraps from 255 (-1)...1 skipping zero.	-128...+127 The value of 0 is skipped except during module power-up.	DSC
I.Modx.RunMode	BOOL	Module's operating state	<ul style="list-style-type: none"> <li>• 0 = Idle</li> <li>• 1 = Run</li> </ul>	—
I.Modx.DiagnosticActive	BOOL	Indicates if any diagnostics are active for the module.	<ul style="list-style-type: none"> <li>• 0 = No diagnostics are active</li> <li>• 1 = One or more diagnostics are active</li> </ul>	—
I.Modx.CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master.	<ul style="list-style-type: none"> <li>• 0 = CIP Sync is not available</li> <li>• 1 = CIP Sync is available</li> </ul>	—

Table 32 - 5015-U8IHFTXT - Module-level input Tags (Duplex Pair)

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
I.Modx.CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but is not now due to a timeout.	<ul style="list-style-type: none"> <li>0 = A valid time master has not timed out</li> <li>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.</li> </ul>	—
I.Modx.DiagnosticSequenceCount	SINT	Increments at each RPI, regardless of diagnostic conditions. Set to zero by product reset or power cycle. Wraps from 255 (-1)...1 skipping zero.	-128...+127 The value of 0 is skipped except during module powerup.	DSC
I.Modx.MissingFault	BOOL	Indicates if the module is missing from a Duplex pair.	<ul style="list-style-type: none"> <li>0 = Module is not missing</li> <li>1 = Module is missing</li> </ul>	DIAG4
I.Modx.ProductTypeFault	BOOL	Indicates if the module cannot pair due to keying mismatch of anything but revision.	<ul style="list-style-type: none"> <li>0 = Module can pair</li> <li>1 = Module cannot pair</li> </ul>	DIAG4
I.Modx.RevisionFault	BOOL	Indicates if the module cannot pair due to Revision conflict.	<ul style="list-style-type: none"> <li>0 = Module can pair</li> <li>1 = Module cannot pair</li> </ul>	DIAG4
I.Modx.OwnershipFault	BOOL	Indicates if the module cannot pair due to being owned by a different originator.	<ul style="list-style-type: none"> <li>0 = Module can pair</li> <li>1 = Module cannot pair</li> </ul>	DIAG4
I.Modx.FlashUpdateFault	BOOL	Indicates if the module cannot pair due to currently being flash updated.	<ul style="list-style-type: none"> <li>0 = Module can pair</li> <li>1 = Module cannot pair</li> </ul>	DIAG4
I.Modx.SystemPowerAFault	BOOL	Indicates if MOD Power RTBA is providing power and that the power is within the required range.	<ul style="list-style-type: none"> <li>0 = System power that the MOD Power RTB A provides is normal.</li> <li>1 = System power that MOD Power RTB A provides is either: <ul style="list-style-type: none"> <li>- Not detected</li> <li>- Outside the required range</li> </ul> </li> </ul>	DIAG4
I.Modx.SystemPowerBFault	BOOL	Indicates if MOD Power RTBB is providing power and that the power is within the required range.	<ul style="list-style-type: none"> <li>0 = System power is that the MOD Power RTB B provides is normal.</li> <li>1 = System power that MOD Power RTB B provides is either: <ul style="list-style-type: none"> <li>- Not detected</li> <li>- Outside the required range</li> </ul> </li> </ul>	DIAG4
I.Modx.BackplaneAFault	BOOL	Indicates if Backplane A is faulted due to a BIM or other connectivity fault.	<ul style="list-style-type: none"> <li>0 = Backplane A is not faulted due to a connectivity fault</li> <li>1 = Backplane A is faulted due to a connectivity fault</li> </ul>	DIAG4
I.Modx.BackplaneBFault	BOOL	Indicates if Backplane B is faulted due to a BIM or other connectivity fault.	<ul style="list-style-type: none"> <li>0 = Backplane B is not faulted due to a connectivity fault</li> <li>1 = Backplane B is faulted due to a connectivity fault</li> </ul>	DIAG4
I.Modx.RTBFault	BOOL	Indicates if an RTB is missing.	<ul style="list-style-type: none"> <li>0 = RTB is not missing</li> <li>1 = RTB missing</li> </ul>	DIAG1
		<b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.		
I.Modx.OverTemperature	BOOL	Module is higher temperature than its rated operating limits.	<ul style="list-style-type: none"> <li>0 = Module is operating within its rated operating limits.</li> <li>1 = Module is operating at a higher temperature than its rated operating limits.</li> </ul>	DIAG4
I.Modx.CriticalTemperature	BOOL	Module is operating at a temperatures that is outside the allowed range. The temperature can be above or below the normal operating limits.	<ul style="list-style-type: none"> <li>0 = Module is operating within its rated operating limits.</li> <li>1 = Module is operating outside the critical temperature operating limits.</li> </ul>	DIAG1

Table 32 - 5015-U8IHFTXT - Module-level input Tags (Duplex Pair)

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
I.Modx.InternalFault	BOOL	The module is experiencing at least one internal issue.	<ul style="list-style-type: none"> <li>0 = No internal faults</li> <li>1 = One or more internal issues exist in the product. Fault is latched until the channel or module is reset.</li> </ul>	DIAG1
I.Modx.Redundant	BOOL	Indicates if the module is properly configured for redundancy.	<ul style="list-style-type: none"> <li>0 = Module is not configured for redundancy or redundancy is not operating properly</li> <li>1 = Module redundancy is operating properly</li> </ul>	—
I.Modx.Chxx.DiagnosticActive	BOOL	Indicates if any diagnostics are active on the specified channel and respective module.	<ul style="list-style-type: none"> <li>0 = No diagnostics active</li> <li>1 = One or more diagnostics are active</li> </ul>	—

### Module-level Input Tags - Simplex I/O Module

[Table 33](#) lists the module-level input tags for a Simplex I/O module.

Table 33 - 5015-U8IHFTXT - Module-level input Tags (Simplex I/O Module)

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
I.RunMode	BOOL	Channel's operating state	<ul style="list-style-type: none"> <li>0 = Idle</li> <li>1 = Run</li> </ul>	—
I.ConnectionFaulted	BOOL	Indicates if a connection is faulted. The module sets this tag to 0 when not faulted. If the module is faulted, it changes the tag to 1.	<ul style="list-style-type: none"> <li>0 = Connection is not faulted; it can be running, never opened, or closed normally.</li> <li>1 = Connection is faulted and not running; it was open and closed due to an issue.</li> </ul>	DIAG5
I.DiagnosticActive	BOOL	Indicates if any diagnostics are active.	<ul style="list-style-type: none"> <li>0 = No diagnostics are active</li> <li>1 = One or more diagnostics are active</li> </ul>	—
I.CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master.	<ul style="list-style-type: none"> <li>0 = CIP Sync is not available</li> <li>1 = CIP Sync is available</li> </ul>	—
I.CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master, but is not now due to a timeout.	<ul style="list-style-type: none"> <li>0 = A valid time master has not timed out</li> <li>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.</li> </ul>	—
I.SystemPowerAFault	BOOL	Indicates if MOD Power RTBA is providing power and that the power is within the required range.	<ul style="list-style-type: none"> <li>0 = System power that the MOD Power RTB A provides is normal.</li> <li>1 = System power that MOD Power RTB A provides is either: <ul style="list-style-type: none"> <li>Not detected</li> <li>Outside the required range</li> </ul> </li> </ul>	DIAG4
I.SystemPowerBFault	BOOL	Indicates if MOD Power RTB B is providing power and that the power is within the required range.	<ul style="list-style-type: none"> <li>0 = System power that the MOD Power RTB B provides is normal.</li> <li>1 = System power that MOD Power RTB B provides is either: <ul style="list-style-type: none"> <li>Not detected</li> <li>Outside the required range</li> </ul> </li> </ul>	DIAG4
I..BackplaneAFault	BOOL	Indicates if Backplane A is faulted due to a BIM or other connectivity fault.	<ul style="list-style-type: none"> <li>0 = Backplane A is not faulted due to a connectivity fault</li> <li>1 = Backplane A is faulted due to a connectivity fault</li> </ul>	DIAG4
I.BackplaneBFault	BOOL	Indicates if Backplane B is faulted due to a BIM or other connectivity fault.	<ul style="list-style-type: none"> <li>0 = Backplane B is not faulted due to a connectivity fault</li> <li>1 = Backplane B is faulted due to a connectivity fault</li> </ul>	DIAG4

Table 33 - 5015-U8IHFTXT - Module-level input Tags (Simplex I/O Module)

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
I.OverTemperature	BOOL	Module is higher temperature than its rated operating limits.	<ul style="list-style-type: none"> <li>0 = Module is operating within its rated operating limits.</li> <li>1 = Module is operating at a higher temperature than its rated operating limits.</li> </ul>	DIAG4
I.CriticalTemperature	BOOL	Module is operating at a temperatures that is outside the allowed range. The temperature can be above or below the normal operating limits.	<ul style="list-style-type: none"> <li>0 = Module is operating within its rated operating limits.</li> <li>1 = Module is operating outside the critical temperature operating limits.</li> </ul>	DIAG1
I.InternalFault	BOOL	The module is experiencing at least one internal issue.	<ul style="list-style-type: none"> <li>0 = No internal faults</li> <li>1 = One or more internal issues exist in the product. Fault is latched until the channel or module is reset.</li> </ul>	DIAG1
I.RTBFault	BOOL	Indicates if an RTB is missing.	<ul style="list-style-type: none"> <li>0 = RTB is not missing</li> <li>1 = RTB missing</li> </ul>	DIAG1
		<b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.		
I.DiagnosticSequenceCount	SINT	Increments at each RPI, regardless of diagnostic conditions. Set to zero by product reset or power cycle. Wraps from 255 (-1)...1 skipping zero.	-128...+127 The value of 0 is skipped except during module power-up.	DSC

## Analog Input Mode

This section describes the tags that are created when a channel on the Universal I/O module is configured to operate as an analog input.

### Configuration Tags

Table 34 - 5015-U8IHFTXT - Analog Input Mode Configuration Tags

Tag Name	Data Type	Definition	Valid Values
Cxx.Ch.SensorType	SINT	Sets the type of sensor that is connected to the channel.	Always 0
Cxx.Ch.LineNoiseFilter	SINT	Sets the channel line noise elimination filter	<ul style="list-style-type: none"> <li>1 = 10 Hz</li> <li>3 = 20 Hz</li> <li>4 = 50 Hz (default)</li> </ul>
Cxx.Ch.ThreeWireSensor	BOOL	Sets whether channel wiring is using 3 wires.	<ul style="list-style-type: none"> <li>0 = 2 Wire (default)</li> <li>1 = 3 Wire</li> </ul>
Cxx.Ch.OpenWireEn	BOOL	Enables the Open Wire Detection diagnostic	<ul style="list-style-type: none"> <li>0 = The Open Wire diagnostic is disabled on the channel.</li> <li>1 = The Open Wire diagnostic is enabled (default) on the channel.</li> </ul>
Cxx.Ch.Disable	BOOL	Disables channel	<ul style="list-style-type: none"> <li>0 = channel enabled (default)</li> <li>1 = channel disabled</li> </ul>
Cxx.Ch.Sourcing	BOOL	Indicates if input is Sourcing or Sinking.	<ul style="list-style-type: none"> <li>0 = Sinking</li> <li>1 = Sourcing (default)</li> </ul>
Cxx.Ch.TenOhmOffset	INT	Offset used when linearizing a sensor type input.	Always 0
Cxx.Ch.LowSignal	REAL	One of four points used in scaling. The low signal is in terms of the inputs signal units and corresponds to the low engineering term when scaled.	4.0 = 4 mA (default)
Cxx.Ch.HighSignal	REAL	One of four points used in scaling. The high signal is in terms of the inputs signal units and corresponds to the high engineering term when scaled.	20.0 = 20 mA (default)
Cxx.Ch.LowEngineering	REAL	One of four points used in scaling. The low engineering helps determine the engineering units the signal values scale into. The low engineering term corresponds to the low signal value.	0.0 (default)
Cxx.Ch.HighEngineering	REAL	One of four points used in scaling. The high engineering helps determine the engineering units the signal values scale into. The high engineering term corresponds to the high signal value.	100.0 (default)

## Input Tags

Table 35 - 5015-U8IHFTXT - Analog Input Mode Input Tags

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
Ixx.Ch.Fault	BOOL	Indicates that channel 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. <b>IMPORTANT:</b> Once the condition that causes the Fault tag to change to 1 is removed, if the fault tag does not go back to 0, you must reset the module. For more information on how to reset the module, see <a href="#">Fault Reset on page 98</a> .	<ul style="list-style-type: none"> <li>0 = Channel data is accurate</li> <li>1 = Channel data is inaccurate</li> </ul>	—
Ixx.Ch.Uncertain	BOOL	Indicates that the channel 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. <b>IMPORTANT:</b> Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	<ul style="list-style-type: none"> <li>0 = Channel data is accurate</li> <li>1 = Uncertain channel data</li> </ul>	—
Ixx.Ch.OpenWire	BOOL	Indicates that the signal is disconnected from the channel or the RTB is removed from the module.	<ul style="list-style-type: none"> <li>0 = Open Wire condition does not exist</li> <li>1 = Open Wire condition does exist</li> </ul>	—
Ixx.Ch.ShortCircuit	BOOL	Indicates that a Short Circuit or Overcurrent condition exists.	<ul style="list-style-type: none"> <li>0 = Short Circuit or Overcurrent condition does not exist.</li> <li>1 = Short Circuit or Overcurrent condition exists.</li> </ul>	—
Ixx.Ch.OverTemperature	BOOL	Module is higher temperature than its operating limits. <ul style="list-style-type: none"> <li>If this tag is set to 1 but a fault does not exist on the channel, this tag is only an indication of operating conditions but the channel is functioning.</li> <li>If this tag is set to 1 and a fault exists on the channel, the channel is not functioning.</li> </ul>	<ul style="list-style-type: none"> <li>0 = Channel temperature is not over the operating limits</li> <li>1 = Channel temperature is over the operating limits</li> </ul>	DIAG4
Ixx.Ch.FieldPowerOff	BOOL	Field power is not present at the channel.	<ul style="list-style-type: none"> <li>0 = Field Power is present</li> <li>1 = Field Power is not present</li> </ul>	DIAG1
Ixx.Ch.NotANumber	BOOL	Indicates that the last value received for the SensorOffset tag was not a number.  <b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.	<ul style="list-style-type: none"> <li>0 = Last channel data that was received is a valid floating point number</li> <li>1 = Last channel data received was not the floating point value number</li> </ul>	—
Ixx.Ch.Underrange	BOOL	Indicates that the channel data is beneath the underrange threshold for this channel. The underrange threshold is 1.0 mA.	<ul style="list-style-type: none"> <li>0 = Channel data is not beneath the underrange threshold</li> <li>1 = Channel data is beneath the underrange threshold</li> </ul>	DIAG1
Ixx.Ch.Overrange	BOOL	Indicates that the channel data is above the overrange threshold for this channel. The overrange threshold is 23.0 mA.	<ul style="list-style-type: none"> <li>0 = Channel data is not above the overrange threshold</li> <li>1 = Channel data is above the overrange threshold</li> </ul>	DIAG1
Ixx.Ch.Data	REAL	Indicates the input signal value that is currently measured at the RTB in scaled Engineering Units.	Any value	—
Ixx.Ch.RollingTimestamp	INT	Continuously running 15-bit timer that counts in milliseconds. Whenever a new input sample is taken, the input module updates the value of the RollingTimestamp.	0...32767	—

## Output Tags

Table 36 - 5015-U8IHFTXT - Analog Input Mode Output Tags

Tag Name	Data Type	Definition	Valid Values
Oxx.ResetFault	BOOL	Resets the channel after a fault occurs on a rising edge.  <b>IMPORTANT:</b> This tag does not work with the 5015-U8IHFTXT module because you must reset the module to clear channel faults. You cannot clear channels faults on a channel-by-channel basis.	<ul style="list-style-type: none"> <li>0 = Do not reset the channel</li> <li>1 = Reset the channel on a rising edge</li> </ul>

## Analog Output Mode

This section describes the tags that are created when a channel on the Universal I/O module is configured to operate as an analog output.

### Configuration Tags

**Table 37 - 5015-U8IHFTXT - Analog Output Mode Configuration Tags**

Tag Name	Data Type	Definition	Valid Values
Cxx.Ch.NoLoadEn	BOOL	Enables the No Load diagnostic	<ul style="list-style-type: none"> <li>0 = No Load diagnostic is disabled</li> <li>1 = No Load diagnostic is enabled (default)</li> </ul>
		<b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.	
Cxx.Ch.Disable	BOOL	Disables channel	<ul style="list-style-type: none"> <li>0 = channel enabled (default)</li> <li>1 = channel disabled</li> </ul>
Cxx.Ch.PulseTestEn	BOOL	Enables pulse testing on the channel.	<ul style="list-style-type: none"> <li>0 = Pulse testing of the channel is disabled</li> <li>1 = Pulse testing of the channel is enabled (default)</li> </ul>
		<b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.	
Cxx.Ch.LowSignal	REAL	One of four points used in scaling. The low signal is in terms of the inputs signal units and corresponds to the low engineering term when scaled.	4.0 = 4 mA (default)
Cxx.Ch.HighSignal	REAL	One of four points used in scaling. The high signal is in terms of the inputs signal units and corresponds to the high engineering term when scaled.	20.0 = 20 mA (default)
Cxx.Ch.LowEngineering	REAL	One of four points used in scaling. The low engineering helps determine the engineering units the signal values scale into. The low engineering term corresponds to the low signal value.	0.0 (default)
Cxx.Ch.HighEngineering	REAL	One of four points used in scaling. The high engineering helps determine the engineering units the signal values scale into. The high engineering term corresponds to the high signal value.	100.0 (default)

### Input Tags

**Table 38 - 5015-U8IHFTXT - Analog Output Mode Input Tags**

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
Ixx.Fault	BOOL	Indicates that channel 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. <b>IMPORTANT:</b> Once the condition that causes the Fault tag to change to 1 is removed, if the fault tag doesn't change to 0, you must reset the module. For more information on how to reset the module, see <a href="#">Fault Reset on page 98</a> .	<ul style="list-style-type: none"> <li>0 = Channel data is accurate</li> <li>1 = Channel data is inaccurate</li> </ul>	—
Ixx.Uncertain	BOOL	Indicates that the channel 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. <b>IMPORTANT:</b> Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	<ul style="list-style-type: none"> <li>0 = Channel data is accurate</li> <li>1 = Uncertain channel data</li> </ul>	—
Ixx.NoLoad	BOOL	Indicates that the signal is disconnected from the channel or the RTB is removed from the module.	<ul style="list-style-type: none"> <li>0 = No Load condition does not exist</li> <li>1 = No Load condition does exist</li> </ul>	DIAG1
Ixx.ShortCircuit	BOOL	Indicates that a Short Circuit or Overcurrent condition exists.	<ul style="list-style-type: none"> <li>0 = Short Circuit or Overcurrent condition does not exist.</li> <li>1 = Short Circuit or Overcurrent condition exists.</li> </ul>	DIAG1
		<b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.		



Table 38 - 5015-U8IHFTXT - Analog Output Mode Input Tags

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
Ixx.OverTemperature	BOOL	Module is higher temperature than its operating limits. <ul style="list-style-type: none"> <li>If this tag is set to 1 but a fault does not exist on the channel, this tag is only an indication of operating conditions but the channel is functioning.</li> <li>If this tag is set to 1 and a fault exists on the channel, the channel is not functioning.</li> </ul>	<ul style="list-style-type: none"> <li>0 = Channel is operating within its rated operating limits.</li> <li>1 = Channel is operating at a higher temperature than its rated operating limits.</li> </ul>	DIAG4
Ixx.FieldPowerOff	BOOL	Field power is not present at the channel.	<ul style="list-style-type: none"> <li>0 = Field Power is present</li> <li>1 = Field Power is not present</li> </ul>	DIAG1
Ixx.NotANumber	BOOL	Indicates that the last value received for the channel output data value was not a number.	<ul style="list-style-type: none"> <li>0 = Last channel data that was received was a valid floating point number</li> <li>1 = Last channel data that was received was not the floating point value of a number</li> </ul>	—
Ixx.Underrange	BOOL	Indicates that the channel data is beneath the underrange threshold for this channel (2.0 mA)	<ul style="list-style-type: none"> <li>0 = Channel data is not beneath the underrange threshold</li> <li>1 = Channel data is beneath the underrange threshold</li> </ul>	DIAG1
Ixx.Overrange	BOOL	Indicates that the channel data is above the overrange threshold for this channel (23.0 mA)	<ul style="list-style-type: none"> <li>0 = Channel data is not above the overrange threshold</li> <li>1 = Channel data is above the overrange threshold</li> </ul>	DIAG1
Ixx.Data	REAL	Indicates the signal value at the terminal that is currently read back by the channel in scaled Engineering Units.	Any value	—
Ixx.RollingTimestamp	INT	Continuously running 15-bit timer that counts in milliseconds. Whenever the data value changes, the output module updates the value of the RollingTimestamp.	0...32767	—

### Output Tags

Table 39 - 5015-U8IHFTXT - Analog Output Mode Output Tags

Tag Name	Data Type	Definition	Valid Values
Oxx.ResetFault	BOOL	Resets the channel after a fault occurs  <b>IMPORTANT:</b> This tag does not work with the 5015-U8IHFTXT module because you must reset the module to clear channel faults. You cannot clear channels faults on a channel-by-channel basis.	<ul style="list-style-type: none"> <li>0 = Do not reset the channel</li> <li>1 = Reset the channel on a rising edge</li> </ul>
Oxx.Data	REAL	Analog output to apply to the channel	Any value

## Digital Input Mode

This section describes the tags that are created when a channel on the Universal I/O module is configured to operate as a digital input.

### Configuration Tags

**Table 40 - 5015-U8IHFTXT - Digital Input Mode Configuration Tags**

Tag Name	Size	Definition	Valid Values
Cxx.Pt.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.	<ul style="list-style-type: none"> <li>• 0 = 0 <math>\mu</math>s (default)</li> <li>• 10 = 100 <math>\mu</math>s</li> <li>• 11 = 200 <math>\mu</math>s</li> <li>• 12 = 500 <math>\mu</math>s</li> <li>• 13 = 1 ms</li> <li>• 14 = 2 ms</li> <li>• 15 = 5 ms</li> <li>• 16 = 10 ms</li> <li>• 17 = 20 ms</li> <li>• 18 = 50 ms</li> </ul>
Cxx.Pt.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.	<ul style="list-style-type: none"> <li>• 0 = 0 <math>\mu</math>s (default)</li> <li>• 10 = 100 <math>\mu</math>s</li> <li>• 11 = 200 <math>\mu</math>s</li> <li>• 12 = 500 <math>\mu</math>s</li> <li>• 13 = 1 ms</li> <li>• 14 = 2 ms</li> <li>• 15 = 5 ms</li> <li>• 16 = 10 ms</li> <li>• 17 = 20 ms</li> <li>• 18 = 50 ms</li> </ul>
Cxx.Pt.FieldPowerDiagEn	BOOL	If Field Power Diagnostics are reported.	<ul style="list-style-type: none"> <li>• 0 = Field Power diagnostics are not reported</li> <li>• 1 = Field Power diagnostics are reported (default)</li> </ul>
		<b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.	
Cxx.Pt.Disable	BOOL	Disables channel	<ul style="list-style-type: none"> <li>• 0 = channel enabled (default)</li> <li>• 1 = channel disabled</li> </ul>
Cxx.Pt.OpenOffRising	INT	The voltage threshold for the transition from Open Wire detection to Off state when voltage is rising.	Units are hundredths of volts (1 = 0.01V) Dry Contact = 50 = 0.50V
Cxx.Pt.OffOpenFalling	INT	The voltage threshold for the transition from Off state to Open Wire detection when voltage is falling.	Units are hundredths of volts (1 = 0.01V) Dry Contact = 25 = 0.25V
Cxx.Pt.OffIndeterminateRising	INT	The voltage threshold for the transition from Off state to Indeterminate state detection when voltage is rising.	Units are hundredths of volts (1 = 0.01V) Dry Contact = 550 = 5.50V
Cxx.Pt.IndeterminateOffFalling	INT	The voltage threshold for the transition from Indeterminate to Off state detection when voltage is falling.	Units are hundredths of volts (1 = 0.01V) Dry Contact = 500 = 5.00V
Cxx.Pt.IndeterminateOnRising	INT	The voltage threshold for the transition from Indeterminate to On state detection when voltage is rising.	Units are hundredths of volts (1 = 0.01V) Dry Contact = 1000 = 10.00V
Cxx.Pt.OnIndeterminateFalling	INT	The voltage threshold for the transition from On state to Indeterminate detection when voltage is falling.	Units are hundredths of volts (1 = 0.01V) Dry Contact = 950 = 9.50V
Cxx.Pt.OnShortRising	INT	The voltage threshold for the transition from On state to Short Circuit detection when voltage is rising.	Units are hundredths of volts (1 = 0.01V) Default: Dry Contact = 2100 = 21.00V
Cxx.Pt.ShortOnFalling	INT	The voltage threshold for the transition from Short Circuit to On detection when voltage is falling.	Units are hundredths of volts (1 = 0.01V) Dry Contact = 2100 = 21.00V

## Input Tags

Table 41 - 5015-U8IHFTXT - Digital Input Mode Input Tags

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
Ixx.Data	BOOL	Current digital input value.	<ul style="list-style-type: none"> <li>0 = Off</li> <li>1 = On</li> </ul>	—
Ixx.Fault	BOOL	Indicates that channel 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. <b>IMPORTANT:</b> Once the condition that causes the Fault tag to change to 1 is removed, if the fault tag doesn't turn to 0, you must reset the module. For more information on how to reset the module, see <a href="#">Fault Reset on page 98</a> .	<ul style="list-style-type: none"> <li>0 = Channel data is accurate</li> <li>1 = Channel data is inaccurate</li> </ul>	DIAG3
Ixx.Uncertain	BOOL	Indicates that the channel 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. <b>IMPORTANT:</b> Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	<ul style="list-style-type: none"> <li>0 = Channel data is accurate</li> <li>1 = Uncertain channel data</li> </ul>	—
Ixx.OpenWire	BOOL	Possible causes of this condition are the following: <ul style="list-style-type: none"> <li>Signal is disconnected from the channel.</li> <li>RTB is removed from the module.</li> <li>Wire value is below the minimum input thresholds in the module configuration.</li> </ul> <b>IMPORTANT:</b> Some conditions can exist that represent Open Wire conditions and this tag is not set to 1.	<ul style="list-style-type: none"> <li>0 = Open Wire condition does not exist</li> <li>1 = Open Wire condition does exist</li> </ul>	DIAG1
Ixx.ShortCircuit	BOOL	Possible causes of this condition are the following: <ul style="list-style-type: none"> <li>Short Circuit condition exists.</li> <li>Overcurrent condition exists.</li> <li>Voltage at the channel is above the maximum input threshold in the module configuration.</li> </ul> <b>IMPORTANT:</b> Some conditions can exist that represent Short Circuit conditions and this tag is not set to 1.	<ul style="list-style-type: none"> <li>0 = Short Circuit or Overcurrent condition does not exist.</li> <li>1 = Short Circuit or Overcurrent condition exists.</li> </ul>	DIAG1
Ixx.FieldPowerOff	BOOL	Field power is not present at the channel.	<ul style="list-style-type: none"> <li>0 = Field Power is present</li> <li>1 = Field Power is not present</li> </ul>	DIAG1
Ixx.Indeterminate	INT	Indicates that the input is in the indeterminate range. If it is, there is likely a fault in your input wiring or threshold configuration.	<ul style="list-style-type: none"> <li>0 = Input is not in the indeterminate range. That is, it is normal.</li> <li>1 = Input is in the indeterminate range.</li> </ul>	DIAG1

## Output Tags

Table 42 - 5015-U8IHFTXT - Digital Input Mode Output Tags

Tag Name	Size	Definition	Valid Values
Oxx.ResetFault	BOOL	Resets the channel after a fault occurs  <b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.	<ul style="list-style-type: none"> <li>0 = Do not reset the channel</li> <li>1 = Reset the channel on a rising edge</li> </ul>

## Digital Output Mode

This section describes the tags that are created when a channel on the Universal I/O module is configured to operate as a digital output.

### Configuration Tags

**Table 43 - 5015-U8IHFTXT - Digital Output Mode Configuration Tags**

Member Name	Size	Definition	Valid Values
Cxx.Pt.NoLoadEn	BOOL	Enables the No Load diagnostic	<ul style="list-style-type: none"> <li>0 = No Load diagnostic is disabled</li> <li>1 = No Load diagnostic is enabled (default)</li> </ul>
		<b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.	
Cxx.Pt.PulseTestEn	BOOL	Enables pulse testing on the channel.	<ul style="list-style-type: none"> <li>0 = Pulse testing of the channel is disabled</li> <li>1 = Pulse testing of the channel is enabled (default)</li> </ul>
		<b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.	
Cxx.Pt.Disable	BOOL	Disables channel	<ul style="list-style-type: none"> <li>0 = channel enabled (default)</li> <li>1 = channel disabled</li> </ul>
Cxx.Pt.Sourcing	BOOL	The channel is in power sourcing mode.	<ul style="list-style-type: none"> <li>0 = External Power Supply</li> <li>1 = Internal Power Supply Sources power (default)</li> </ul>

### Input Tags

**Table 44 - 5015-U8IHFTXT - Digital Output Mode Input Tags**

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
Ixx.Readback	BOOL	Indicates the state of the output read back by the channel.	<ul style="list-style-type: none"> <li>0 = Output is off</li> <li>1 = Output is on</li> </ul>	—
Ixx.Fault	BOOL	Indicates that channel 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. <b>IMPORTANT:</b> Once the condition that causes the Fault tag to change to 1 is removed, if the fault tag doesn't turn to 0, you must reset the module. For more information on how to reset the module, see <a href="#">Fault Reset on page 98</a> .	<ul style="list-style-type: none"> <li>0 = Channel data is accurate</li> <li>1 = Channel data is inaccurate</li> </ul>	DIAG3
Ixx.Uncertain	BOOL	Indicates that the channel 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. <b>IMPORTANT:</b> Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.	<ul style="list-style-type: none"> <li>0 = Channel data is accurate</li> <li>1 = Uncertain channel data</li> </ul>	—
Ixx.NoLoad	BOOL	Indicates that the signal is disconnected from the channel or the RTB is removed from the module.	<ul style="list-style-type: none"> <li>0 = No Load condition does not exist</li> <li>1 = No Load condition does exist</li> </ul>	DIAG1
		<b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.		
Ixx.ShortCircuit	BOOL	Indicates that a Short Circuit or Overcurrent condition exists.	<ul style="list-style-type: none"> <li>0 = Short Circuit or Overcurrent condition does not exist</li> <li>1 = Short Circuit or Overcurrent condition exists</li> </ul>	DIAG1
		<b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.		

Table 44 - 5015-U8IHFTXT - Digital Output Mode Input Tags

Tag Name	Data Type	Definition	Valid Values	Automatic Diagnostics
Ixx.FieldPowerOff	BOOL	Field power is not present at the channel.	<ul style="list-style-type: none"> <li>0 = Field Power is present</li> <li>1 = Field Power is not present</li> </ul>	DIAG1
Ixx.ReturnCurrentMismatch	BOOL	Indicates if the High and Low side current are within range and valid.  <b>IMPORTANT:</b> This tag is currently non-functional. It's planned for future use.	<ul style="list-style-type: none"> <li>0 = High and Low side current is within range and valid</li> <li>1 = High and Low side current is inconsistent or wrong, indicating that a wiring issue likely exists.</li> </ul>	—

### Output Tags

Table 45 - 5015-U8IHFTXT - Digital Output Mode Output Tags

Tag Name	Size	Definition	Valid Values
Oxx.ResetFault	BOOL	Resets the channel after a fault occurs  <b>IMPORTANT:</b> This tag does not work with the 5015-U8IHFTXT module because you must reset the module to clear channel faults. You cannot clear channels faults on a channel-by-channel basis.	<ul style="list-style-type: none"> <li>0 = Do not reset the channel</li> <li>1 = Reset the channel on a rising edge</li> </ul>
Oxx.Data	BOOL	Digital output to apply to the channel	<ul style="list-style-type: none"> <li>0 = Off</li> <li>1 = On</li> </ul>

**Notes:**

## Diagnostic Information

Your Logix Designer application project provides diagnostic information for your FLEXHA5000™ I/O system. The information is available via the Module Properties dialog boxes in the project.

### EtherNet/IP Adapter Diagnostics

Diagnostics are available for the EtherNet/IP™ adapter. The Diagnostics dialog box doesn't show all diagnostics. To see all diagnostics, scroll down the screen in the software.

Table 46 - Adapter Diagnostic Information

Access	<table border="1"> <thead> <tr> <th></th> <th>Module A</th> <th>Module B</th> </tr> </thead> <tbody> <tr> <td>Vendor</td> <td>Rockwell Automation/Allen-Bradley</td> <td>Rockwell Automation/Allen-Bradley</td> </tr> <tr> <td>Product Type</td> <td>Communications Adapter</td> <td>Communications Adapter</td> </tr> <tr> <td>Revision</td> <td>2.011</td> <td>2.011</td> </tr> <tr> <td>Serial Number</td> <td>0134218B</td> <td>01342174</td> </tr> <tr> <td>Catalog Number</td> <td>5015-AENFT</td> <td>5015-AENFT</td> </tr> <tr> <td>Series</td> <td>A</td> <td>A</td> </tr> <tr> <td>Manufacturing Date</td> <td>2022-07-14</td> <td>2022-05-19</td> </tr> </tbody> </table>		Module A	Module B	Vendor	Rockwell Automation/Allen-Bradley	Rockwell Automation/Allen-Bradley	Product Type	Communications Adapter	Communications Adapter	Revision	2.011	2.011	Serial Number	0134218B	01342174	Catalog Number	5015-AENFT	5015-AENFT	Series	A	A	Manufacturing Date	2022-07-14	2022-05-19															
	Module A	Module B																																						
Vendor	Rockwell Automation/Allen-Bradley	Rockwell Automation/Allen-Bradley																																						
Product Type	Communications Adapter	Communications Adapter																																						
Revision	2.011	2.011																																						
Serial Number	0134218B	01342174																																						
Catalog Number	5015-AENFT	5015-AENFT																																						
Series	A	A																																						
Manufacturing Date	2022-07-14	2022-05-19																																						
Diagnostics Dialog Box	<table border="1"> <thead> <tr> <th>Health</th> <th>Module A</th> <th>Module B</th> </tr> </thead> <tbody> <tr> <td>Run Mode</td> <td>Run</td> <td>Run</td> </tr> <tr> <td>Diagnostic Active</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>Diagnostic Sequence Count</td> <td>7</td> <td>5</td> </tr> <tr> <td>Able To Control</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>Backplane Composition Fault</td> <td>No</td> <td>No</td> </tr> <tr> <td>Backplane Composition Fault Timestamp</td> <td></td> <td></td> </tr> <tr> <td>System Power A Load Share Fault</td> <td>No</td> <td>No</td> </tr> <tr> <td>System Power A Load Share Fault Timestamp</td> <td></td> <td></td> </tr> <tr> <td>System Power B Load Share Fault</td> <td>No</td> <td>No</td> </tr> <tr> <td>System Power B Load Share Fault Timestamp</td> <td></td> <td></td> </tr> <tr> <td>Revisions Different</td> <td>No</td> <td>No</td> </tr> <tr> <td>Revisions Different Timestamp</td> <td></td> <td></td> </tr> </tbody> </table>	Health	Module A	Module B	Run Mode	Run	Run	Diagnostic Active	Yes	Yes	Diagnostic Sequence Count	7	5	Able To Control	Yes	Yes	Backplane Composition Fault	No	No	Backplane Composition Fault Timestamp			System Power A Load Share Fault	No	No	System Power A Load Share Fault Timestamp			System Power B Load Share Fault	No	No	System Power B Load Share Fault Timestamp			Revisions Different	No	No	Revisions Different Timestamp		
Health	Module A	Module B																																						
Run Mode	Run	Run																																						
Diagnostic Active	Yes	Yes																																						
Diagnostic Sequence Count	7	5																																						
Able To Control	Yes	Yes																																						
Backplane Composition Fault	No	No																																						
Backplane Composition Fault Timestamp																																								
System Power A Load Share Fault	No	No																																						
System Power A Load Share Fault Timestamp																																								
System Power B Load Share Fault	No	No																																						
System Power B Load Share Fault Timestamp																																								
Revisions Different	No	No																																						
Revisions Different Timestamp																																								

# Media Landing Card Diagnostics

Diagnostics are available for the MLC.

Table 47 - MLC Diagnostic Information

<p>Access</p>	
<p>Diagnostics Dialog Box</p>	



# Power Conditioner Diagnostics

Diagnostics are available for the Power Conditioner.

Table 48 - Power Conditioner Diagnostic Information

Access

---

Diagnostics Dialog Box

	Power Conditioner A	Power Conditioner B
Fault	No	No
Uncertain	No	No
Over Temperature	No	No
Over Temperature Timestamp		
Critical Temperature	No	No
Critical Temperature Timestamp		
Internal Fault	No	No
Internal Fault Timestamp		
Missing Fault	No	No
Missing Fault Timestamp		
System Power Fault	No	No
System Power Fault Timestamp		

# Backplane Interface Module Diagnostics

Diagnostics are available for the BIM. The Diagnostics dialog box doesn't show all diagnostics. To see all diagnostics, scroll down.

Table 49 - BIM Diagnostic Information

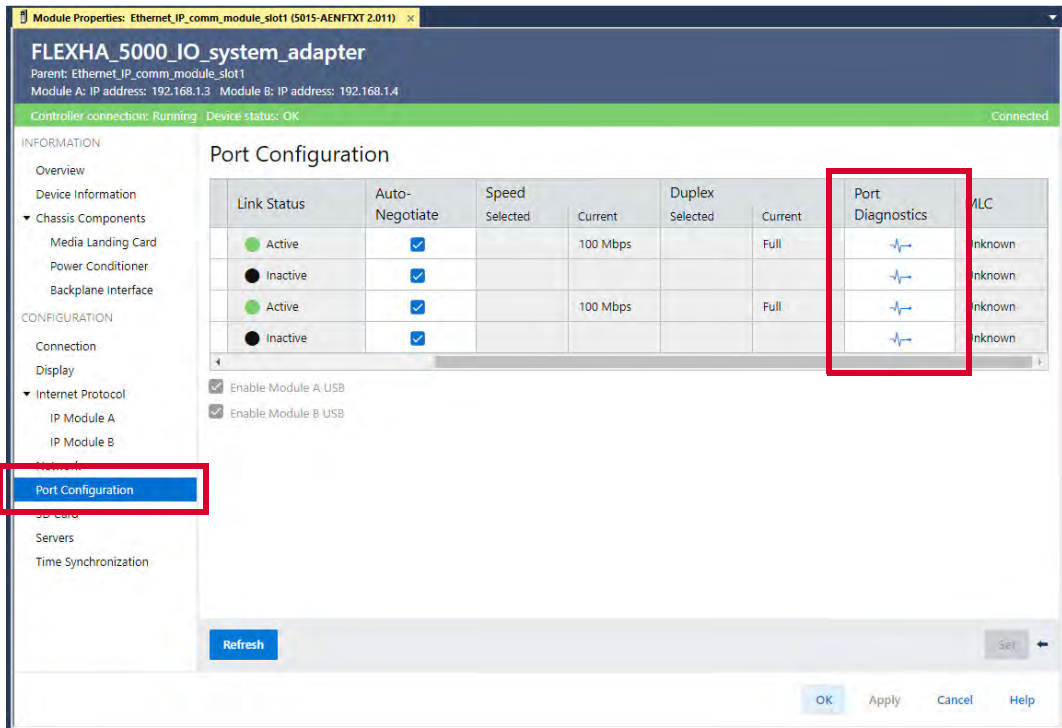
<p>Access</p>																																		
<p>Diagnostics Dialog Box</p>	<table border="1"> <thead> <tr> <th></th> <th>Backplane Interface A</th> <th>Backplane Interface B</th> </tr> </thead> <tbody> <tr> <td>Vendor</td> <td>Rockwell Automation/ Allen-Bradley</td> <td>Rockwell Automation/ Allen-Bradley</td> </tr> <tr> <td>Product Type</td> <td>Communication Physical Layer Component</td> <td>Communication Physical Layer Component</td> </tr> <tr> <td>Revision</td> <td>1.001</td> <td>1.001</td> </tr> <tr> <td>Serial Number</td> <td>012CF9F0</td> <td>012CF80B</td> </tr> <tr> <td>Catalog Number</td> <td>5015-BIM</td> <td>5015-BIM</td> </tr> <tr> <td>Series</td> <td>A</td> <td>A</td> </tr> <tr> <td>Manufacturing Date</td> <td>2022-03-07</td> <td>2022-03-07</td> </tr> <tr> <td>Warranty Number</td> <td>00000000094618743</td> <td>00000000094618730</td> </tr> <tr> <td>Base Fault</td> <td>No</td> <td>No</td> </tr> <tr> <td>Base Uncertain</td> <td>No</td> <td>No</td> </tr> </tbody> </table>		Backplane Interface A	Backplane Interface B	Vendor	Rockwell Automation/ Allen-Bradley	Rockwell Automation/ Allen-Bradley	Product Type	Communication Physical Layer Component	Communication Physical Layer Component	Revision	1.001	1.001	Serial Number	012CF9F0	012CF80B	Catalog Number	5015-BIM	5015-BIM	Series	A	A	Manufacturing Date	2022-03-07	2022-03-07	Warranty Number	00000000094618743	00000000094618730	Base Fault	No	No	Base Uncertain	No	No
	Backplane Interface A	Backplane Interface B																																
Vendor	Rockwell Automation/ Allen-Bradley	Rockwell Automation/ Allen-Bradley																																
Product Type	Communication Physical Layer Component	Communication Physical Layer Component																																
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Serial Number	012CF9F0	012CF80B																																
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Series	A	A																																
Manufacturing Date	2022-03-07	2022-03-07																																
Warranty Number	00000000094618743	00000000094618730																																
Base Fault	No	No																																
Base Uncertain	No	No																																

# Ethernet Port Diagnostics

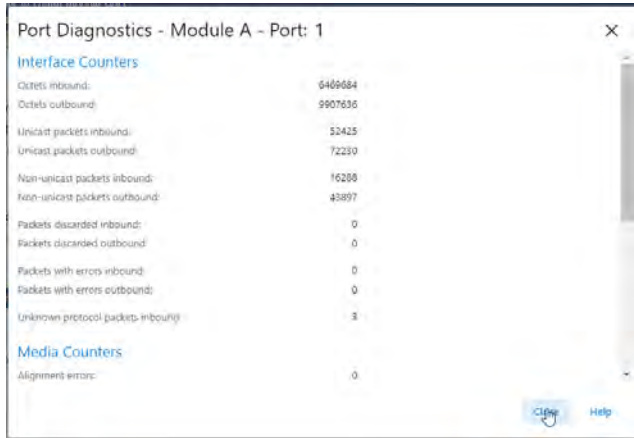
Diagnostics are available for the Ethernet ports. The Diagnostics dialog box doesn't show all diagnostics. To see all diagnostics, scroll down.

Table 50 - Ethernet Ports Diagnostic Information

Access



Diagnostics Dialog Box



# I/O Modules Diagnostics

Diagnostics are available for I/O modules. The following affect what diagnostics are available and how the diagnostics dialog box appears:

- Module's or Duplex or Simplex configuration - This factor determines whether diagnostics are provided for both I/O modules in a Duplex Pair or a Simplex I/O module.
- Channel configuration - This factor affects what diagnostics are available.

**IMPORTANT** Some of the diagnostics that are shown on the screens in this section are currently non-functional. They are planned for future use. For more information, see the FLEXHA 5000 I/O product release notes. You can download the release notes from the Product Compatibility and Download Center (PCDC) at [rok.auto/pcdc](http://rok.auto/pcdc).

## Analog Input Mode

The Diagnostics dialog box for a Duplex Pair doesn't show all diagnostics. The full list, however, is shown in the Simplex module diagnostics list. The difference is that each diagnostic applies to Module A and Module B in the Duplex Pair.

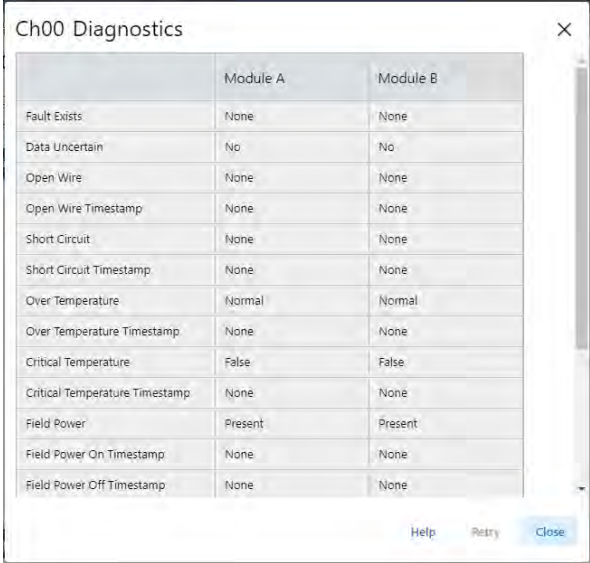
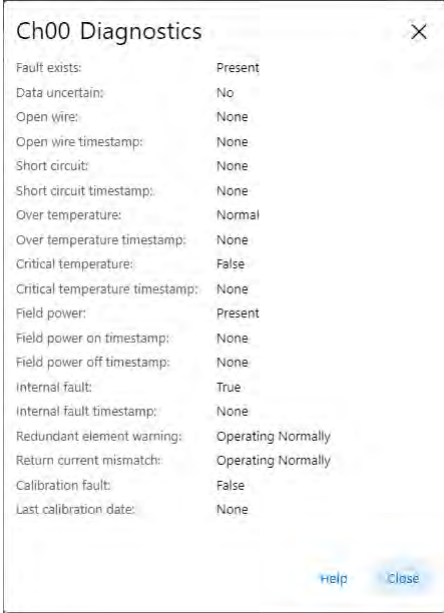
**Table 51 - Analog Input Diagnostic Information**

Access

The figure consists of three screenshots from the Rockwell Automation software interface, illustrating the steps to access and configure diagnostics for an analog input channel in a duplex pair. Red boxes highlight the specific elements being accessed or configured in each step.

- Top Screenshot:** Shows the 'Channels' configuration page. The 'Analog Input Channels' section is expanded, and the 'Diagnostics' button is highlighted with a red box.
- Middle Screenshot:** Shows the 'Scaling' configuration page for the selected channel. The 'Diagnostics' button is highlighted with a red box.
- Bottom Screenshot:** Shows the 'Diagnostics Configuration' dialog box for the channel. The 'Diagnostics' button is highlighted with a red box.

**Table 51 - Analog Input Diagnostic Information**

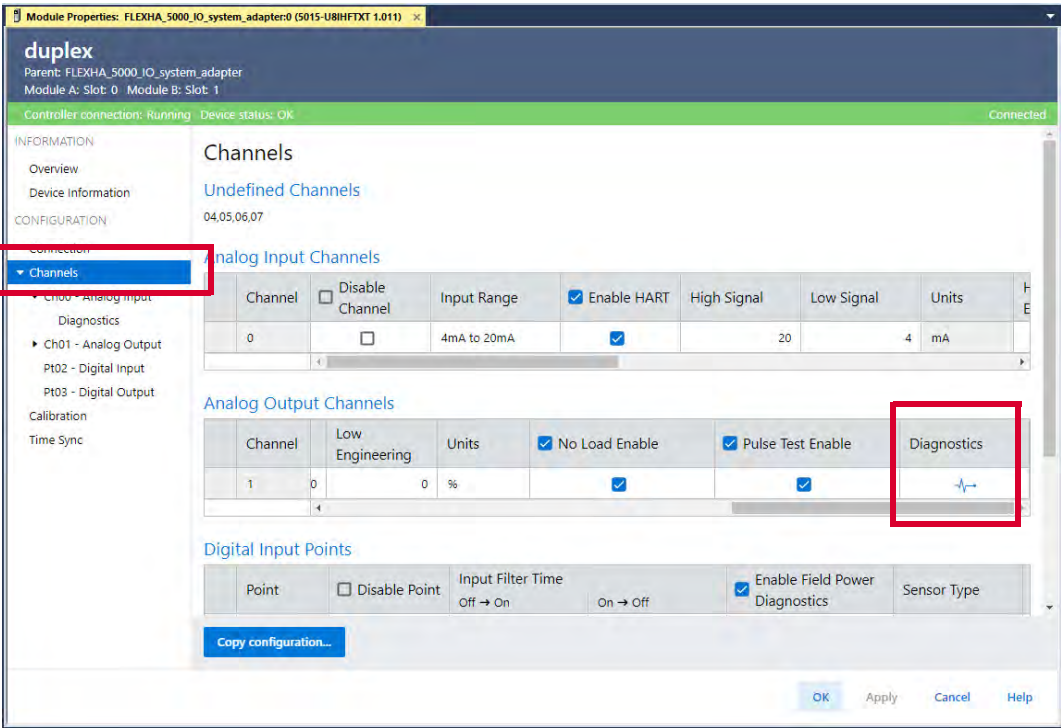
<p><b>Diagnostics Dialog Box - Duplex Pair</b></p>	 <table border="1"> <thead> <tr> <th></th> <th>Module A</th> <th>Module B</th> </tr> </thead> <tbody> <tr><td>Fault Exists</td><td>None</td><td>None</td></tr> <tr><td>Data Uncertain</td><td>No</td><td>No</td></tr> <tr><td>Open Wire</td><td>None</td><td>None</td></tr> <tr><td>Open Wire Timestamp</td><td>None</td><td>None</td></tr> <tr><td>Short Circuit</td><td>None</td><td>None</td></tr> <tr><td>Short Circuit Timestamp</td><td>None</td><td>None</td></tr> <tr><td>Over Temperature</td><td>Normal</td><td>Normal</td></tr> <tr><td>Over Temperature Timestamp</td><td>None</td><td>None</td></tr> <tr><td>Critical Temperature</td><td>False</td><td>False</td></tr> <tr><td>Critical Temperature Timestamp</td><td>None</td><td>None</td></tr> <tr><td>Field Power</td><td>Present</td><td>Present</td></tr> <tr><td>Field Power On Timestamp</td><td>None</td><td>None</td></tr> <tr><td>Field Power Off Timestamp</td><td>None</td><td>None</td></tr> </tbody> </table>		Module A	Module B	Fault Exists	None	None	Data Uncertain	No	No	Open Wire	None	None	Open Wire Timestamp	None	None	Short Circuit	None	None	Short Circuit Timestamp	None	None	Over Temperature	Normal	Normal	Over Temperature Timestamp	None	None	Critical Temperature	False	False	Critical Temperature Timestamp	None	None	Field Power	Present	Present	Field Power On Timestamp	None	None	Field Power Off Timestamp	None	None
	Module A	Module B																																									
Fault Exists	None	None																																									
Data Uncertain	No	No																																									
Open Wire	None	None																																									
Open Wire Timestamp	None	None																																									
Short Circuit	None	None																																									
Short Circuit Timestamp	None	None																																									
Over Temperature	Normal	Normal																																									
Over Temperature Timestamp	None	None																																									
Critical Temperature	False	False																																									
Critical Temperature Timestamp	None	None																																									
Field Power	Present	Present																																									
Field Power On Timestamp	None	None																																									
Field Power Off Timestamp	None	None																																									
<p><b>Diagnostics Dialog Box - Simplex Module</b></p>	 <table border="1"> <tbody> <tr><td>Fault exists:</td><td>Present</td></tr> <tr><td>Data uncertain:</td><td>No</td></tr> <tr><td>Open wire:</td><td>None</td></tr> <tr><td>Open wire timestamp:</td><td>None</td></tr> <tr><td>Short circuit:</td><td>None</td></tr> <tr><td>Short circuit timestamp:</td><td>None</td></tr> <tr><td>Over temperature:</td><td>Normal</td></tr> <tr><td>Over temperature timestamp:</td><td>None</td></tr> <tr><td>Critical temperature:</td><td>False</td></tr> <tr><td>Critical temperature timestamp:</td><td>None</td></tr> <tr><td>Field power:</td><td>Present</td></tr> <tr><td>Field power on timestamp:</td><td>None</td></tr> <tr><td>Field power off timestamp:</td><td>None</td></tr> <tr><td>Internal fault:</td><td>True</td></tr> <tr><td>Internal fault timestamp:</td><td>None</td></tr> <tr><td>Redundant element warning:</td><td>Operating Normally</td></tr> <tr><td>Return current mismatch:</td><td>Operating Normally</td></tr> <tr><td>Calibration fault:</td><td>False</td></tr> <tr><td>Last calibration date:</td><td>None</td></tr> </tbody> </table>	Fault exists:	Present	Data uncertain:	No	Open wire:	None	Open wire timestamp:	None	Short circuit:	None	Short circuit timestamp:	None	Over temperature:	Normal	Over temperature timestamp:	None	Critical temperature:	False	Critical temperature timestamp:	None	Field power:	Present	Field power on timestamp:	None	Field power off timestamp:	None	Internal fault:	True	Internal fault timestamp:	None	Redundant element warning:	Operating Normally	Return current mismatch:	Operating Normally	Calibration fault:	False	Last calibration date:	None				
Fault exists:	Present																																										
Data uncertain:	No																																										
Open wire:	None																																										
Open wire timestamp:	None																																										
Short circuit:	None																																										
Short circuit timestamp:	None																																										
Over temperature:	Normal																																										
Over temperature timestamp:	None																																										
Critical temperature:	False																																										
Critical temperature timestamp:	None																																										
Field power:	Present																																										
Field power on timestamp:	None																																										
Field power off timestamp:	None																																										
Internal fault:	True																																										
Internal fault timestamp:	None																																										
Redundant element warning:	Operating Normally																																										
Return current mismatch:	Operating Normally																																										
Calibration fault:	False																																										
Last calibration date:	None																																										

## Analog Output Mode

The Diagnostics dialog box for a Duplex Pair doesn't show all diagnostics. The full list, however, is shown in the Simplex module diagnostics list. The difference is that each diagnostic applies to Module A and Module B in the Duplex Pair.

Table 52 - Analog Output Diagnostic Information

Access



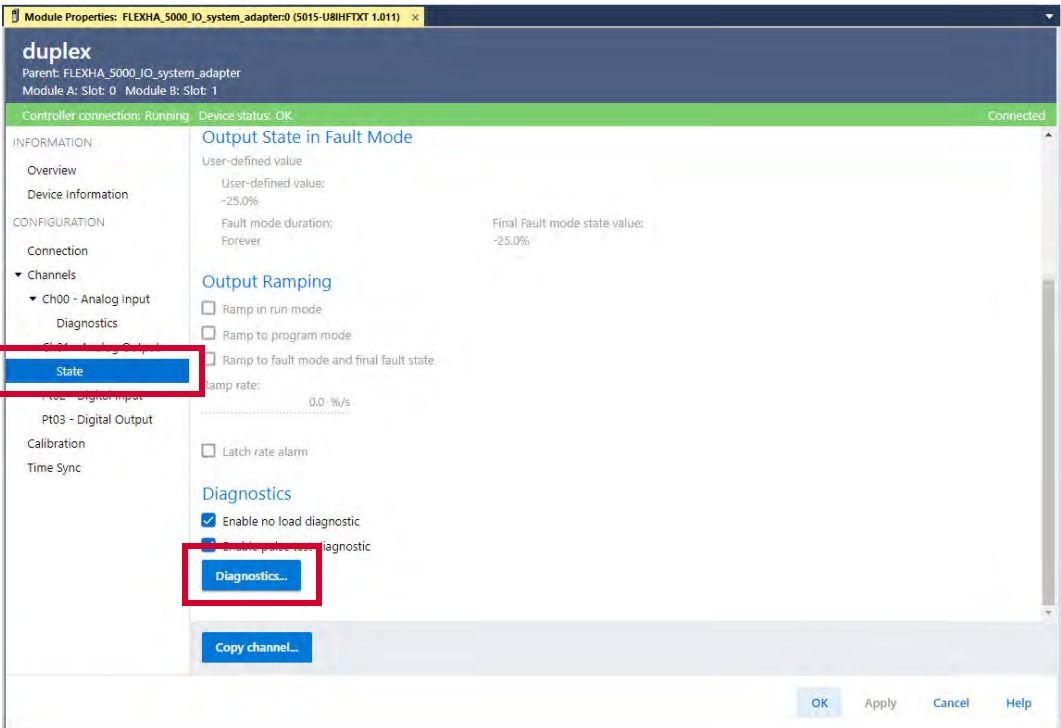
The screenshot shows the 'duplex' configuration window for a FLEXHA\_5000\_IO\_system\_adapter. The left sidebar has 'Channels' selected. The main area shows 'Analog Output Channels' with a table:

Channel	Low Engineering	Units	No Load Enable	Pulse Test Enable	Diagnostics
1	0	%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

The 'Diagnostics' button in the table is highlighted with a red box.

Access



The screenshot shows the 'duplex' configuration window for a FLEXHA\_5000\_IO\_system\_adapter. The left sidebar has 'Channels' expanded to 'Ch00 - Analog Input', where 'State' is selected. The main area shows 'Output State in Fault Mode' and 'Output Ramping' sections. The 'Diagnostics' section has a 'Diagnostics...' button highlighted with a red box.

**Table 52 - Analog Output Diagnostic Information**

Diagnostics Dialog Box  
- Duplex Pair

	Module A	Module B
Fault Exists	Present	Present
Data Uncertain	No	No
No Load	None	Present
No Load Timestamp	None	None
Short Circuit	None	None
Short Circuit Timestamp	None	None
Over Temperature	Normal	Normal
Over Temperature Timestamp	None	None
Critical Temperature	False	False
Critical Temperature Timestamp	None	None
Field Power	Present	Present
Field Power On Timestamp	None	None
Field Power Off Timestamp	None	None

Buttons: Help, Retry, Close

Diagnostics Dialog Box  
- Simplex Module

Fault exists:	Present
Data uncertain:	No
No load:	Present
No load timestamp:	None
Short circuit:	None
Short circuit timestamp:	None
Over temperature:	Normal
Over temperature timestamp:	None
Critical temperature:	False
Critical temperature timestamp:	None
Field power:	Present
Field power on timestamp:	None
Field power off timestamp:	None
Internal fault:	False
Internal fault timestamp:	None
Redundant element warning:	Operating Normally
Return current mismatch:	Operating Normally
Calibration fault:	True
Last calibration date:	None

Buttons: Help, Close

## Digital Input Mode

The Diagnostics dialog box for a Duplex Pair doesn't show all diagnostics. The full list, however, is shown in the Simplex module diagnostics list. The difference is that each diagnostic applies to Module A and Module B in the Duplex Pair.

Table 53 - Digital Input Diagnostic Information

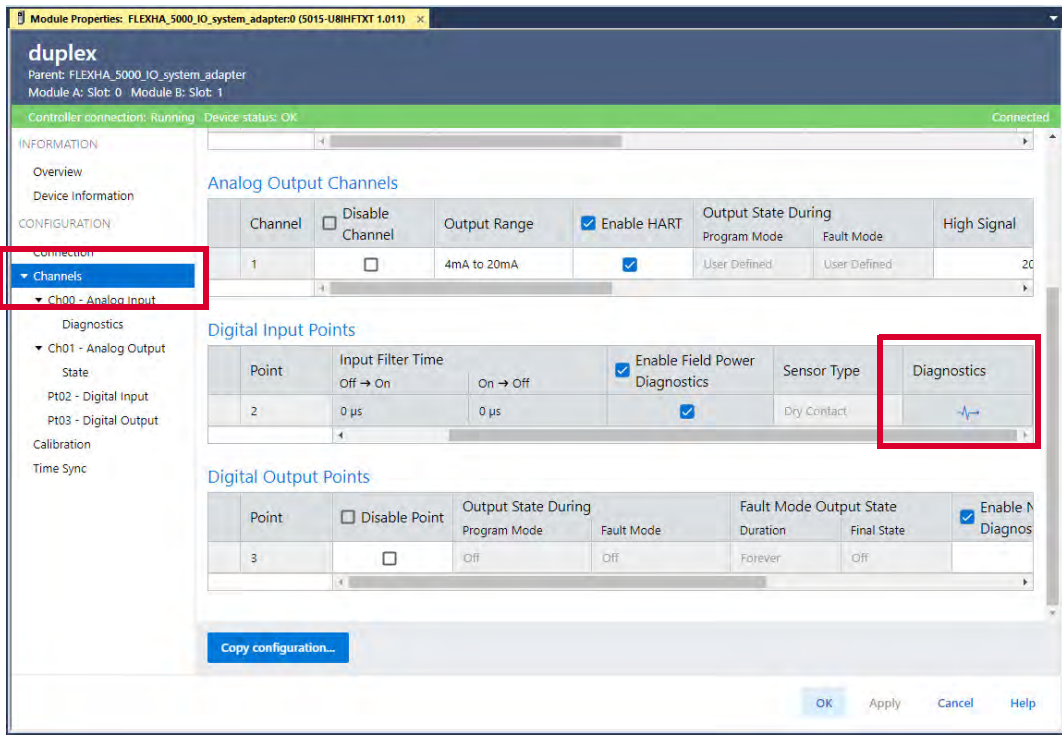
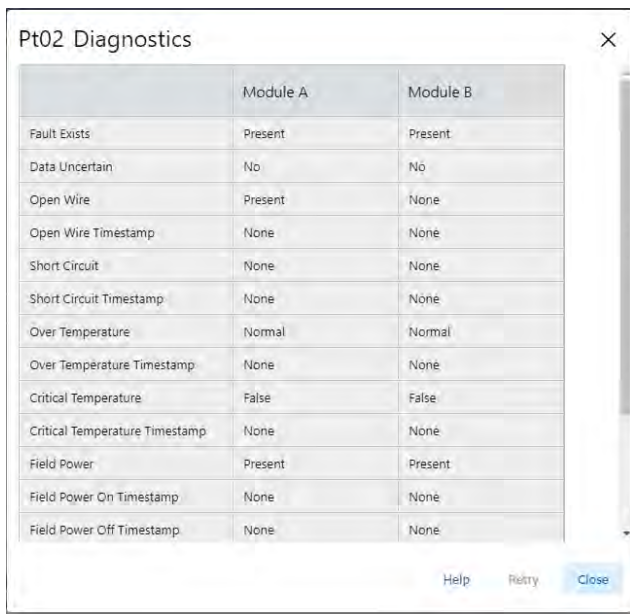
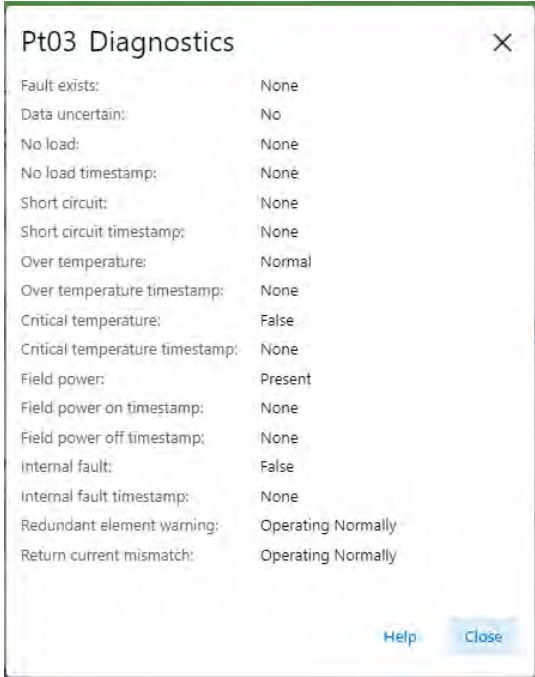
<p>Access</p>																																											
<p>Diagnostics Dialog Box - Duplex Pair</p>	 <table border="1"> <thead> <tr> <th></th> <th>Module A</th> <th>Module B</th> </tr> </thead> <tbody> <tr><td>Fault Exists</td><td>Present</td><td>Present</td></tr> <tr><td>Data Uncertain</td><td>No</td><td>No</td></tr> <tr><td>Open Wire</td><td>Present</td><td>None</td></tr> <tr><td>Open Wire Timestamp</td><td>None</td><td>None</td></tr> <tr><td>Short Circuit</td><td>None</td><td>None</td></tr> <tr><td>Short Circuit Timestamp</td><td>None</td><td>None</td></tr> <tr><td>Over Temperature</td><td>Normal</td><td>Normal</td></tr> <tr><td>Over Temperature Timestamp</td><td>None</td><td>None</td></tr> <tr><td>Critical Temperature</td><td>False</td><td>False</td></tr> <tr><td>Critical Temperature Timestamp</td><td>None</td><td>None</td></tr> <tr><td>Field Power</td><td>Present</td><td>Present</td></tr> <tr><td>Field Power On Timestamp</td><td>None</td><td>None</td></tr> <tr><td>Field Power Off Timestamp</td><td>None</td><td>None</td></tr> </tbody> </table>		Module A	Module B	Fault Exists	Present	Present	Data Uncertain	No	No	Open Wire	Present	None	Open Wire Timestamp	None	None	Short Circuit	None	None	Short Circuit Timestamp	None	None	Over Temperature	Normal	Normal	Over Temperature Timestamp	None	None	Critical Temperature	False	False	Critical Temperature Timestamp	None	None	Field Power	Present	Present	Field Power On Timestamp	None	None	Field Power Off Timestamp	None	None
	Module A	Module B																																									
Fault Exists	Present	Present																																									
Data Uncertain	No	No																																									
Open Wire	Present	None																																									
Open Wire Timestamp	None	None																																									
Short Circuit	None	None																																									
Short Circuit Timestamp	None	None																																									
Over Temperature	Normal	Normal																																									
Over Temperature Timestamp	None	None																																									
Critical Temperature	False	False																																									
Critical Temperature Timestamp	None	None																																									
Field Power	Present	Present																																									
Field Power On Timestamp	None	None																																									
Field Power Off Timestamp	None	None																																									



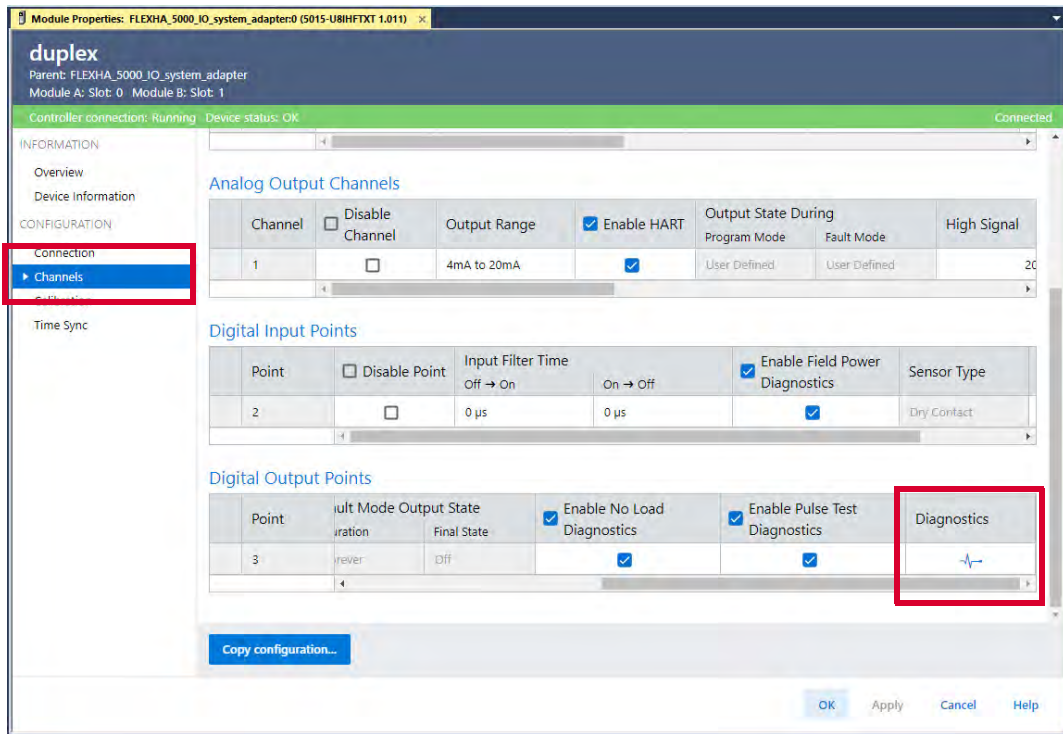
Table 53 - Digital Input Diagnostic Information

<p>Diagnostics Dialog Box - Simplex Module</p>	 <p>The screenshot shows a dialog box titled "Pt03 Diagnostics" with a close button (X) in the top right corner. The dialog contains a list of diagnostic parameters and their current status:</p> <table border="1"><tr><td>Fault exists:</td><td>None</td></tr><tr><td>Data uncertain:</td><td>No</td></tr><tr><td>No load:</td><td>None</td></tr><tr><td>No load timestamp:</td><td>None</td></tr><tr><td>Short circuit:</td><td>None</td></tr><tr><td>Short circuit timestamp:</td><td>None</td></tr><tr><td>Over temperature:</td><td>Normal</td></tr><tr><td>Over temperature timestamp:</td><td>None</td></tr><tr><td>Critical temperature:</td><td>False</td></tr><tr><td>Critical temperature timestamp:</td><td>None</td></tr><tr><td>Field power:</td><td>Present</td></tr><tr><td>Field power on timestamp:</td><td>None</td></tr><tr><td>Field power off timestamp:</td><td>None</td></tr><tr><td>Internal fault:</td><td>False</td></tr><tr><td>Internal fault timestamp:</td><td>None</td></tr><tr><td>Redundant element warning:</td><td>Operating Normally</td></tr><tr><td>Return current mismatch:</td><td>Operating Normally</td></tr></table> <p>At the bottom of the dialog, there are two buttons: "Help" and "Close".</p>	Fault exists:	None	Data uncertain:	No	No load:	None	No load timestamp:	None	Short circuit:	None	Short circuit timestamp:	None	Over temperature:	Normal	Over temperature timestamp:	None	Critical temperature:	False	Critical temperature timestamp:	None	Field power:	Present	Field power on timestamp:	None	Field power off timestamp:	None	Internal fault:	False	Internal fault timestamp:	None	Redundant element warning:	Operating Normally	Return current mismatch:	Operating Normally
Fault exists:	None																																		
Data uncertain:	No																																		
No load:	None																																		
No load timestamp:	None																																		
Short circuit:	None																																		
Short circuit timestamp:	None																																		
Over temperature:	Normal																																		
Over temperature timestamp:	None																																		
Critical temperature:	False																																		
Critical temperature timestamp:	None																																		
Field power:	Present																																		
Field power on timestamp:	None																																		
Field power off timestamp:	None																																		
Internal fault:	False																																		
Internal fault timestamp:	None																																		
Redundant element warning:	Operating Normally																																		
Return current mismatch:	Operating Normally																																		

## Digital Output Mode

The Diagnostics dialog box for a Duplex Pair doesn't show all diagnostics. The full list, however, is shown in the Simplex module diagnostics list. The difference is that each diagnostic applies to Module A and Module B in the Duplex Pair.

Table 54 - Digital Output Diagnostic Information



Access

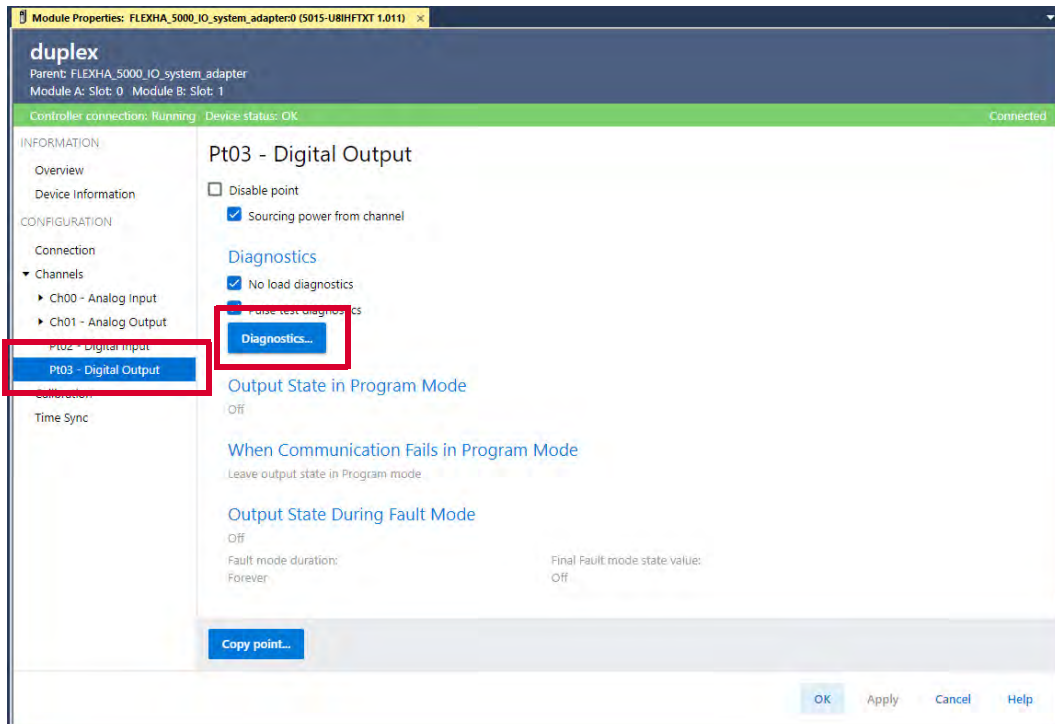


Table 54 - Digital Output Diagnostic Information

Diagnostics Dialog Box - Duplex Pair

	Module A	Module B
Fault Exists	Present	Present
Data Uncertain	No	No
No Load	None	None
No Load Timestamp	None	None
Short Circuit	None	None
Short Circuit Timestamp	None	None
Over Temperature	Normal	Normal
Over Temperature Timestamp	None	None
Critical Temperature	False	False
Critical Temperature Timestamp	None	None
Field Power	Present	Present
Field Power On Timestamp	None	None
Field Power Off Timestamp	None	None

Buttons: Help, Retry, Close

Diagnostics Dialog Box - Simplex Module

Fault exists:	None
Data uncertain:	No
No load:	None
No load timestamp:	None
Short circuit:	None
Short circuit timestamp:	None
Over temperature:	Normal
Over temperature timestamp:	None
Critical temperature:	False
Critical temperature timestamp:	None
Field power:	Present
Field power on timestamp:	None
Field power off timestamp:	None
Internal fault:	False
Internal fault timestamp:	None
Redundant element warning:	Operating Normally
Return current mismatch:	Operating Normally

Buttons: Help, Close

**Notes:**

## Reset Components Via Logix Designer Application

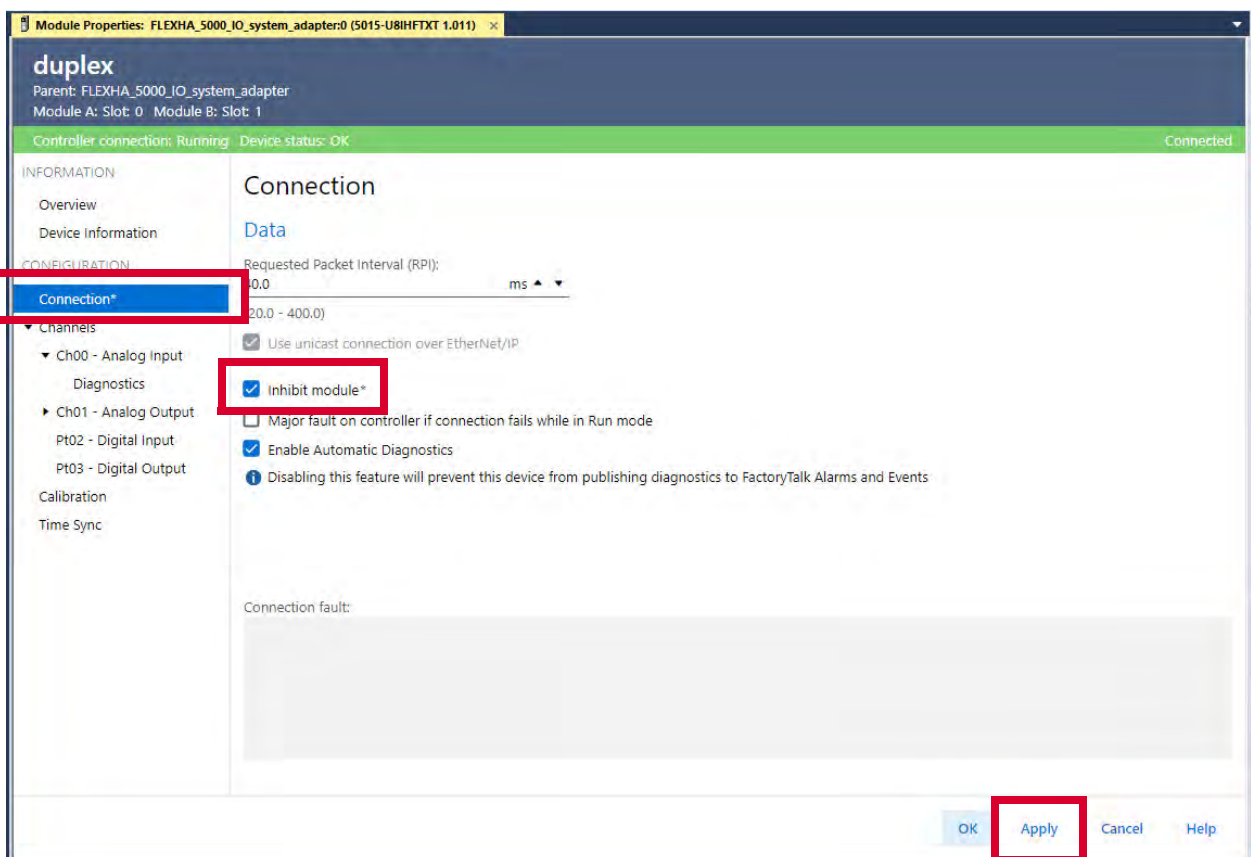
Use Logix Designer application for a simple way to reset the components in your FLEXHA 5000™ I/O system. Your project must be online to reset the components.

### Reset I/O Modules

To reset I/O modules, complete the following steps.

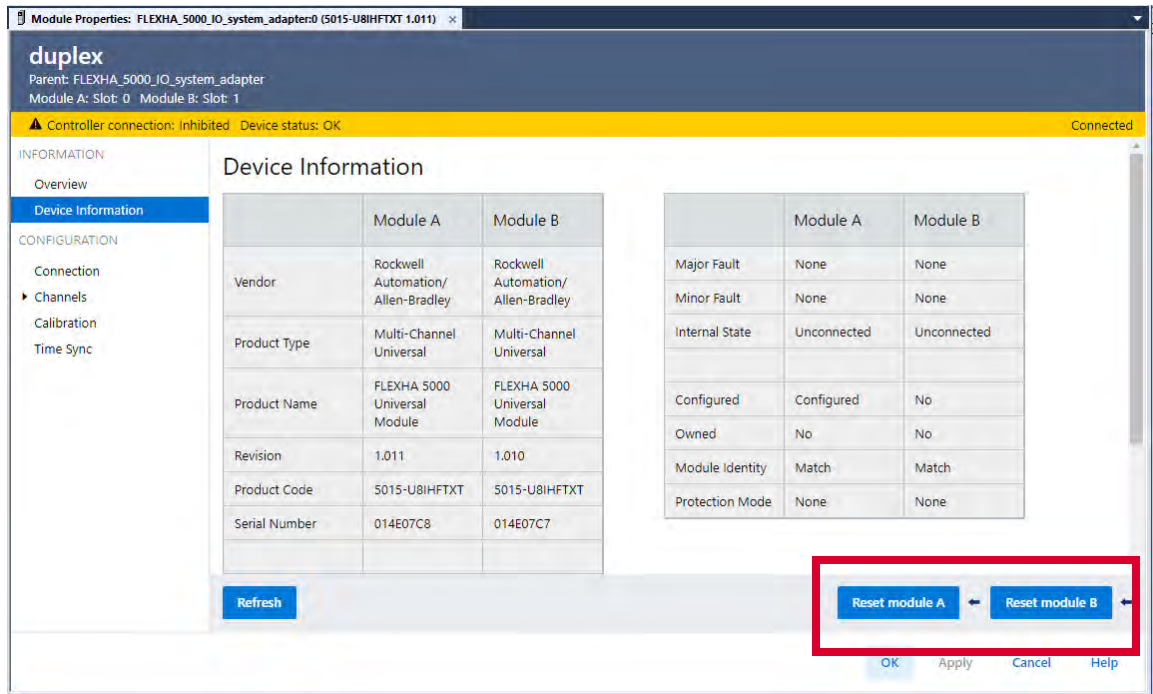
1. On the Connection view, inhibit the connection to the I/O module(s) and click Apply. Inhibiting the connection impacts how the I/O module is used for control in the system. Before you inhibit the connection, make sure that you account for how it impacts the system.

**IMPORTANT** The inhibiting process breaks the connection to the I/O module. When the connection is closed, control is lost. This occurs whether you are inhibiting an I/O module in Simplex mode or a Duplex pair of I/O modules.

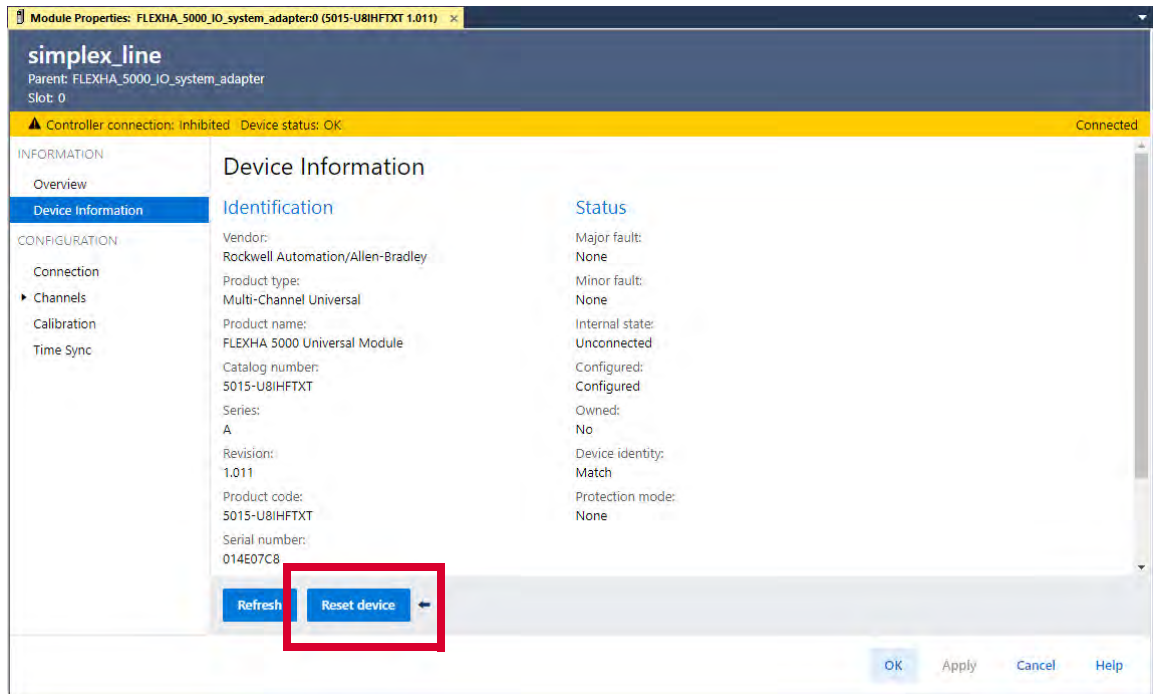


2. Reset the I/O modules via the module reset button on the Device Information view. If it's a Duplex pair of I/O modules, reset the module(s) that requires a reset.

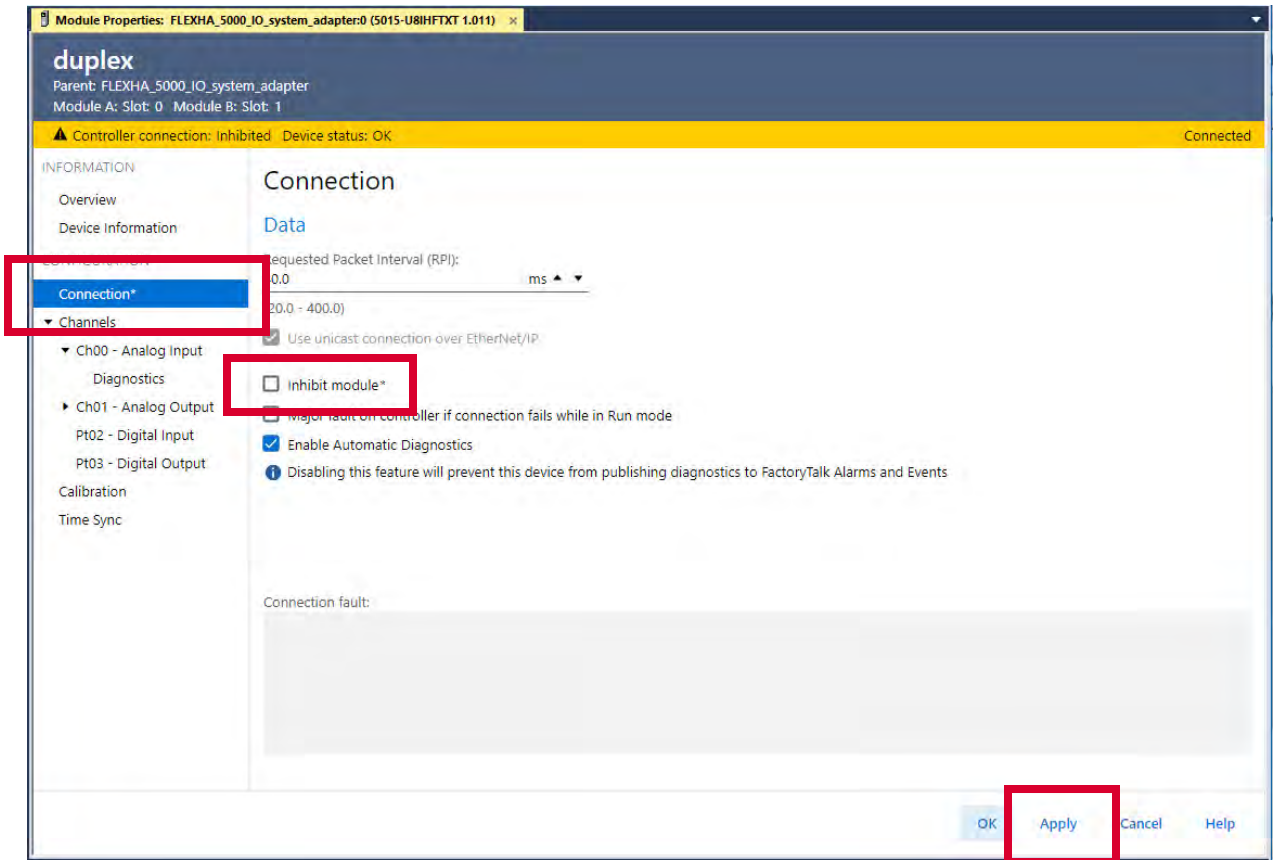
Duplex Pair



Simplex Module



3. Clear the Inhibit module checkbox, and click Apply.



## Reset EtherNet/IP Adapters

Reset EtherNet/IP™ adapters from the Device Information view.

The screenshot displays the 'Module Properties' window for an Ethernet\_IP\_comm\_module\_slot1 (5015-AENFTXT 2.011). The main title is 'FLEXHA\_5000\_IO\_system\_adapter'. Below the title, it shows the parent module and IP addresses for Module A (192.168.1.3) and Module B (192.168.1.4). The status bar indicates 'Controller connection: Running' and 'Device status: OK'.

The left sidebar shows a tree view with 'Device Information' selected and highlighted in red. Below this, there are sections for 'CONFIGURATION' and 'Servers'.

The main area is titled 'Device Information' and contains two tables. The first table lists hardware details for Module A and Module B. The second table shows fault and status information for both modules.

	Module A	Module B
Vendor	Rockwell Automation/ Allen-Bradley	Rockwell Automation/ Allen-Bradley
Product Type	Communications Adapter	Communications Adapter
Revision	2.011	2.011
Serial Number	013421BB	01342174
Catalog Number	5015-AENFT	5015-AENFT
Series	A	A
Manufacturing Date	2022-07-14	2022-05-19

	Module A	Module B
Major Fault	None	None
Minor Fault	None	None
Internal State	Run mode	Run mode
Configured	No	No
Owned	No	No
Module Identity	Match	Match
Protection Mode	Implicit	Implicit

At the bottom of the window, there are buttons for 'Refresh', 'Diagnostics...', 'Reset module A', and 'Reset module B'. The 'Reset module A' and 'Reset module B' buttons are highlighted in red. At the very bottom, there are 'OK', 'Apply', 'Cancel', and 'Help' buttons.



# Reset Media Landing Cards

Reset MLCs from the Chassis Components>Media Landing Card view.

**Module Properties: Ethernet\_IP\_comm\_module\_slot1 (5015-AENFTXT 2.011)**

**FLEXHA\_5000\_IO\_system\_adapter**  
 Parent: Ethernet\_IP\_comm\_module\_slot1  
 Module A: IP address: 192.168.1.3 Module B: IP address: 192.168.1.4

Controller connection: Running Device status: OK Connected

**Chassis Components - Media Landing Card**

	Media Landing Card A	Media Landing Card B		Media Landing Card A	Media Landing Card B
Vendor	Rockwell Automation/ Allen-Bradley	Rockwell Automation/ Allen-Bradley	Major Fault	None	None
Product Type	Communication Physical Layer Component	Communication Physical Layer Component	Minor Fault	None	None
Revision	2.005	2.005	Internal State	Self-test or State Unknown	Self-test or State Unknown
Serial Number	012DAC57	012DAC63			
Catalog Number	5015-MLTR	5015-MLTR			
Series	A	A			
Manufacturing Date	2022-02-22	2022-02-22			

Buttons: Refresh, Diagnostics..., Reset media landing card A, Reset media landing card B

Footer: OK, Apply, Cancel, Help

# Reset Power Conditioners

Reset Power Conditioners from the Chassis Components>Power Conditioner view.

**Module Properties: Ethernet\_IP\_comm\_module\_slot1 (5015-AENFTXT 2.011)**

**FLEXHA\_5000\_IO\_system\_adapter**  
 Parent: Ethernet\_IP\_comm\_module\_slot1  
 Module A: IP address: 192.168.1.3 Module B: IP address: 192.168.1.4

Controller connection: Running Device status: OK Connected

**Chassis Components - Power Conditioner**

	Power Conditioner A	Power Conditioner B		Power Conditioner A	Power Conditioner B
Vendor	Rockwell Automation/Allen-Bradley	Rockwell Automation/Allen-Bradley	Major Fault	None	None
Product Type	Power Component	Power Component	Minor Fault	None	None
Revision	1.060	1.060	Internal State	Self-test or State 11	Self-test or State 11
Serial Number	012DF1A2	012DF1D3		<b>Reset</b> ←	<b>Reset</b> ←
Catalog Number	5015-PBFT100	5015-PBFT100			
Series	A	A			
Manufacturing Date	2021-11-17	2021-11-17			
Warranty Number	00000000092344096	00000000092344078			

Buttons: Refresh, Diagnostics..., Cycle power to chassis

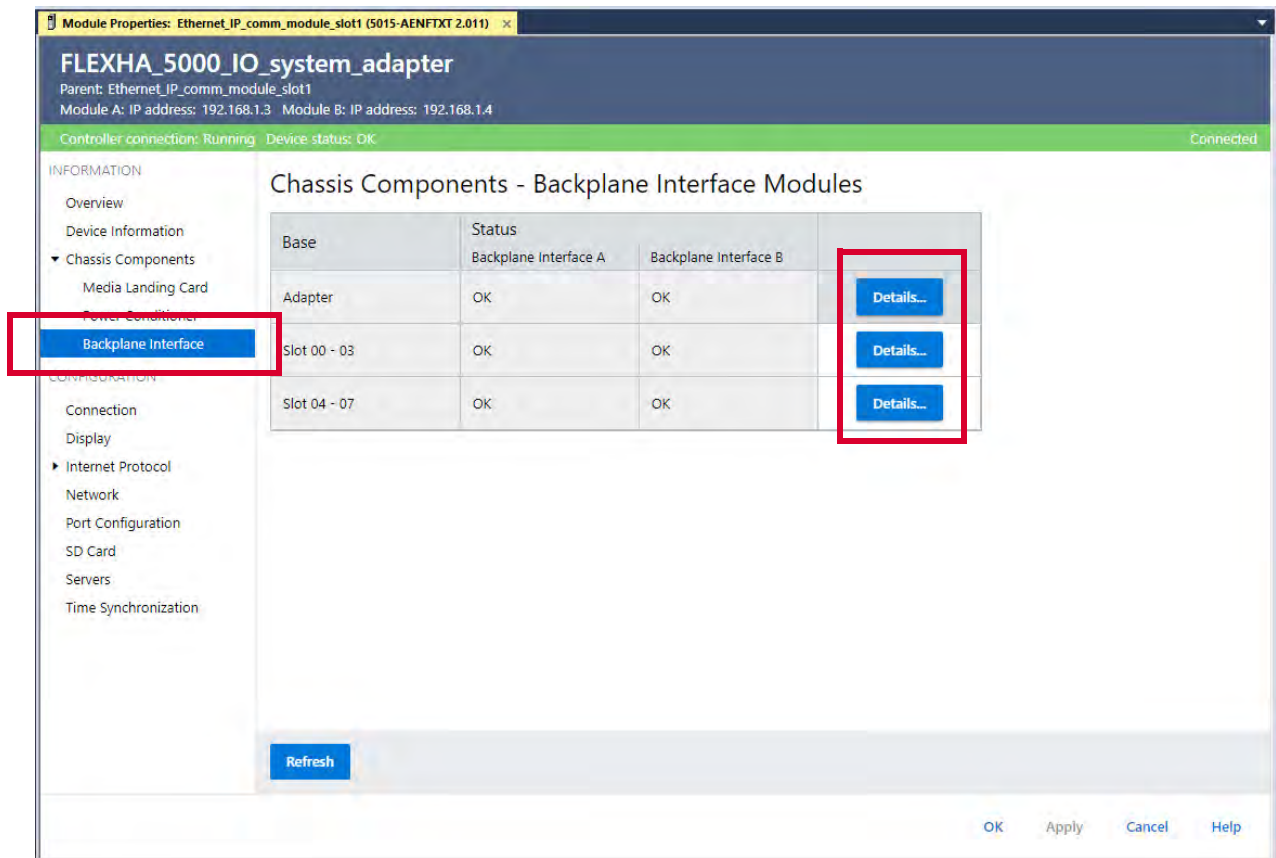
Footer: OK, Apply, Cancel, Help

## Reset Backplane Interface Modules

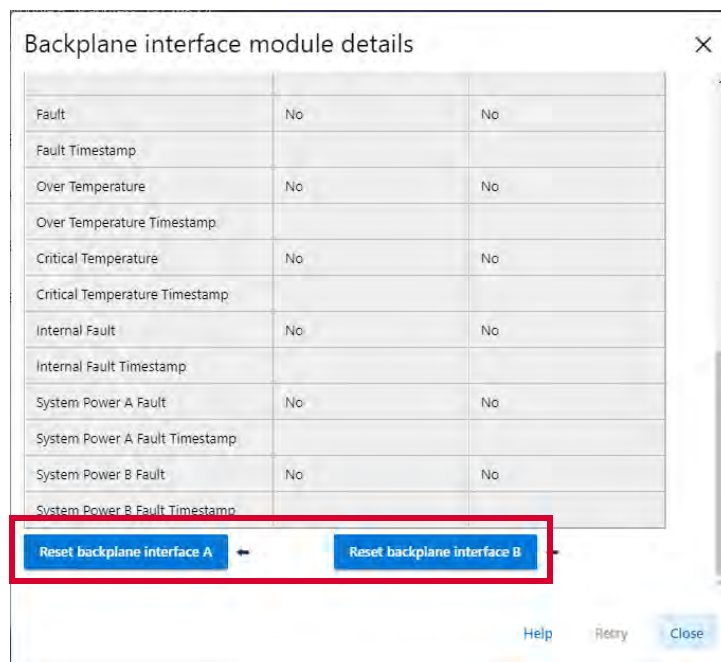
If the BIM is not faulted, you cannot reset it because a reset would result in inadvertent loss of control.

To reset BIMs, complete the following steps.

1. Click the Details button on the Chassis Components>Backplane Interface view.



2. Scroll to the bottom of the Details dialog box and click the Reset button.



**Notes:**

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**1606-XLE240ECRZ** 58  
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