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Compact 5000™ 16-Point 12/24 V Discrete High-Speed Sourcing Input Module

Catalog Numbers: 5069-IV16F-SC/5069-IV16FK-SC

Important Notes

1. Please read all the information in this owner's guide before installing the product.
2. The information in this owner's guide applies to hardware Series A and firmware version 1.1 or later.
3. This guide assumes that the reader has a full working knowledge of the relevant processor.

Notice

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Preface

Read this preface to familiarize yourself with the rest of the manual. This preface covers the following topics:

- Who should use this manual.
- How to use this manual.
- Related documentation.
- Technical support.
- Documentation.
- Conventions used in this manual.

Who Should Use This Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting Compact 5000™ and Logix 5000™ control systems that use the Compact 5000™ 16-Point 12/24 V Source Discrete Input Module.

NOTE



Before you access any equipment or begin to install any IO modules, review all safety material and warnings in the associated . Be sure to review the warnings provided in this document before you start installing a module in a system.

How to Use This Manual

As much as possible, we organized this manual to explain, in a task-by-task manner, how to install, configure, program, operate, and troubleshoot a control system using the Compact 5000™ 16-Point 12/24 V Source Discrete Input Module. Make sure you are familiar with the following:

- Use of a controller in a Logix 5000 control system.
- Use of an EtherNet/IP™ network, if the digital I/O modules are used remotely.
- Use of safety systems.
- Use Studio 5000 Logix Designer® environment.

Related Documentation

The table below provides a listing of publications that contain important information about the Compact 5000™ 16-Point 12/24 V Source Discrete Input Module.

For	Refer to this Document	Allen-Bradley Pub. No.
Describes how to install and wire the 5069-FPD field potential distributor.	Compact 5000 I/O Field Potential Distributor Installation Instructions	5069-IN001

For	Refer to this Document	Allen-Bradley Pub. No.
Describes how to install the 5069-ARM address reserve module.	Compact 5000 I/O Address Reserve Module Installation Instructions	5069-IN002
Describes how to install and wire the Compact 5000 I/O EtherNet/IP adapters.	Compact 5000 I/O EtherNet/IP Adapter Installation Instructions	5069-IN003
Provides specifications, wiring diagrams, and module block diagrams for Compact 5000 I/O modules and EtherNet/IP adapters.	Compact 5000 I/O Modules and EtherNet/IP Adapter Technical Data, publication	5069-TD001
Describes how to configure, operate, and troubleshoot Compact 5000 I/O analog modules.	Compact 5000 I/O Analog Modules User Manual	5069-UM005
Describes how to configure, operate, and troubleshoot the Compact 5000 I/O EtherNet/IP adapters.	Compact 5000 EtherNet/IP Adapters User Manual	5069-UM007
Describes how to configure, operate, and troubleshoot CompactLogix™ 5380 and Compact GuardLogix ^R 5380 controllers.	CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual	5069-UM001
Describes how to configure, operate, and troubleshoot CompactLogix 5480 controllers.	CompactLogix 5480 Controllers User Manual	5069-UM002
Describes how to configure, operate, and troubleshoot ControlLogix ^R 5580 and GuardLogix 5580 controllers.	ControlLogix 5580 and GuardLogix 5580 Controllers User Manual	1756-UM543
Provides more information on event tasks and event task configuration.	Logix5000 Controllers Tasks, Programs, and Routines Programming Manual, publication	1756-PM005
Environment and Enclosure Information	Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1, for additional installation requirements. NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.	1770-4.1 NEMA 250-2014 IEC 60529
Declarations of conformity, certificates, and other certification details.	Product Certification website: https://spectrumcontrols.com	

Technical Support

For technical support, please contact your local Rockwell Automation TechConnect Office for all Spectrum products.

Contact numbers are as follows:

- USA 1-440-646-6900
- United Kingdom 01-908-635-230
- Australia 1-800-809-929
- Mexico 001-888-365-8677
- Brazil 55-11-3618-8800
- Europe +49-211- 41553-630

or send an email to support@spectrumcontrols.com




Documentation

If you would like a manual, you can download a free electronic version from the Internet at www.spectrumcontrols.com

Conventions Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists (like this one) provide information not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.
- **Bold** type identifies headings and sub-headings.

<p>WARNING</p> 	<p>Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. These messages help you to identify a hazard, avoid a hazard, and recognize the consequences.</p>
<p>ATTENTION</p> 	<p>Actions ou situations risquant d'entraîner des blessures pouvant être mortelles, des dégâts matériels ou des pertes financières. Les messages « Attention » vous aident à identifier un danger, à éviter ce danger et en discerner les conséquences.</p>
<p>NOTE</p> 	<p>Identifies information that is critical for successful application and understanding of the product.</p>

Chapter 1

Module Overview

This chapter covers the following topics:

- General description.
- Controller ownership of I/O Modules.
- Input specifications.
- Hardware features.
- System overview and module operation.

Section 1.1 General Description

The Compact 5000™ 5069-IV16F-SC and 5069-IV16FK-SC are 16-Point, 12/24 VDC fast digital source input modules designed to expand the local I/O capability of Rockwell Automation Compact 5000™ Systems. Other than the conformal coating, both 5069 modules are identical so all information applicable to the 5069sc-IV16F-SC also applies to the K version.

Compact 5000 I/O modules such as the 5069-IV16F-SC may be used as local I/O modules in CompactLogix™ 5380 and Compact GuardLogix® 5380 controllers, CompactLogix 5480, ControlLogix 5580, and GuardLogix 5580 controllers. The module may also be used as a remote I/O module with CompactLogix 5380, Compact GuardLogix 5380 controllers, and other Logix 5000 controllers via 5069-AEN(2)TR over an EtherNet/IP network.

You use the Studio 5000 Logix Designer® application to configure the modules. The 5069-IV16F-SC module is compatible with Logix Designer application, version 28 or later.

Compact 5000 I/O digital modules use the Producer/Consumer network communication model. This communication is an intelligent data exchange between modules and other system devices in which each module produces data without first being polled.

All data exchanged between a controller and the modules is through the backplane bus that these modules share with other modules. The bus is created when the controller, its modules, and/or a communications adapter are assembled. There is no dedicated bus that is part of the controller itself.

The 5069-IV16F-SC module has a left and a right side set of connectors. The right-side connector has 13 pins plus an additional “tab” of metal on the bottom of all 5069 modules where the module attaches to the DIN rail for FGND purposes.

The module requires an 18-pin removable terminal block (RTB) to connect field-side wiring. RTBs are not included with the I/O modules. You must order RTBs separately.

Either of the following RTBs may be used with the 5069 modules:

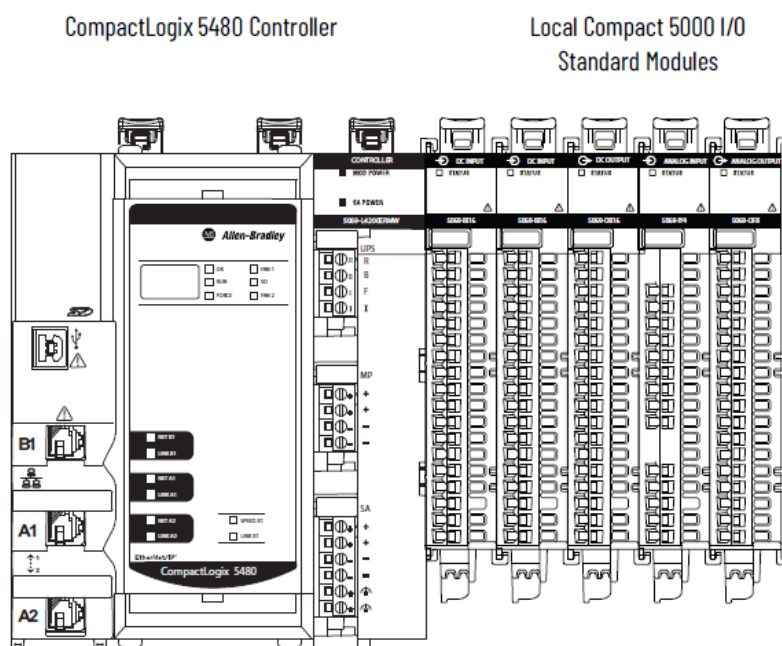
- 5069-RTB18-SPRING RTB
- 5069-RTB18-SCREW RTB

The module is designed to interface by wiring an input pin to a switch so that the controller can detect either an open or a closed switch position. The inputs are IEC 61121-2, Type 3 inputs and therefore can also convert resistance placed across the input. It is also possible to interpret voltage present at the input as a switch. This means the inputs are able to operate with an analog signal and digitize that signal based on the specification limits for an input to be either an open or closed switch.

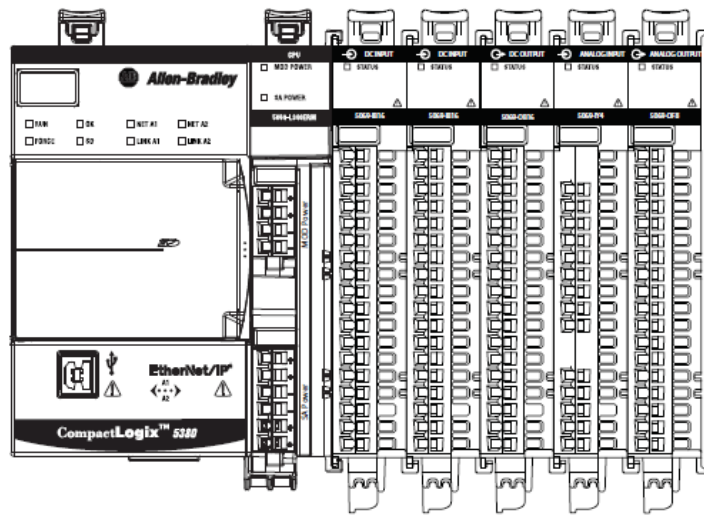
1.1.1 Field Side Circuitry Power

The Compact 5000 bus provides power to the 5069-IV16F-SC module field side circuitry using the Sensor/Actuator (SA) power bus using the Field Potential Distributor module, RA part number 5069-FPD. This module must be installed between the controller and the 5069-IV16F-SC module. The field side power supply is connected to the 5069-FPD and any circuitry external to the module, such as a sensor or switch. Simple switches connected to the module inputs only require that the other switch terminal be connected to the power supply return.

You cannot use the separate field power supply to provide power to the module's field side circuitry other than via the SA bus. There are no positions on the RTB to support such connections.



CompactLogix 5380 Controller

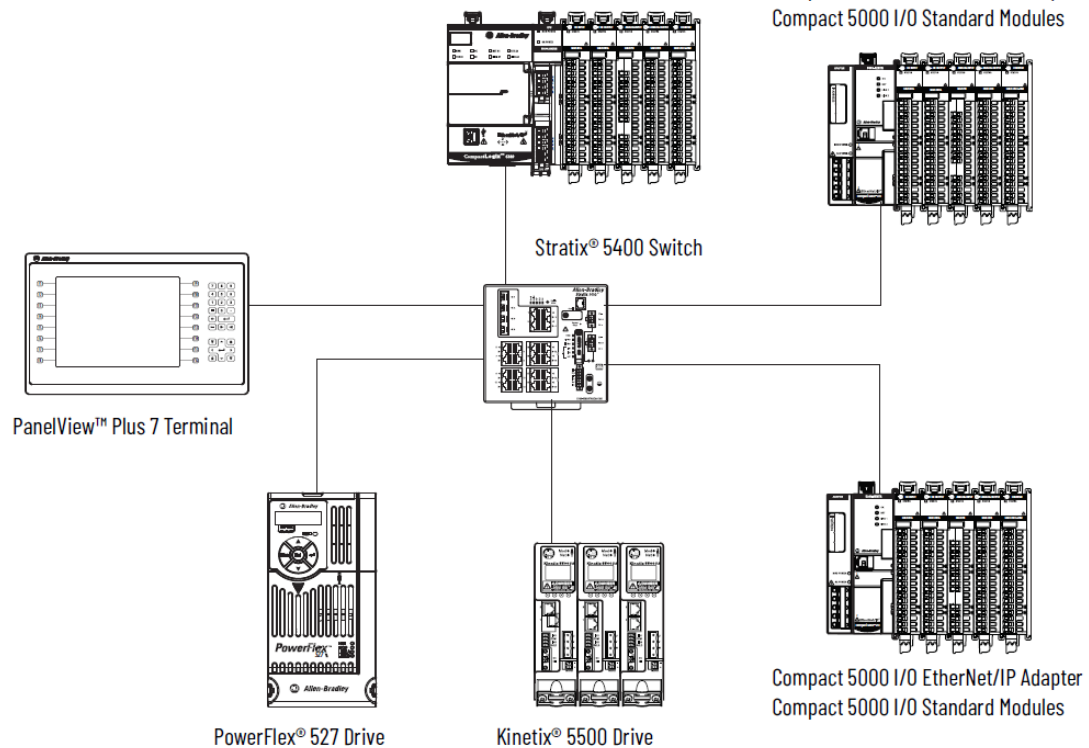
Local Compact 5000
I/O Standard Modules

Local I/O modules are those modules that reside in the same system as the controller. They are installed to the right of the controller and exchange data with the controller over the system backplane.

Remote I/O modules reside in a separate location from the Logix 5000 controller.

CompactLogix 5380 Controller

Compact 5000 I/O Standard Modules

Compact 5000 I/O EtherNet/IP Adapter
Compact 5000 I/O Standard Modules

The discrete module supports 16, sourcing, digital input channels. The module provides the following functions:

- Simple counting.
- Timestamps events.
- Detects events.
- Pulse latching.
- Detects sequence of events.

The Rockwell Automation Logix Designer software also contains an add-on-profile (AOP) that provides a graphical user interface to the module's features.

Before you can use the module, you will need to set up a program within the PLC that configures the module before it is able to be used.

Section 1.2

Controller Ownership of I/O Modules

For the 5069-IV16F-SC to function in a Logix 5000 control system, a controller must own the module. The controller that owns the input module performs the following functions:

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

You can connect multiple Logix 5000 controllers to the input module. Conditions for multiple connections are:

NOTE



If the controller that owns the module configuration changes the configuration, the other controllers are not notified of the changes.

- The controllers maintain the same configuration.
- The configuration in each controller uses a Data connection to the input module.
- The first controller to make a connection to the input module is the only controller that can change the connection. Therefore, it 'owns' the module configuration.
- The controllers that do maintain, but do not 'own', the module configuration are similar to Listen-only controllers.
- The difference between the controllers is that the controllers that maintain, but do not own, the module configuration can use a Multicast or Unicast connection over the EtherNet/IP network.

Section 1.3 Input Specifications

The 5069-IV16F-SC modules have the following input specifications:

1.3.1 General Specifications

Parameter	Specification
Inputs	16 Channels (1 group of 16), sourcing
Voltage category	12/24 VDC
Voltage and current ratings	
MOD ¹ power, minimum	1.3 W, 55 mA at 24 VDC
MOD Input inrush	1.3 A, max. (Decays to nominal limit in less than 50 ms)
MOD Current Passthrough, max ²	9.55 A at 18...32 VDC
SA Power Passthrough, max ³	9.95 A at 10...32 VDC
NOTE: Do not exceed 10 A MOD or SA Power (Passthrough) current draw	
Thermal dissipation, maximum	13.65 BTU/hr.
Isolation voltage	250 V (continuous), Basic Insulation Type backplane system to field, tested at 1500 VAC for 60 seconds. No isolation between LA power and output ports. No isolation between individual output ports.
Module keying	Electronic, module keying, software configurable
Indicators	1 green/red module status indicator 16 yellow/red I/O status indicators
Slot width	1
Dimensions (H×W×D), approximately	144.57 × 22.00 × 105.42 mm (5.69 × 0.87 × 4.15 in.)
DIN rail	Compatible zinc-plated chromate-passivated steel DIN rail. You can use the following DIN rail sizes: EN50022 - 35 × 7.5 mm (1.38 × 0.30 in.) EN50022 - 35 × 15 mm (1.38 × 0.59 in.)

¹ MOD refers to the Module.

² Level of MOD Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, and EtherNet/IP Communication Modules in Logix 5000 Control Systems User Manual, ENET-UM004.

³ Level of SA Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, and EtherNet/IP Communication Modules in Logix 5000 Control Systems User Manual, ENET-UM004.

Parameter	Specification
RTB torque (5069-RTB18-SCREW RTB only)	0.4 N•m (3.5 lb•in)
RTB	One of these RTB types: <ul style="list-style-type: none"> • 5069-RTB18-SPRING RTB • 5069-RTB18-SCREW RTB
RTB keying	None
Wire category ⁴	2 – power ports 1 wire per terminal for each input port
Wire size	
5069-RTB18-SPRING removable terminal block	0.5...1.5 mm ² (22...16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) maximum diameter including insulation
5069-RTB18-SCREW removable terminal block	0.5...1.5 mm ² (22...16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) maximum diameter including insulation
Insulation stripping length	
5069-RTB18-SPRING connections	10 mm (0.39 in.)
5069-RTB18-SCREW connections	12 mm (0.47 in.)
Weight, approx.	175 g (0.39 lb.)
Enclosure type	None (open – style)
North American temperature code	T4
ATEX temp code	T4
IECEX temp code	T4

1.3.2 Electrical Specifications

Parameter	Specification
Inputs per module	16 (Sixteen) 2-wire or 3-wire (powered) sensor/switch sourcing input channels
Input Sensor range	Switch: 24 VDC nominal, 32 VDC max.
On State voltage: Minimum: Maximum:	10 VDC 32 VDC

⁴ Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Parameter	Specification
On State current: Minimum: Maximum:	3 mA at 10 VDC 5 mA at 32 VDC
Off State voltage	5 V
Off State current	1.5 mA maximum
Input impedance	2.5 k minimum, 30 k maximum
Overvoltage protection	36 V
Input inrush current, maximum	250 mA, decays to less than 37% within 22 ms.
Input Transition Delay, Screw to Backplane: Time, Off-to-On: Time Off-On-Off:	User-selectable from less than 10 μ Sec up to 50 ms User-selectable from less than 10 μ Sec up to 50 ms
Input Pulse Width: On-Off-On: Off-On-Off:	6 μ Sec 6 μ Sec
SA Power, maximum	50 mW (no inputs connected)
Isolation voltage	250 V (continuous), Basic Insulation Type system to field, tested at 2550 VDC for 60 seconds.

1.3.3 Input/Performance/Environmental Requirements

Input Description	Value
Operating Temperature	-0 °C to 60 °C (32 °F to 140 °F)
Storage/Non-Operating Temperature	-40 °C to 85 °C (-40 °F to 185 °F)
Temperature, Surrounding Air ⁵	60 °C (140 °F)
Operating Humidity	5% to 95%, non-condensing
Storage/Non-Operating Humidity	5% to 85%, non-condensing
Vibration/Operating	10 Hz to 500 Hz, 5 G, 0.030 maximum peak-to-peak
Operating Shock	30 G, peak acceleration, 11 ms pulse, half sine
Storage/Non-Operating Shock	50 G peak acceleration, 11 ms pulse, half sine
Pollution Level	Meets Pollution Degree 2 requirements.
12/24 VDC customer supply voltage	10.5 VDC minimum, 30 VDC maximum
ON-state voltage	10 VDC minimum ON under all conditions
	30 VDC maximum

⁵ Horizontal orientation only, if using the AENTR adapter in the Vertical orientation follow its operating ambient temperature derating to 42 °C (108 °F) max.

Input Description	Value
ON-state current	43 mA minimum at 10 VDC
Reverse voltage protection	Yes, group protection
Input to backplane isolation	50 VAC working Reinforced isolation tested at 2 kVDC for 1 minute
Input to Chasis GND isolation	50 V working Reinforced isolation tested at 2 kVDC for 1 minute.
Power Requirements	
Bus +24 VDC (19.9 V to 26.4 V)	55 mA maximum
Heat Dissipation	OB32: 5.5 W maximum (at full load) OV32: 4 W maximum (at full load)
Inrush current	Less than 150 mA at 5 V Less than 400 mA at 24 V
RoHS	Meets European RoHS component standards (January 2015 and earlier).
REACH	Meets European REACH 7 requirements.
Wire Installation	
Wire size	#16 to #28 AWG
Wire Strip Length	0.375 in.
Recommended Tightening Torque:	0.25 N-m (2.2 lb.-in) (Use hand tool to tighten; see warning regarding risk of over-tightening.)
Module Dimensions H×D×W (With RTBs installed, RTB extends the total depth approximately 2 mm from 87 mm to 89 mm.)	110 mm × 89 mm × 51 mm (4.33 in × 3.54 in × 2.00 in) 90 mm × 89 mm × 44.5 mm (excluding mounting feet, DIN rail latches, or the plastic that extends into the adjacent module once installed). (3.54 in × 3.5 in × 1.75 in)

1.3.4 EMC Specification Table

EMC Tests	Test Level
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharge 8 kV air discharge
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...6000 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on power ports ±3 kV at 5 kHz on output ports

EMC Tests	Test Level
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on output ports
Conducted RF immunity IEC 61000-4-6	10 VRMS with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Voltage variation IEC 61000-4-29	10 ms interruption on MOD power port

1.3.5 Regulatory Table

Certification ⁶	Industry Standard
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. UL Listed for Class I, Division 2 Group A, B, C, D Hazardous Locations, certified for U.S. and Canada.
CE	European Union 2014/30/EU EMC Directive, compliant with: EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU, compliant with: EN 61010-2-201; Control Equipment Safety Requirements
UKCA	EMC Regulations 2016, compliant with: BS EN 61326-1; Meas./Control/Lab., Industrial Requirements BS EN 61000-6-2; Industrial Immunity BS EN 61000-6-4; Industrial Emissions BS 61131-2; Programmable Controllers (Clause 8, Zone A & B) Electrical Equipment (Safety) Regulations 2016, compliant with: BS EN 61010-2-201; Control Equipment Safety Requirements Equipment and Protective systems Intended for use in Potentially Explosive Atmospheres Regulations 2016, compliant with: BS EN 60079-0; General Requirements BS EN 60079-7; Potentially Explosive Atmospheres, Protection "ec" II 3 G Ex ec IIC T4 Gc
CMIM	Arrêté ministériel n° 6404-15 du 29 ramadan 1436 (16 juillet 2015) NM EN 61131-2, NM EN 61000-6-4, NM EN 61000-6-2

⁶ When marked.

Certification⁶	Industry Standard
Ex (ATEX)	European Union 2014/34/EU ATEX Directive, compliant with: <ul style="list-style-type: none"> • EN 60079-0; General Requirements • EN 60079-7; Potentially Explosive Atmospheres, Protection "ec" • II 3 G Ex ec IIC T4 Gc
IECEX	IECEX System, compliant with: <ul style="list-style-type: none"> • IEC 60079-0; General Requirements • IEC 60079-7; Potentially Explosive Atmospheres, Protection "ec" • II 3 G Ex ec IIC T4 Gc

Section 1.4

Hardware Features

The module has 16 LEDs for indicating the input status for each of the channels, and an LED that indicates module status.

1.4.1 LED Operation

The circuit board contains a bicolor red/green module status LED. The bicolor LED is forced Red on power-up until it is controlled by the firmware. It is used to indicate the health of the product.

In addition, there are 16 bicolor red/yellow LEDs that indicate the input status for each of the 16 channels:

- When the channel LED is steady yellow, it means the channel is turned on.
- When the channel LED is off, it means the channel is turned off or no module power is applied.

The module uses the top, bicolor red/green Module Status LED to indicate the status of the module.

The table below summarizes the Module Status LED states:

Module State:	Module Status LED State:	Comments:
The module is not powered.	Off	Confirm that the system is powered.
The module has a connection to the owner controller and is operating normally.	Steady Green	None.
The module does not have a connection to the controller. A connection can result from missing, incomplete, or incorrect module configuration.	Flashing Green	Troubleshoot your Logix Designer application to determine what is preventing a connection from the module to the controller and correct the issue.
The module experienced a nonrecoverable fault.	Steady Red	Cycle power to the module.

Module State:	Module Status LED State:	Comments:
<p>One of the following conditions exists:</p> <ul style="list-style-type: none"> • A module firmware update is in progress. • A module firmware update attempt failed. • The device has experienced a recoverable fault. • A connection to the module has timed out. 	Flashing Red	<ul style="list-style-type: none"> • Let the firmware update progress complete. • Re-attempt a firmware update after one fails. • Use the Logix Designer application to determine the cause of the module fault. <p>The Connection and Module Info categories of the module's configuration indicate the fault type.</p>

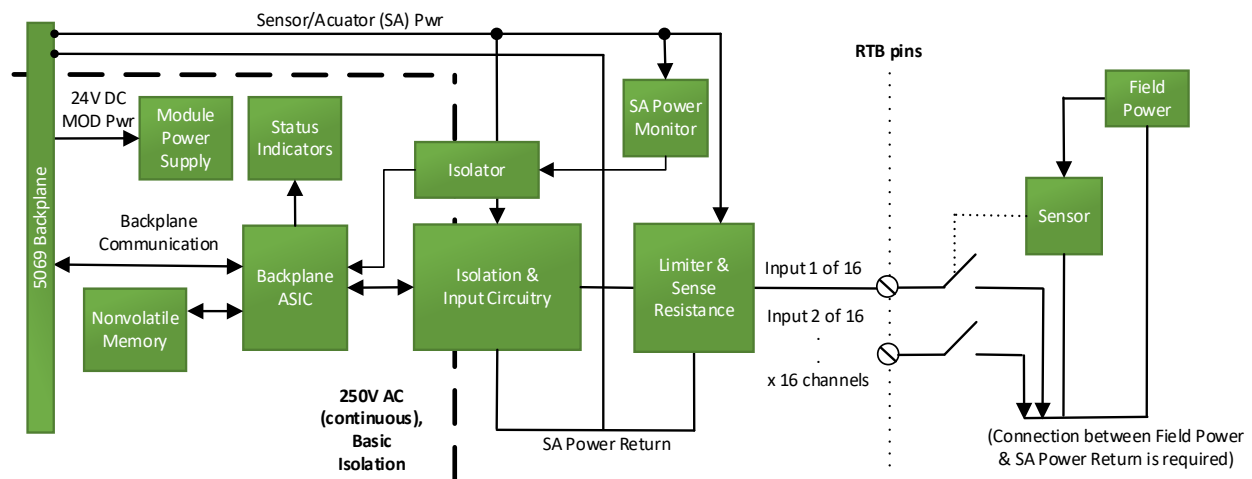
Section 1.5

System Overview and Module Operation

The 5069-IV16F-SC modules are expected to operate indefinitely with periodic shut-downs for maintenance. The module may operate attended or unattended. There are no backup or recovery operations requiring data storage and/or remote programming of the product.

The module communicates to the controller through the bus interface. The module also receives 24 VDC through the 5069 bus interface. A single row, 18-pin, removable terminal block is used to connect between the edge fingers of the 5069-IV16F-SC PCB and the 5069 backplane. The available RTB connection types are screw terminal or spring cage clamp.

Block diagram:



Chapter 2

Installation and Wiring

This chapter will cover:

- Compliance to European union directives.
- Power requirements.
- General considerations.
- Mounting.

Section 2.1 Compliance to European Union Directives

This product is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

The 5069-IV16F-SC module is tested to meet Council Directive 2014/30/EU Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 61131-2 Programmable controllers, Part 2 - Equipment requirements and tests.
- EN 61000-6-2 Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments.
- EN 61000-6-4 Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments.

UKCA Electromagnetic Compatibility Regulations 2016

- BS EN 61131-2, BS EN 61000-6-4, BS EN 61000-6-2

This product is intended for use in an industrial environment.

2.1.1 ATEX Directive

This product is tested to meet Council Directive 2014/30/U/ATEX, and the following standards, in whole or in part, documented in a technical construction file:

- EN 60079-0 Explosive atmospheres – Part 0: Equipment – General requirements.
- EN 60079-7 Explosive atmospheres – Part 7: Equipment protection by increased safety "e".

This module also meets the standards for the United Kingdom Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016:

- BS EN 60079-0
- BS EN 60079-7

2.1.2 Conformal Coating Standard

The conformally coated versions of the module meet or exceed the ANSI/ISA 71.04.2013 G3 Environment standard.

Section 2.2 Power Requirements

2.2.1 External power supply limitations

The power supply voltage provided via the 14-pin interface connector is 24 VDC nominal. The 24 VDC supply specification is 18 VDC minimum and 32 VDC maximum. The maximum amount of power that can be supplied from the controller is a maximum of 150 VA, or a current maximum of around 5 A. Surge/Inrush current requirements are such that the 24 V inrush current will not exceed 1 A.

A second 24 VDC power supply is provided via the backplane to run the field-side circuitry., This is the Sensor/Actuator Power Supply (SA Power). The field side circuitry is expected to require less than 150 mA from this supply.

- MP: 80 mA at 18 to 32 VDC.
- LA: 8 A at 10 to 32 VDC.
- OUT: 10 to 32 VDC, 0.5 A.

Section 2.3 Removable Terminal Block and Housing

The module mounts in a Compact 5000 chassis and uses a Removable Terminal Block (RTB) to connect all field-side wiring. RTBs are not included with your purchase.

When ordering RTBs, specify Allen Bradley Part Number:

- 5069-RTB-18 Spring RTB
- 5069-RTB-18 Screw RTB

You receive the following components with your RTB:

- The specified RTB housing.
- A generic RTB door label.

Use these components in all module applications.


Section 2.4 General Considerations

The 5069-IV16F-SC modules are suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2⁷).


⁷ Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is expected.

2.4.1 Hazardous Location Considerations


This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only. The following WARNING statement applies to use in hazardous locations.

<p>WARNING</p> 	<p>EXPLOSION HAZARD</p> <ul style="list-style-type: none"> • Substitution of components may impair suitability for Class I, Division 2; Class II, Division 2. Do not replace components or disconnect equipment unless power has been switched off or the area is known to be non-hazardous. • Do not connect or disconnect components unless power has been switched off or the area is known to be non-hazardous. • This product must be installed in an enclosure. • All wiring must comply with N.E.C. article 501-4(b), 502-4(b), or 503-3(b), as appropriate for Class I, Class II, and Class III equipment. • These DC-type modules MUST be installed on an SA power bus that is separated from an SA power bus containing AC-type modules.
---	---

2.4.2 Prevent Electrostatic Discharge

<p>WARNING</p> 	<p>Electrostatic discharge can damage integrated circuits or semiconductors if you touch the module card bus connector pins or the terminal block on the output module. Follow these guidelines when you handle the module:</p> <ul style="list-style-type: none"> • Touch a grounded object to discharge static potential. • Wear an approved wrist-strap grounding device. • Do not touch the bus connector or connector pins. • Do not touch circuit components inside the module. • If available, use a static-safe workstation. • When it is not in use, keep the module(s) in a static-shield bag.
---	--

2.4.3 Remove Power

WARNING 	<p>This module is NOT designed to be hot-swapped and may be damaged if added or removed while power is applied. Remove power before removing or inserting this module.</p> <p>When you remove or insert a module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:</p> <ul style="list-style-type: none">• Sending an erroneous signal to your system's field devices, causing unintended machine motion.• Causing an explosion in a hazardous environment.• Causing an electrical arc. Electrical arcing causes excessive wear to contacts on both the module and its mating connector and may lead to premature failure.
---	---

2.4.4 Selecting a Location


Reducing Noise

Most applications require installation in an industrial enclosure to reduce the effects of electrical interference. Group your modules to minimize adverse effects from radiated electrical noise and heat. Consider the following conditions when selecting a location for the analog module. Position the module:

- Away from sources of electrical noise such as hard-contact switches, relays, and AC motor drives.

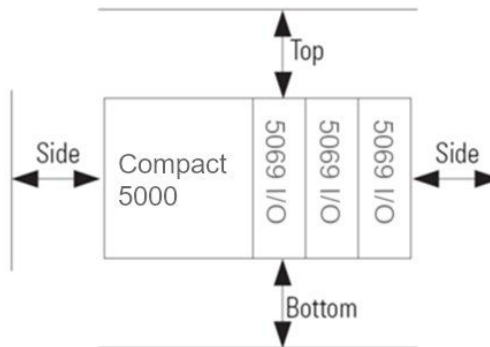
In addition, route wiring away from any high-voltage I/O wiring.

Section 2.5 Mounting

WARNING 	<p>Keeping module free of debris and avoiding overheating:</p> <ul style="list-style-type: none">• Do not remove protective debris strip until after the module and all other equipment near the module is mounted and the wiring is complete.• Once wiring is complete, and the module is free of debris, carefully remove protective strip.• Failure to remove strip before operating can cause overheating.
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2.5.1 Minimum Spacing

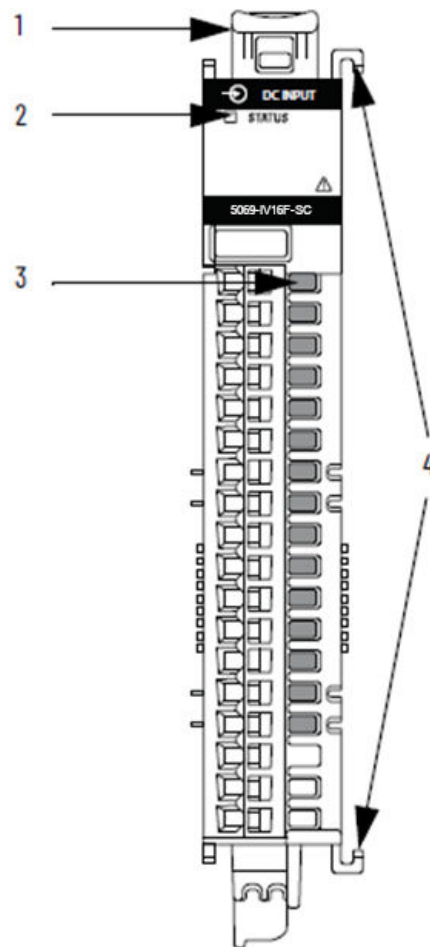
Maintain spacing from enclosure walls, wire ways, adjacent equipment, etc. Allow 50.8 mm (2 in.) of space on all sides for adequate ventilation, as shown:

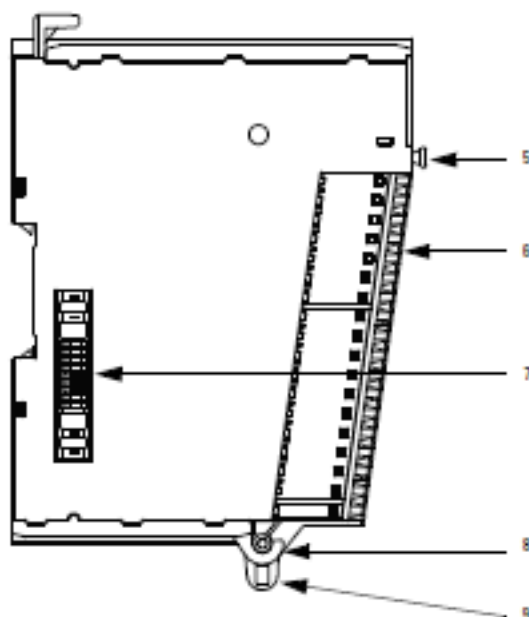


2.5.2 Parts List

Your package contains one Compact 5000 I/O 5069-IV16F-SC Module and one Quick Start Guide.

2.5.3 Module Description







	Item	Description
1	DIN rail mounting latch	Locks the module on the DIN rail.
2	Module and power status indicators	Standard modules: <ul style="list-style-type: none"> • STATUS - Displays the status of communication and module health. Safety modules: <ul style="list-style-type: none"> • MOD Status - Displays the status of communication and module health. • SA - Displays whether SA power is applied to the module.
3	I/O status indicators	Displays the status of the input/output point.
4	Interlocking pieces	Securely installs Compact 5000 I/O digital modules in the system.
5	RTB handle	Anchors the RTB on the module.
6	RTB	Provides a wiring interface for the module.
7	MOD power bus and SA power bus connectors	Pass system-side and field-side power across the internal circuitry of the module in a Compact 5000 I/O system. The connectors are isolated from each other.
8	RTB lower tab	Hooks RTB onto the module to begin installation.
9	Lower hook	Used with cable tie after you wire the module.

You can choose to wire the expansion I/O module before installing it next to the controller or wire it once the module is secured in place.

Place the module next to the controller against the panel where you are mounting it. Make sure the controller and module are spaced properly.

<p>WARNING</p> 	<ul style="list-style-type: none"> • This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR 11. Without appropriate precautions, there may be difficulties with electromagnetic compatibility in residential and other environments due to conducted and radiated disturbance. • Be careful when stripping wires. Wire fragments that fall into the controller could cause damage. Once wiring is complete, make sure the controller is free of all metal fragments before removing the protective debris strip. • Do not wire more than 2 conductors on any single terminal. • If you insert or remove the expansion I/O module while power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.
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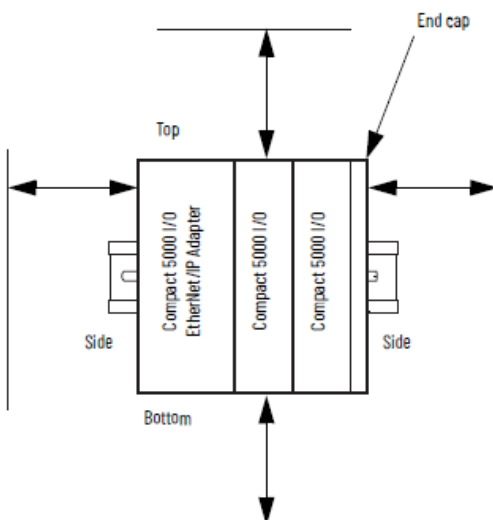
<p>NOTE</p> 	<p>The module expansion may only be mounted horizontally and vertically. To mount vertically you need to use a 5069-AENTR adapter. When mounting this module vertically, the operating ambient temperature in the AENTR document states the temperature must be derated to 42 °C (108 °F).</p>
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Mounting Dimensions and DIN Rail Mounting

The minimum distances on all sides of the adapter system are as follows:

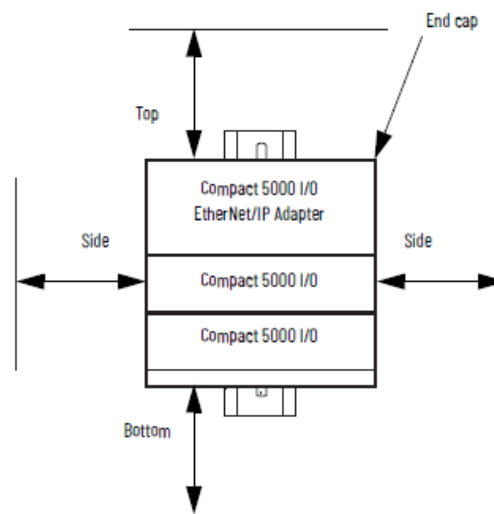
- 25.40 mm (1.00 in) - If the system uses only Compact 5000 I/O standard modules.
- 50.80 mm (2.00 in) - If the system uses at least one Compact 5000 I/O safety module.

Horizontal Mounting




Vertical Mounting

Only the 5069-AENTR adapter supports vertical mounting.




You can install the module on DIN rails of dimension 35 mm × 7.5 mm × 1 mm (EN 50 022 – 35 × 7.5) or EN50022 - 35 x 15 mm (1.38 x 0.59 in.)

<p>WARNING</p> 	<p>Hazard of intermittent grounding.</p> <p>This product is grounded through the DIN rail to chassis ground. To assure proper grounding, use zinc-plated, yellow-chromate steel DIN rail. Using other DIN rail materials such as aluminum or plastic, that can corrode, oxidize, or are poor conductors, may result in improper or intermittent grounding.</p> <p>Use the correct DIN rail type, and secure DIN rail to mounting surface approximately every 200 mm (7.8 in.) and use end-anchors appropriately.</p>
---	---

1. Before mounting the module on a DIN rail, use a flat-bladed screwdriver in the DIN rail latch and pry it downwards until it is in the unlatched position.
2. Hook the top of the DIN rail mounting area of the module onto the DIN rail, and then press the bottom until the module snaps onto the DIN rail.
3. Push the DIN rail latch back into the latched position. Use DIN rail end anchors for vibration or shock environments.

2.5.4 Installing a Local I/O Module


To install a local module:

<p>WARNING</p> 	<p>The end cap in a CompactLogix 5380, CompactLogix 5480, or Compact GuardLogix 5380 control system covers the exposed interconnection on the last module on the DIN rail.</p> <p>If you do not install an end cap on the last module on the DIN rail, injury to personnel or damage to equipment may occur.</p>
---	--

1. Install a Compact GuardLogix 5380 controller.
2. Install the digital I/O module(s) to the right of the controller.
3. Install the end cap on the last module in the local system.

2.5.5 Remote I/O Modules

To install a remote module:

<p>WARNING</p> 	<p>The end cap in a CompactLogix 5380, CompactLogix 5480, or Compact GuardLogix 5380 control system covers the exposed interconnection on the last module on the DIN rail.</p> <p>If you do not install an end cap on the last module on the DIN rail, injury to personnel or damage to equipment may occur.</p>
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1. Install a controller that is compatible with the remote Compact 5000 I/O digital modules to be used in the application via an EtherNet/IP network.

2. Install an EtherNet/IP network.
3. Connect the controller to the network.
4. Install a Compact 5000 I/O EtherNet/IP adapter.
5. Connect the adapter to the network.
6. Install the 5069 module to the right of the adapter.
7. Install the end cap on the last module in the local system.
8. For information on how to install compatible controllers, adapters, and Compact 5000 I/O modules, see the publications that are listed earlier in this manual.

2.5.6 How Power Flows Through the Modules

Compact 5000 I/O digital modules receive the following power types from first component in the system, that is, the controller or adapter:

- **System-side Power.** Powers the system and lets modules transfer data and execute logic.
System-side power is provided through the Module (MOD) Power connector and is passed to each module as it is added to the system.
System-side power is also known as **MOD power**.
- **Field-side Power.** Powers field-side devices that are connected to some Compact 5000 I/O digital modules.
Field-side power is provided through the Sensor/Actuator (SA) Power connector and is passed to each module as it is added to the system.
Field-side power is also known as **SA power**.

Power begins at the leftmost device in the system and passes across the I/O module internal circuitry via power buses. The MOD power bus and SA power buses are isolated from each other. The leftmost device is either a controller or an EtherNet/IP adapter.

Remember the following:

- A system has only one MOD power bus.
- A system can have multiple SA power buses. The first SA power bus typically starts at the controller or adapter, and 5069-FPD field potential distributors let you establish new SA power buses in the same system.
- Compact GuardLogix 5380 controllers only:
 - You must use an SELV/PELV-listed power supply to provide MOD power and SA power to the controller.
 - Additional requirements exist when you power a functional safety application that includes Compact 5000 I/O safety modules.

2.5.7 Wiring Diagram

The RTB pins are identified by numbers that are raised above the surface of the RTB adjacent the screw or slot.

The example shows devices connected to channels 1, 2, and 5. You are not restricted to using only those channels. You may connect devices to any channel or combination of channels as needed.

2.5.8 Connecting to SA Power

Connections to an external power supply that provides SA power via the SA Power RTB on one of the following:

- CompactLogix 5380 controller.
- Compact GuardLogix 5380 controller.
- CompactLogix 5480 controller.
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter.
- 5069-FPD field potential distributor.

Remember the following:

- The 5069-IV16F-SC module uses DC SA power.
- You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- The 5069-IV16F module inputs use a shared common. The inputs are powered through internal module circuitry to the SA (+). Switch and sensor current must return externally to the same power supply ground, SA (-).
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You must install a 5069-FPD (field potential distributor) to the left of the 5069-IV16F to provide the connection points for field power supply to the controller. The 5069-IV16F-SC module provides power from the backplane to run field side circuitry but does not provide connections for an external power supply, or connection to power external sensors.

To keep the modules on separate SA Power buses, install as follows:

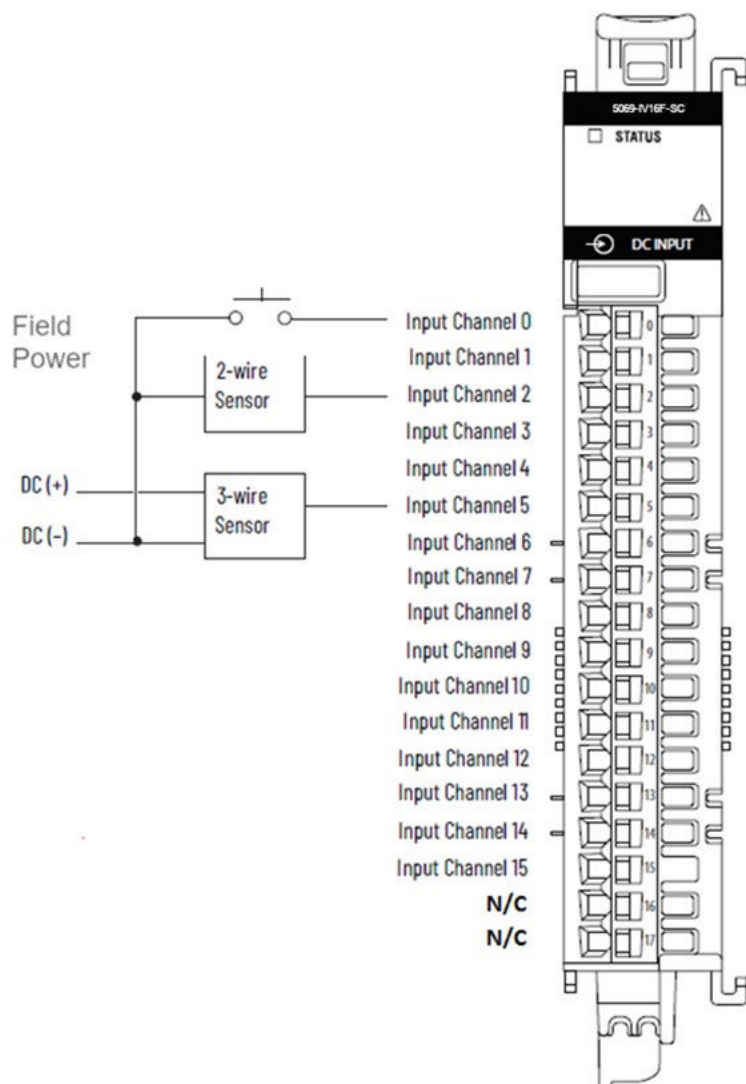
1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.

NOTE



Keep the following in mind:

- Either switches or variable resistance can be used as inputs. These are IEC 61131-2 type 3 inputs, and will “digitize” a resistance value, that is, if the resistance provides an input current that is lower or higher than the specification limits, the input will be reported to the controller as open or closed by the module. Unconnected pins (as shown) are acceptable and will be read as open by the module.
- Channel Connections: The wiring diagram shows devices that are connected to channels 0, 2, and 5. You are not restricted to using only those channels. You can connect devices to any channel or combination of channels as needed.
- The Field Power supply negative and the SA power negative must be connected; this must be external to the module.



Wire the module using the images, which explain the layout of the 18-pin terminal block:

RTB#	Name	Description
0	In-0	Channel 0 Input
1	In-1	Channel 1 Input
2	In-2	Channel 2 Input
3	In-3	Channel 3 Input
4	In-4	Channel 4 Input
5	In-5	Channel 5 Input
6	In-6	Channel 6 Input
7	In-7	Channel 7 Input
8	In-8	Channel 8 Input
9	In-9	Channel 9 Input

RTB#	Name	Description
10	In-10	Channel 10 Input
11	In-11	Channel 11 Input
12	In-12	Channel 12 Input
13	In-13	Channel 13 Input
14	In-14	Channel 14 Input
15	In-15	Channel 15 Input
16	NC	
17	NC	

Chapter 3

Configuring the 5069-IV16F-SC

Using Studio 5000

This chapter covers the following subjects:

- System Introduction.
- Controller Ownership of I/O Modules.
- Configuration Changes in a Standard Input Module with Multiple Owners.
- How to use Studio 5000 to configure the Module.
- Software Versioning.
- System Updates.
- System Functions.

Section 3.1 System Introduction

You use Studio 5000 software (v 28 and above) to configure the 5069-IV16F-SC Modules. Your controller firmware must be at v.28 and above as well. The software provides a module-specific Add-On Profile (AOP) to operate the module. Before you begin installing your module, you need to have completed the system installation steps in Chapter 2 so that you have a working system with either a local I/O module or a remote I/O installed. Other conditions must also be met, as explained in the following sections.


Section 3.2 Controller Ownership of I/O Modules

For the 5069-IV16F-SC to function In a Studio 5000 control system, a controller must own the module. The controller that owns the input module performs the following functions:

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

You can connect multiple Logix 5000 controllers to the input module.

Conditions for multiple connections are:

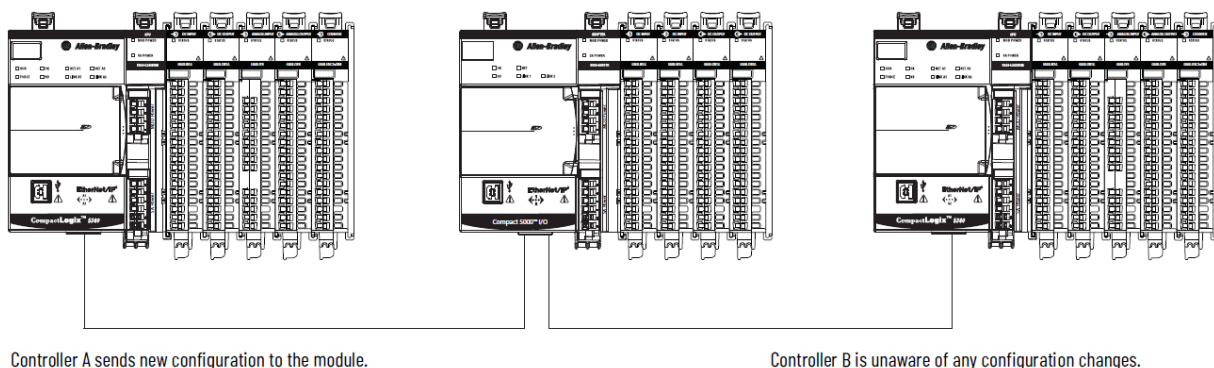
<p>NOTE</p> 	<p>If the controller that owns the module configuration changes the configuration, the other controllers are not notified of the changes.</p>
--	---

- The controllers maintain the same configuration.
- The configuration in each controller uses a **Data** or a **Data with Events** connection to the input module.
- The first controller to make a connection to the input module is the only controller that can change the connection. Therefore, it 'owns' the module configuration.
- The controllers that do maintain, but do not 'own', the module configuration are similar to Listen-only controllers.
- The difference between the controllers is that the controllers that maintain, but do not own, the module configuration can use a Multicast or Unicast connection over the EtherNet/IP network.

Section 3.3 Configuration Changes in a Standard Input Module with Multiple Owners

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

Module Configuration Changes with Multiple Owners



NOTE

A message in the Logix Designer application alerts you to the possibility of a multiple owner-controller situation and lets you inhibit the connection before changing the module configuration. When changing the configuration for a module with multiple owners, we recommend that you inhibit the connection.

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

1. For each owner-controller, inhibit the connection to the module either in the software on the Connection tab or the message dialog box warning you of the multiple owner condition.
2. Make the appropriate configuration data changes in the software.
For more information on how to use the Logix Designer application to change the configuration, refer to the Compact 5000 I/O Analog Modules User Manual, PN 5069-UM005.
3. Repeat step 1 and step 2 for all owner-controllers, to make the exact same changes in each.
4. Clear the Inhibit checkbox in each owner-controller configuration.

Section 3.4 Before You Configure the Module

You must create a Studio 5000 application project for the controller that owns the Compact 5000 I/O digital modules. The project includes module configuration data for the module.

The Logix Designer application transfers the project to the owner-controller during the program download. Data is then transferred to the I/O modules either across the backplane or over an EtherNet/IP network.

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

3.4.1 Connections with Compact 5000 I/O Digital Modules

During module configuration, you must define the module. Among the Module Definition parameters with Compact 5000 I/O digital modules, you must choose a connection type for the module. A connection is a real-time data transfer link between the owner-controller and the module that occupies the slot that the configuration references. When you download a module configuration to a controller, the controller attempts to establish a connection to each module in the configuration. Because part of module configuration includes a slot number in the local or remote system, the owner-controller checks for the presence of a module there. If a module is detected, the owner-controller sends the configuration.

One of the following occurs:

- If the configuration is appropriate to the module detected, a connection is made, and operation begins.
- If the configuration is not appropriate to the module detected, the data is rejected, and the Logix Designer application indicates that an error occurred.
- The configuration can be inappropriate for many reasons. For example, a mismatch in electronic keying that helps prevent normal operation.

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

Section 3.5

Configuring the Module with Studio 5000

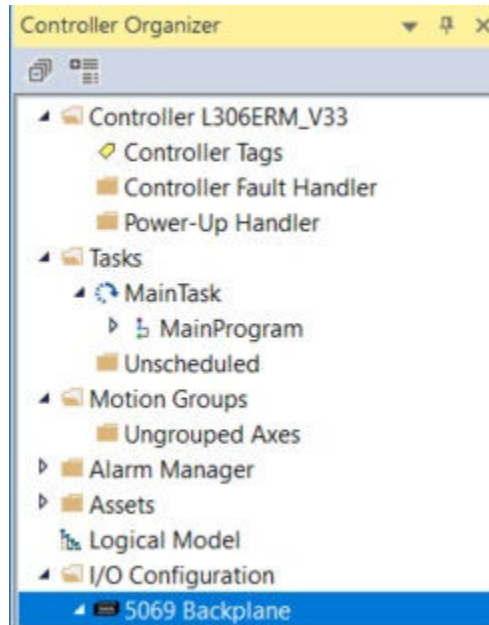
Before you start, if needed, install the latest version of Rockwell Automation's Studio 5000.

You use the module's AOP to operate your module. The AOP is available in the Studio 5000 software from version 28. If the AOP is not available, or a newer revision is released, see Appendix A about how to manually import the module AOP to Studio 5000.

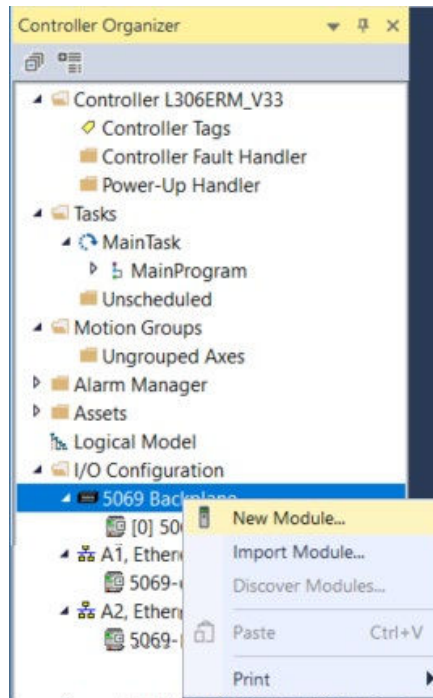
To install a local module, that is, one that is installed on the same DIN rail as the controller:

1. If needed, install a current copy of the correct AOP software. Refer to Appendix A, Manually Importing an AOP.
If this is not available, install a generic module and modify it instead.
2. Start up your Studio 5000 software.

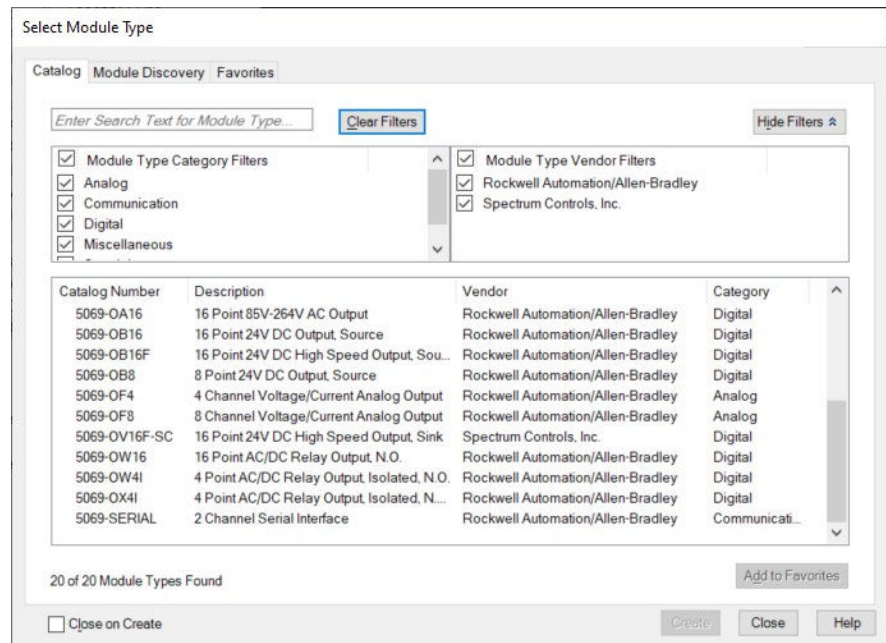
3. In the Controller Organizer panel, select the **5069 Backplane** in which you have already physically installed the new module:



4. Right click on the selected backplane or controller, and from the popup menu, select **New Module**:

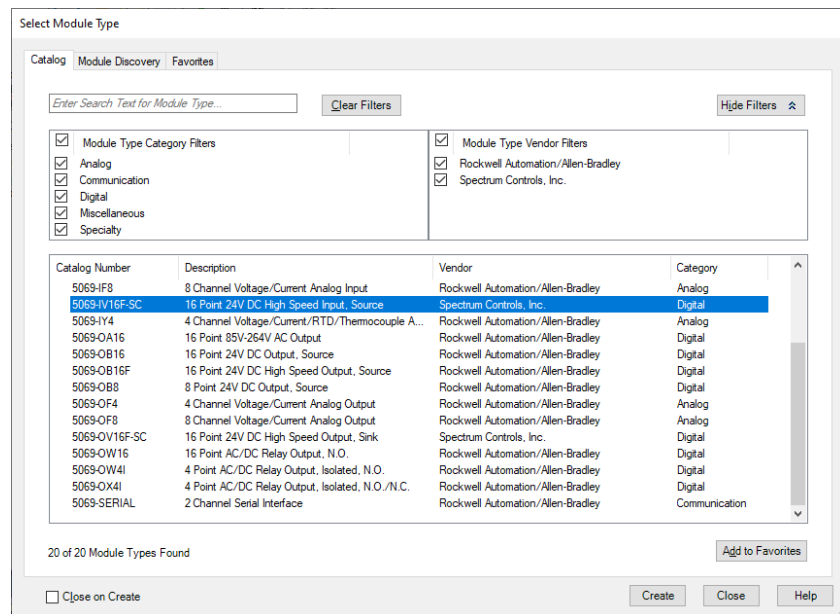


The Select Module Type dialog appears:



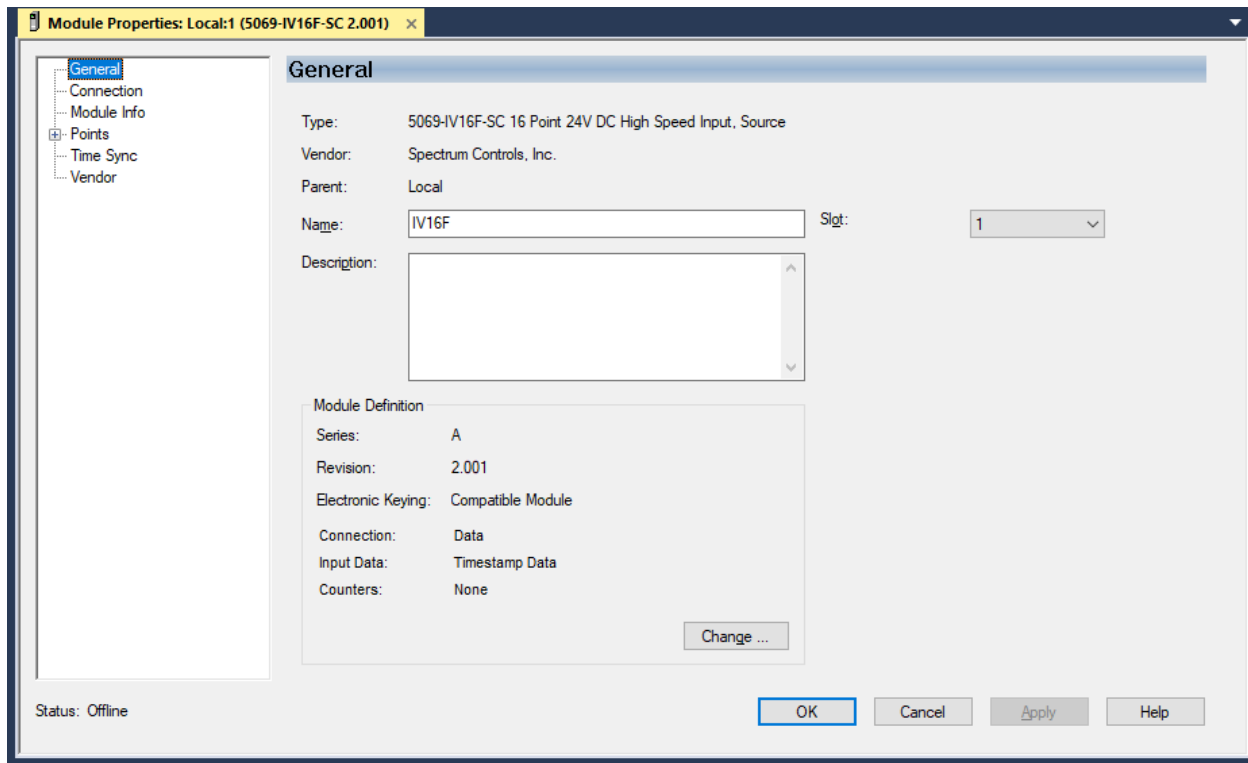
5. You can filter to reduce the number of modules in the Catalog Number list by selecting the **Digital** category.

You can also just scroll down the list of Catalog Numbers to locate the 5069-IV16F-SC type of module:



6. To configure the module for addition to the 5069 backplane, select the entry and click **Create**.

A listing for the selected module appears in the Controller Organizer tree and the following New Module dialog appears:



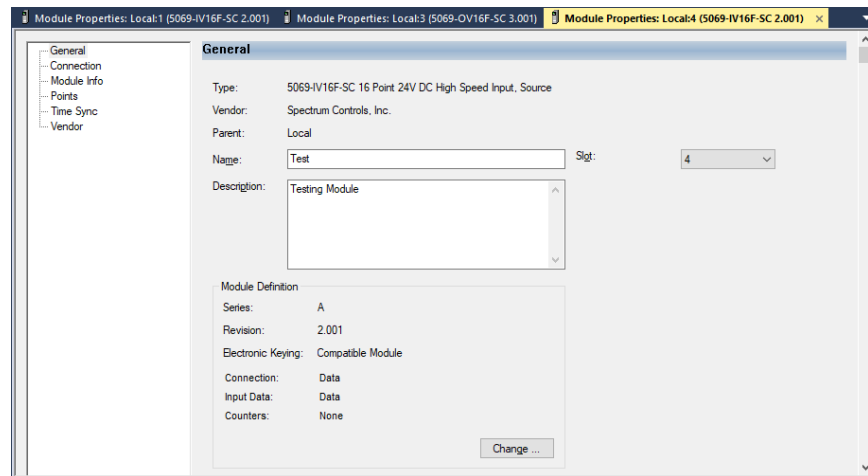
There are six categories to review and/or configure:

- **General.** Identifies the general type of the product.
- **Connection.** Lists options for specifying data connection speeds and related settings.
- **Module Info.** Displays module and status information about the module when the project is online.
- **Points.** Lists the configuration options available for each point so that you can configure the associated point parameters.
- **Time Sync.** Time synchronizes the module so that schedules can be applied.
- **Vendor.** Identifies the device manufacturer.

3.5.1 Specifying General Options

The General option provides the module identity information.

1. To define, access the General dialog:



2. View or specify the following options:

- **Example: 5069-IV16F-SC 16 Point 24V DC High Speed Input. Source.**
 - **Vendor.** Lists the device manufacturer. Example: **Spectrum Controls, Inc.** Not editable.
 - **Parent.** Displays the name of the parent module. If the module is in the local chassis, Local displays. Example: **Local.** Not editable.
 - **Name.** The name of the controller. The name must be IEC 61131 compliant. If an invalid character is entered in this field, or if the name exceeds 40 characters, the software ignores the character. You cannot change the name when online. Example: **IV16F.**
 - **Description.** Provides a text box for you to enter descriptive information about the module and/or system.
 - **Slot.** Specifies the slot number where the module resides. Only slots between 1 and the maximum number of I/O modules are valid depending on the platform. When the module is created, the slot number defaults to the first available slot position. Not editable.
 - When the controller is changed to one supporting a smaller maximum I/O count, the current slot value may no longer be valid.
 - **Module Definition.** Provides the following information:
 - ✦ Series. List series of module.
 - ✦ Revision. A value that represents the functional capabilities (Major) and behavior changes (Minor) to a device. Example: **2.001.**
 - ✦ Electronic keying. This option prevents the

inadvertent connection to a module of the wrong type. The following fields are checked for either an exact match, or a compatible match:

- Vendor.
- Product Type.
- Catalog Number.
- Major Revision.
- Minor Revision.

During initial module configuration, select one of the following keying options:

- Exact Match. All of the listed parameters must exactly match, or the newly installed module will reject the connection.
- Compatible Module. The following fields may match as follows:
 - Major revision. Field does not need to match as long as the module in the chassis is greater than, or equal to, the software's configuration's major revision.
 - Minor revision. Field of the physical module must be equal to, or greater than, the one specified in the software.

DANGER



Hazard of personnel death or injury, damage to property, or economic loss if keying is disabled.

Disabling keying could lead to a module being incorrectly connected to a programmable logic controller, resulting in loss of connection and/or improper controller function.

When using this feature, exercise extreme caution.

- Disable Keying. When selected, the controller employs no keying to check whether it is connected to a compatible module.

- Connection. The connection format for the module.
- Input Data. Specifies the connection type which creates all controller tags specific to the module type being used.

Options are:

- ✦ Data. Data with individual Boolean member.
- ✦ Timestamp Data. Timestamping registers a time reference to a change in input data. For more information about how this works, see Timestamping Per Point Sequences of Events later in this chapter.
- ✦ Packed Data. Concise data format for integer access.

- Counters. Specifies **4**, **8**, or **None**. A module counts input pulses up to a defined maximum frequency. For more information about how counters function, see Using Simple Count Mode later in this chapter.

To change any of the data selections in the Module Definition options, click **Change** and make new selections from the Module Definition dialog:

The screenshot shows the 'Module Definition' dialog box. It contains the following fields and values:

- Series:** A dropdown menu with 'A' selected.
- Revision:** A dropdown menu with '2' selected, and a text box containing '001'.
- Electronic Keying:** A dropdown menu with 'Compatible Module' selected.
- Connection:** A dropdown menu with 'Data' selected.
- Input Data:** A dropdown menu with 'Data' selected.
- Counters:** A dropdown menu with 'None' selected.

At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Help'.

When finished, to save your changes and return to the previous dialog, click **OK**.

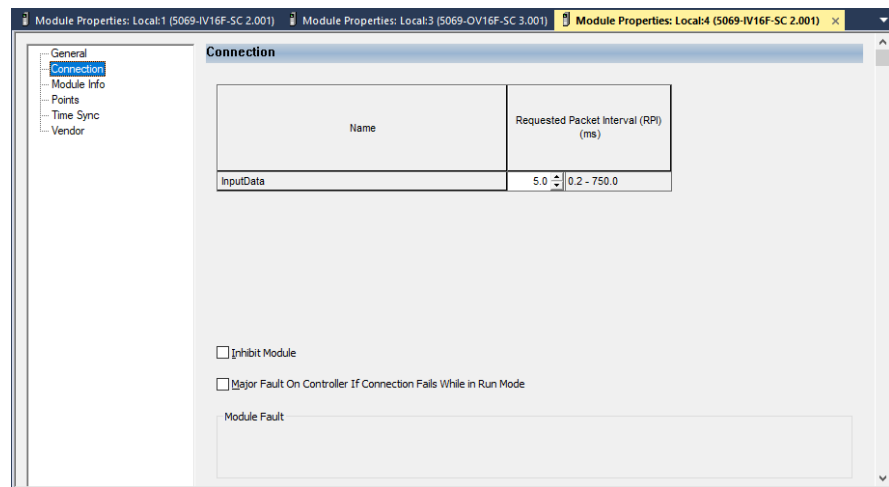
- **Status**. Displays the status of the module:
 - Standby. A transient state that occurs when shutting down the connection to the module.
 - Faulted. The controller is unable to communicate with the module. When the status is Faulted, the Connection tab displays the fault.
 - Validating. A transient state that occurs before connecting to the module.
 - Connecting. A state that occurs when establishing a connection with the module.
 - Running. The module is communicating, and everything is working as expected.
 - Shutting down. The connections to the module are closing.
 - Inhibited. The connection to the module is inhibited.
 - Waiting. A connection to this module was not made because:
 - ✦ Its parent has not yet made a connection to it.
 - ✦ Its parent is inhibited.
 - ✦ Its parent is faulted.
 - Offline. You are not online with the controller.
- **OK**. Selects dialog choices and/or changes.

- **Cancel.** Cancels changes made to the dialog.
- **Apply.** Applies changes made to the dialog to the selected module.
- **Help.** Opens the module's online help.

3.5.2 Specifying Connection Options

Connection options set up connection parameters.

1. Access the Connection dialog:



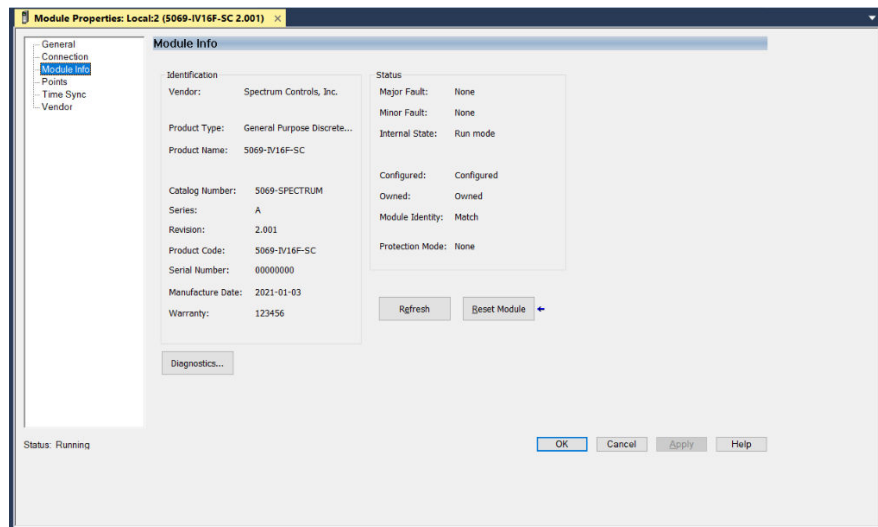
2. View or specify the following options:

- **Requested Packet Interval (RPI) (ms).** Sets the RPI rate. This is the rate at which the owner-controller and the module exchange data. For more information about RPI and valid settings, refer to Compact 5000 I/O Digital Modules documentation, PN 5069-UM004.
- **Number (0.2 – 750.0).** Sets RPI interval in milliseconds according to the listed range.
- **Inhibit Module.** When selected, allows you to indefinitely suspends a connection between an owner-controller and the module without removing the module from the configuration. Inhibiting the module temporarily disables a module so you can perform an operation such as servicing it. For more information about inhibiting a module, refer to Compact 5000 I/O Digital Modules documentation, PN 5069-UM004.
- **Major Fault on Controller if Connection Fails While in Run Mode.** Sets whether a connection failure while the controller is in Run module causes a major or minor fault.
- **Module Fault.** Displays information about a module fault that has occurred to aid you in troubleshooting the issue.

3.5.3 Specifying Module Info Options

Module Info options display module and status information. You use this information to determine the identity of the module, to access module diagnostics, refresh data on the screen, and to reset the module.

1. Access the Module Info dialog:




View or specify the following options:

- **Identification.** Displays information that identifies the module such as vendor, product type, product name, catalog number, series, revision, product code, serial number, manufacture date, and warranty number.
The product name is read from the module.
Not editable.
- **Status.** Major/Minor Fault Status. Displays whether there is a major and minor fault. Not editable.
For a digital module, these options are available:
 - EEPROM fault.
 - Backplane fault.
 - None.
- **Internal State Status.** Displays the module's current operational state. Not editable.
- **Configured.** Displays **Yes** or **No** indicating whether the module was configured by the owner controller connected to it.
Once a module is configured, it stays configured until the module is reset or power is cycled, even if the owner drops connection to the module.
This applies only to I/O modules. Not editable.
- **Owned.** Displays **Yes** or **No** indicating whether an owner controller is currently connected to the module.
This applies only to I/O modules. Not editable.
- **Module Identity.** Displays whether the physical module matches or mismatches with the configuration on General. Not editable.
- **Protection Mode.** Displays the protection mode of the module when online. The protection mode depends on the module and may include:

- Explicit protection.
- Implicit protection.

When the module is offline or if a communication failure to the module occurs, the field is blank. Not editable.

- **Refresh.** Retrieves and displays the latest values from the module.
- **Reset Module.** Initiates a reset operation on the module, which returns the module to its power-up state by emulating the cycling of power.

<p>NOTE</p> 	<p>IMPORTANT: Resetting a module causes all connections to, or through, the module to be closed, which may result in loss of control.. You cannot reset the module if either of the following conditions exist:</p> <ul style="list-style-type: none"> • There are pending edits to the module properties. • When a safety signature exists in the controller project.
--	---

- **Diagnostics.** Module diagnostics provide information on a module-wide basis. For example, the Module Diagnostics dialog box indicates the mode within which a module is operating, that is, **Run**, **Remote Run**, **Remote Program**, or **Program**. For more information about diagnostics, refer to Compact 5000 I/O Digital Modules documentation, PN 5069-UM004.
- **OK.** Selects dialog choices and/or changes.
- **Cancel.** Cancels changes made to the dialog.
- **Apply.** Applies changes made to the dialog to the selected module.
- **Help.** Opens the module's online help.
- **Status.** Lists current module status. The digital input module multicasts fault and status data with point data to the owner and listening controllers. The data is returned via modules that you can monitor in your Studio 5000 application. More information about fault and status reporting is provided in the Fault and Status Reporting section later in this chapter.

3.5.4 Specifying Points Options

You can increase the time that it takes for an input point to transition from On to Off and Off to On for Compact 5000 I/O digital input modules. 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. This option also helps prevent rapid changes of the input data due to contact bounce.

The **Input Filter Time** parameter can be configured for each point on the module:

NOTE

Keep in mind the following:

The input filter time defines how long an input signal transition must remain in the new state before the transition is valid and the input changes state. Input and Event timestamps are only recorded with valid transitions.

A transition is only valid if the input signal remains in the new state for the entirety of the filter duration. If the input changes state again before the chosen input filter time elapses, the transition is not valid.

The input filters work the same whether the transition is a simple state transition or when the state transition triggers an Event.

For more information, refer to Compact 5000 I/O Digital Modules documentation, PN 5069-UM004.

NOTE

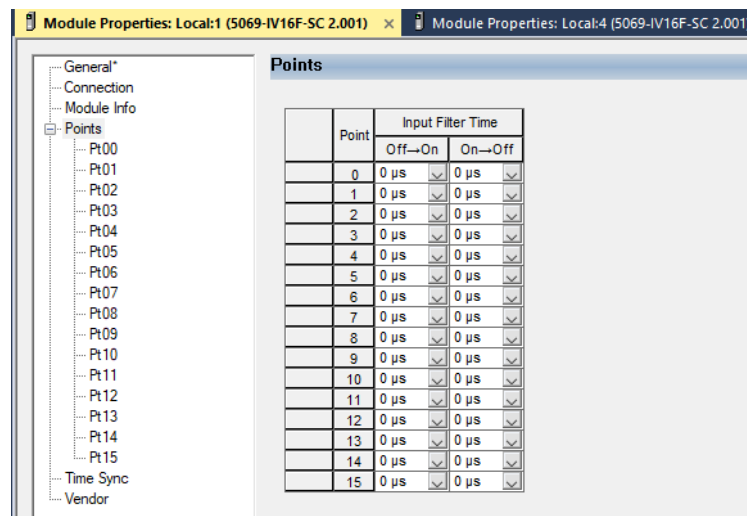
IMPORTANT. The Logix Designer application lets you choose filter time values that are invalid for some input signals.

For example, the only valid Off to On filter value when a 120 VAC signal is connected to the module is 1 ms. However, you can choose 1 ms, 2 ms, or 5 ms.

Make sure that you select a valid input filter value when you configure the module. If you select an invalid input filter value, the module can read signal levels incorrectly.

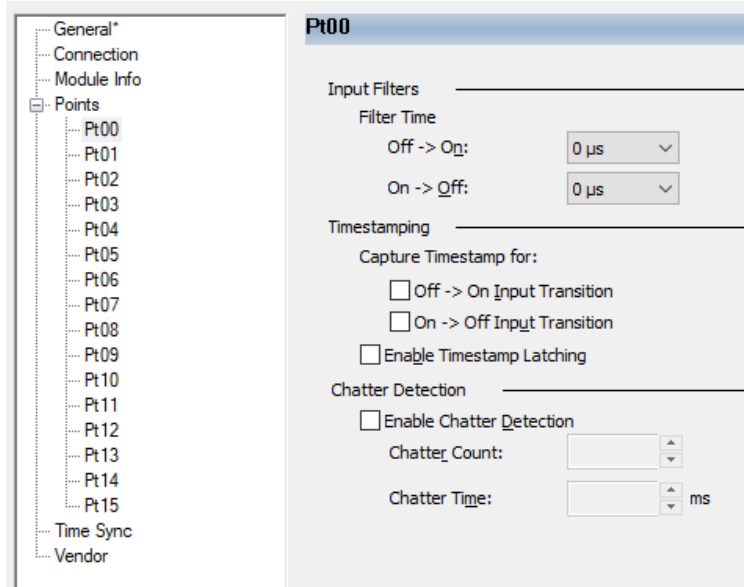
For more information, refer to Compact 5000 I/O Digital Modules documentation, PN 5069-UM004.

1. Access the Points dialog:



2. Select one of the above **Off -> On**, **On -> Off** options for each point in the list and select the number of μs to delay the transition from Off to On, and/or On to Off for that point. You can make these selections from the Points list on the right, or you can select individual Points from the expanded Points list on the right.

Selecting any point from the list on the right brings up the following dialog:



3. View or specify the following options:

- **Input Filters.** Define time it takes for an input point to transition between on and/or off states:
 - Filter Time.
 - ✦ *Off -> On $n \mu s$.* Select to define an off-to-on state and the time for that state to transition.
 - ✦ *On -> Off $n \mu s$.* Select to define an on-to-off state and the time for that state to transition.
- **Timestamping.** Timestamping registers a time reference to a change in input data. CIP Sync™ is used for timestamping. The module provides sub-millisecond timestamping on a per point basis. Time stamp values have a $\pm 10 \mu s$ accuracy and $1 \pm ns$ resolution. For detailed implementation information, refer to Compact 5000 I/O Digital Modules documentation, PN 5069-UM004.
 - Capture Timestamp for:
 - ✦ *Off -> On $n \mu s$ Input Transition.* Select to latch short duration off-to-on pulses.
 - ✦ *On -> Off $n \mu s$ Input Transition.* Select to latch short duration on-to-off pulses.
 - Enable Timestamp Latching. Select to turn on timestamp latching.
- **Chatter Detection.** Chatter occurs when the device causes the inputs to transition in error many times in a relatively short period. As a result, the module timestamps invalid input transitions. Use this option to detect when a device that is connected to an input module causes chatter:
 - Enable Chatter Detection. Turns on chatter detection:
 - ✦ *Chatter Count.* Determines the number of acceptable input transitions that can occur in a given time

period before considering the input to be chatter. Range is 2 to 127.

- ✦ *Chatter Time n ms.* Determines the amount of time within which the number of input transitions are counted. Range is 1 to 1000 ms.

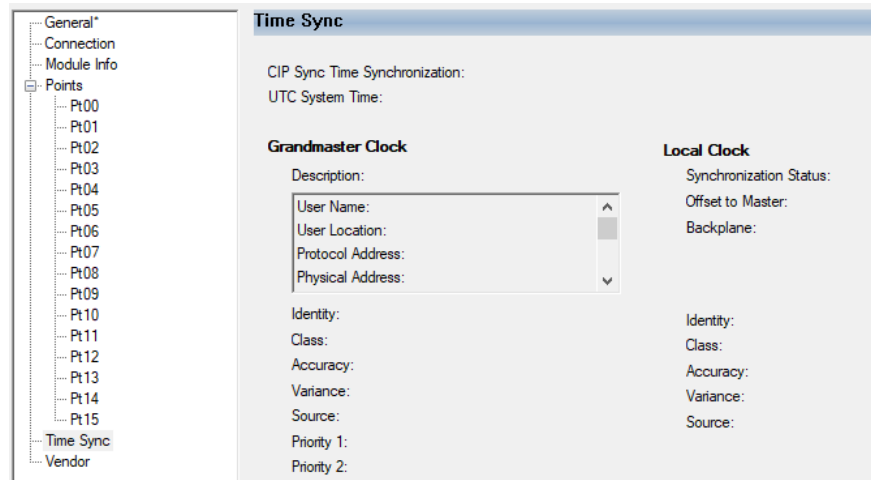
For more information about specifying point options, refer to Configurable Point-level Output State in Program Mode or Communications Fault Mode later in this chapter.

3.5.5 Time Sync

Viewing Time Sync displays time synchronization and status information about the module when the project is online.

For more information about how this option works, see Use CIP Sync Time with Fast I/O Modules, later in this chapter.

1. Access the Time Sync dialog:



2. View the following options:
 - **CIP Sync™ Synchronization.** Provides accurate real-time (Real-World Time) or Universal Coordinated Time (UTC) synchronization of controllers and devices that are connected over CIP networks.
 - **UTC System Time.** Show current UTC system time.
 - **Grandmaster Clock.** Shows master clock time on the module on the network that is functioning as the master clock.
 - **Local Clock.** Shows time on module.

3.5.6 Vendor Information

The Vendor options list Name, Address, Contact, and Technical Support information for the module manufacturer:



3.5.7 Software Versioning

The software version tracks major and minor revisions for end users.

The shipped software version begins at version 2.*n*.

Once released, the major revision is typically incremented if new features are introduced to the product. Otherwise only the minor revision is incremented.

3.5.8 Software Updates

In-field updating of the software by the end user is not supported.

Section 3.6 System Functions

3.6.1 Data Transfer at RPI or Change of State

Digital input modules always send data at the Requested Packet Interval (RPI), but they send data at a change of state only if the Change-of-State (COS) feature is enabled.

- **RPI**

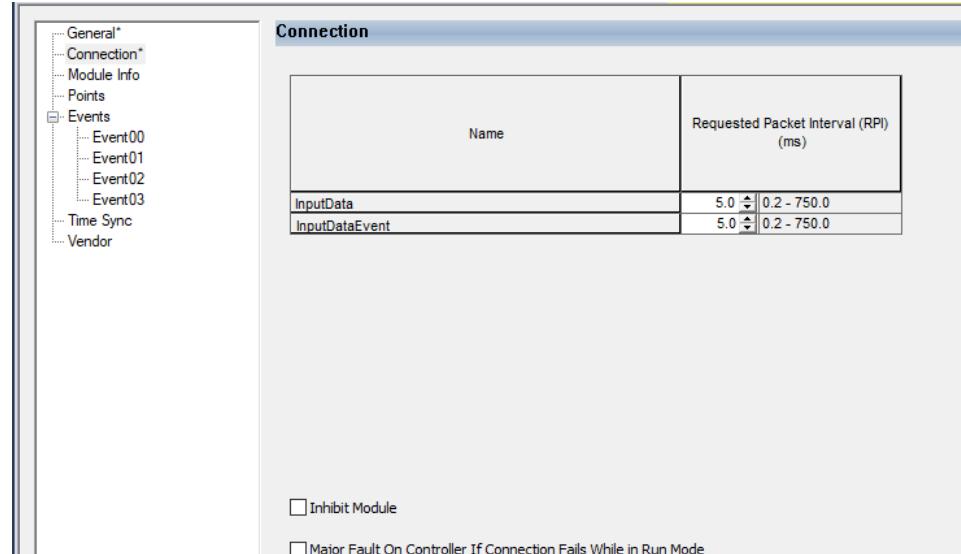
RPI is a user-defined rate at which the module updates the information that is sent to its owner-controller.

- **COS**

COS is a configurable feature that, when enabled, instructs the module to update its owner-controller with new data whenever a specified input point transitions from **On** to **Off** and **Off** to **On**. The data is sent at the RPI rate when there is no change of state. By default, this setting is always enabled for input modules.

A module sends data to the owner-controller either as **Data** or as a **Data Event**.

You set the RPI on the Connection page of the Module Properties dialog box in the Logix Designer application as shown below:



3.6.2 Setting Software Configurable Input Filters and Delays

You can increase the time that it takes for an input point to transition from On to Off and Off to On for Compact 5000 I/O digital input modules. For the 5069-IV16F-SC module, valid filter range is from 0 μ s – 50 ms. Default value is 0 μ s.

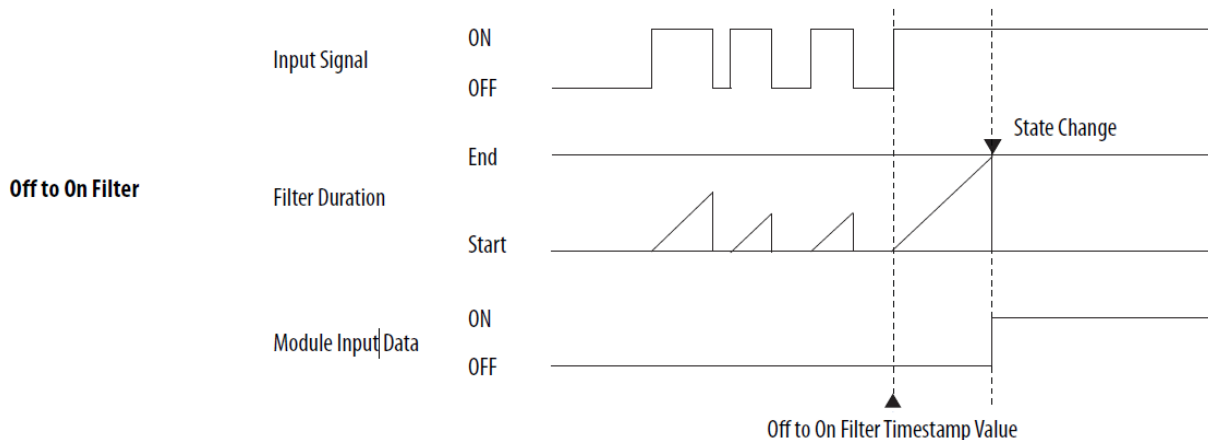
On the Compact 5000 I/O fast input modules, the input filter not only helps to improve noise immunity in a signal but also to help prevent rapid changes of the input data due to contact bounce.

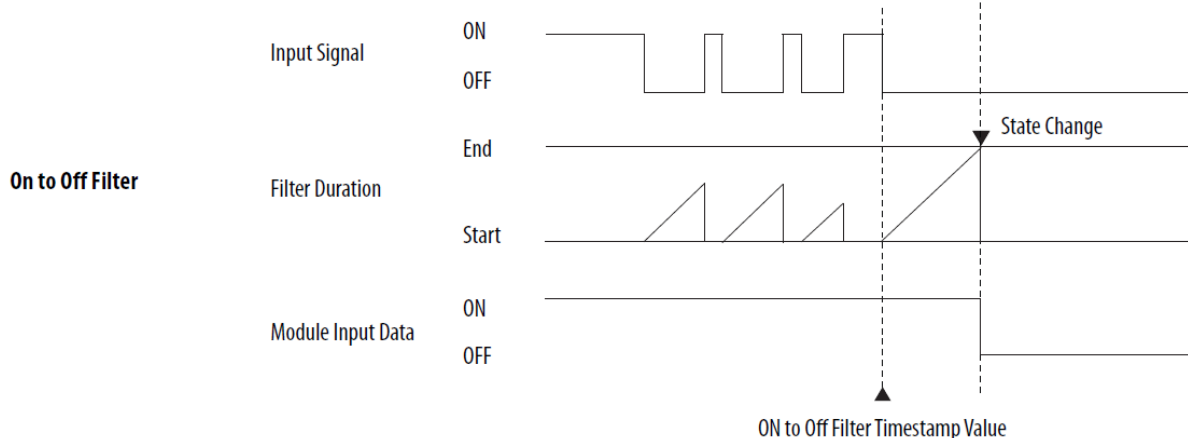
The input filter time defines how long an input signal transition must remain in the new state before the transition is valid and the input changes state. Input and Event timestamps are only recorded with valid transitions.

A transition is only valid if the input signal remains in the new state for the entirety of the filter duration. If the input changes state again before the chosen input filter time elapses, the transition is not valid.

In the following figure, the first three signal transitions--both On to Off and Off to On-- remain the same state until the filter time elapses and are not valid.

Input Filter Usage on Compact 5000 I/O Fast Input Modules





3.6.3 Module Health Diagnostic

The digital module has a status indicator on the front of the module that indicates module health. Indicators are as follows:

Off

The module is not powered.

Recommended Action

None if your application does not use the module.

If your application uses the module and it is expected to be operating, complete the following:

- Confirm that the system is powered.
- Confirm that the module is installed properly.

Steady green

The module has a connection to the owner controller and is operating normally.

Recommended Action

None.

Flashing green

One of the following:

- The module does not have a connection to the controller.
- A connection can result from missing, incomplete, or incorrect module configuration.

Recommended Action

Troubleshoot your Logix Designer application to determine what is preventing a connection from the module to the controller and correct the issue.

Steady red

The module experienced a nonrecoverable fault.

Recommended Action

Complete the following actions:

1. Cycle power to the module.
2. If the status indicator remains in the steady red state, replace the module.

Flashing red

One of the following conditions exists:

- A module firmware update is in progress.
- A module firmware update attempt failed.
- The device has experienced a recoverable fault.
- A connection to the module has timed out.

Recommended Action

Complete one of the following:

- Let the firmware update progress complete.
- Re-attempt a firmware update after the initial firmware update fails.
- Use the Logix Designer application to determine the cause of the module fault.

The Connection and Module Info categories of the module's configuration indicate the fault type.

To clear a recoverable fault, complete one of the following:

1. Cycle module power.
2. Click **Reset Module** in the Logix Designer application project via the Module Info category of the Module Properties dialog box.

If the fault does not clear after you cycle power and click **Reset Module**, contact Rockwell Automation Technical Support.

- Use the Logix Designer application to determine if a connection has timed out. The Connection category in the Module Properties for the module indicates the module state, including if a connection has timed out.
- If a connection has timed out, determine the cause and correct it. For example, a cable failure can cause a connection timeout.

3.6.4 Fault and Status Reporting

Digital input modules provide the fault and data status in a point-centric format. The tag names that include Ptxx represent point-centric data in the table. The xx represents the point number.

Tag Name	Description
ConnectionFaulted ⁸	The owner-controller loses its connection to the module.
Counterxx.Fault	The counter data quality is bad.
Ptxx.Fault	The point data quality is bad.
Eventx.CounterxxFault	The corresponding counter had a fault that indicated when the event occurred.
Eventx.Fault	The signal connection is lost.
Eventx.Ptxx.Fault	The event data quality is bad.
RunMode	The module is in Run Mode.
DiagnosticActive	Indicates if any diagnostics are active or if the prognostics threshold is reached.
DiagnosticSequenceCount	The count increments each time that a diagnostic condition is detected or removed.
Counterxx.Data	The point input status is 0 or 1.
Counterxx.Uncertain	The counter data can be imperfect.
Eventx.PtxxData	The point input status is 0 or 1.
Eventx.Uncertain	The event data can be imperfect.
Ptxx.Data	The point input status is 0 or 1.
Ptxx.Uncertain	The point data can be imperfect.
Uncertain ⁹	The module is operating outside its designed operating range if data is under manual or override control.

3.6.5 Using Simple Count Mode

When using the simple counter function, a module counts input pulses up to a defined maximum frequency. The simple counter maximum frequency for the 5069-IV16F-SC modules is 30 kHz (inv. period 33.3 μ s).

The maximum number of counters on the 5069-IV16F module is 8.

You may configure channels 0...7 to be counters.

When counting, the module compares total count to previously programmed values and may then be configured to activate an associated output. The modules also provide count up functionality and counter overflow.

3.6.6 Timestamping Per Point Sequences of Events

Timestamping registers a time reference to a change in input data. CIP Sync™ is

⁸ Not all tag names apply to all Compact 5000 I/O standard input modules. For example, only modules that support the Events feature use the Event tags.

⁹ This tag provides module-wide data and affects all channels simultaneously.

used for timestamping.

The 5069-IV16F-

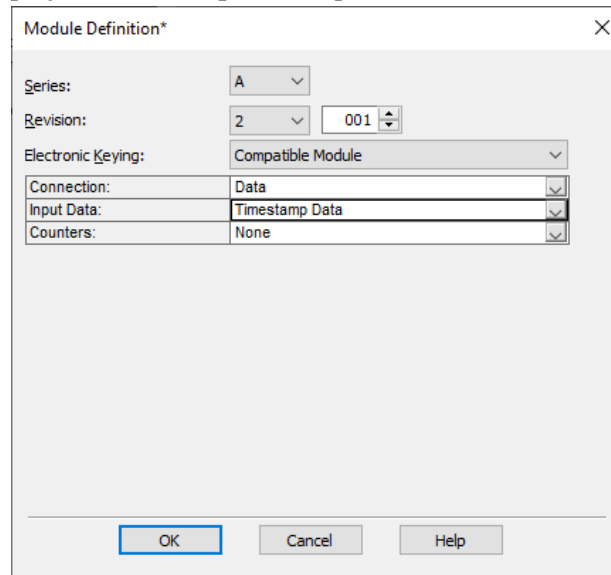
Sc

DC input modules offer sub-millisecond timestamping on a per point basis.

Timestamp values have $\pm 10 \mu\text{s}$ accuracy and $\pm 1 \text{ ns}$ resolution.

You can use CIP Sync to establish a sequence of events occurring at an input module point by timestamping the input data. To determine a sequence of events, you must perform the following:

- On the Module Definition dialog box in the Logix Designer application project, set the **Input Data** parameter to **Timestamp Data**:



- Enable COS for the input point where a sequence occurs and disable COS for all other points on the module.

You can enable COS in the following ways.

- Module Properties dialog box > Points category > Ptxx subcategory
Check the input transition type where you need to latch short duration pulses.
For example, if you need to latch short duration pulses for Off to On transitions, check Off -> On Input Transition.
- Module tags-do one or both of the following:
 - Change the C.Ptxx.CaptureOffOnEn tag to 1.
 - Change the C.Ptxx.CaptureOnOffEn tag to 1.

For more information on Timestamping, see the section on timestamping later in this chapter.

3.6.7 Detecting Chatter

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

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

transitions.

You can configure the following:

- Chatter count determines the number of acceptable input transitions that can occur in a given time period before considering the input to be chatter. Valid chatter count values range from 2...127.
- Chatter Time determines the amount of time within which the number of input transitions are counted. Valid chatter time values range from 1...10000 ms.

Section 3.7 Events

The modules support up to four event configurations. The following can trigger events:

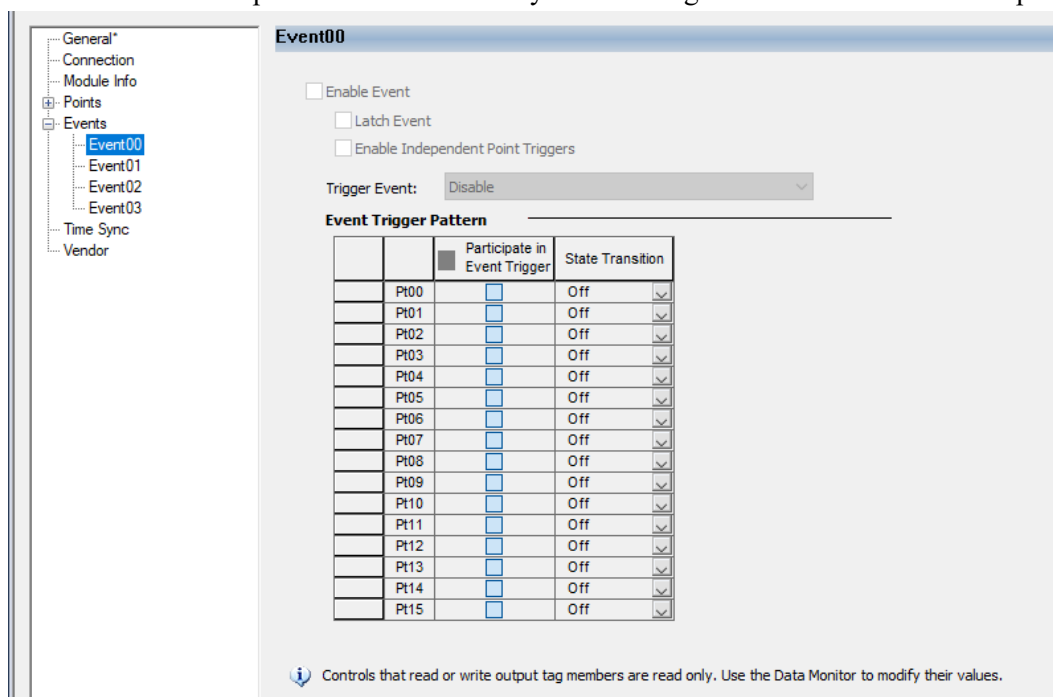
- An input state change.
- A counting input done bit change.
- A pattern of input state changes on multiple module inputs.

You must use the **Data with Events** connection type in the Module Definition to use the Events feature.

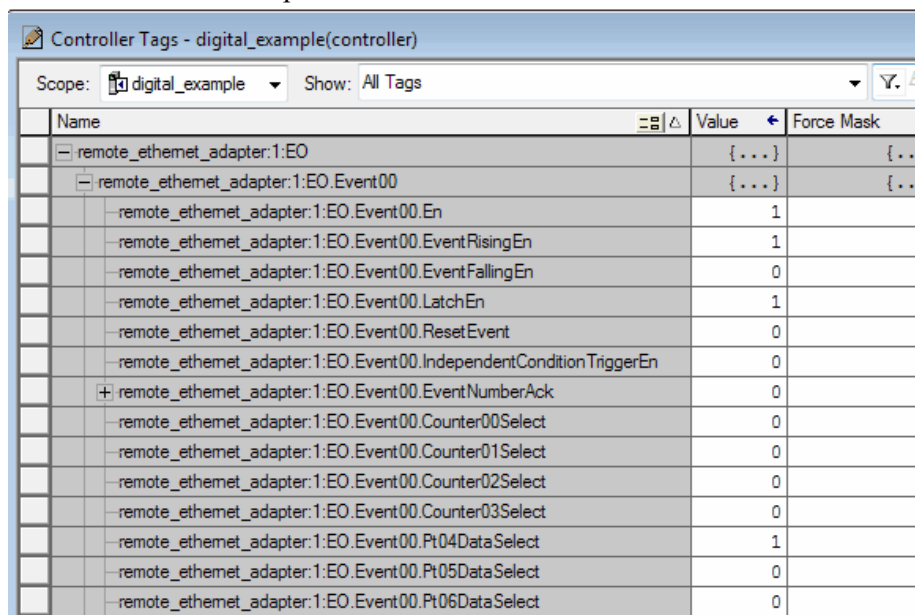
3.7.1 Event Definition

You define an event. When you define an event, remember the following:

- The event definition parameters are shown on Eventsxx category in the Module Properties dialog.
- The parameters are read-only in the dialog box as shown in this example:



- The event definition parameters are configured in the Event Outputs as shown in this example:



3.7.2 Event Definition Steps

Task	Event Output Tag to Change	Valid Values
1. Enable the event.	EO.Eventxx.En	<ul style="list-style-type: none"> 0 = Event is disabled. 1 = Event is enabled.
2. Choose if an input state change or a pattern of input state changes triggers the event.	EO.Eventxx.IndependentConditionTriggerEn	<ul style="list-style-type: none"> 0 = Pattern of input state changes triggers the event. 1 = Single input state change triggers the event.
3. Select at least one point on the module to participate in the event.	<p>The tag name changes based on the input function. The following names are available:</p> <ul style="list-style-type: none"> EO.Eventxx.PttxDataSelect - This tag appears for any point on the module if no counters are used. EO.Eventxx.CounterxxSelect - These tags begin at point00 and continue based on the number of counters that the module uses. 	<ul style="list-style-type: none"> 0 = Point does not participate in the event trigger. 1 = Point participates in the event trigger.
4. For all points that participate in the event, choose what constitutes an event state.	<p>The tag name changes based on the input function. The following names are available:</p> <ul style="list-style-type: none"> EO.Eventxx.PttxDataValue - This tag appears for any point on the module if no counters are used. EO.Eventxx.CounterxxValue - The tags begin at point00 and continue based on the number of counters that the module uses. 	<ul style="list-style-type: none"> 0 = On to Off state transition 1 = Off to On state transition

Task	Event Output Tag to Change	Valid Values
5. Choose which edge of the event triggers the event. That is, the rising edge, falling edge, or either edge of the event.	Both of the following: <ul style="list-style-type: none"> • EO.Eventxx.EventRisingEn • EO.Eventxx.EventFallingEn 	The combination of the tag settings determines which edge triggers the event: <ul style="list-style-type: none"> • Rising edge triggers the event set by this combination: <ul style="list-style-type: none"> – EO.Eventxx.EventRisingEn = 1 – EO.Eventxx.EventFallingEn = 0 • Falling edge triggers the event set by this combination: <ul style="list-style-type: none"> – EO.Eventxx.EventRisingEn = 0 – EO.Eventxx.EventFallingEn = 1 • Falling edge triggers the event set by this combination: <ul style="list-style-type: none"> – EO.Eventxx.EventRisingEn = 1 – EO.Eventxx.EventFallingEn = 1
6. Latch the event. This task is optional.	EO.Eventxx.LatchEn	<ul style="list-style-type: none"> • 0 = Event is not latched. • 1 = Event is latched.

3.7.3 Using Independent Point Triggers

An input state change triggering an event is known as an independent point trigger.

To use this type of trigger, you must enable the Independent Point Trigger option in the event definition. You set the EO.Eventxx.IndependentConditionTriggerEn tag to 1.

3.7.4 Using Pattern Match Triggers

When a pattern of input state changes triggers an event, multiple points participate in the event trigger. To use this type of trigger, you must disable the Independent Point Trigger option in the event definition. You set the EO.Eventxx.IndependentConditionTriggerEn tag to 0.


Every point that participates in an event trigger is configured separately. Depending on the event definition, the collective status of all points triggers the event. The following table describes event triggers:

Trigger	Definition
Enter pattern match state	If the event is defined to trigger on the rising edge, the event is triggered when a state change on any participating point results in all point configuration conditions being met. In the event definition dialog box, Trigger Event = On input transition to match Pattern
Leave pattern match state	If the event is defined to trigger on the falling edge, the event is triggered when a state change on any participating point results in all point configuration conditions no longer being met. In the event definition dialog box, Trigger Event = On input transition to not match Pattern
Enter or leave pattern match state	If the event is defined to trigger on the rising or falling edge, the event is triggered when a state change on any participating point results in all point configuration conditions being met or no longer being met. In the event definition dialog box, Trigger Event = On input transition to not match pattern.

3.7.5 Additional Event Considerations

When you use the Events feature, also consider the following:

- An Event task only actuates if an event occurs.

NOTE 	IMPORTANT. Make sure that you link the Event task to the Event Input tag, not the Input tag. Keep in mind that when the Event task executes, the input tag data can have the same data that was sent at the last RPI.
--	---

- An event is recognized only when it maintains the same state for at least the duration of the input filter time specified.
- Configure the event at a rate that stops task overlap conditions. If you enable COS for multiple points, a task overlap of the event can occur.
- Configure the event at a rate that is likely to succeed. A 2 ms signal width is the minimum pulse width that can be used at which the event succeeds.
- After the event executes, it does not execute again until the event occurs again.
- For more information on event tasks, see the Logix5000™ Controllers Tasks, Programs, and Routines Programming Manual, publication 1756-PM005.
- To see how to configure the Events feature, refer to Events Category later in this chapter.

3.7.6 Pulse Latching

You can use Pulse Latching to detect or latch short duration pulses. The module can detect incoming pulses with a duration as short as 10 μ s if the frequency is under 4 kHz (period of 250 μ s).

Pulse Latching is supported via the Timestamping feature and Timestamp Latching.

To use Pulse Latching, you must complete the following:

- On the Module Definition dialog box in the Logix Designer application project, set the Input Data parameter to Timestamp Data.
- Enable COS for the input point where a latch of short duration pulses is needed.

You can enable COS in the following ways.

Location in Logix Designer Application

Module Properties dialog box > Points category >

Ptxx subcategory

Action

Check the input transition type where you need to latch short duration pulses.

For example, if you need short duration pulses latched for Off to On transitions, check Off -> On Input Transition.

Location in Logix Designer Application

Module tags

Action

One or both of the following:

- Change the C.Ptxx.CaptureOffOnEn tag to 1.
- Change the C.Ptxx.CaptureOnOffEn tag to 1.

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

Input Transition Type Where Pulse Is Captured

Off to On

Change in Logix Designer Project

- The I.Ptxx.TimestampOffOnNumber tag increments.
- The timestamp is recorded in I.Ptxx.TimestampOffOn tag.

Input Transition Type Where Pulse Is Captured

On to Off

Change in Logix Designer Project

- The I.Ptxx.TimestampOnOffNumber tag increments.
- The timestamp is recorded in I.Ptxx.TimestampOnOff tag.

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

Latching Configuration	Input Transition Type Where Pulse Is Captured	Change in Logix Designer Project
Disabled (default): The following conditions disable Timestamp Latching: <ul style="list-style-type: none"> • Enable Timestamp Latching field on the Module Properties dialog box is clear. • C.Pttx.TimestampLatchEn tag = 0. 	Off to On	The I.Pttx.TimestampOffOnNumber tag increments. The new timestamp is recorded in the I.Pttx.TimestampOffOn tag, overwriting the previous timestamp.
	On to Off	The I.Pttx.TimestampOnOffNumber tag increments. The new timestamp is recorded in the I.Pttx.TimestampOnOff tag, overwriting the previous timestamp.
Enabled: The following conditions enable Timestamp Latching: <ul style="list-style-type: none"> • Enable Timestamp Latching field on the Module Properties dialog box is checked. • C.Pttx.TimestampLatchEn tag = 1. 	Off to On	The I.Pttx.TimestampOffOnNumber and I.Pttx.TimestampOffOn tags remain latched until the last captured pulse is acknowledged. In other words, the tag values remain the same until the last captured pulse is acknowledged.
	On to Off	The I.Pttx.TimestampOnOffNumber and I.Pttx.TimestampOnOff tags remain latched until the last captured pulse is acknowledged. In other words, the tag values remain the same until the last captured pulse is acknowledged.

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

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

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

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

3.7.7 Use CIP Sync Time with Fast I/O Modules

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

The 5069-IV16F modules are CIP Sync slave-only devices. There must be another module on the network that functions as a master clock. For more information on how to use CIP Sync technology, see the Integrated Architecture® System and CIP Sync Configuration Application Technique, publication IA-AT003.

You can use this module to capture time stamps and schedule outputs as follows:

- A fast I/O module has much higher precision than other modules.
- Inputs are timestamped by point, so multiple inputs can be configured for COS without losing time stamp data.
- CIP Sync is system-wide, so time stamp and schedule values are consistent across all modules in the system.

For example, if you use time stamps on a 5069-IV16F-SC module to schedule outputs on a 5069-OV16F-SC module, the controller, input module, and output module are not required to reside in the same local system. The I/O modules can reside in a remote I/O system.

- Output modules use all 64 bits of the time stamp to schedule, so there are no limits on schedule ranges.

3.7.8 Timestamping

The control system uses a 64-bit system clock. The modules support CIP Sync timestamping by using the 1588 protocol that is passed throughout the system.

The 1588 protocol is defined in the IEEE 1588-2002 standard, publication Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems.

Each input channel scan or new output application is stamped with a CIP Sync time stamp. One time stamp is returned to the controller for the module with the input data transfer.

You can use this feature for the following:

- To identify the sequence of events in fault conditions or during normal operation. You can use the system clock between multiple modules in the same chassis or throughout a system in which a common Time Master is used.
- To measure the change between samples and detect when a new sample is available for processing via the logic. The change between samples likely correlates closely with the RPI if no samples are missed in the logic.

You can also use the 1588 Protocol to synchronize sampling for modules across the entire system. By using the Synchronized Sampling feature, you can configure multiple modules to coordinate their input samples precisely with each other by using the same RPI.

Synchronized Sampling lets you configure a test stand, for example, and take many measurements simultaneously across many modules, if needed, while still precisely coordinating the sampling. With these modules, the synchronized sampling coordinates within approximately $\pm 10 \mu\text{s}$.

Timestamping for a sequence of events

You can use CIP Sync to establish a sequence of events occurring at a particular input module point by timestamping the input data. To determine a sequence of events, you must complete the following:

- Set the format of the input module to Timestamped Input Data.
- Enable COS for the input where a sequence occurs and disable COS for all other points on the module.

TIP If you configure multiple inputs for COS, your module generates a unique time stamp each time any of those inputs change state if the changes do not occur within 500 μs of each other.

If multiple inputs that are configured for COS change state within 500 μs of each other, one time stamp is generated for all state changes. As a result, it appears as if they changed simultaneously.

Timestamping with scheduled outputs

You can use timestamping with the scheduled outputs feature, so that after input data changes state and a time stamp occurs, an output point actuates at a specific time.

You can schedule outputs into the future. Outputs that are sent in one packet can differ by approximately 2 seconds. Sending in multiple messages allows greater spacing between schedules. When you use timestamping of inputs and scheduled outputs, you must complete the following:

- Choose a connection format for each input and output module that enables timestamping.
- Disable COS for all input points on the input module except the point being timestamped.

TIP For scheduled outputs to work most effectively, remember the following:

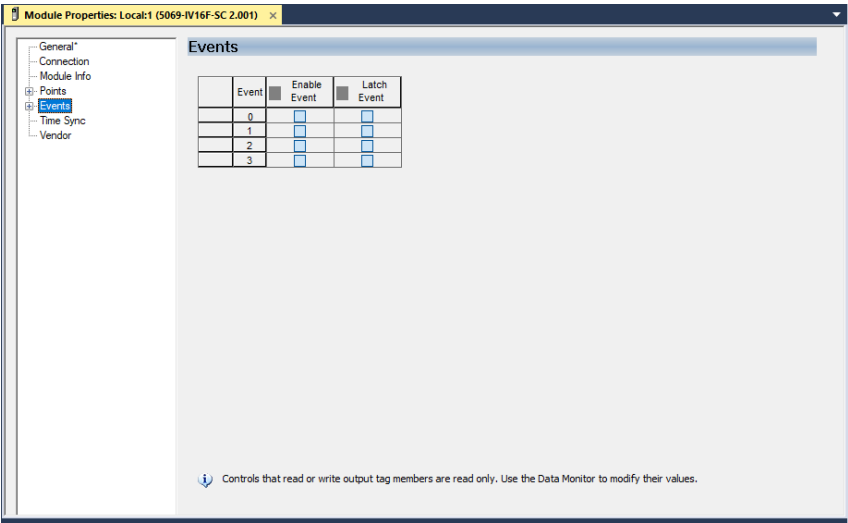
- The schedule fires when it is configured to. You must make sure that there is enough time for the schedule to plan ahead. If you are using a MAOC instruction, you cannot control the schedule.
- A system-level Grandmaster synchronizes the times of the I/O modules.

3.7.9 Events Category

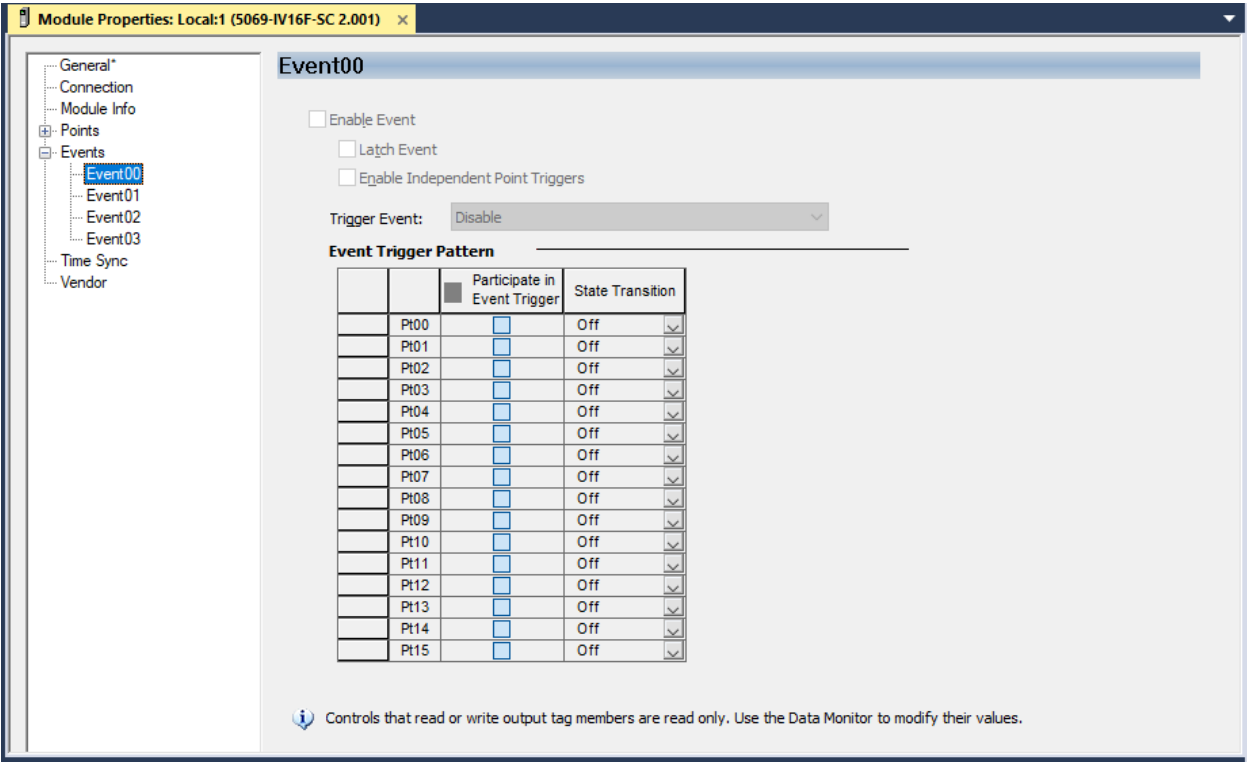
The Events category is available only if you choose Data with Events for Connection in the Module Definition dialog box. Click the + sign next to the Events category to expand it.

The Events subcategories show the configuration parameters for events.

IMPORTANT You cannot configure events on the Module Properties dialog box. The parameters that are displayed are read-only.



The Events subcategories show the configuration parameters for events.



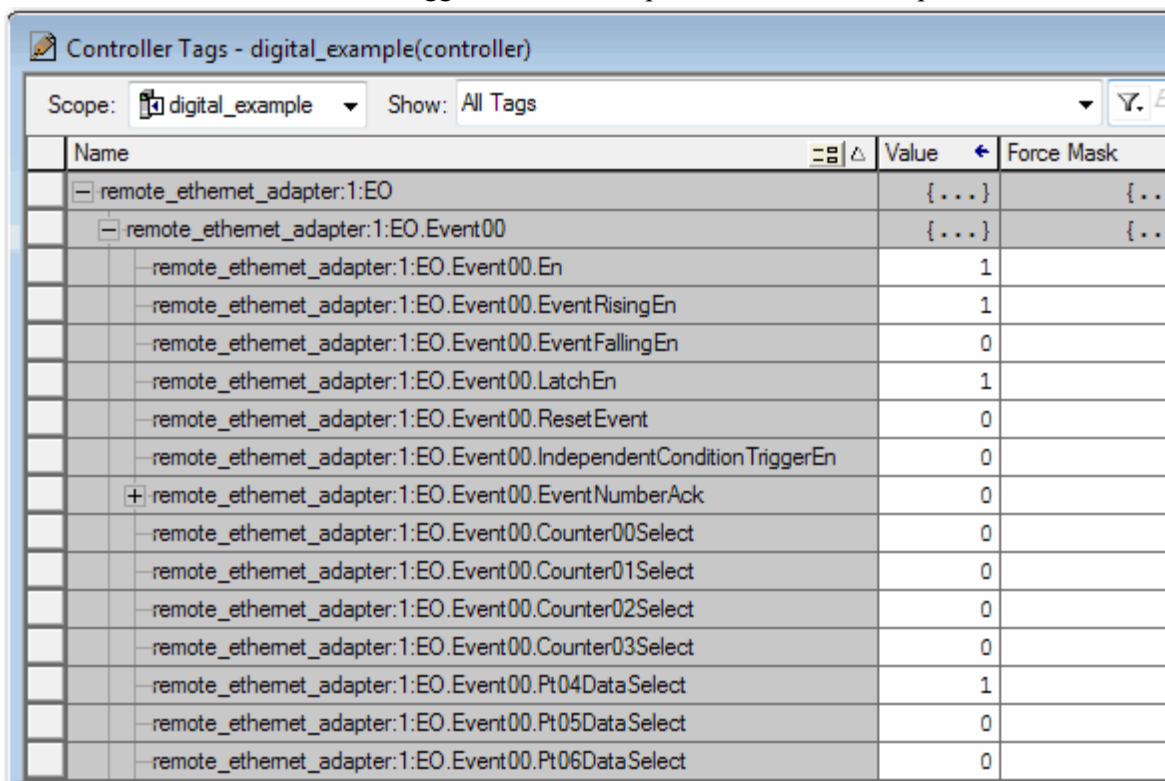
3.7.10 Configure an Event in the Event Output Tags

To configure an event, you must change the Event Output tags for the affected module via the Tag Monitor in the Logix Designer application. When you change the tags, the change is reflected on the Module Properties dialog box.

The following graphics show how tag values are reflected on the Module Properties. The following conditions are shown:

- Event is enabled.

- Point 4 is configured to trigger the event.
- Event is latched.
- Trigger Event is on input transition to match pattern.

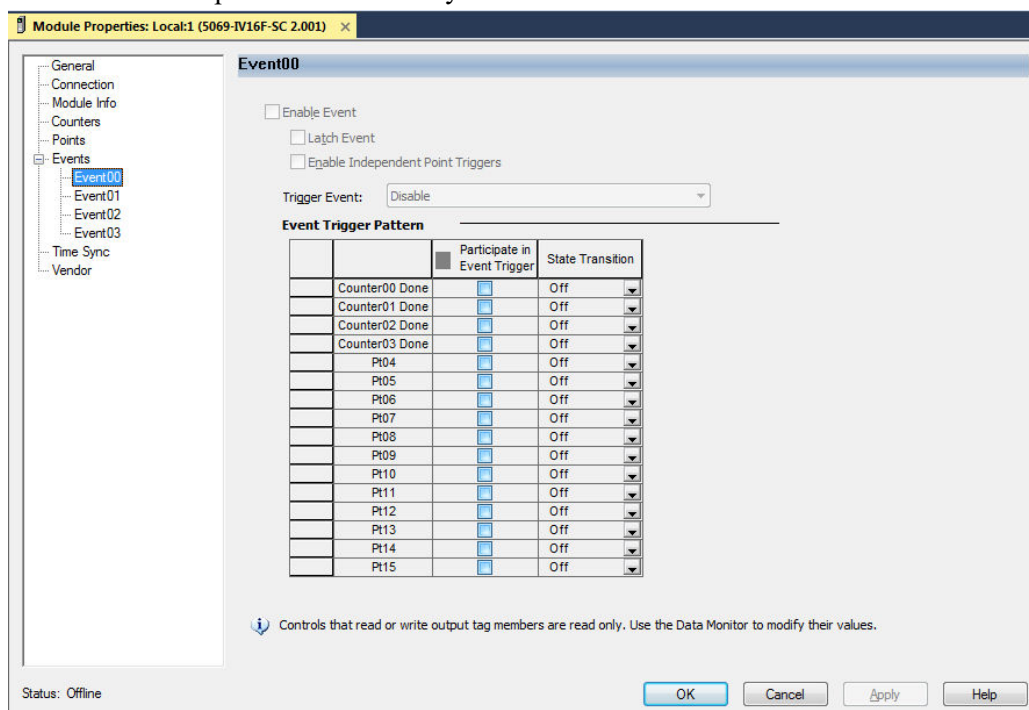


The screenshot shows the 'Controller Tags - digital_example(controller)' window. The 'Scope' is set to 'digital_example' and 'Show' is set to 'All Tags'. The table lists various tags under the 'remote_ethernet_adapter:1:EO' hierarchy, including event-related tags like 'Event00', 'Event00.En', 'Event00.EventRisingEn', 'Event00.EventFallingEn', 'Event00.LatchEn', 'Event00.ResetEvent', 'Event00.IndependentConditionTriggerEn', 'Event00.EventNumberAck', 'Event00.Counter00Select', 'Event00.Counter01Select', 'Event00.Counter02Select', 'Event00.Counter03Select', 'Event00.Pt04DataSelect', 'Event00.Pt05DataSelect', and 'Event00.Pt06DataSelect'. The 'Value' column shows the current state of each tag, and the 'Force Mask' column shows the mask applied to the value.

Name	Value	Force Mask
remote_ethernet_adapter:1:EO	{...}	{..
remote_ethernet_adapter:1:EO.Event00	{...}	{..
remote_ethernet_adapter:1:EO.Event00.En	1	
remote_ethernet_adapter:1:EO.Event00.EventRisingEn	1	
remote_ethernet_adapter:1:EO.Event00.EventFallingEn	0	
remote_ethernet_adapter:1:EO.Event00.LatchEn	1	
remote_ethernet_adapter:1:EO.Event00.ResetEvent	0	
remote_ethernet_adapter:1:EO.Event00.IndependentConditionTriggerEn	0	
remote_ethernet_adapter:1:EO.Event00.EventNumberAck	0	
remote_ethernet_adapter:1:EO.Event00.Counter00Select	0	
remote_ethernet_adapter:1:EO.Event00.Counter01Select	0	
remote_ethernet_adapter:1:EO.Event00.Counter02Select	0	
remote_ethernet_adapter:1:EO.Event00.Counter03Select	0	
remote_ethernet_adapter:1:EO.Event00.Pt04DataSelect	1	
remote_ethernet_adapter:1:EO.Event00.Pt05DataSelect	0	
remote_ethernet_adapter:1:EO.Event00.Pt06DataSelect	0	

These changes in the Event Output tags configure the event.

After the tags are changed, the related parameters on the Module Properties are updated automatically.



The control system uses a 64-bit system clock. The modules support CIP Sync times.

Section 3.8 Technical Assistance

Note that your module contains electronic components which are susceptible to damage from electrostatic discharge (ESD). An electrostatic charge can accumulate on the surface of ordinary plastic wrapping or cushioning material. **In the unlikely event that the module should need to be returned to Spectrum Controls, please ensure that the unit is enclosed in approved ESD packaging (such as static-shielding / metalized bag or black conductive container).** Spectrum Controls reserves the right to void the warranty on any unit that is improperly packaged for shipment.

RMA (Return Merchandise Authorization) form required for all product returns.

For further information or assistance, please contact your local distributor, or call the Spectrum Controls Technical Support at:

For Rockwell Automation Compatible I/O Products:

- USA 1-440-646-6900
- United Kingdom 01-908-635-230
- Australia 1-800-809-929
- Mexico 001-888-365-8677
- Brazil 55-11 3618-8800
- Europe +49-211-41553-630

or send an email to support@spectrumcontrols.com.

Section 3.9

Declaration of Conformity


Available upon request.

Appendix A

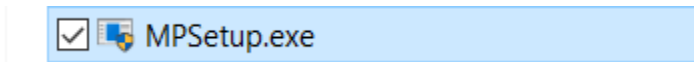
Manually Importing an AOP

This appendix explains how to manually import an AOP .ACD file into Studio 5000 software:

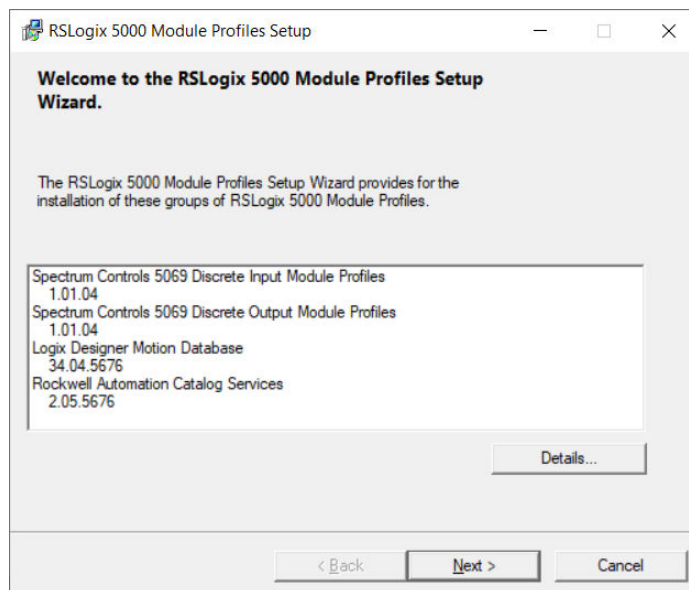
1. Download the latest, zipped, module AOP from Spectrum Controls website, <https://www.spectrumcontrols.com>, and save the file to a local folder on your computer (normally the Downloads folder).
2. Extract the contents of the zipped folder using the default folder name and location.

<input type="checkbox"/> Name	Date modified	Type	Size
 Spectrum_5069_Discrete_AOP_Rel_1.0...	6/17/2021 10:38 AM	File folder	

3. Open the folder and run MPSetup.exe:



4. Confirm that you wish to run this software when asked if you wish to do so by your Windows operating system.
5. Follow the prompts provided by the RSLogix5000 Module Profiles Setup Wizard:



These prompts include accepting the license agreement, choosing to install the module profiles, and selecting which module profiles you wish to install.

6. Click **Finish** to complete the installation.

The newly imported module(s) are now available as a selection from the Expansion Modules list.

Appendix B

Module Tag Tables

This section provides data type, definition, and valid value information for System Tags.

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

The set of tags that are associated with the 5069-IV16F-SC module are listed below. However, the choices that you make in the Module Definition dialog box define the connection and the tags. For example, if you use a Listen Only Connection, the Logix Designer application creates only Input tags for that module.

The following types of tags are described in this Appendix.

- Configuration
- Event Input
- Event Output
- Input
- Output

Module Configuration Tags

Name	Data Type	Definition	Valid Values
Pttx.InputOffOnFilter	SINT	<p>The amount of time that a signal must be in the on state before the input data indicates the on state.</p> <p>The amount of time is indicated using an enumeration. Not all products support all enumeration values.</p>	<p>The valid values are determined by the input signal.</p> <p>Input signal is 120 VAC.</p> <p>13 = 1 ms</p> <p>Input signal is 240 VAC.</p> <p>13 = 1 ms</p> <p>14 = 2 ms</p> <p>15 = 5 ms</p> <p>IMPORTANT: Logix Designer application lets you enter tag values for filter values that are invalid for some input signals.</p> <p>Make sure that you select a valid input filter value. If you select an invalid input filter value, the module can read signal levels incorrectly.</p>
Pttx.InputOnOffFilter	SINT	<p>The amount of time that a signal must be in the off state before the input data indicates the off state.</p> <p>The amount of time is indicated using an enumeration. Not all products support all enumeration values.</p>	<p>Input signal is 120 VAC:</p> <p>16 = 10 ms</p> <p>17 = 20 ms</p> <p>Input signal is 240 VAC:</p> <p>15 = 5 ms</p> <p>16 = 10 ms</p> <p>17 = 20 ms</p>
Pttx.ChatterTime	INT	A value from 1...10000 ms in whole ms increments.	1...10000

Name	Data Type	Definition	Valid Values
Ptxx.ChatterCount	SINT	The number of input changes that are considered Chatter.	0 = Disabled 2...127 = Enabled
Ptxx.CaptureOffOnEn	BOOL	Enables capturing Off to On time stamps. If cleared, the point does not record Off to On time stamps.	0 = Capture disabled (default) for OFF to ON input transitions 1 = Capture enabled for OFF to ON input transitions
Ptxx.CaptureOnOffEn	BOOL	Enables capturing On to Off time stamps. If cleared, the point does not record On to Off time stamps.	0 = Capture disabled (default) for ON to OFF input transitions 1 = Capture enabled for ON to OFF input transitions
Ptxx.TimestampLatchEn	BOOL	<p>When this bit is set, timestamps are latched; this means that a Timestamp is not overwritten until acknowledged. All subsequent transitions on that point are ignored until acknowledged/reset.</p> <p>If the bit is not set, the new LO Timestamp overwrites the first LO Timestamp immediately, even if the controller has yet to extract that data.</p> <p>You can acknowledge the timestamp in the following ways:</p> <p>Off to On transition timestamp: The Ptxx.TimestampOffOnNumber.x input tag value is written to the Ptxx.TimestampxxxxxNumberAck output tag value.</p> <p>If Timestamp Latching is enabled, the Ptxx.Timestampxxxx input tag remains the same until the next input Off to On transition occurs. Otherwise, the input tag value is cleared.</p> <p>On to Off transition timestamp: The Ptxx.TimestampOnOffNumber.x input tag value is written to the Ptxx.TimestampxxxxxNumberAck output tag value.</p> <p>If Timestamp Latching is enabled, the Ptxx.Timestampxxxx input tag remains the same until the next input On to Off transition. Otherwise, the input tag value is cleared.</p>	0 = Timestamps are overwritten with each successive COS transition. 1 = Timestamps are latched until acknowledged.

Event Output Tags

The event output tags are displayed only if Data with Events is selected in the Module Definition window.

Name	Size	Definition	Valid Values
Eventxx.En	BOOL	When set, the corresponding event trigger definition is active, and events are triggered when conditions match the definition.	0 = Event trigger definition is not active, and events are not triggered when conditions match the definition. 1 = Event trigger definition is active, and events are triggered when conditions match the definition.
Eventxx.EventRisingEn	BOOL	When set an event is to trigger each time a condition change results in conditions that match the event trigger definition.	0 or 1
Eventxx.EventFallingEn	BOOL	When set, an event is to trigger each time a condition change results in conditions that no longer match the event trigger definition.	0 or 1
Eventxx.LatchEn	BOOL	When set, events are latched until acknowledged. A new event is lost if the previous event has not been acknowledged. When not set, new events overwrite old events.	0 = Not latched (default). 1 = Latched.
Eventxx.ResetEvent	BOOL	When transitions from 0 to 1, resets all events and clears the event queue on the channel.	0 = Events are not cleared. 1 = Events are cleared when a rising edge occurs.
Eventxx.IndependentConditionTriggerEn	BOOL	For events, determines whether each condition that is indicated in the trigger definition can initiate an event independently.	0 = When all selected conditions achieve the configured values, an event is triggered. 1 = When any selected condition achieves the configured value, an event is triggered.
Eventxx.EventNumberAck	DINT	The controller writes back the EI:Event[<n>].EventNumber into this EO:Event[<n>].EventNumberAck to indicate receipt of the event. All events with I:EventNumbers that occurred before EventNumberAck are acknowledged.	All values.
Eventxx.CounterxxSelect	BOOL	When set, indicates that the corresponding counter is to participate in the event trigger definition.	0 = Corresponding counter does not participate in the event trigger definition.. 1 = Corresponding counter participates in the event trigger definition..
Eventxx.PtxxDataSelect	BOOL	When set, indicates that the corresponding data value is to participate in the event trigger definition.	0 or 1
Eventxx.CounterxxValue	BOOL	If the counter function is selected in the event trigger definition, this member indicates that value that is to trigger the event.	0 or 1
Eventxx.PtxxDataValue	BOOL	Indicates the input value of the event point data.	0 = Input inactive. 1 = Input active.

Event Input Tags

Name	Size	Definition	Valid Values
RunMode	BOOL	Channel's operating state	0 = Idle 1 = Run Mode
ConnectionFaulted	BOOL	Indicates if a connection is running. The module sets this tag to 0 when connected. If the module is not connected, it changes the tag to 1.	0 = Connection running. 1 = Connection not running.
Diagnostic Active	BOOL	Indicates if any diagnostics are active or if the prognostics threshold is reached.	0 = No diagnostics active. 1 = One or more diagnostics are active, or the prognostics threshold is reached.
CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master.	0 = CIP Sync is not available. 1 = CIP Sync is available.
CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master but is not now due to a timeout.	0 = A valid time master has not timed out. 1 = A valid time master was detected on the backplane, but the time master has timed out. The module is using its local clock and can be drifting away from the last known time master.
DiagnosticSequence Count	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) to 1 skipping zero.	-128...+127 The value of 0 is skipped except during module power-up.
Counterxx.Data	BOOL	Current output data to be applied for normal (unscheduled) outputs.	0 = Off 1 = On
Counterxx.Fault	BOOL	Indicates that counter data is inaccurate and cannot be trusted for use in the application. For more information, see Module Data Quality Reporting in Compact 5000 I/O Digital Modules documentation, PN 5069-UM004.	0 = Good data 1 = Bad data (Faulted) If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. IMPORTANT: Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.
Counterxx.Uncertain	BOOL	Indicates that the channel data can be inaccurate, but the degree of inaccuracy is not known. For more information, see Module Data Quality Reporting in refer to Compact 5000 I/O Digital Modules documentation, PN 5069-UM004.	0 = Good data. 1 = Uncertain data. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. IMPORTANT: Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.
Counterxx.Done	BOOL	Indicates that the I:Count tag \geq O:Preset.G430.	0 or 1

Name	Size	Definition	Valid Values
Counterxx.Rollover	BOOL	The counter counted up to RolloverValue - 1 (for HSC) or Preset -1 (for simple counters) and then continued counting from the O:Rollunder (for HSC) or 0 (for simple counters). The O:RolloverAck bit transitioning from 0 to 1 or the O:Reset transitioning from 0 to 1 clears this bit.	0 or 1
Counterxx.Count	DINT	The number of input transitions counted by a counter.	All values
EventStatus[x].EventDropped	BOOL	Indicates when an event has been discarded because events are occurring faster than they are being acknowledged.	0 = An event status has not been dropped. 1 = An event status has been dropped.
EventStatus[x].CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master.	0 = CIP Sync is not available. 1 = CIP Sync is available.
EventStatus[x].CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master but is not now due to a timeout.	0 = A valid time master has not timed out. 1 = A valid time master was detected on the backplane, but the time master has timed out. The module is using its local clock and can be drifting away from the last known time master.
EventStatus[x].EventReset	BOOL	When EO.Event[<n>].ResetEvent transitions from 0 to 1, I.EventStatus[<n>].EventReset transitions to 1 to indicate that the reset was received and completed. It stays 1 until EO.Event[<n>].ResetEvent transition to zero.	0 = Do not reset. 1 = Reset.
EventStatus[x].EventsPending	SINT	The number of events currently queued in the modules. A value greater than zero indicates that the controller is not currently keeping up with the rate of events.	All positive values.
EventStatus[x].EventNumber	DINT	Running count of events, which increments by one each new time event. The originator sets the Event Number Ack to the Event Number to acknowledge receipt of the event. When the EventNumber reaches its maximum value and rolls over, it is to roll over to 1, not 0.	All values.
PtxxData	BOOL	When set, indicates the corresponding data value (rising or falling depending on configuration) triggered the event.	0 or 1
PtxxFault	BOOL	Indicates that channel data is inaccurate and cannot be trusted for use in the application. For more information, see Module Data Quality Reporting in Compact 5000 I/O Digital Modules documentation, PN 5069-UM004.	0 = Good data. 1 = Bad data (Faulted). If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. IMPORTANT: Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.

Name	Size	Definition	Valid Values
Ptxx.Uncertain	BOOL	Indicates that the channel data can be inaccurate, but the degree of inaccuracy is not known. For more information, see Module Data Quality Reporting in Compact 5000 I/O Digital Modules documentation, PN 5069-UM004.	0 = Good data. 1 = Uncertain data. If the tag is set to 1, you must troubleshoot the module to correct the cause of the inaccuracy. IMPORTANT: Once the condition that causes the tag to change to 1 is removed, the tag automatically resets to 0.
Ptxx.Chatter	BOOL	Indicates if the input is chattering per the ChatterTime and ChatterCount settings.	0 = Normal. 1 = Input is chattering.
Ptxx.TimestampOverflowOffOn	BOOL	Indicates an Off to On time stamp was lost in a discrete product. If TimestampLatchEn is set, a new time stamp was not recorded because one is already latched. If TimestampLatchEn is clear, a timestamp was overwritten.	0 or 1
Ptxx.TimestampOverflowOnOff	BOOL	Indicates an On to Off time stamp was lost in a discrete product. If TimestampLatchEn is set, a new time stamp was not recorded because one is already latched. If TimestampLatchEn is clear, a timestamp was overwritten.	0 or 1
Ptxx.CIPSyncValid	BOOL	Indicates whether the module is synced with a 1588 master.	0 = CIP Sync is not available. 1 = CIP Sync is available.
Ptxx.CIPSyncTimeout	BOOL	Indicates that the module was once synced with a 1588 master but is not now due to a timeout.	0 = A valid time master has not timed out. 1 = A valid time master was detected on the backplane, but the time master has timed out. The module is using its local clock and can be drifting away from the last known time master.
Ptxx.TimestampOffOnNumber	INT	A timestamp number for the Off to On transition for the most-recently produced timestamp. IMPORTANT: If Timestamp Latching is enabled, when this tag value matches the Ptxx.TimestampOffOnNumberAck output tag value, the Pt.xxTimestampOffOn input tag remains the same until the next input Off to On transition. Otherwise, the input tag value is cleared.	All values.
Ptxx.TimestampOnOffNumber	INT	A timestamp number for the On to Off transition for the most-recently produced timestamp. IMPORTANT: If Timestamp Latching is enabled, when this tag value matches the Ptxx.TimestampOnOffNumberAck output tag value, the Pt.xxTimestampOnOff input tag remains the same until the next input On to Off transition. Otherwise, the input tag value is cleared.	All values.

Name	Size	Definition	Valid Values
Pt.xx.TimestampOffOn	LINT	64-bit Timestamp corresponding to when a change of state Off to On was recorded at the input. IMPORTANT: This number is cleared when Pt.xx.TimestampOffOnNumber input tag value and the Pt.xx.TimestampOffOnNumberAck output tag value match.	All values.
Pt.xx.TimestampOnOff	LINT	64-bit Timestamp corresponding to when a change of state On to Off was recorded at the input. IMPORTANT: This number is cleared when Pt.xx.TimestampOnOffNumber input tag value and the Pt.xx.TimestampOnOffNumberAck output tag value match.	All values.

Output Table

Name	Size	Definition	Valid Values
Counterxx.Reset	BOOL	When this bit transitions from 0 to 1, I:Count, and I:Rollover are set to zero.	0 = Do not reset. 1 = Reset.
Counterxx.RolloverAck	BOOL	Clears the Rollunder tag in the input tag when it transitions from 0 to 1.	0 or 1
Counterxx.Preset	DINT	If RolloverAtPreset is set, the counter counts to thePreset value and then rolls over to zero. If RolloverAtPreset is not set, the counter sets the Done bit and continues counting up to Max DINT. If C:RolloverAtPreset = 1, then if I:Count \geq O:Preset, I:Count=0., else I:Done bit always = 0. Set I:Rollover bit when I:Count transitions from O:Preset – 1 to 0. If C:RolloverAtPreset = 0, then if I:Count \geq O:Preset, I:Done = 1, else I:Done = 0. Set I:Rollover bit when I:Counttransitions from 2,147,483,647 to 0.	0...2,147,483,647
Pt.xx.ResetTimestamps	BOOL	Erases all recorded timestamps for the input channelwhen it transitions from 0 to 1.	0 = Timestamps are not erased. 1 = Timestamps are erased.

Name	Size	Definition	Valid Values
Pttx.TimestampOffOnNumberAck	INT	<p>An Off to On timestamp identifier that is written by the controller to indicate that the identified timestamp has been seen and acted on.</p> <p>When Latching is enabled and the Timestamp Number that is received from the controller transitions to the most recent timestamp that is produced, the module can produce a new timestamp.</p> <p>When Latching is disabled and the Timestamp Number that is received from the controller transitions to the most recent timestamp that is produced, the Pttx.TimestampOffOn and the Pttx.TimestampOverflowOffOn tags are cleared.</p>	All values.
Pttx.TimestampOnOffNumberAck	INT	<p>An On to Off timestamp identifier that is written by the controller to indicate that the identified timestamp has been seen and acted on.</p> <p>When Latching is enabled and the Timestamp Number that is received from the controller transitions to the most recent timestamp that is produced, the module can produce a new timestamp.</p> <p>When Latching is disabled and the Timestamp Number that is received from the controller transitions to the most recent timestamp that is produced, the Pttx.TimestampOnOff and the Pttx.TimestampOverflowOnOff tags are cleared.</p>	All values.

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