Modicon Edge I/O NTS

Counting Modules

User Guide

Original instructions

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www.se.com

Legal Information

The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

This document is not intended as a substitute for a detailed study or operational and site-specific development or schematic plan. It is not to be used for determining suitability or reliability of the products/solutions for specific user applications. It is the duty of any such user to perform or have any professional expert of its choice (integrator, specifier or the like) perform the appropriate and comprehensive risk analysis, evaluation and testing of the products/solutions with respect to the relevant specific application or use thereof.

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Table of Contents

Safety Information

Important Information

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

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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

Before You Begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

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

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

Start-up and Test

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check are made and that enough time is allowed to perform complete and satisfactory testing.

⚠WARNING

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

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

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

Operation and Adjustments

The following precautions are from the NEMA Standards Publication ICS 7.1-1995:

(In case of divergence or contradiction between any translation and the English original, the original text in the English language will prevail.)

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer’s instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer’s instructions and the machinery used with the electrical equipment.
- Only those operational adjustments required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Document

Document Scope

This guide describes the implementation of Modicon Edge I/O NTS counting modules. It provides the description, characteristics, wiring diagrams and configuration details for Modicon Edge I/O NTS counting modules.

Validity Note

This document has been updated for the release of Modicon Edge I/O NTS counting modules firmware V1.0.1.

The characteristics of the products described in this document are intended to match the characteristics that are available on www.se.com. As part of our corporate strategy for constant improvement, we may revise the content over time to enhance clarity and accuracy. If you see a difference between the characteristics in this document and the characteristics on www.se.com, consider www.se.com to contain the latest information.

Product Related Information

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

⚠WARNING

LOSS OF CONTROL

- Perform a Failure Mode and Effects Analysis (FMEA), or equivalent risk analysis, of your application, and apply preventive and detective controls before implementation.
- Provide a fallback state for undesired control events or sequences.
- Provide separate or redundant control paths wherever required.
- Supply appropriate parameters, particularly for limits.
- Review the implications of transmission delays and take actions to mitigate them.
- Review the implications of communication link interruptions and take actions to mitigate them.
- Provide independent paths for control functions (for example, emergency stop, over-limit conditions, and error conditions) according to your risk assessment, and applicable codes and regulations.
- Apply local accident prevention and safety regulations and guidelines.[1]
- Test each implementation of a system for proper operation before placing it into service.

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

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software and hardware components approved by Schneider Electric for use with the system.
- Update your application program every time you change the physical hardware configuration.

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

General Cybersecurity Information

In recent years, the growing number of networked machines and production plants has seen a corresponding increase in the potential for cyber threats, such as unauthorized access, data breaches, and operational disruptions. You must, therefore, consider all possible cybersecurity measures to help protect assets and systems against such threats.

To help keep your Schneider Electric products secure and protected, it is in your best interest to implement the cybersecurity best practices as described in the Cybersecurity Best Practices document.

Schneider Electric provides additional information and assistance:

- Subscribe to the Schneider Electric security newsletter.
- Visit the Cybersecurity Support Portal web page to:
  - Find Security Notifications.
  - Report vulnerabilities and incidents.
- Visit the Schneider Electric Cybersecurity and Data Protection Posture web page to:
  - Access the cybersecurity posture.
  - Learn more about cybersecurity in the cybersecurity academy.
  - Explore the cybersecurity services from Schneider Electric.

Environmental Data

For product compliance and environmental information, refer to the Schneider Electric Environmental Data Program.

Related Documents

Title of Documentation	Reference Number
Modicon Edge I/O - System Planning and Installation Guide	EIO0000004786 (ENG)
Modicon Edge I/O - Configurator and Web Interface - User Guide	EIO0000004810 (ENG)
Modicon Edge I/O - Software Integration and Compatibility - User Guide	EIO0000004818 (ENG)
Modicon Edge I/O - Diagnostic Data - User Guide	EIO0000004826 (ENG)
Modicon Edge I/O NTS - Network Interface Modules - User Guide	EIO0000004794 (ENG)
Modicon Edge I/O NTS - Discrete Modules - User Guide	EIO0000005238 (ENG)
Modicon Edge I/O NTS - Analog Modules - User Guide	EIO0000005246 (ENG)
Modicon Edge I/O NTS - Field Device Master Modules - User Guide	EIO0000005270 (ENG)

To find documents online, visit the Schneider Electric download center (www.se.com/ww/en/download/).

Information on Non-Inclusive or Insensitive Terminology

As a responsible, inclusive company, Schneider Electric is constantly updating its communications and products that contain non-inclusive or insensitive terminology. However, despite these efforts, our content may still contain terms that are deemed inappropriate by some customers.

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in the information contained herein, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2023	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2020	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2021	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2021	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive* (*2006/42/EC*) and *ISO 12100:2010*.

NOTE: The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

Counting Input Modules

What’s in This Part

NTSEHC0100 High Speed Counter Module, 1 Incremental Input, 24 Vdc, 250 kHz, 2 Inputs

What's in This Chapter

NTSEHC0100 Presentation

Overview

This section provides a presentation of the NTSEHC0100 module.

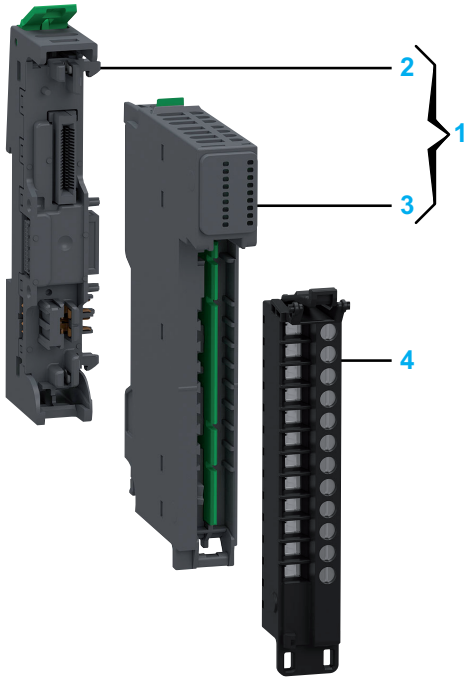
Main Characteristics

The following table describes the main characteristics of the NTSEHC0100 input module:

Main Characteristics	**Value**
Number of physical inputs	6
Number of incremental channels	1 The incremental input channel can use up to 4 inputs.
Minimum additional inputs	2 Inputs not used for the incremental channel can be used as auxiliary inputs or as inputs of **Simple counting** functions.
Encoder type	High speed incremental counter
Input frequency	250 kHz
Encoder supply (external)	10...30 Vdc
Encoder input	Single ended
Resolution	Main counting function: 32 bits **Simple counting** function: 16 bits
Operating mode	Synchronous, isochronous and asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS NTSEHC0100 module:

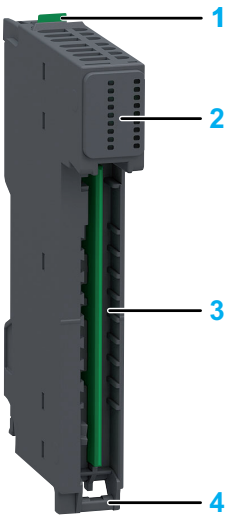


Number	Reference	Description
1	NTSEHC0100K	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSEHC0100	High Speed Counter Module, 1 Incremental Input, 24 Vdc, 250 kHz, 2 Inputs
4	NTSXTB12200H	Spring Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12201H	Spring Terminal Block, 12 Points, 5 mm Pitch, With Cover, use on Low Height Module, Hardened
	NTSXTB12000H	Screw Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12001H	Screw Terminal Block, 12 Points, 5 mm Pitch, With cover, use on Low Height Module, Hardened
		NOTE: The terminal blocks are purchased separately.

NOTE: For more information on accessories and spare parts, refer to Modicon Edge I/O - System Planning and Installation Guide.

Physical Description

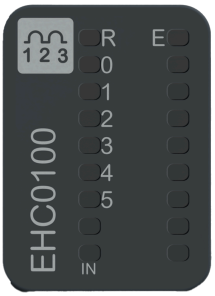
The following figure presents the elements of the module:



1: Release button for disengaging the module from the base
2: Status LEDs
3: Slot for the terminal block
4: Hinge for the terminal block installation

Status LED

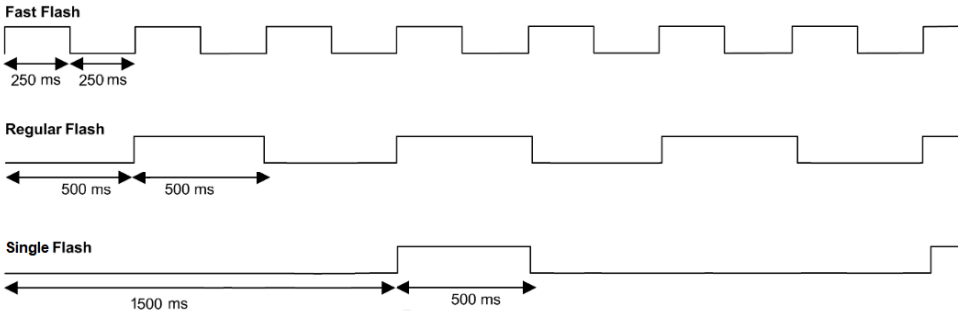
The following figure presents the NTSEHC0100 status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	Channel (Green)	Description
Initialization and non-operational states			
OFF	OFF	OFF	Indicates that the module is not energized.
OFF	Fast Flash	-	Indicates that the module has detected a system error.
Regular Flash	OFF	-	Indicates that the firmware is being updated.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the channel is activated.
ON	-	OFF	Indicates that the channel is deactivated.
ON	Regular Flash	OFF	Indicates that the module is in fallback state.

The following graphic shows the system status of LEDs during module operation:



NTSEHC0100 Characteristics

Overview

This section provides a general description of the characteristics of the module.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

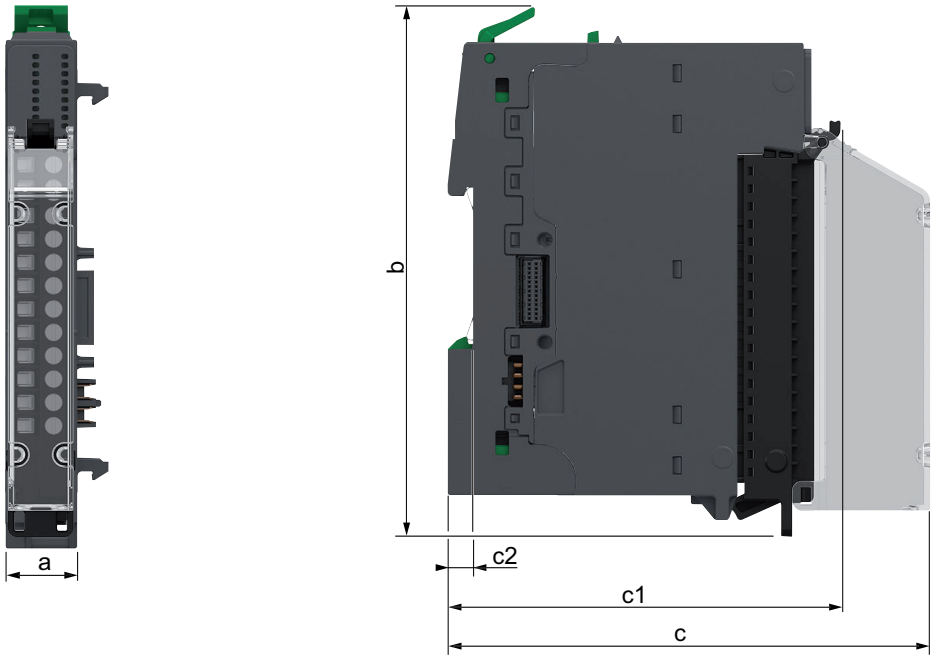
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

For more information on environmental characteristics, refer to Modicon Edge I/O - System Planning and Installation Guide.

Dimensions

The following figure presents the external dimensions of the assembled module:



a: 15 mm (0.59 in)
b: 116.6 mm (4.57 in)
c: 107.5 mm (4.21 in)
c1: 88.2 mm (3.46 in)
c2: 5.6 mm (0.2 in)

Weight

- NTSEHC0100: 48 g (1.69 oz)
- NTSEHC0100K: 70 g (2.47 oz)

General Characteristics

The following table describes the general characteristics of the NTSEHC0100 input module:

Characteristics		**Value**
Rated supplied voltage		24 Vdc
Power supplied voltage range		20.4...28.8 Vdc
Power dissipation		1.08 W
Isolation	Between channels	No
	Between channels and bus	1,500 Vac
	Between channels and field power	No
	Between field power and bus	No
Overvoltage protection		30 Vdc

Input Characteristics

The following table describes the input characteristics of the NTSEHC0100 input module:

Characteristics		**Value**	
		Voltage input	**Current input**
Rated input value		24 Vdc	2.27 mA
Operating range	Logic state 1	> 11 Vdc	2 mA
	Logic state 0	< 5 Vdc	< 1.5 mA
Peak values		30 Vdc	3 mA
Input logic		Sink or source	
Input compatibility		Type 3 according to EN/IEC 61131-2	
Input wiring mode		2-wire	
Anti-bounce filter		Yes, configurable	
Counting Frequency		250 kHz	
Input delay	Logic state 0 to logic state 1	< 1 µs + filter time	
	Logic state 1 to logic state 0	< 1 µs + filter time	
Response time	Enable	< 1 µs + filter time (1)	
	Synchronization	< 1 µs + filter time (1)	
	Capture	< 1 µs + filter time (1)	
Cable	Type	Shielded	
	Maximum length	10 m (32.8 ft)	
(1) Select an anti-bounce filter time of 0.5 µs or 1 µs so that the response time for ENAInput, SyncInput and CapInput parameters is less than 3 µs.			

NTSEHC0100 Wiring

Overview

This section provides the wiring diagrams of the NTSEHC0100 module.

Wiring Rules

For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagrams

Each input channel requires an external 24 Vdc power supply.

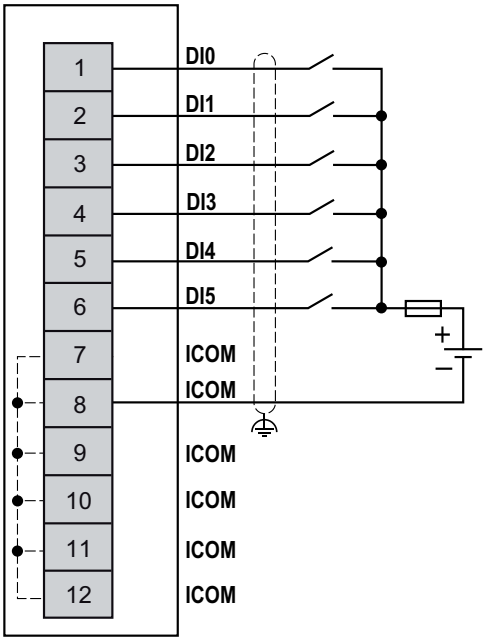
⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Use the sensor and actuator power supply only for supplying power to sensors or actuators connected to the module.

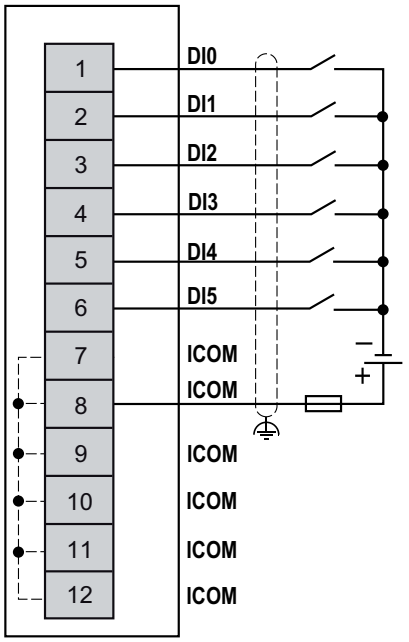
Failure to follow these instructions can result in death, serious injury, or equipment damage.

The following figure illustrates the 2-wire sink input connection:



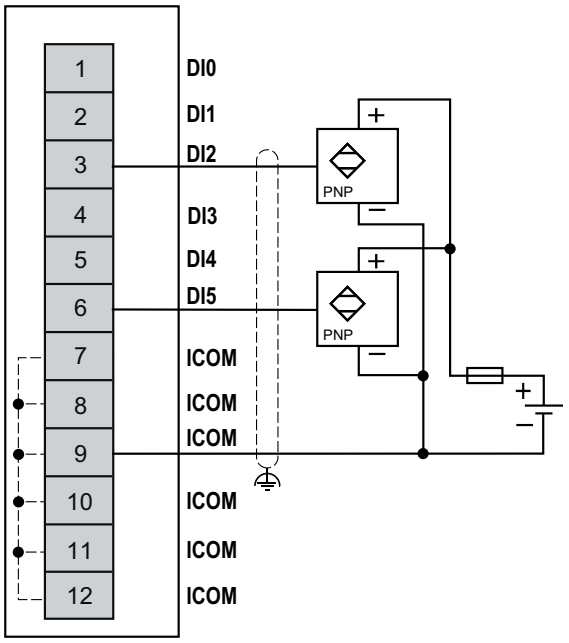
External Fuse: Type T, 0.1 A, 250 Vac is mandatory and must be chosen in compliance with IEC60269 standard.

The following figure illustrates the 2-wire source input connection:



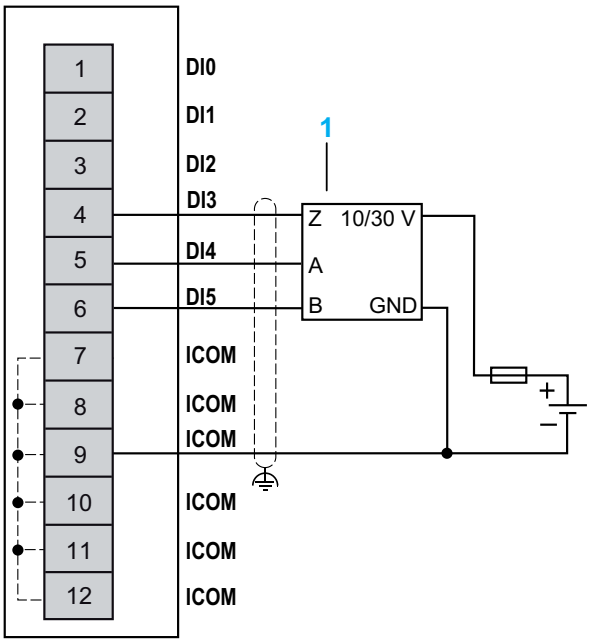
External Fuse: Type T, 0.1 A, 250 Vac is mandatory and must be chosen in compliance with IEC60269 standard.

The following figure illustrates the 3-wire input connection:



External Fuse: Type T, 0.1 A, 250 Vac is mandatory and must be chosen in compliance with IEC60269 standard.

The following figure illustrates the incremental encoder connection:



1: Encoder
External Fuse: Type T, 0.1 A, 250 Vac is mandatory and must be chosen in compliance with IEC60269 standard.

NTSEHC0100 Parameters

Overview

This section describes the standard input parameters of the NTSEHC0100 module.

The module supports the following counting functions:

- Simple Counting Function, page 59
- Frequency Meter Function, page 64
- Period Meter Function, page 68
- Ratio Meter Function, page 73
- Single Phase Event Counting Function, page 78
- Single Phase Counting Function, page 82
- Dual Phase Counting Function, page 90
- Enable Function, page 112
- Capture Function, page 114
- Preset Function, page 113

Parameters Description

Configurable Parameters

The following table presents the configurable parameters for the NTSEHC0100 module:

Displayed Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Device Mode *DeviceMode*	0: **Normal*** 1: **Optional** 2: **Virtual reserved**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically connected in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual module is physically installed in the cluster, a configuration error is detected.
* Parameter default value			

The following table presents the input configurable parameters for the channels of the NTSEHC0100 module:

Displayed Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Latch *Latch*	0: **No*** 1: **Rising Edge - Automatic Acknowledge** 2: **Falling Edge - Automatic Acknowledge** 3: **Both Edges - Automatic Acknowledge** 4: **Rising Edge - Manual Acknowledge** 5: **Falling Edge - Manual Acknowledge** 6: **Both Edges - Manual Acknowledge**	ENUM	Allows incoming pulses with a pulse width shorter than the network interface module scan time to be captured and recorded. For more information, refer to Input Latch, page 115.
Filter *InputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time.
* Parameter default value			

Implicit Data

The following table presents the input implicit data for the NTSEHC0100 module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
GCS	0...255	BYTE 1 R/-	Group Cyclic Status Bit 0: Data quality Bit 1: General module status Bit 2: I/O status Bit 3: N/A Bit 4: Output status Bit 5: Advisory status Bit 6: N/A Bit 7: Data freshness **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
ChannelHealthIn0_7(1)	0...255	BYTE 1 R/-	Status of input channel 0...7 Bit 0...7 = Value of input channel 0...7 • Bit = FALSE: Channel is invalid or not present. • Bit = TRUE: Channel is valid or disabled.
IValue0_7	0...255	BYTE 1 R/-	Input value of the channels (Bit field) Bit 0...7 = Value of channel 0...7 **NOTE:** Unused bits are reserved.
ModuleState	0...255	BYTE 1 R/-	Status of module detected error (Bit field) Bit 0: HSC in fallback status **NOTE:** Bit 1...7 are reserved. • Bit = FALSE: No error detected • Bit = TRUE: Error detected
(1) This parameter is not part of the implicit data if the optimized I/O profile is selected.			

The following table presents the output implicit data for the NTSEHC0100 module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
LatchAck0_7	0...255	BYTE 1 R/W	When **Latch** is set to **Manual Acknowledge**, resets the latch value of the input on the channel 0...7. Bit 0...7 = Value of channel 0...7

Explicit Data

The following table presents the input explicit data for the channels of the NTSEHC0100 module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
ChannelErrorIn	0...255	BYTE 1 R/-	Error detected on input channel. **NOTE:** Bit 0...7 are reserved, set to 0.

Counting Input/Output Modules

What's in This Part

NTSEHC0120H High Speed Counter Module, 1 Incremental Input, 24 Vdc, 250 kHz, 2 Inputs, 4 Outputs, Hardened

What's in This Chapter

NTSEHC0120H Presentation

Overview

This section provides a presentation of the NTSEHC0120H module.

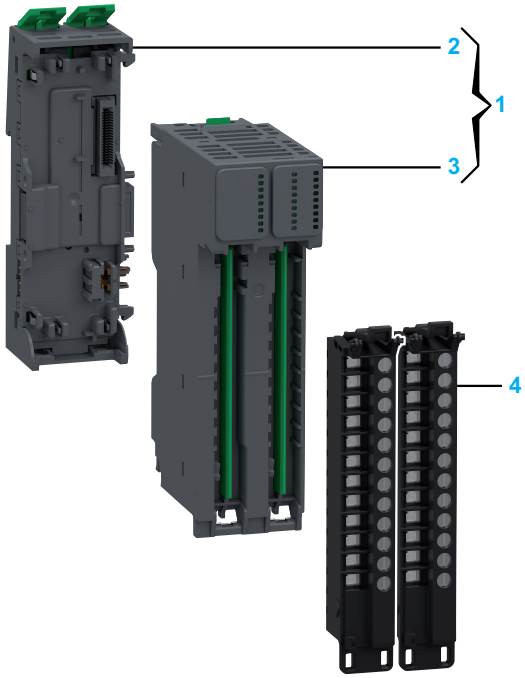
Main Characteristics

The following table describes the main characteristics of the NTSEHC0120H input and output module:

Main Characteristics	**Value**
Number of physical inputs	6
Number of incremental channels	1 The incremental input channel can use up to 4 inputs.
Minimum additional inputs	2 Inputs not used for the incremental channel can be used as auxiliary inputs or as inputs of **Simple counting** functions.
Number of physical outputs	4
Number of PWM channels	1 The PWM channel uses one output.
Minimum additional outputs	3 The outputs not used for the PWM channel can be used as auxiliary outputs or as reflex outputs.
Encoder type	High speed incremental counter
Input frequency	250 kHz
Encoder supply (external)	10...30 Vdc
Encoder input	Single ended
Resolution	Main counting function: 32 bits **Simple counting** function: 16 bits
Operating mode	Synchronous, isochronous and asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS NTSEHC0120H module:

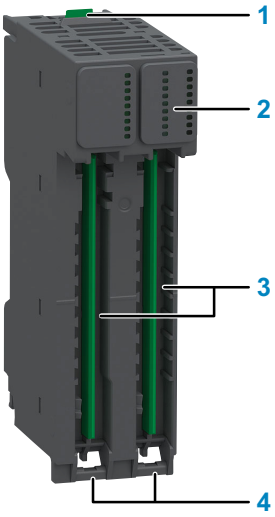


Number	Reference	Description
1	NTSEHC0120HK	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0200H	Spare Base, 2 Slots, for Input/Output Common/Expert/Safety Module, Hardened
3	NTSEHC0120H	High Speed Counter Module, 1 Incremental Input, 24 Vdc, 250 kHz, 2 Inputs, 4 Outputs, Hardened
4	NTSXTB12200H	Spring Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12201H	Spring Terminal Block, 12 Points, 5 mm Pitch, With Cover, use on Low Height Module, Hardened
	NTSXTB12000H	Screw Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12001H	Screw Terminal Block, 12 Points, 5 mm Pitch, With cover, use on Low Height Module, Hardened
		NOTE: The terminal blocks are purchased separately.

NOTE: For more information on accessories and spare parts, refer to Modicon Edge I/O - System Planning and Installation Guide.

Physical Description

The following figure presents the elements of the module:



1: Release button for disengaging the module from the base
2: Status LEDs
3: Slot for the terminal block
4: Hinge for the terminal block installation

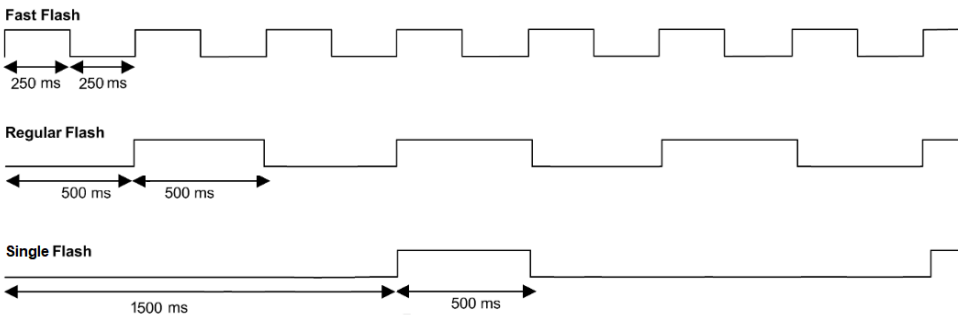
Status LED

The following figure presents the NTSEHC0120H status LEDs:

The following table describes the status of LEDs:

R (Green)	E (Red)	Channel (Green)	Description
Initialization and non-operational states			
OFF	OFF	OFF	Indicates that the module is not energized.
OFF	Fast Flash	-	Indicates that the module has detected a system error.
Regular Flash	OFF	-	Indicates that the firmware is being updated.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	Regular Flash	When the channel is configured as the **PWM Output**, it indicates that the frequency generation and duty cycle is between 0.1% and 50%.
ON	-	Fast Flash	When the channel is configured as the **PWM Output**, it indicates that the frequency generation and duty cycle is between 50.1% and 99.9%.
ON	-	ON	Indicates that the input or output channel is activated.
ON	-	OFF	Indicates that the input or output channel is deactivated. When the channel is configured as the **PWM Output**, it indicates that the frequency generation and duty cycle is 0%.
ON	Regular Flash	OFF	Indicates that an error is detected in the 24 Vdc field power.
ON	Regular Flash	Regular Flash	Indicates that a short circuit is detected on the output.

The following graphic shows the system status of LEDs during module operation:



NTSEHC0120H Characteristics

Overview

This section provides a general description of the characteristics of the module.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

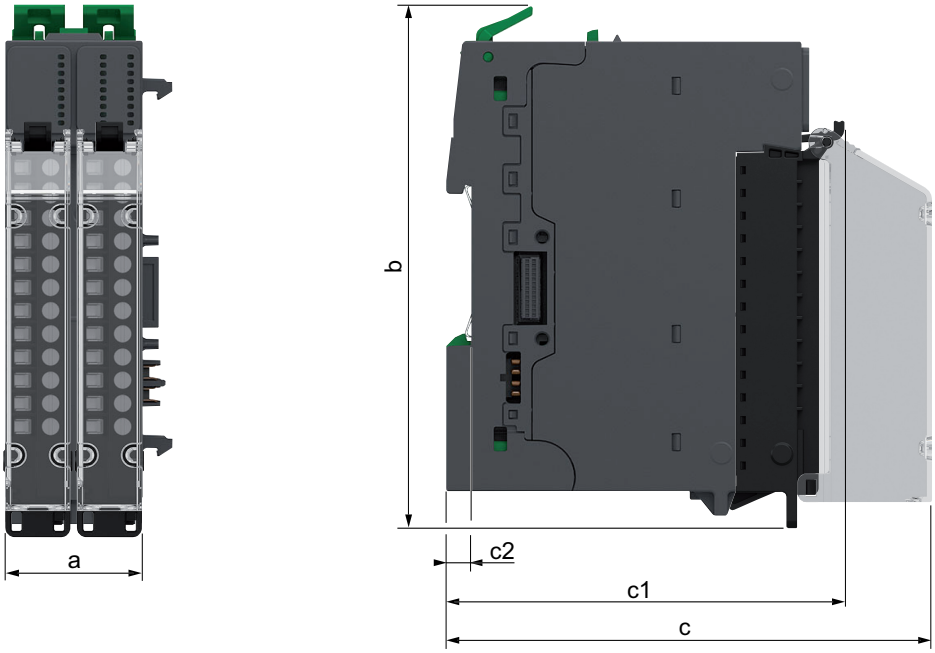
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

For more information on environmental characteristics, refer to Modicon Edge I/O - System Planning and Installation Guide.

Dimensions

The following figure presents the external dimensions of the assembled module:



a: 30 mm (1.18 in)
b: 116.6 mm (4.57 in)
c: 107.5 mm (4.21 in)
c1: 88.2 mm (3.46 in)
c2: 5.6 mm (0.2 in)

Weight

- NTSEHC0120H: 85 g (3 00 oz)
- NTSEHC0120HK: 130 g (4.59 oz)

General Characteristics

The following table describes the general characteristics of the NTSEHC0120H input and output module:

Characteristics		Value
Rated supplied voltage		24 Vdc
Power supplied voltage range		20.4...28.8 Vdc
Power dissipation		2.54 W
Isolation	Between channel groups	850 Vac
	Between channels and bus	1,500 Vac
	Between channels and field power	No
	Between field power and bus	No
Overvoltage protection		30 Vdc

Input and Output Characteristics

The following table describes the input characteristics of the NTSEHC0120H input and output module:

Characteristics		Value	
		Voltage input	Current input
Rated input value		24 Vdc	2.27 mA
Operating range	Logic state 1	> 11 Vdc	2 mA
	Logic state 0	< 5 Vdc	< 1.5 mA
Peak values		30 Vdc	3 mA
Input logic		Sink or source	
Input compatibility		Type 3 according to EN/IEC 61131-2	
Input wiring mode		2-wire	
Anti-bounce filter		Yes, configurable	
Counting Frequency		250 kHz	
Input delay	Logic state 0 to logic state 1	< 1 µs + filter time	
	Logic state 1 to logic state 0	< 1 µs + filter time	
Response time	Enable	< 1 µs + filter time (1)	
	Synchronization	< 1 µs + filter time (1)	
	Capture	< 1 µs + filter time (1)	
Cable	Type	Shielded	
	Maximum length	10 m (32.8 ft)	

(1) Select an anti-bounce filter time of 0.5 µs or 1 µs so that the response time for ENAInput, SyncInput and CapInput parameters is less than 3 µs.

The following table describes the output characteristics of the NTSEHC0120H input and output module:

Characteristics		Value
Rated output voltage		24 Vdc
Output current per channel		Auxiliary output: 0.5 A maximum
		PWM output: 100 mA maximum
		When using a filament lamp, power consumption must be below 2.4 W
Output current per module		2 A maximum
Output logic		Source
Output wiring mode		2-wire
Output delay	Logic state 0 to logic state 1	< 5 µs
	Logic state 1 to logic state 0	< 5 µs
Response time		≤ 20 µs
Cable	Type	Shielded
	Maximum length	10 m (32.8 ft)

NTSEHC0120H Wiring

Overview

This section provides the wiring diagrams of the NTSEHC0120H module.

Wiring Rules

For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagrams

Each input channel requires an external 24 Vdc power supply.

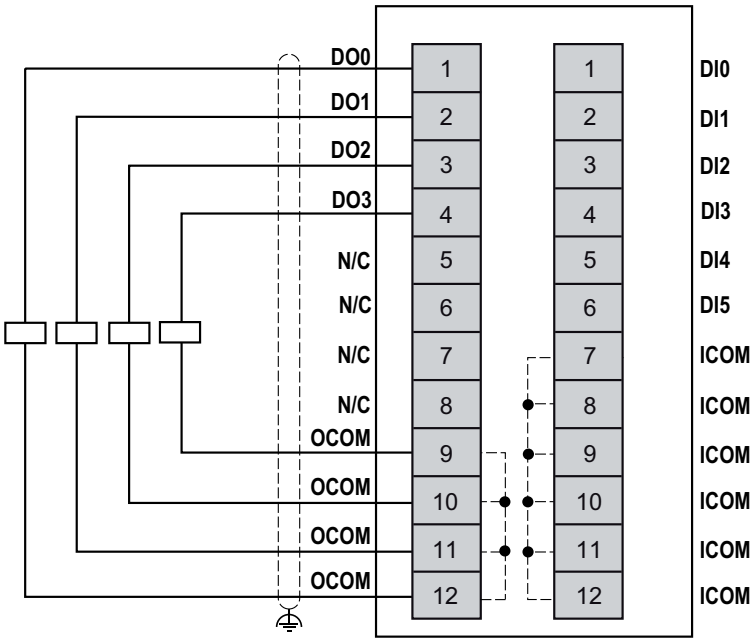
⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Use the sensor and actuator power supply only for supplying power to sensors or actuators connected to the module.

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

The following figure illustrates the source output (push-pull) connection:



N/C: No Connection

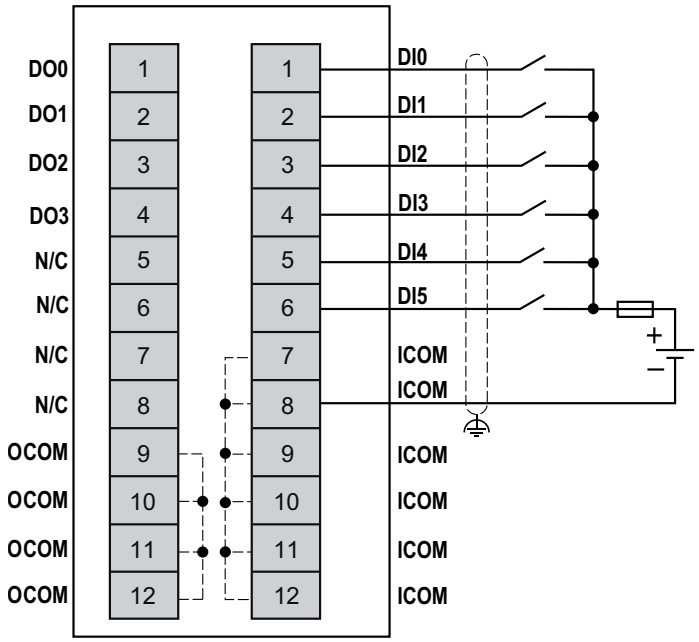
⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N/C)”.

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

The following figure illustrates the 2-wire sink input connection:



N/C: No Connection
External Fuse: Type T, 0.1 A, 250 Vac is mandatory and must be chosen in compliance with IEC60269 standard.

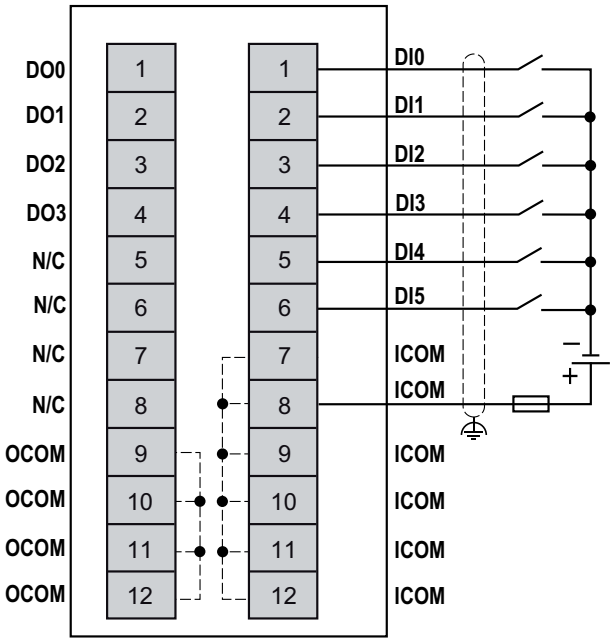
⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N/C)”.

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

The following figure illustrates the 2-wire source input connection:



N/C: No Connection
External Fuse: Type T, 0.1 A, 250 Vac is mandatory and must be chosen in compliance with IEC60269 standard.

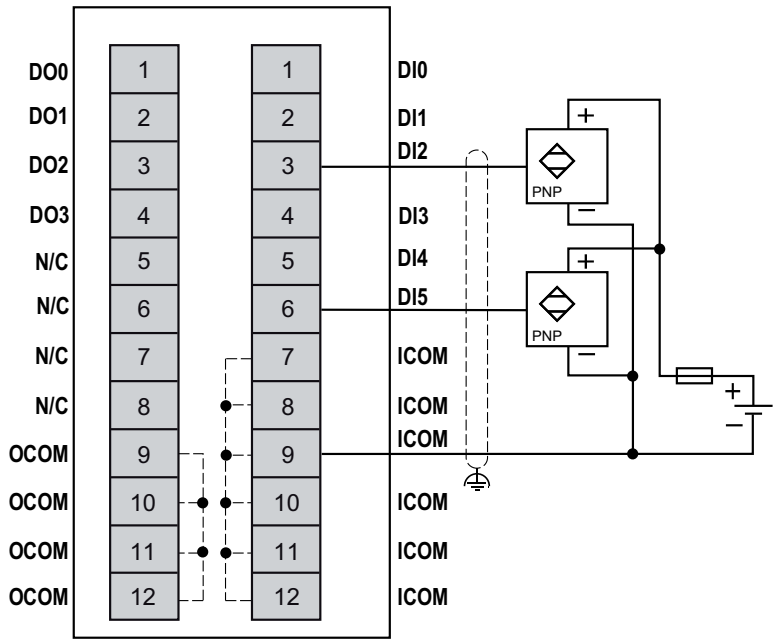
⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N/C)”.

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

The following figure illustrates the 3-wire input connection:



N/C: No Connection
External Fuse: Type T, 0.1 A, 250 Vac is mandatory and must be chosen in compliance with IEC60269 standard.

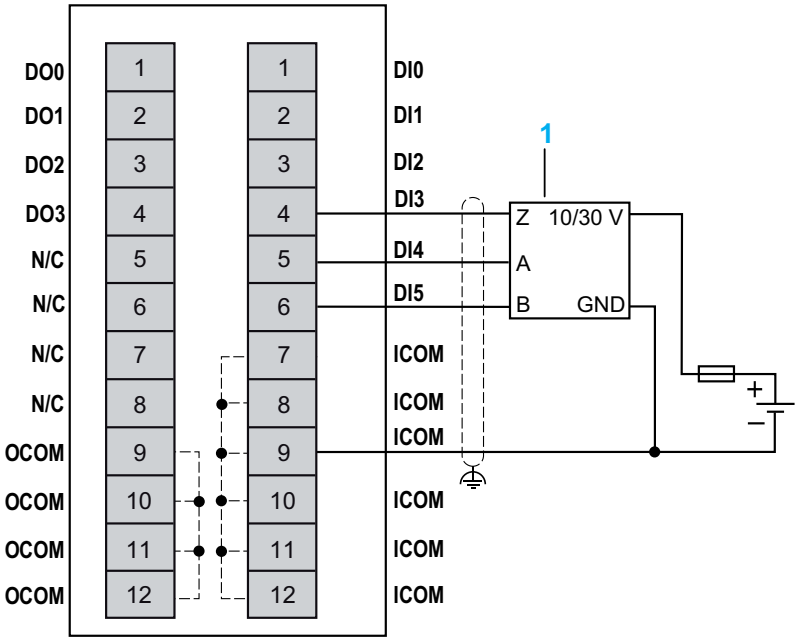
⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N/C)”.

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

The following figure illustrates the incremental encoder connection:



1: Encoder
N/C: No Connection
External Fuse: Type T, 0.1 A, 250 Vac is mandatory and must be chosen in compliance with IEC60269 standard.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N/C)”.

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

NTSEHC0120H Parameters

Overview

This section describes the standard input and output parameters of the NTSEHC0120H module.

The module supports the following counting functions:

Parameters Description

Configurable Parameters

The following table presents the configurable parameters for the NTSEHC0120H module:

Displayed Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Device Mode *DeviceMode*	0: **Normal*** 1: **Optional** 2: **Virtual reserved**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically connected in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual module is physically installed in the cluster, a configuration error is detected.
Rearming Output Mode *RearmOutputMode*	0: **Latched Off** 1: **Auto Recovery***	ENUM	Allows you to select the rearming mode for an output channel which are latched off due to a detected error. Two modes are available: • **Latched Off**: The channel is rearmed if the cause of the detected error is no longer present, and a rising edge on **RearmOutputCmd** is applied. • **Auto Recovery**: the output channel is rearmed automatically if the cause of the detected error is no longer present for a predefined delay.
* Parameter default value			

The following table presents the input configurable parameters for the channels of the NTSEHC0120H module:

Displayed Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Latch *Latch*	0: **No*** 1: **Rising Edge - Automatic Acknowledge** 2: **Falling Edge - Automatic Acknowledge** 3: **Both Edges - Automatic Acknowledge** 4: **Rising Edge - Manual Acknowledge** 5: **Falling Edge - Manual Acknowledge** 6: **Both Edges - Manual Acknowledge**	ENUM	Allows incoming pulses with a pulse width shorter than the network interface module scan time to be captured and recorded. For more information, refer to Input Latch, page 115.
Filter *InputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
* Parameter default value			

The following table presents the output configurable parameters for the channels of the NTSEHC0120H module:

Displayed Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Fallback Mode *OutputFallbackMode*	0: **Fallback Value*** 1: **Maintain**	ENUM	Allows you to select the behavior for the output in case of a communication interruption: • **Fallback Value**: Sets the output at the configured **Predefined Fallback Value** value. • **Maintain**: The output remains in its state.
Predefined Fallback Value *PredefinedFallbackValue*	0: **0*** 1: **1**	ENUM	Determines the state for the output in case of a communication interruption and **Fallback Mode** parameter is set to **Fallback Value**.
* Parameter default value			

Implicit Data

The following table presents the input implicit data for the NTSEHC0120H module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
GCS	0...255	BYTE R/-	Group Cyclic Status Bit 0: Data quality Bit 1: General module status Bit 2: I/O status Bit 3: Receive status Bit 4: Output status Bit 5: Advisory status Bit 6: N/A Bit 7: Data freshness **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
ChannelHealthIn0_7(1)	0...255	BYTE 1 R/-	Status of input channel 0...7 (Bit field) Bit 0...7 = Value of input channel 0...7 • Bit = FALSE: Channel is invalid or not present. • Bit = TRUE: Channel is valid or disabled.
IValue0_7	0...255	BYTE 1 R/-	Value of the input channels (Bit field) Bit 0...7 = Value of input channel 0...7 **NOTE:** Unused bits are set to 0.
ChannelHealthOut0_7	0...255	BYTE 1 R/-	Status of output channel 0...7 (Bit field) Bit 0...7 = Value of output channel 0...7 • Bit = FALSE: Channel is invalid or not present. • Bit = TRUE: Channel is valid or disabled.
ModuleState	0...255	BYTE 1 R/-	Status of module detected error (Bit field) Bit 0: HSC Output fallback status Bit 1: HSC Short circuit group 0 status Bit 2: N/A Bit 3: HSC Internal field power supply status **NOTE:** Bit 4...7 are reserved. • Bit = FALSE: No error detected • Bit = TRUE: Error detected
(1) This parameter is not part of the implicit data if the optimized I/O profile is selected.			

The following table presents the output implicit data for the NTSEHC0120H module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
LatchAck0_7	0...255	BYTE 1 R/W	When **Latch** is set to **Manual Acknowledge**, resets the latch value of the input on the channel 0...7. Bit 0...7 = Value of channel 0...7
QValue0_7	0...255	BYTE 1 R/W	Value of the output channels (Bit field). Bit 0...7 = Value of output channel 0...7 **NOTE:** Unused bits are reserved.
RearmOutputCmd	TRUE or FALSE	BOOL 1 R/W	If the **Rearming Output Mode** parameter is set to **Latched Off** and the cause of the detected error is no longer present, then, on a rising edge, it rearms the output channels.

Explicit Data

The following table presents the input explicit data for the channels of the NTSEHC0120H module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
ChannelErrorIn	0...255	BYTE 1 R/-	Error detected on input channel. **NOTE:** Bit 0...7 are reserved, set to 0.

The following table presents the output explicit data for the channels of the NTSEHC0120H module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
ChannelErrorOut	0...255	BYTE 1 R/-	Error detected on output channel (Bit field). Bit 1: Short-circuit error detected Bit 4: Internal field power supply error detected Bit 5: Output in fallback state **NOTE:** Unused bits are reserved.

NTSEHC0220 High Speed Counter Module, 2 Incremental Inputs, 24 Vdc, 250 kHz, 4 Inputs, 8 Outputs

What's in This Chapter

NTSEHC0220 Presentation

Overview

This section provides a presentation of the NTSEHC0220 module.

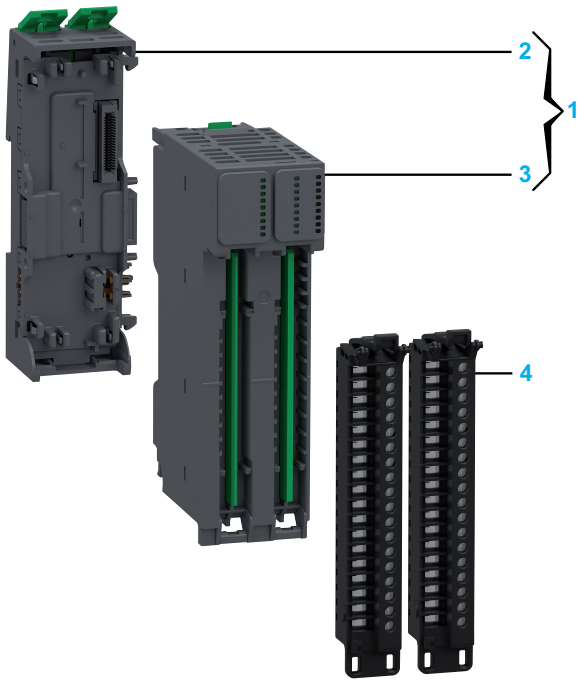
Main Characteristics

The following table describes the main characteristics of the NTSEHC0220 input and output module:

Main Characteristics	Value
Number of physical inputs	12
Number of incremental channels	Up to 2 Each incremental input channel can use up to 4 inputs.
Minimum additional inputs	4 Inputs not used for the incremental channels can be used as auxiliary inputs or as inputs of **Simple counting** functions.
Number of physical outputs	8
Number of PWM channels	Up to 2 Each PWM channel uses one output.
Minimum additional outputs	6 The outputs not used for the PWM channel can be used as auxiliary outputs or as reflex outputs.
Encoder type	High speed incremental counter
Input frequency	250 kHz
Encoder supply (external)	10...30 Vdc
Encoder input	Single ended
Resolution	Main counting function: 32 bits **Simple counting** function: 16 bits
Operating mode	Synchronous, isochronous and asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS NTSEHC0220 module:

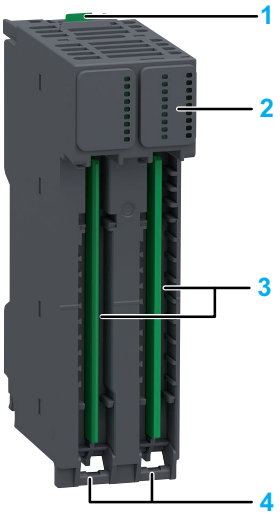


Number	Reference	Description
1	NTSEHC0220K	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0200H	Spare Base, 2 Slots, for Input/Output Common/Expert/Safety Module, Hardened
3	NTSEHC0220	High Speed Counter Module, 2 Incremental Inputs, 24 Vdc, 250 kHz, 4 Inputs, 8 Outputs
4	NTSXTB18200H	Spring Terminal Block, 18 Points, 3.81 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB18201H	Spring Terminal Block, 18 Points, 3.81 mm Pitch, With Cover, use on Low Height Module, Hardened
	NTSXTB18000H	Screw Terminal Block, 18 Points, 3.81 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB18001H	Screw Terminal Block, 18 Points, 3.81 mm Pitch, With Cover, use on Low Height Module, Hardened **NOTE:** The terminal blocks are purchased separately.

NOTE: For more information on accessories and spare parts, refer to Modicon Edge I/O - System Planning and Installation Guide.

Physical Description

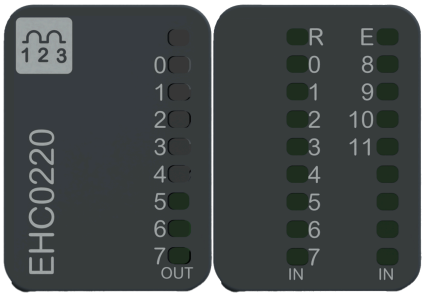
The following figure presents the elements of the module:



1: Release button for disengaging the module from the base
2: Status LEDs
3: Slot for the terminal block
4: Hinge for the terminal block installation

Status LED

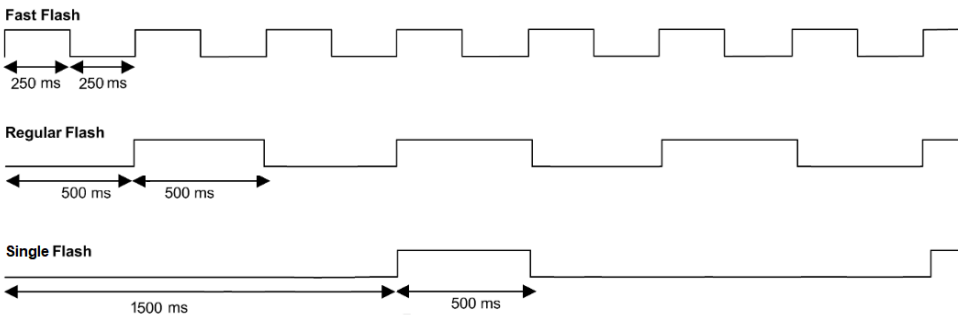
The following figure presents the NTSEHC0220 status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	Channel (Green)	Description
Initialization and non-operational states			
OFF	OFF	OFF	Indicates that the module is not energized.
OFF	Fast Flash	-	Indicates that the module has detected a system error.
Regular Flash	OFF	-	Indicates that the firmware is being updated.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	Regular Flash	When the channel is configured as the **PWM Output**, it indicates that the frequency generation and duty cycle is between 0.1% and 50%.
ON	-	Fast Flash	When the channel is configured as the **PWM Output**, it indicates that the frequency generation and duty cycle is between 50.1% and 99.9%.
ON	-	ON	Indicates that the input or output channel is activated.
ON	-	OFF	Indicates that the input or output channel is deactivated. When the channel is configured as the **PWM Output**, it indicates that the frequency generation and duty cycle is 0%.
ON	Regular Flash	OFF	Indicates that an error is detected in the 24 Vdc field power.
ON	Regular Flash	Regular Flash	Indicates that a short circuit is detected on the output.

The following graphic shows the system status of LEDs during module operation:



NTSEHC0220 Characteristics

Overview

This section provides a general description of the characteristics of the module.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

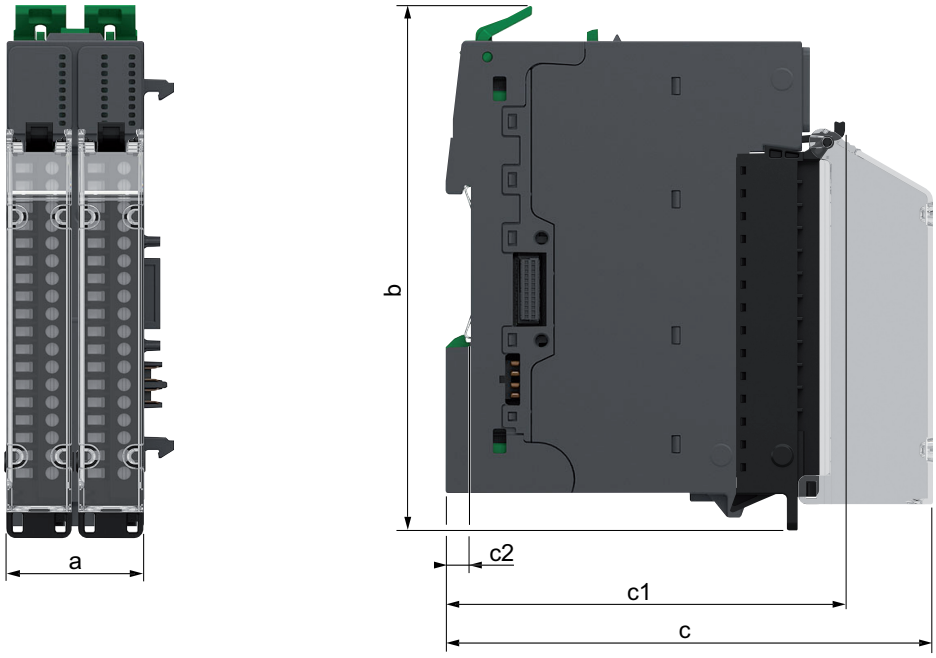
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

For more information on environmental characteristics, refer to Modicon Edge I/O - System Planning and Installation Guide.

Dimensions

The following figure presents the external dimensions of the assembled module:



a: 30 mm (1.18 in)
b: 116.6 mm (4.57 in)
c: 107.5 mm (4.21 in)
c1: 88.2 mm (3.46 in)
c2: 5.6 mm (0.2 in)

Weight

- NTSEHC0220: 88 g (3.10 oz)
- NTSEHC0220K: 134 g (4.73 oz)

General Characteristics

The following table describes the general characteristics of the NTSEHC0220 input and output module:

Characteristics		Value
Rated supplied voltage		24 Vdc
Power supplied voltage range		20.4...28.8 Vdc
Power dissipation		2.97 W
Isolation	Between channel groups	850 Vac
	Between channels and bus	1,500 Vac
	Between channels and field power	No
	Between field power and bus	No
Overvoltage protection		30 Vdc

Input and Output Characteristics

The following table describes the input characteristics of the NTSEHC0220 input and output module:

Characteristics		Value	
		Voltage input	Current input
Rated input value		24 Vdc	2.27 mA
Operating range	Logic state 1	> 11 Vdc	2 mA
	Logic state 0	< 5 Vdc	< 1.5 mA
Peak values		30 Vdc	3 mA
Input logic		Sink or source	
Input compatibility		Type 3 according to EN/IEC 61131-2	
Input wiring mode		2-wire	
Anti-bounce filter		Yes, configurable	
Counting Frequency		250 kHz	
Input delay	Logic state 0 to logic state 1	< 1 µs + filter time	
	Logic state 1 to logic state 0	< 1 µs + filter time	
Response time	Enable	< 1 µs + filter time (1)	
	Synchronization	< 1 µs + filter time (1)	
	Capture	< 1 µs + filter time (1)	
Cable	Type	Shielded	
	Maximum length	10 m (32.8 ft)	

(1) Select an anti-bounce filter time of 0.5 µs or 1 µs so that the response time for ENAInput, SyncInput and CapInput parameters is less than 3 µs.

The following table describes the output characteristics of the NTSEHC0220 input and output module:

Characteristics		Value
Rated output voltage		24 Vdc
Output current per channel		Auxiliary output: 0.5 A maximum
		PWM: 100 mA maximum
		When using a filament lamp, power consumption must be below 2.4 W
Output current per module		2 A maximum
Output logic		Source
Output wiring mode		2-wire
Output delay	Logic state 0 to logic state 1	< 5 µs
	Logic state 1 to logic state 0	< 5 µs
Response time		≤ 20 µs
Cable	Type	Shielded
	Maximum length	10 m (32.8 ft)

NTSEHC0220 Wiring

Overview

This section provides the wiring diagrams of the NTSEHC0220 module.

Wiring Rules

For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagrams

Each input channel requires an external 24 Vdc power supply.

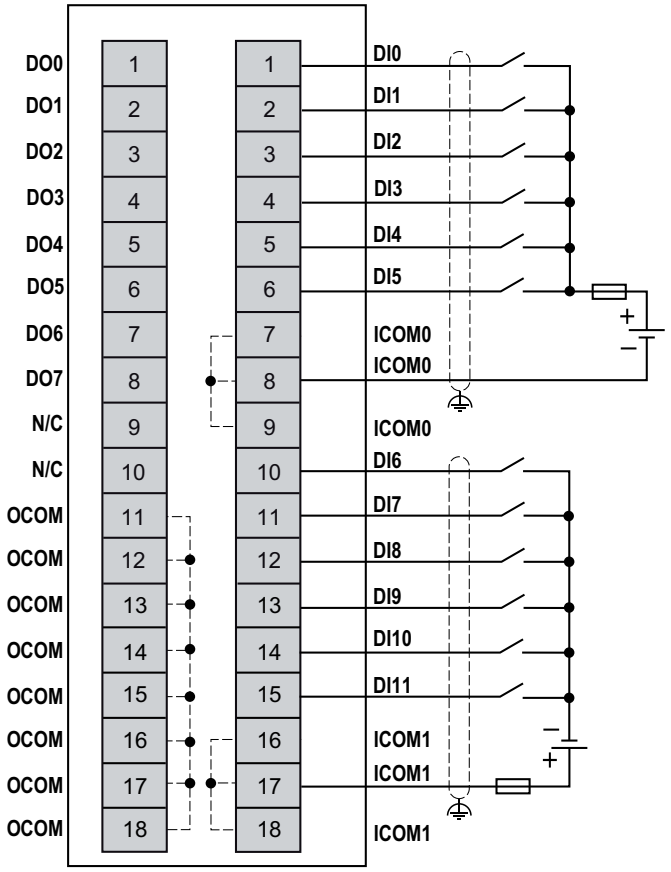
⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Use the sensor and actuator power supply only for supplying power to sensors or actuators connected to the module.

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

The following figure illustrates the 2-wire sink input and the 2-wire source input connections:



N/C: No Connection
External Fuse: Type T, 0.1 A, 250 Vac is mandatory and must be chosen in compliance with IEC60269 standard.

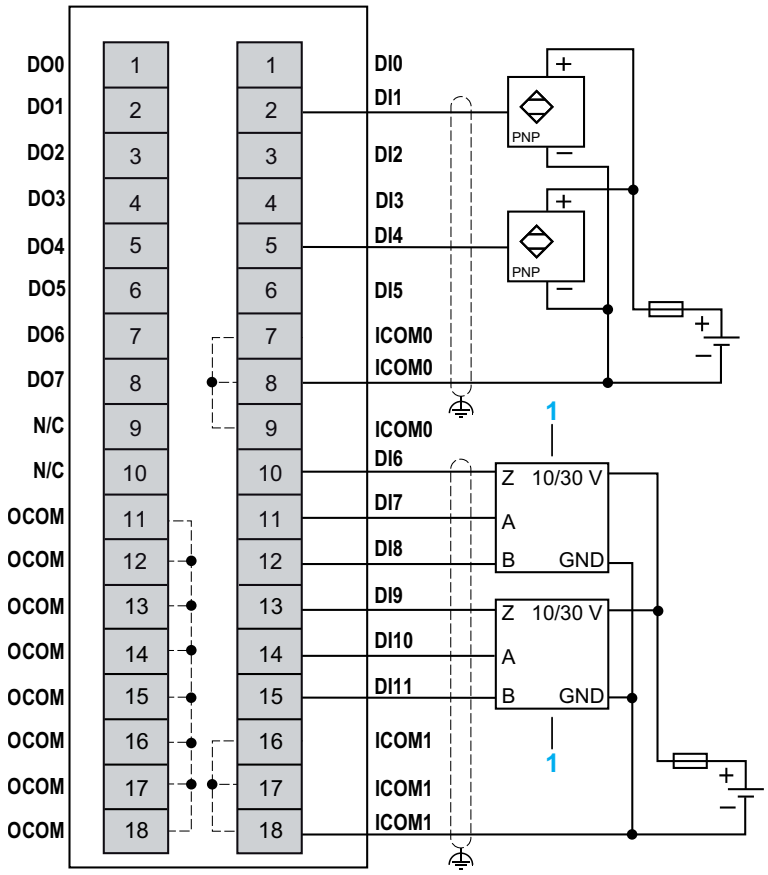
⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N/C)”.

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

The following figure illustrates the 3-wire input connection and incremental encoder connection:



1: Encoder
N/C: No Connection
External Fuse: Type T, 0.1 A, 250 Vac is mandatory and must be chosen in compliance with IEC60269 standard.

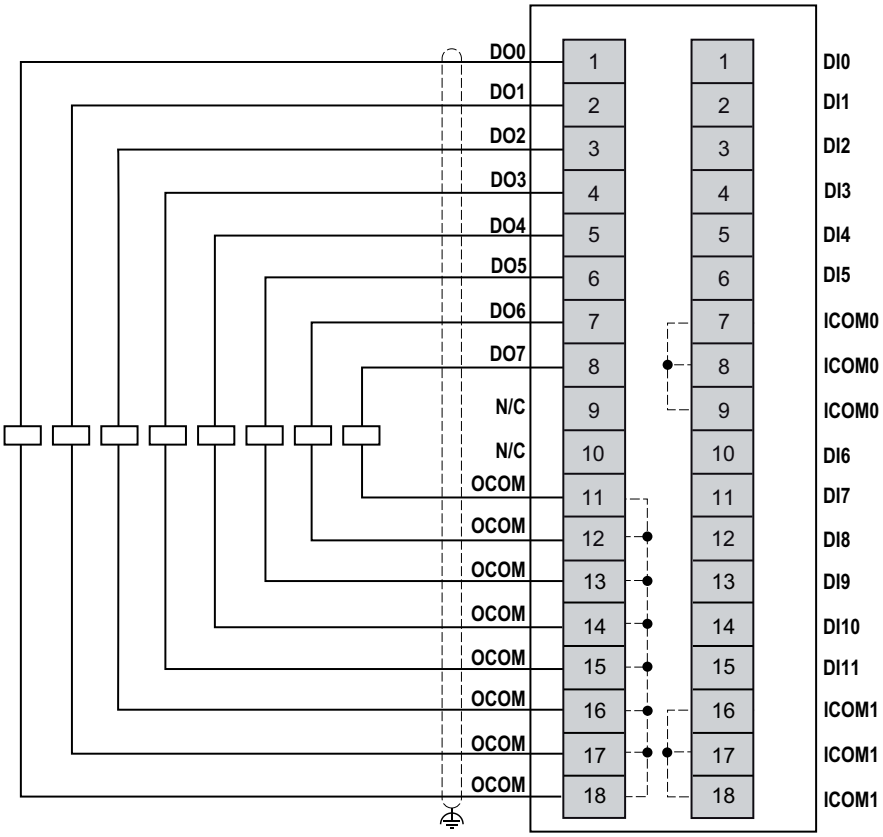
⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N/C)”.

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

The following figure illustrates the source output (push-pull) connection:



N/C: No Connection

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N/C)”.

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

NTSEHC0220 Parameters

Overview

This section describes the standard input and output parameters of the NTSEHC0220 module.

The module supports the following counting functions:

Parameters Description

Configurable Parameters

The following table presents the configurable parameters for the NTSEHC0220 module:

Displayed Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Device Mode *DeviceMode*	0: **Normal*** 1: **Optional** 2: **Virtual reserved**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically connected in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual module is physically installed in the cluster, a configuration error is detected.
Rearming Output Mode *RearmOutputMode*	0: **Latched Off** 1: **Auto Recovery***	ENUM	Allows you to select the rearming mode for an output channel which are latched off due to a detected error. Two modes are available: • **Latched Off**: The channel is rearmed if the cause of the detected error is no longer present, and a rising edge on **RearmOutputCmd** is applied. • **Auto Recovery**: the output channel is rearmed automatically if the cause of the detected error is no longer present for a predefined delay.
* Parameter default value			

The following table presents the input configurable parameters for the channels of the NTSEHC0220 module:

Displayed Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Latch *Latch*	0: **No*** 1: **Rising Edge - Automatic Acknowledge** 2: **Falling Edge - Automatic Acknowledge** 3: **Both Edges - Automatic Acknowledge** 4: **Rising Edge - Manual Acknowledge** 5: **Falling Edge - Manual Acknowledge** 6: **Both Edges - Manual Acknowledge**	ENUM	Allows incoming pulses with a pulse width shorter than the network interface module scan time to be captured and recorded. For more information, refer to Input Latch, page 115.
Filter *InputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
* Parameter default value			

The following table presents the output configurable parameters for the channels of the NTSEHC0220 module:

Displayed Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Fallback Mode *OutputFallbackMode*	0: **Fallback Value** 1: **Maintain**	ENUM	Allows you to select the behavior for the output in case of a communication interruption: • **Fallback Value**: Sets the output at the configured **Predefined Fallback Value** value. • **Maintain**: The output remains in its actual state.
Predefined Fallback Value *PredefinedFallbackValue*	0: **0*** 1: **1**	ENUM	Determines the state for the output in case of a communication interruption and **Fallback Mode** parameter is set to **Fallback Value**.
* Parameter default value			

Implicit Data

The following table presents the input implicit data for the NTSEHC0220 module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
GCS	0...255	BYTE 1 R/-	Group Cyclic Status Bit 0: Data quality Bit 1: General module status Bit 2: I/O status Bit 3: Receive status Bit 4: Output status Bit 5: Advisory status Bit 6: N/A Bit 7: Data freshness **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
ChannelHealthIn0_7(1)	0...255	BYTE 1 R/-	Status of input channel 0...7 Bit 0...7 = Value of input channel 0...7 • Bit = FALSE: Channel is invalid or not present. • Bit = TRUE: Channel is valid or disabled.
ChannelHealthIn8_15(1)	0...255	BYTE 1 R/-	Status of input channel 8...15 Bit 0...7 = Value of input channel 8...15 • Bit = FALSE: Channel is invalid or not present. • Bit = TRUE: Channel is valid or disabled.
IValue0_7	0...255	BYTE 1 R/-	Value of the input channels (Bit field) Bit 0...7 = Value of input channel 0...7 **NOTE:** Unused bits are set to 0.
IValue8_15	0...255	BYTE 1 R/-	Value of the input channels (Bit field) Bit 0...7 = Value of input channel 8...15 **NOTE:** Unused bits are set to 0.
ChannelHealthOut0_7	0...255	BYTE 1 R/-	Status of output channel 0...7 (Bit field) Bit 0...7 = Value of output channel 0...7 • Bit = FALSE: Channel is invalid or not present. • Bit = TRUE: Channel is valid or disabled.
ModuleState	0...255	BYTE 1 R/-	Status of module detected error (Bit field): Bit 0: HSC Output fallback status Bit 1: HSC Short circuit group 0 status Bit 2: HSC Short circuit group 1 status Bit 3: HSC Internal field power supply status **NOTE:** Bit 4...7 are reserved. • Bit = FALSE: No error detected • Bit = TRUE: Error detected
(1) This parameter is not part of the implicit data if the optimized I/O profile is selected.			

The following table presents the output implicit data for the NTSEHC0220 module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
LatchAck0_7	0...255	BYTE 1 R/W	When **Latch** is set to **Manual Acknowledge**, resets the latch value of the input on the channel 0...7. Bit 0...7 = Value of channel 0...7
LatchAck8_15	0...255	BYTE 1 R/W	When **Latch** is set to **Manual Acknowledge**, resets the latch value of the input on the channel 8...15. Bit 0...7 = Value of channel 8...15
QValue0_7	0...255	BYTE 1 R/W	Value of the output channels (Bit field). Bit 0...7 = Value of output channel 0...7 **NOTE:** Unused bits are reserved.
RearmOutputCmd	TRUE or FALSE	BOOL 1 R/W	If the **Rearming Output Mode** parameter is set to **Latched Off** and the cause of the detected error is no longer present, then, on a rising edge, it rearms the output channels.

Explicit Data

The following table presents the input explicit data for the channels of the NTSEHC0220 module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
ChannelErrorIn	0...255	BYTE 1 R/-	Error detected on input channel. **NOTE:** Bit 0...7 are reserved, set to 0.

The following table presents the output explicit data for the channels of the NTSEHC0220 module:

Parameter Name	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
ChannelErrorOut	0...255	BYTE 1 R/-	Error detected on output channel (Bit field). Bit 1: Short circuit error detected Bit 4: Internal power supply error detected Bit 5: Output in fallback state **NOTE:** Unused bits are reserved.

Appendices

What's in This Part

Counting Functions

What's in This Chapter

Simple Counting Function

Description

The **Simple counting** function counts the number of pulses applied to input A.

The **Simple counting** function has 2 operating modes:

- One-shot counting
- Modulo-loop counting

With the **Simple counting** function:

- The enable condition, page 112 is controlled with a software command.
- The preset condition, page 113 is controlled with a software command.

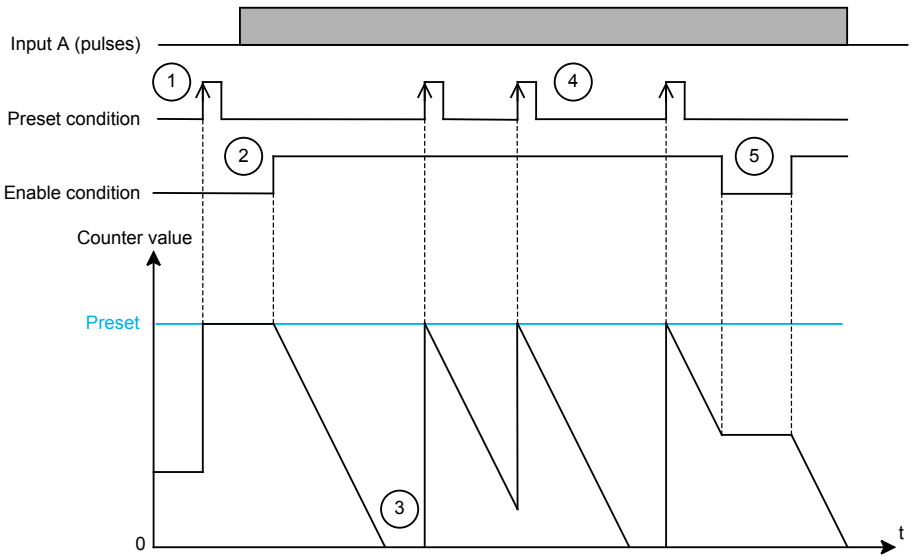
The following table describes the features of the **Simple counting** function:

Item	Description
Inputs	The **Simple counting** function requires a single fast input **A Location** to operate.
Counter register	16 bits
Maximum input frequency	250 kHz
Counter value update rate	At each pulse on input A.

One-Shot Sub-Mode

In the **One-shot** sub-mode, the counter value of the function starts at the **Preset** value and decreases for each pulse on input A.

The following diagram and table describe the **One-shot** sub-mode principle:



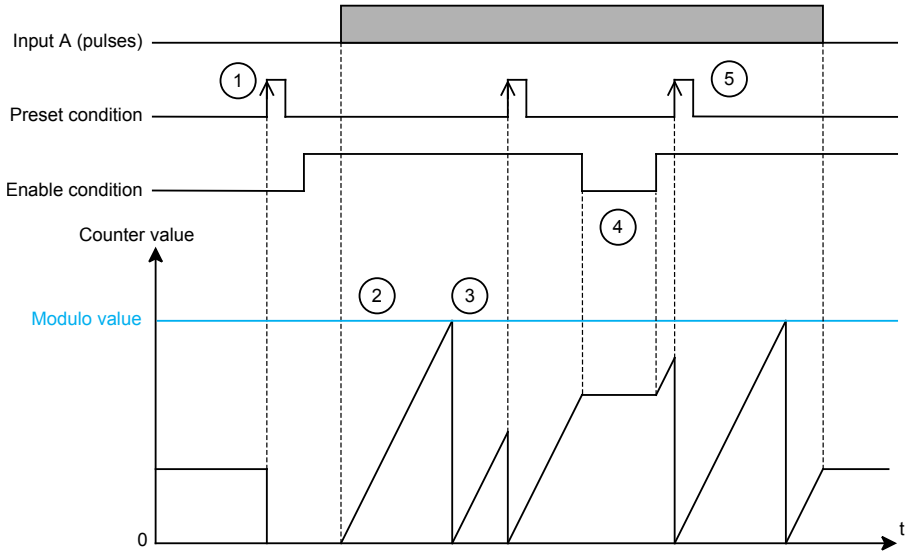
Stage	Action
1	On the rising edge of the preset condition, the counter value is set to the **Preset** value and the counter is activated.
2	While the enable condition is TRUE, the counter value decrements on each pulse on input A until it reaches 0. **NOTE:** When the counter value reaches 0, the Run bit is set to 0.
3	At this point, pulses on input A have no effect on the counter value. On the rising edge of the preset condition, the counter value is set to the **Preset** value and the counting resumes. **NOTE:** On the rising edge of the preset condition and because enable condition is TRUE, the Run bit is set to 1.
4	At any time, a rising edge of the preset condition sets the counter value to the **Preset** value.
5	When the enable condition is FALSE, the counter ignores the pulses from input A and retains the counting value. When the enable condition is TRUE, the counter resumes counting pulses from input A.

Modulo-Loop Sub-Mode

In the **Modulo-loop** sub-mode, the counter value starts from 0 and increases for each pulse on input A.

When the value reaches the configured **Modulo value** - 1, the counter value is set to 0 at the next pulse and the Modulo Flag is set to TRUE.

The following diagram and table describe the **Modulo-loop** sub-mode principle:



Stage	Action
1	On the rising edge of the preset condition, the counter value is reset to 0 and the counter is activated.
2	While the enable condition is TRUE, each pulse on input A increments the counter value.
3	When the value reaches the configured **Modulo value** - 1, the counter value is set to 0 at the next pulse and the Modulo Flag bit is set to TRUE. **NOTE:** To reset the Modulo Flag bit, use the Acknowledge Modulo command.
4	When the enable condition is FALSE, the counter ignores the pulses from input A and retains its value. When the enable condition is TRUE, the counter resumes counting pulses from input A.
5	At any time, a rising edge of the preset condition sets the counter value to 0.

Simple Counting Configuration

The following table presents the configuration parameters of the **Simple counting** function:

Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Sub Mode *SubMode*	0: **One-shot*** 1: **Modulo-loop**	ENUM	Selects the counting sub-mode.
A Location *AInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Selects the input used for the A signal.
A Filter *AInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
Preset *Preset*(1)	**0...65535***	INT	**One-shot** sub-mode: Sets the counting initial value.
Modulo value *Modulo value*(1)	**0...65535***	INT	**Modulo-loop** sub-mode: Sets the modulo value at which the counter loops.

* Parameter default value

(1) Online modification is allowed and applied on the rising edge of the preset condition. For more information about online modifications, refer to Modicon Edge I/O - Configurator and Web Interface - User Guide.

Implicit Data

The following table presents the input implicit data of the **Simple counting** function:

Parameter Name	Value	Data Type Size in Bytes R/W	Description
CounterValue	0...65,535	INT 2 R/-	Counter value. **NOTE:** The implicit data *CounterValue* is updated at each I/O Bus cycle.
OperationalState	0...255	BYTE 1 R/-	Operational state of the **Simple counting** function. Bit 0 (Run), this bit indicates if the counter is active. • TRUE when the enable condition is TRUE. • FALSE: ◦ When the enable condition is FALSE. ◦ In **One-shot** mode, when the counter reaches 0. You must apply a rising edge on the preset condition to run the counter again. Bit 1 (Valid), this bit indicates if the measurement is valid. • TRUE when the measurement is within the *CounterValue* range. • FALSE, when: ◦ Bit 0 (Run) is FALSE. ◦ The measurement is not within the *CounterValue* range. Bit 2 (Modulo Flag), this bit indicates if the counter value looped back to 0 after reaching the modulo value. • TRUE when the counter value looped back to 0. • FALSE on the rising edge of the Acknowledge Modulo. Bit 3 (Preset Flag), this bit indicates if the Preset bit was set to TRUE. • TRUE on the rising edge of the Preset bit. • FALSE on the rising edge of the Acknowledge Preset bit. **NOTE:** Other bits are reserved.

The following table presents the output implicit data of the **Simple counting** function:

Parameter Name	Value	Data Type Size in Bytes R/W	Description
OperationalCommand	0...255	BYTE 1 R/W	Bit 0 (Enable): When TRUE, the enable condition is TRUE. Bit 1 (Preset): When TRUE, the preset condition is TRUE. Bit 2 (Acknowledge Modulo): On a rising edge, sets the Modulo Flag to FALSE. Bit 3 (Acknowledge Preset): On a rising edge, sets the Preset Flag to FALSE. Bit 4 (Acknowledge Counter Value): On a rising edge, sets the counter value to 0. **NOTE:** Other bits are reserved.

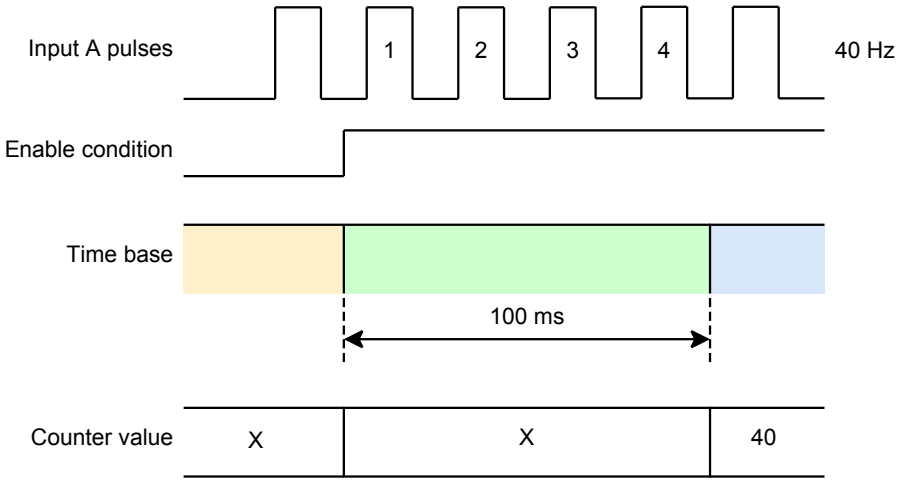
Frequency Meter Function

Description

The **Frequency Meter** function, while the enable condition is TRUE, measures the number of pulses on input A during the configured time base (10 ms, 100 ms, 1 s, or 60 s).

The value returned by this function is in Hertz (Hz).

The following diagram shows an example of measure returned by the **Frequency Meter** function:



With the **Frequency Meter** function, the enable condition, page 112 is controlled with a software command or a physical input.

The following table presents the features of the **Frequency Meter** function:

Item	Description
Inputs	The **Frequency Meter** function requires a single fast input **A Location** to operate. An optional input can be assigned to **EN Location**.
Counter register	32 bits
Reflex Output	Up to 4 reflex outputs can be configured. For more information about reflex outputs, refer to Reflex Output Sub-Function, page 105.
Measurement Range	0.04 Hz...250 kHz
Display Resolution	0.01 Hz
Measurement Accuracy	0.005 %
Counter Value Update Rate	At the end of each **Time Base** period.
Reflex Output State Update Rate	At the end of each **Time Base** period.

Frequency Meter Configuration

The following table presents the configuration parameters of the **Frequency Meter** function:

Name ***Parameter Name***	**Value**	**Data Type**	**Description**
A Location *AInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Selects the input used for the A signal.
A Filter *AInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
A Scaling Factor *AInputScalingFactor*	**1*...255**	BYTE	Sets the number of pulses applied to **A Location** that are required to increase the counter value by 1. For example: If the scaling factor is 5, then 5 pulses applied to **A Location** are required to increase the counter value by 1.
EN Location *ENInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the enable function.

Name *Parameter Name*	Value	Data Type	Description
EN Filter *ENInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
Calibration Factor *CalibrationFactor*(1)	**-100...100** **0***	SBYTE	Sets a calibration factor applied to the counter value from 90.1 % to 110 % in 0.1 % increments. For example: • If a **Calibration Factor** of -2 is configured, the counter value is 99.8 % of the measured value. • If a **Calibration Factor** of 100 is configured, the counter value is 110 % of the measured value. **A Scaling Factor** is applied before the **Calibration Factor**.
Time Base *TimeBase*(1)	0: **10** 1: **100** 2: **1000*** 3: **60000**	ENUM	Sets the sampling time of the **Frequency Meter** measurement (ms). The time base must be at least 2 times greater than the period of the measured signal. **NOTE:** The Valid bit is set to 0 if the time base is less than 2 times the period of the measured signal.

* Parameter default value

(1) Online modification is allowed and applied on the rising edge of the preset condition. For more information about online modifications, refer to Modicon Edge I/O - Configurator and Web Interface - User Guide.

Implicit Data

The following table presents the input implicit data of the **Frequency Meter** function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
CounterValue	0... 4,294,967,295	INT32 4 R/-	Counter value, used to derive the frequency of the meter. To arrive at the frequency in Hz, divide this value by 100. **NOTE:** The implicit data *CounterValue* is updated at each I/O Bus cycle.
OperationalState	0...255	BYTE 1 R/-	Operational state of the frequency meter function. Bit 0 (Run), this bit indicates if the counter is active. • TRUE when the enable condition is TRUE. • FALSE when the enable condition is FALSE. Bit 1 (Valid), this bit indicates if the measurement is valid. • TRUE when the measurement is within the *CounterValue* range. • FALSE, when: ◦ Bit 0 (Run) is FALSE. ◦ The counter value is not within range. ◦ The time base is less than 2 times the period of the measured signal. Bit 3 (Preset Flag), this bit indicates if the Force Preset bit was set to TRUE. • TRUE on the rising edge of the Force Preset bit. • FALSE on the rising edge of the Acknowledge Preset Flag bit. **NOTE:** Other bits are reserved.

The following table presents the input implicit data of the **Frequency Meter** function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
OperationalCommand	0...65,535	INT 2 R/W	Bit 0 (Enable): When TRUE, the **EN Location** physical input can set the enable condition to TRUE. Bit 5 (Enable Compare): When TRUE, the compare function is active. Bit 6 (Suspend Compare): When TRUE, the compare function is suspended. Bit 7 (Force Enable): When TRUE, the enable condition is TRUE. Bit 8 (Force Preset): On a rising edge, resets the internal timer relative to the time base. Bit 11 (Acknowledge Preset Flag): On a rising edge, sets the Preset Flag to FALSE. **NOTE:** Other bits are reserved.

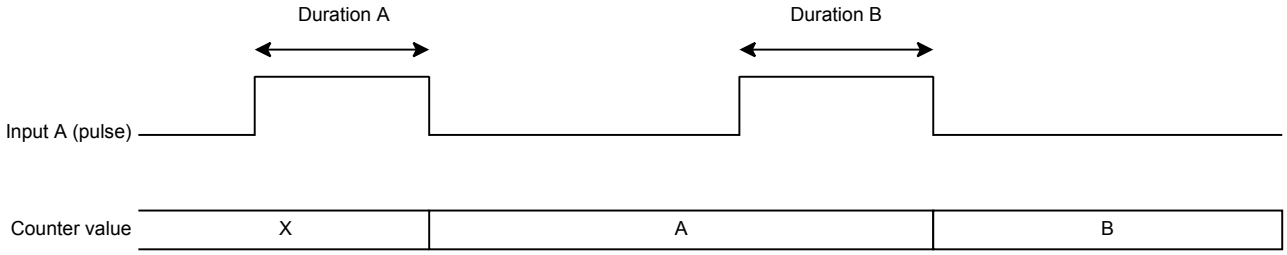
Period Meter Function

Description

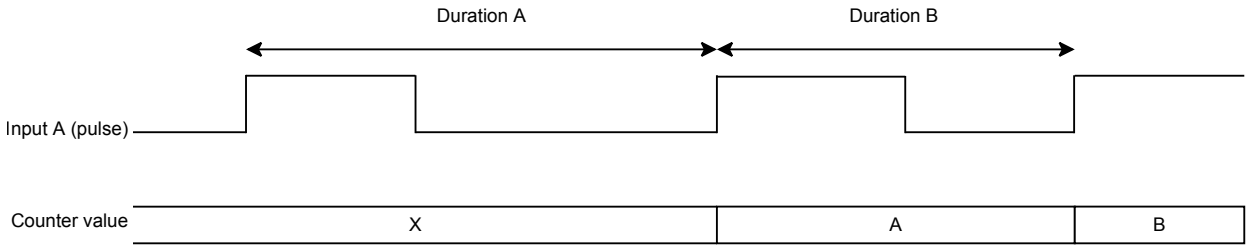
The **Period Meter** function measures a duration on input A.

There are 2 sub-modes for the **Period Meter** function:

- **Edge to opposite**: Measures the duration of an event. While the enable condition is TRUE, the measurement starts at the rising edge of input A and stops at the falling edge of input A.



- **Edge to edge**: Measures the duration between two events. While the enable condition is TRUE, the measurement starts at the rising edge of input A and stops at the next rising edge of input A.



The duration measured is defined by the **Resolution** parameter (0.1 µs, 1 µs, 10 µs, 100 µs, 1,000 µs): Duration = Measured value x **Resolution**.

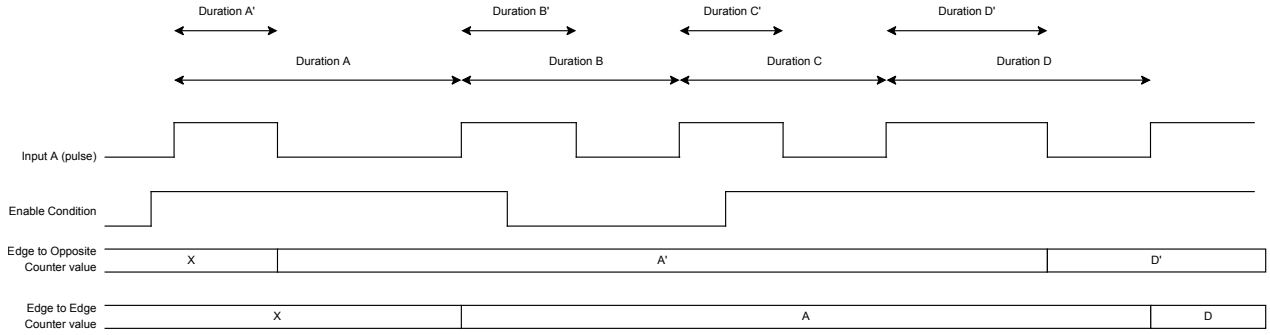
With the **Period Meter** function, the enable condition, page 112 is controlled with a software command or a physical input.

The following table describes the features of the **Period Meter** function:

Item	Description
Inputs	The **Period Meter** function requires a single fast input **A Location** to operate. An optional input can be assigned to **EN Location**.
Counter register	32 bits
Reflex Output	Up to 4 reflex outputs can be configured. For more information about reflex outputs, refer to Reflex Output Sub-Function, page 105.
Measurement Range	0...4,294,967 ms
Shortest Measurable Period	0.1 µs
Period Value Update Rate	At the end of each event measured.
Reflex Output State Update Rate	Depends on the comparison trigger (maximum 20 µs).

Enable Condition Interruption Behavior

The following diagram describes the behavior of the counting register when the enable condition is interrupted:

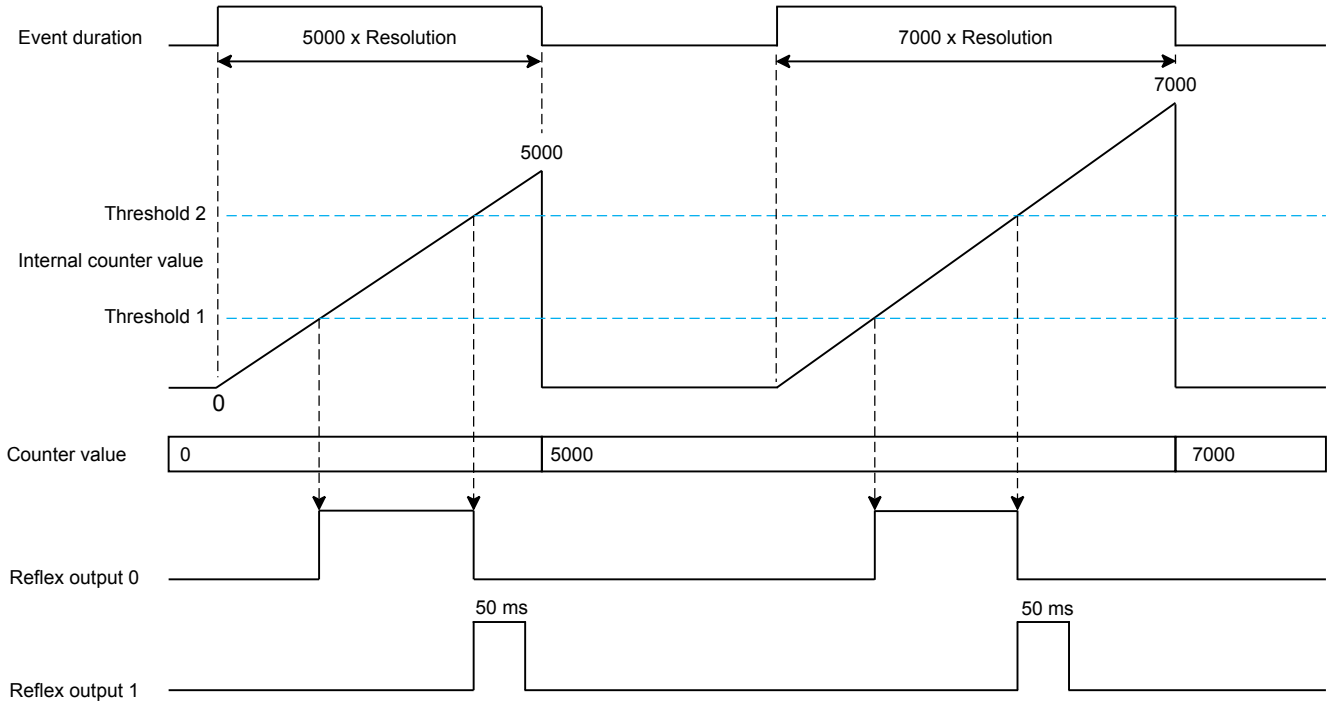


Reflex Output Behavior

The **Period Meter** function measures a duration on input A. In order to perform this action, there is an internal real-time counter based on the **Resolution** parameter measuring the duration of the event, independent from the *CounterValue* parameter.

When you configure one or more reflex outputs with this function, the compare function compares the trigger conditions to the internal counter value as shown in the following example:

Parameter	**Reflex Output 0**	**Reflex Output 1**
ReflexOutput●Condition	**Counter Within Threshold**	**Counter Cross Threshold**
ReflexOutput●CounterWithinThreshold value	4(1)	-
ReflexOutput●CounterCrossThreshold	-	**Pulse = Counter crosses TH2 upwards**
ReflexOutput●PulseWidth	-	50
(1) Bit 2 = TRUE, the counter value is between threshold 1 + 1 and threshold 2.		



Period Meter Configuration

The following table presents the configuration parameters of the **Period Meter** function:

Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Sub Mode *SubMode*	0: **Edge to Opposite*** 1: **Edge to Edge**	ENUM	Selects the counting sub-mode.
A Location *AInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Selects the input used for the A signal.
A Filter *AInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
EN Location *ENInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the enable function.

Name *Parameter Name*	Value	Data Type	Description
EN Filter *ENInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
Timeout *Timeout*	**0*...858993495**	UINT32	Sets the timeout duration of the measurement. When the timeout is set to 0, the timeout value is set to the maximum value. If the measured value exceeds the timeout value, the measurement is set to 0 and the Valid bit is set to 0. In this case, the measured value is not valid until the next measurement. To convert the **Timeout** value into a duration, multiply the value with the **Resolution** parameter:
Resolution *Resolution*(1)	0: **0.1** 1: **1*** 2: **10** 3: **100** 4: **1000**	ENUM	Selects the resolution of measurement (µs): • When **Resolution** is 0.1 µs: ◦ The counter value range is 0...858,993,495. ◦ The **Timeout** value range is 0...85,899 ms. • When **Resolution** is 1 µs: ◦ The counter value range is 0...429,496,729. ◦ The **Timeout** value range is 0...429,496 ms. • When **Resolution** is 10 µs: ◦ The counter value range is 0...429,496,729. ◦ The **Timeout** value range is 0...4,294,967 ms. • When **Resolution** is 100 µs: ◦ The counter value range is 0...42,949,672. ◦ The **Timeout** value range is 0...4,294,967 ms. • When **Resolution** is 1,000 µs: ◦ The counter value range is 0...4,294,967. ◦ The **Timeout** value range is 0...4,294,967 ms.

* Parameter default value

(1) Online modification is allowed and applied on the rising edge of the preset condition. For more information about online modifications, refer to Modicon Edge I/O - Configurator and Web Interface - User Guide.

Implicit Data

The following table presents the input implicit data of the **Period Meter** function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
CounterValue	0... 4,294,967,295	INT32 4 R/-	Counter value, used to derive the period of the meter. To arrive at the period duration, multiply the value with the **Resolution** parameter. **NOTE:** The implicit data *CounterValue* is updated at each I/O Bus cycle.
OperationalState	0...255	BYTE 1 R/-	Operational state of the period meter function. Bit 0 (Run), this bit indicates if the counter is active. • TRUE when the enable condition is TRUE. • FALSE when the enable condition is FALSE. Bit 1 (Valid), this bit indicates if the measurement is valid. • TRUE when the measurement is within the *CounterValue* range. • FALSE, when: ◦ Bit 0 (Run) is FALSE. ◦ The measurement is not within the *CounterValue* range. **NOTE:** Other bits are reserved.

The following table presents the output implicit data of the **Period Meter** function:

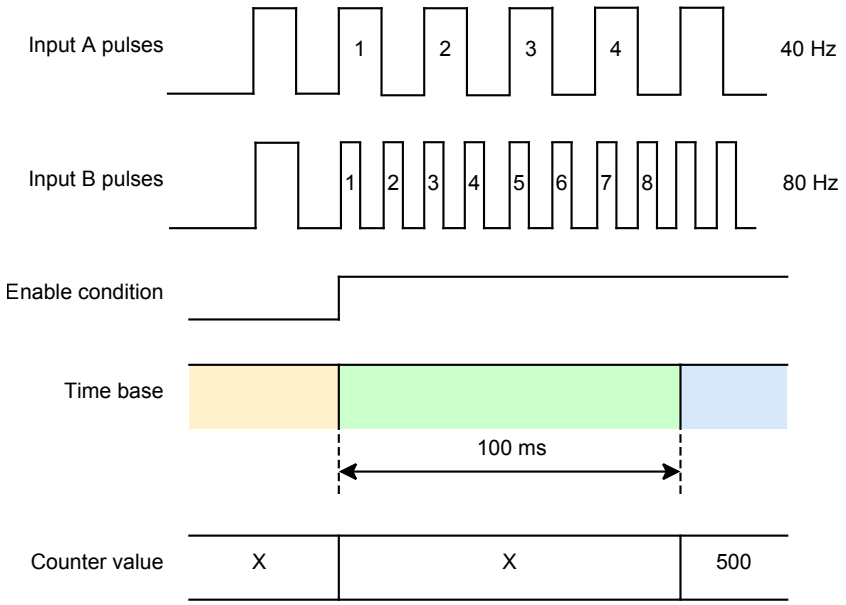
Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
OperationalCommand	0...65,535	BYTE 2 R/W	Bit 0 (Enable): When TRUE, the **EN Location** physical input can set the enable condition to TRUE. Bit 5 (Enable Compare): When TRUE, the compare function is active. Bit 6 (Suspend Compare): When TRUE, the compare function is suspended. Bit 7 (Force Enable): When TRUE, the enable condition is TRUE. **NOTE:** Other bits are reserved.

Ratio Meter Function

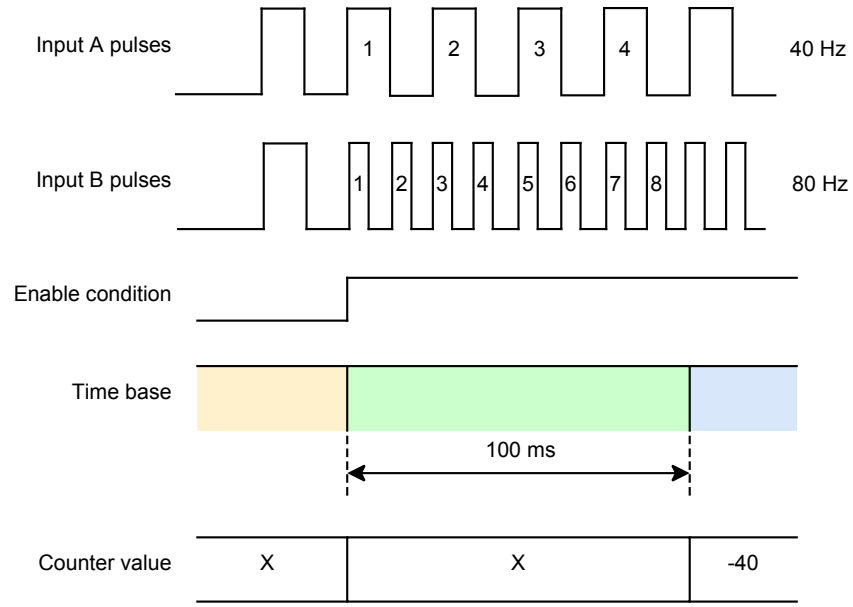
Description

The **Ratio Meter** function, while the enable condition is TRUE, measures simultaneously the frequency of 2 inputs A and B as with a **Frequency Meter** function for each input with a common time base. The function then processes the signals with the following operating sub-mode:

- **Ratio-1**: This sub-mode divides the two frequencies (Frequency of input A / Frequency of input B):



- **Ratio-2**: This sub-mode subtracts the two frequencies (Frequency of input A - Frequency of input B):



With the **Ratio Meter** function, the enable condition, page 112 is controlled with a software command or a physical input.

The following table describes the features of the **Ratio Meter** function:

Item	Description
Inputs	The **Ratio Meter** function requires two fast inputs **A Location** and **B Location** to operate. An optional input can be assigned to **EN Location**.
Counter register	32 bits
Reflex Output	Up to 4 reflex outputs can be configured. For more information about reflex outputs, refer to Reflex Output Sub-Function, page 105.
Measurement Range	-60,000,000...60,000,000
Resolution	**Ratio-1** resolution is 0.001 **Ratio-2** resolution is 0.01 Hz
Ratio Value Update Rate	At the end of each **Time Base** period.
Reflex Output State Update Rate	At the end of each **Time Base** period.

Ratio Meter Configuration

The following table presents the configuration parameters of the **Ratio Meter** function:

Name *Parameter Name*	Value	Data Type	Description
Sub Mode *SubMode*	0: **Ratio-1*** 1: **Ratio-2**	ENUM	Selects the counting sub-mode.
A Location *AInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Selects the input used for the A signal.
A Filter *AInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
A Scaling Factor *AInputScalingFactor*	**1*...255**	BYTE	Sets the number of pulses applied to **A Location** that are required to increase the counter value by 1. For example: If the scaling factor is 5, then 5 pulses applied to **A Location** are required to increase the *CounterValue* by 1.
B Location *AInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Selects the input used for the B signal.

Name *Parameter Name*	Value	Data Type	Description
B Filter *AInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
B Scaling Factor *AInputScalingFactor*	**1*...255**	BYTE	Sets the number of pulses applied to **B Location** that are required to increase the counter value by 1. For example: If the scaling factor is 5, then 5 pulses applied to **B Location** are required to increase the *CounterValue* by 1.
EN Location *ENInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the enable function.
EN Filter *ENInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
Absolute Limit *AbsoluteLimit*(1)	**10...60000000***	UINT32	Sets the absolute counter value limit.

Name *Parameter Name*	Value	Data Type	Description
Calibration Factor *CalibrationFactor*(1)	**-100...100** **0***	SBYTE	Sets a calibration factor applied to the counter value from 90.1 % to 110 % in 0.1 % increments. For example: • If a **Calibration Factor** of -2 is configured, the counter value is 99.8 % of the measured value. • If a **Calibration Factor** of 100 is configured, the counter value is 110 % of the measured value. **A Scaling Factor** and **B Scaling Factor** are applied before the **Calibration Factor**.
Time Base *TimeBase*(1)	0: **10** 1: **100** 2: **1000***	ENUM	Sets the sampling time of the **Period Meter** measurement (ms). The time base must be at least 2 times greater than the measured signal. **NOTE:** The Valid bit is set to 0 if the time base is less than 2 times the period of the measured signal.
* Parameter default value (1) Online modification is allowed and applied on the rising edge of the preset condition. For more information about online modifications, refer to Modicon Edge I/O - Configurator and Web Interface - User Guide.			

Implicit Data

The following table presents the input implicit data of the **Ratio Meter** function:

Name *Parameter Name*	Value	Data Type Size in Bytes R/W	Description
CounterValue	-60,000,000... 60,000,000	SINT32 4 R/-	Counter value, used to derive the ratio of the meter. Depending on the ratio mode, to arrive at the ratio value: • **Ratio-1** resolution is 0.001, for example if *CounterValue* = 68,251, the ratio value is 682.51. • **Ratio-2** resolution is 0.01 Hz, for example if *CounterValue* = 72,351, the ratio value is 723.51 Hz. **NOTE:** The implicit data *CounterValue* is updated at each I/O Bus cycle.
OperationalState	0...255	BYTE 1 R/-	Operational state of the ratio meter function. Bit 0 (Run), this bit indicates if the counter is active. • TRUE when the enable condition is TRUE. • FALSE when the enable condition is FALSE. Bit 1 (Valid), this bit indicates if the measurement is valid. • TRUE when the measurement is within the *CounterValue* range. • FALSE, when: ◦ Bit 0 (Run) is FALSE. ◦ The measurement is not within the *CounterValue* range. Bit 3 (Preset Flag), this bit indicates if the Force Preset bit was set to TRUE. • TRUE on the rising edge of the Force Preset bit. • FALSE on the rising edge of the Acknowledge Preset Flag bit. **NOTE:** Other bits are reserved.

The following table presents the output implicit data of the **Ratio Meter** function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
OperationalCommand	0...65,535	INT 2 R/W	Bit 0 (Enable): When TRUE, the **EN Location** physical input can set the enable condition to TRUE. Bit 5 (Enable Compare): When TRUE, the compare function is active. Bit 6 (Suspend Compare): When TRUE, the compare function is suspended. Bit 7 (Force Enable): When TRUE, the enable condition is TRUE. Bit 8 (Force Preset): On a rising edge, resets the internal timer relative to the time base. Bit 11 (Acknowledge Preset Flag): On a rising edge, sets the Preset Flag to FALSE. **NOTE:** Other bits are reserved.

Single Phase Event Counting Function

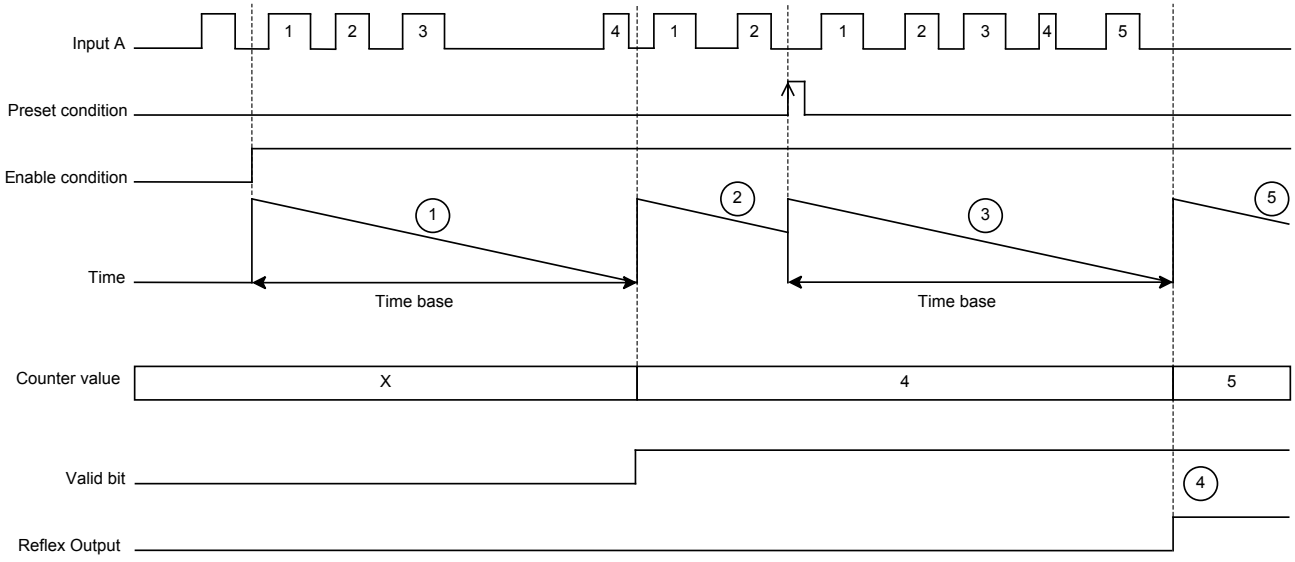
Description

The **Single Phase Event Counting** function counts the number pulses that occur during a given period of time (**Time base**) on input A.

With the **Single Phase Event Counting** function:

- The enable condition, page 112 is controlled with a software command.
- The preset condition, page 113 is controlled with a software command or a physical input.

The following diagram and table describes the **Single Phase Event Counting** principle:



NOTE: The pulse is counted on the rising edge of the input A.

Stage	Action
1	While the enable condition is TRUE, the counter accumulates the number of pulses on input A during the **Time base** duration.
2	At the end of **Time base** period, the counter value is set to the number of pulses on input A and the *OperationalState* bit 1 (Valid) is set to TRUE. The counting restarts for a new period of time. On the rising edge of the preset condition: • The accumulated value of pulses on input A is reset to 0. • The counter value is not updated. • The counting restarts for a new period of time. **NOTE:** When the enable condition is FALSE, you can reset the internal timer relative to the time base on the rising edge of the preset condition.
3	The counting restarts for a new period of time.
4	In this example, a reflex output is configured with the **Counter Within Threshold** condition: • The **Reflex Condition: Counter Within Threshold** value is 2. • Threshold 0 value is 4. • Threshold 1 value is the maximum value. At the end of the **Time base** period, the reflex output is set to TRUE because the counter value is between threshold 0 and the maximum value. For more information about reflex outputs, refer to Reflex Output Sub-Function, page 105.
5	The counting restarts for a new period of time.

The following table describes the features of the **Single Phase Event Counting** function:

Item	Description
Inputs	The **Single Phase Event Counting** function requires a single fast input **A Location** to operate. An optional input can be assigned to **SYNC Location**.
Counter register	32 bits
Reflex Output	Up to 4 reflex outputs can be configured. For more information about reflex outputs, refer to Reflex Output Sub-Function, page 105.
Counter Value Update Rate	At the end of each **Time base** period.
Reflex Output State Update Rate	At the end of each **Time base** period.

Single Phase Event Counting Configuration

The following table presents the configuration parameters of the **Single Phase Event Counting** function:

Name ***Parameter Name***	**Value**	**Data Type**	**Description**
A Location *AInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Selects the input used for the A signal.
A Filter *AInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
SYNC Location *SyncInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the preset function.
SYNC Filter *SyncInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).

Name *Parameter Name*	Value	Data Type	Description
Preset Condition *PresetCondition*	0: **SYNC Rising Edge*** 1: **SYNC Falling Edge** 2: **SYNC Both Edges**	ENUM	Defines how the **SYNC Location** physical input is triggered.
Time Base *TimeBase*(1)	0: **1** 1: **10** 2: **100** 3: **1000*** 4: **10000** 5: **60000**	ENUM	Sets the sampling time of the **Single Phase Event Counting** measurement (ms).

* Parameter default value

(1) Online modification is allowed and applied on the rising edge of the preset condition. For more information about online modifications, refer to Modicon Edge I/O - Configurator and Web Interface - User Guide.

Implicit Data

The following table presents the input implicit data of the **Single Phase Event Counting** function:

Name *Parameter Name*	Value	Data Type Size in Bytes R/W	Description
CounterValue	0... 4,294,967,295	INT32 4 R/-	Counter value. **NOTE:** The implicit data *CounterValue* is updated at each I/O Bus cycle.
OperationalState	0...255	BYTE 1 R/-	Operational state of the single phase event counting function. Bit 0 (Run), this bit indicates if the counter is active. • TRUE when the enable condition is TRUE. • FALSE when the enable condition is FALSE. Bit 1 (Valid), this bit indicates if the measurement is valid. • TRUE when the measurement is within the *CounterValue* range. • FALSE, when: ◦ Bit 0 (Run) is FALSE. ◦ The measurement is not within the *CounterValue* range. Bit 3 (Preset Flag), this bit indicates if the preset condition bit was set to TRUE. • TRUE on the rising edge of the preset condition. • FALSE on the rising edge of the Acknowledge Preset Flag bit. **NOTE:** Other bits are reserved.

The following table presents the output implicit data of the **Single Phase Event Counting** function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
OperationalCommand	0...65,535	INT 2 R/W	Bit 1(Enable Preset): When TRUE, the **SYNC Location** physical input can set the preset condition to TRUE. Bit 5 (Enable Compare): When TRUE, the compare function is active. Bit 6 (Suspend Compare): When TRUE, the compare function is suspended. Bit 7 (Force Enable): When TRUE, the enable condition is TRUE. Bit 8 (Force Preset): On a rising edge, sets the preset condition to TRUE. Bit 11 (Acknowledge Preset Flag): On a rising edge, sets the Preset Flag to FALSE. **NOTE:** Other bits are reserved.

Single Phase Counting Function

Description

The **Single Phase Counting** function operates like the **Simple counting** function with additional features:

- A 32-bit counting register.
- The preset condition, page 113 can be activated with a physical input.
- The enable condition, page 112 can be activated with a physical input.
- A capture condition, page 114 that can be activated with a physical input.
- Up to 4 reflex outputs can be configured. For more information about reflex outputs, refer to Reflex Output Sub-Function, page 105.

The **Single Phase Counting** function has 2 operating modes:

- One-shot counting
- Modulo-loop counting

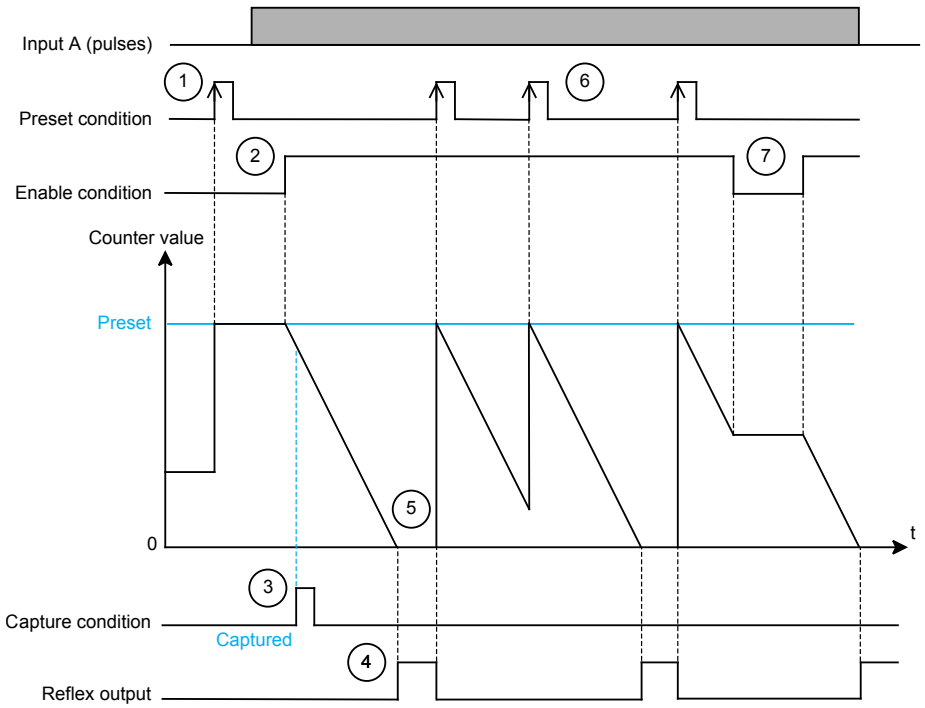
The following table describes the features of the **Single Phase Counting** function:

Item	**Description**
Inputs	The **Single Phase Counting** function requires a single fast input **A Location** to operate. An optional input can be assigned to **EN Location**, **SYNC Location** and **CAP Location**.
Counter register	32 bits
Capture register	32 bits
Reflex output	Up to 4 reflex outputs can be configured. For more information about reflex outputs, refer to Reflex Output Sub-Function, page 105.
Maximum input frequency	250 kHz
Counter value update rate	At each pulse on input A.
Reflex output state update rate	Depends on the comparison trigger (maximum 20 µs).

One-Shot Sub-Mode

In the **One-shot** sub-mode, the counter value of the function starts at the **Preset** value and decreases for each pulse on input A.

The following diagram and table describe the **One-shot** sub-mode principle:



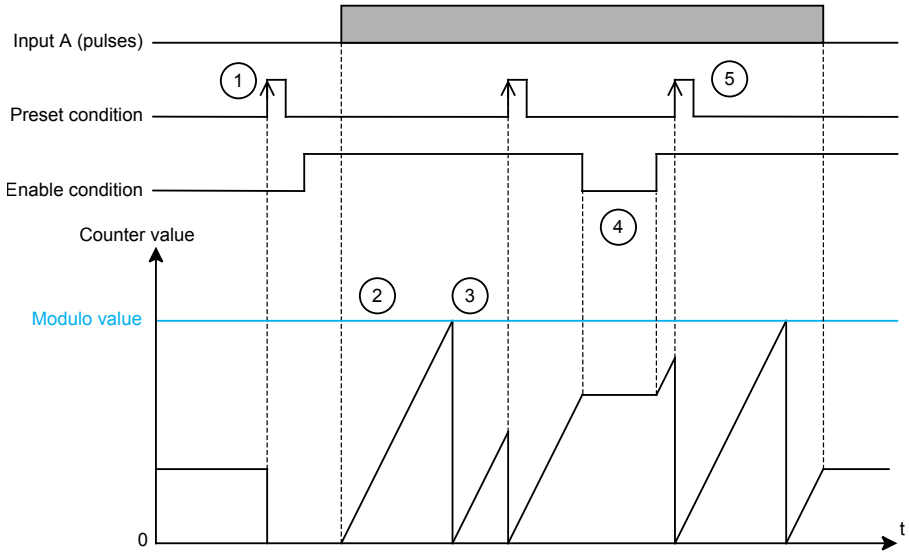
Stage	Action
1	On the rising edge of the preset condition, the counter value is set to the **Preset** value and the counter is activated.
2	While the enable condition is FALSE, the counter does not count the pulses on input A. While the enable condition is TRUE, the counter value decrements on each pulse on input A until it reaches 0. **NOTE:** When the counter value reaches 0, the Run bit is set to 0.
3	On the rising edge of the capture condition, the counter value is captured into the capture register.
4	In this example, a reflex output is configured with the **Counter STOP** condition. The reflex output is set to TRUE when the counter value is 0.
5	At this point, pulses on input A have no effect on the counter value. On the rising edge of the preset condition, the counter value is set to the **Preset** value and the counting resumes. **NOTE:** On the rising edge of the preset condition and because enable condition is TRUE, the Run bit is set to 1.
6	At any time, a rising edge of the preset condition sets the counter value to the **Preset** value.
7	When the enable condition is FALSE, the counter ignores the pulses from input A and retains the counting value. When the enable condition is TRUE, the counter resumes counting pulses from input A.

Modulo-Loop Sub-Mode

In the **Modulo-loop** sub-mode, the counter value of the function starts from 0 and increases for each pulse on input A.

When the value reaches the configured **Modulo value** - 1, the counter value is set to 0 at the next pulse and the Modulo Flag is set to TRUE.

The following diagram and table describe the **Modulo-loop** sub-mode principle:



Stage	Action
1	On the rising edge of the preset condition, the counter value is reset to 0 and the counter is activated.
2	While the enable condition is TRUE, each pulse on input A increments the counter value.
3	When the value reaches the configured **Modulo value** - 1, the counter value is set to 0 at the next pulse and the Modulo Flag is set to TRUE. **NOTE:** To reset the Modulo Flag, use the Acknowledge Modulo command.
4	When the enable condition is FALSE, the counter ignores the pulses from input A and retains its value. When the enable condition is TRUE, the counter resumes counting pulses from input A.
5	At any time, a rising edge of the preset condition sets the counter value to 0.

Single Phase Counting Configuration

The following table presents the configuration parameters of the **Single Phase Counting** function:

Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Sub Mode *SubMode*	0: **One-shot*** 1: **Modulo-loop**	ENUM	Selects the counting sub-mode.
A Location *AInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Selects the input used for the A signal.
A Filter *AInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
A Scaling Factor *AInputScalingFactor*	**1*...255**	BYTE	Sets the number of pulses applied to **A Location** that are required to increase the counter value by 1. For example: If the scaling factor is 5, then 5 pulses applied to **A Location** are required to increase the counter value by 1.
EN Location *EnableInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the enable function.

Name *Parameter Name*	Value	Data Type	Description
EN Filter *EnableInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
SYNC Location *SyncInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the preset function.
SYNC Filter *SyncInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
Preset Condition *PresetCondition*	0: **SYNC Rising Edge*** 1: **SYNC Falling Edge** 2: **SYNC Both Edges**	ENUM	Defines how the **SYNC Location** physical input is triggered.

Name *Parameter Name*	Value	Data Type	Description
CAP Location *CaptureInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the capture function.
CAP Filter *CaptureInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
Capture Condition *CaptureCondition*	0: **Preset*** 1: **CAP Rising Edge** 2: **CAP Falling Edge** 3: **CAP Both Edges**	ENUM	Defines how the **CAP Location** input is triggered.
Preset *Preset*(1)	**0... 2147483647***	INT32	**One-shot** mode: Sets the counting initial value.
Modulo value *Modulo value*(1)	**0... 2147483647***	INT32	**Modulo-loop** sub-mode: Sets the modulo value at which the counter loops.
CAP Window Start *CaptureWindowStartPosition*(1)	**0*... 2147483646**	INT32	Sets the starting value of the capture window. **CAP Window Start**<**CAP Window End**
CAP Window End *CaptureWindowEndPosition*(1)	**1*... 2147483647**	INT32	Sets the ending value of the capture window. **CAP Window Start**<**CAP Window End**

* Parameter default value

(1) Online modification is allowed and applied on the rising edge of the preset condition. For more information about online modifications, refer to Modicon Edge I/O - Configurator and Web Interface - User Guide.

Implicit Data

The following table presents the input implicit data of the **Single Phase Counting** function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
CounterValue	0... 4,294,967,295	INT32 4 R/-	Counter value. **NOTE:** The implicit data *CounterValue* is updated at each I/O Bus cycle.
CaptureValue	0... 4,294,967,295	INT32 4 R/-	Captured value, valid when Capture Flag is TRUE. **NOTE:** The implicit data *CaptureValue* is updated at each I/O Bus cycle.
OperationalState	0...255	BYTE 1 R/-	Operational state of the single phase counting function. Bit 0 (Run), this bit indicates if the counter is active. • When the enable condition is FALSE. • In **One-shot** mode, when the counter reaches 0. You must apply a rising edge on the preset condition to run the counter again. Bit 1 (Valid), this bit indicates if the measurement is valid. • TRUE when the measurement is within the *CounterValue* range. • FALSE, when: ◦ Bit 0 (Run) is FALSE. ◦ The measurement is not within the *CounterValue* range. Bit 2 (Modulo Flag), this bit indicates if the counter looped back to 0 after reaching the modulo value. • TRUE when the counter loops back to 0. • FALSE on the rising edge of the Acknowledge Modulo Flag bit. Bit 3 (Preset Flag), this bit indicates if the preset condition bit was set to TRUE. • TRUE on the rising edge of the preset condition. • FALSE on the rising edge of the Acknowledge Preset Flag bit. Bit 4 (Capture Flag), this bit indicates if the capture condition was set to TRUE. • TRUE on the rising edge of the capture condition. • FALSE on the rising edge of the Acknowledge Capture Flag bit. **NOTE:** Other bits are reserved.

The following table presents the output implicit data of the **Single Phase Counting** function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
OperationalCommand	0...65,535	INT 2 R/W	Bit 0 (Enable): When TRUE, the **EN Location** physical input can set the enable condition to TRUE. Bit 1 (Enable Preset): When TRUE, the **SYNC Location** physical input can set the preset condition to TRUE. Bit 2 (Enable Capture): When TRUE, the **CAP Location** physical input can set the capture condition to TRUE. Bit 3 (Enable Capture Function): When TRUE, enables the capture function. Bit 4 (Enable Capture Window): When TRUE, the capture condition can be TRUE only if the counter value is within the capture window parameters. Bit 5 (Enable Compare): When TRUE, the compare function is active. Bit 6 (Suspend Compare): When TRUE, the compare function is suspended. Bit 7 (Force Enable): When TRUE, the enable condition is TRUE. Bit 8 (Force Preset): On a rising edge, the preset condition is TRUE. Bit 10 (Acknowledge Modulo): On a rising edge, sets the Modulo Flag to FALSE. Bit 11 (Acknowledge Preset): On a rising edge, sets the Preset Flag to FALSE. Bit 12 (Acknowledge Capture Flag): On a rising edge, sets the Capture Flag to FALSE. **NOTE:** Other bits are reserved.

Dual Phase Counting Function

Description

The **Dual Phase Counting** function operates like the **Simple counting** function with additional features:

- A 32-bit counting register.
- Two inputs A and B for positive or negative counting.
- The preset condition, page 113 can be activated with a physical input.
- The enable condition, page 112 can be activated with a physical input.
- A capture condition, page 114 that can be activated with a physical input.
- Up to 4 reflex outputs can be configured. For more information about reflex outputs, refer to Reflex Output Sub-Function, page 105.

The **Dual Phase Counting** function has 2 operating modes:

- **Modulo-loop** counting
- **Free-large** counting

The following table describes the features of the **Dual Phase Counting** function:

Item	Description
Inputs	The **Dual Phase Counting** function requires two fast inputs **A Location** and **B Location** to operate. An optional input can be assigned to **EN Location**, **SYNC Location** and **CAP Location**.
Counter register	32 bits
Capture register	32 bits
Reflex Output	Up to 4 reflex outputs can be configured. For more information about reflex outputs, refer to Reflex Output Sub-Function, page 105.
Maximum input frequency	250 kHz
Counter update rate	At each pulse on inputs A or B.
Reflex output update rate	Depends on the comparison trigger (maximum 20 µs).

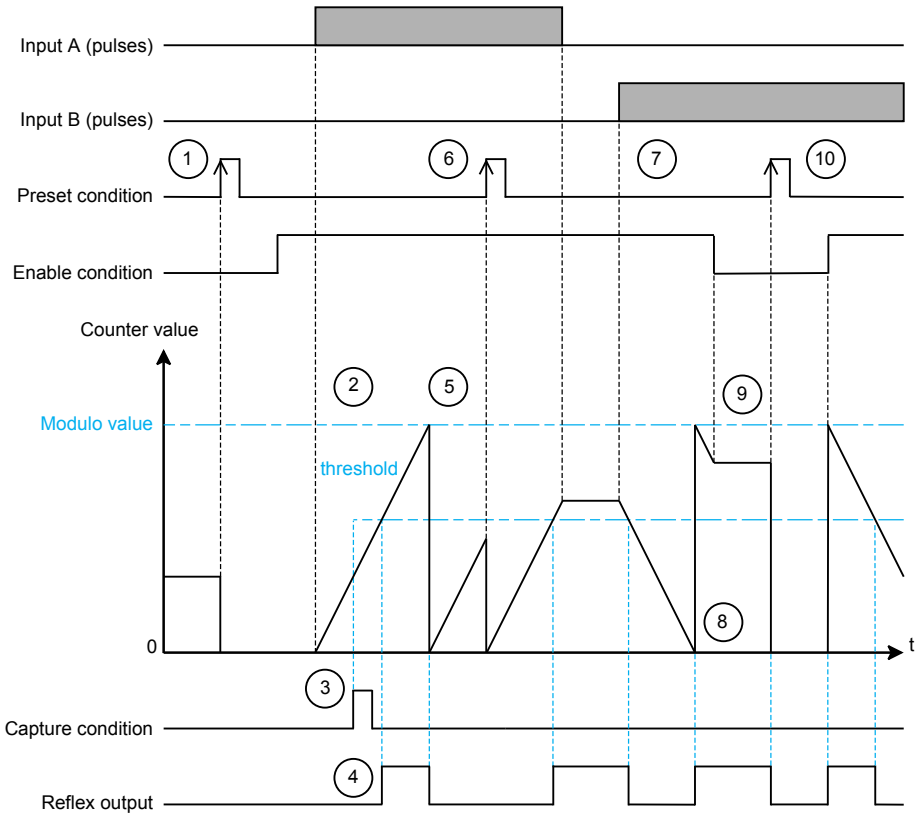
Modulo-Loop Sub-Mode

In the **Modulo-loop** sub-mode, the output value of the function starts from 0.

When the value reaches the configured **Modulo value** - 1, the counter value is set to 0 at the next pulse and the Modulo Flag is set to TRUE.

The counter can count up and down according to the input mode used. For more information about the input modes, refer to Input modes, page 93.

The following diagram and table describe an example on how a dual phase counter operates in **Modulo-loop** mode with an input mode configured as **A = UP and B = DOWN**:

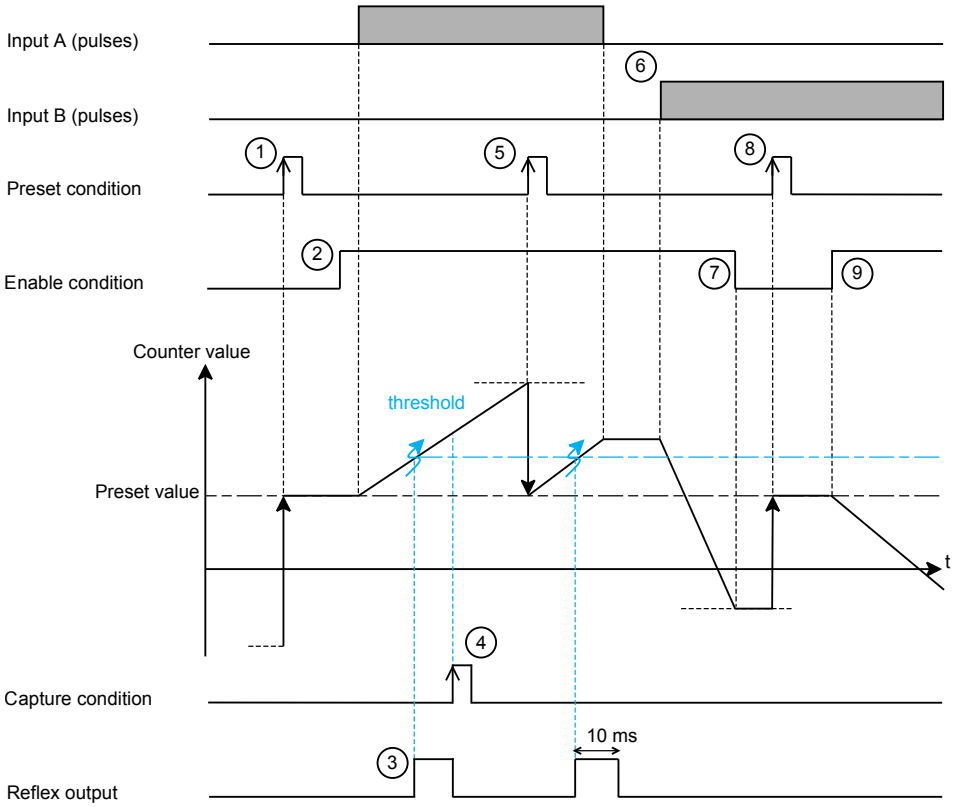


Stage	Action
1	On the rising edge of the preset condition, the counter value is set to 0 and the counter is activated.
2	While the enable condition is TRUE, each pulse on input A increments the counter value.
3	On the rising edge of the capture condition, the counter value is captured into the capture register.
4	In this example, a reflex output is configured with the **Counter Within Threshold** condition: • The **Reflex Condition: Counter Within Threshold** value is 2. • Threshold 0 is the threshold value in the graphic. • Threshold 1 is set at the **Modulo value** value. The reflex output is set to TRUE when the counter value is above the threshold value.
5	When the value reaches the configured **Modulo value** - 1, the counter value is set to 0 at the next pulse and the Modulo Flag is set to TRUE. The reflex output is set to FALSE when the counter value is below the threshold value. **NOTE:** To reset the Modulo Flag use the Acknowledge Modulo command.
6	At any time, a rising edge of the preset condition sets the counter value to 0.
7	While the enable condition is TRUE, each pulse on input B decreases the counter value.
8	When the value reaches 0, the counter value is set to the configured **Modulo value** - 1 at the next pulse and the Modulo Flag is set to TRUE. The reflex output is set to TRUE when the counter value is below the threshold value. **NOTE:** To reset the Modulo Flag use the Acknowledge Modulo command.
9	When the enable condition is FALSE, the counter ignores the pulses from input B and retains its value. When the enable condition is TRUE, the counter resumes counting pulses from input B.
10	At any time, a rising edge of the preset condition sets the counter value to 0. The reflex output is set to FALSE when the counter value is below the threshold value.

Free-Large Sub-Mode

In the **Free-large** sub-mode, the counter value starts at the value of the **Preset** parameter and counts up and down depending on the input mode used. For more information about the input modes, refer to Input modes, page 93.

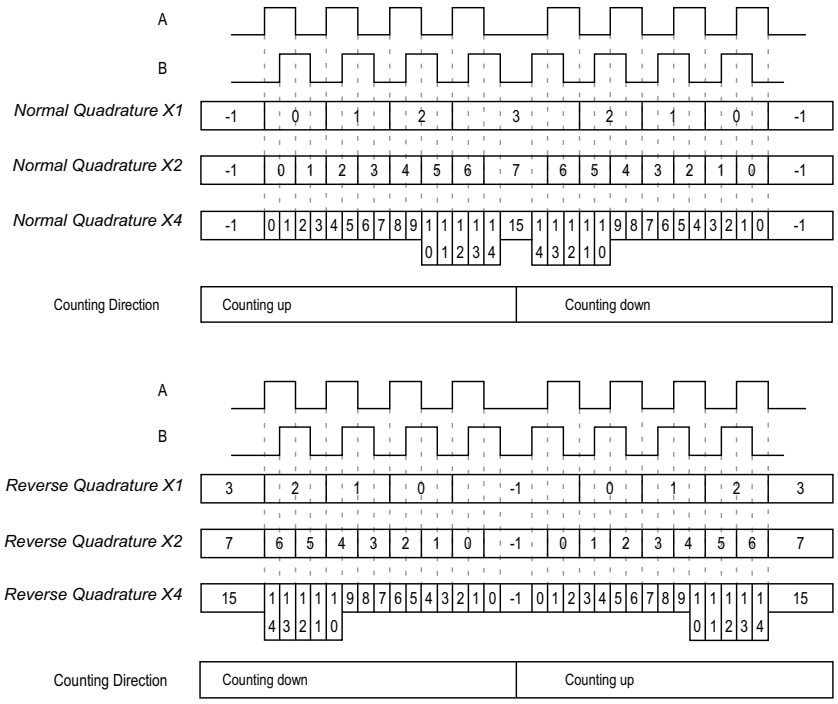
The following diagram shows an example on how a dual phase counter operates in **Free-large** sub-mode with an input mode configured as **A = UP and B = DOWN**:



Stage	Action
1	On the rising edge of the preset condition, the counter value is set to the **Preset** value and the counter is activated.
2	While the enable condition is TRUE, each pulse on input A increments the counter value.
3	In this example, a reflex output is configured with the **Counter Cross Threshold Upwards** condition. The reflex output is set to TRUE when the counter value crosses the threshold value for a duration defined by the **Reflex: Pulse Width** parameter. In this example, **Reflex: Pulse Width** is set to 10 ms.
4	On the rising edge of the capture condition, the counter value is captured into the capture register.
5	At any time, a rising edge of the preset condition sets the counter value to the **Preset** value.
6	While the enable condition is TRUE, each pulse on input B decreases the counter value.
7	When the enable condition is FALSE, the counter ignores the pulses from input B and retains its value. When the enable condition is TRUE, the counter resumes counting pulses from input B.
8	At any time, a rising edge of the preset condition sets the counter value to the **Preset** value.
9	While the enable condition is TRUE, each pulse on input B decreases the counter value.

Input modes

The following table presents the 8 types of input modes available:

Input Mode	Comment
A = Up, B = Down	Default mode The counter increments on A and decrements on B.
A = Pulse, B = Direction	If there is a rising edge on A and B is TRUE, then the counter decrements. If there is a rising edge on A and B is FALSE, then the counter increments.
Normal Quadrature X1 Normal Quadrature X2 Normal Quadrature X4 Reverse Quadrature X1 Reverse Quadrature X2 Reverse Quadrature X4	A physical encoder provides 2 signals with a 90° shift that allows the counter to count pulses and detect direction: • X1: 1 count for each encoder cycle. • X2: 2 counts for each encoder cycle. • X4: 4 counts for each encoder cycle. The encoder signal is counted according to the input mode selected as follows: 

Dual Phase Counting Configuration

This following table presents the configuration parameters of the **Dual Phase Counting** function:

Name ***Parameter Name***	**Value**	**Data Type**	**Description**
Sub Mode *SubMode*	0: **Modulo-loop*** 1: **Free-large**	ENUM	Selects the counting sub-mode.
Input Mode *InputMode*	0: **A = UP, B = DOWN*** 1: **A = Pulse, B = Direction** 2: **Normal Quadrature X1** 3: **Normal Quadrature X2** 4: **Normal Quadrature X4** 5: **Reverse Quadrature X1** 6: **Reverse Quadrature X2** 7: **Reverse Quadrature X4**	ENUM	Selects the input mode.
A Location *AInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Selects the input used for the A signal.
A Filter *AInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).

Name *Parameter Name*	Value	Data Type	Description
B Location *AInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Selects the input used for the B signal
B Filter *AInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
Scaling Factor *ScalingFactor*	**1*...255**	BYTE	Sets the number of pulses applied to **A Location** and **B Location** that are required to increase the counter value by 1. For example: If the scaling factor is 5, then 5 pulses applied to **A Location** or **B Location** are required to increase the counter value by 1.
EN Location *EnableInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the enable function.
EN Filter *EnableInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).

Name *Parameter Name*	Value	Data Type	Description
SYNC Location *SyncInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the preset function.
SYNC Filter *SyncInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
Preset Condition *PresetCondition*	0: **SYNC Rising Edge*** 1: **SYNC Falling Edge** 2: **SYNC Both Edges**	ENUM	Defines how the **SYNC Location** physical input triggers a preset condition.
CAP Location *CaptureInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the capture function.

Name *Parameter Name*	Value	Data Type	Description
CAP Filter *CaptureInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
Capture Condition *CaptureCondition*	0: **Preset*** 1: **CAP Rising Edge** 2: **CAP Falling Edge** 3: **CAP Both Edges**	ENUM	Defines how the **CAP Location** physical input is triggered.
Limits *LimitManagement*	0: **Lock on limits*** 1: **Rollover**	ENUM	In **Free-large** sub-mode, this parameter defines the behavior when the counter reaches the lower or upper limit: • **Lock on limits**: When the counter value reaches the lower or upper limit, the Run bit is set to FALSE and the counter value is maintained. You must apply a rising edge on the preset condition to run the counter again. • **Rollover**: When the counter value reaches the lower or upper limit, the counter rolls over to the opposite limit. **NOTE:** In **Free-large** sub-mode, the lower and upper limit values are -2,147,483,648...2,147,483,647.
Modulo value *Modulo value*(1)	**0...2147483647***	SINT32	In **Modulo-loop** sub-mode, sets the modulo value at which the counter loops.
Preset *Preset*(1)	**-2147483648... 2147483647***	SINT32	In **Free-large** sub-mode, sets the initial counter value on the rising edge of the preset condition.
Hysteresis *Hysteresis*(1)	**-128...127** **0***	SBYTE	Sets the number of pulses that are not taken into account when changing the direction of counting.
CAP Window Start *CaptureWindowStartPosition*(1)	**0...2147483646** (**Modulo-loop**) **-2147483648... 2147483646** (**Free-large**) **0***	SINT32	Sets the starting value of the capture window. **CAP Window Start**<**CAP Window End**

Name ***Parameter Name***	Value	Data Type	Description
CAP Window End *CaptureWindowEndPosition*(1)	**1...2147483647** (**Modulo-loop**) **-2147483647... 2147483647** (**Free-large**) **1***	SINT32	Sets the ending value of the capture window. **CAP Window End**>**CAP Window Start**
* Parameter default value (1) Online modification is allowed and applied on the rising edge of the preset condition. For more information about online modifications, refer to Modicon Edge I/O - Configurator and Web Interface - User Guide.			

Implicit Data

The following table presents the input implicit data of the **Dual Phase Counting** function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes**	**Description**
CounterValue	0... 2,147,483,647* (**Modulo-loop**) -2,147,483,648 ... 2,147,483,646 (**Free-large**)	SINT32 4	Dual phase value. **NOTE:** The implicit data *CounterValue* is updated at each I/O Bus cycle.
CaptureValue	0... 2,147,483,647* (**Modulo-loop**) -2,147,483,648 ... 2,147,483,646 (**Free-large**)	SINT32 4	Captured value, valid when capture flag is TRUE. **NOTE:** The implicit data *CaptureValue* is updated at each I/O Bus cycle.
OperationalState	0...255	BYTE 1	Operational state of the dual phase counting function. Bit 0 (Run), this bit indicates if the counter is active. • TRUE when the enable condition is TRUE. • FALSE: ◦ When the enable condition is FALSE. ◦ In **Free-large** mode, when the counter reaches the lower or upper limit. You must apply a rising edge on the preset condition to run the counter again. Bit 1 (Valid), this bit indicates if the measurement is valid. • TRUE when the measurement is within the *CounterValue* range. • FALSE, when: ◦ Bit 0 (Run) is FALSE. ◦ The measurement is not within the *CounterValue* range. Bit 2 (Modulo Flag), this bit indicates if the counter looped back to 0 after reaching the modulo value. • TRUE when the counter loops back to 0. • FALSE on the rising edge of the Acknowledge Modulo Flag bit. Bit 3 (Preset Flag), this bit indicates if the preset condition bit was set to TRUE. • TRUE on the rising edge of the preset condition. • FALSE on the rising edge of the Acknowledge Preset Flag bit. Bit 4 (Capture Flag), this bit indicates if the capture condition was set to TRUE. • TRUE on the rising edge of the capture condition. • FALSE on the rising edge of the Acknowledge Capture Flag bit. **NOTE:** Other bits are reserved.

The following table presents the output implicit data of the **Dual Phase Counting** function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes**	**Description**
OperationalCommand	0...65,535	INT 2	Bit 0 (Enable): When TRUE, the **EN Location** physical input can set the enable condition to TRUE. Bit 1 (Enable Preset): When TRUE, the **SYNC Location** physical input can set the preset condition to TRUE. Bit 2 (Enable Capture): When TRUE, the **CAP Location** physical input can set the capture condition to TRUE. Bit 3 (Enable Capture Function): When TRUE, enables the capture function. Bit 4 (Enable Capture Window): When TRUE, the capture condition can be TRUE only if the counter value is within the configured capture window. Bit 5 (Enable Compare): When TRUE, the compare function is active. Bit 6 (Suspend Compare): When TRUE, the compare function is suspended. Bit 7 (Force Enable): When TRUE, the enable condition is TRUE. Bit 8 (Force Preset): On a rising edge, the preset condition is TRUE. Bit 10 (Acknowledge Modulo): On a rising edge, sets the Modulo Flag to FALSE. Bit 11 (Acknowledge Preset): On a rising edge, sets the Preset Flag to FALSE. Bit 12 (Acknowledge Capture Flag): On a rising edge, sets the Capture Flag to FALSE. **NOTE:** Other bits are reserved.

PWM Output Function

Description

The **PWM Output** produces a periodic signal at the **PWM Ouput Location** output while the enable condition is TRUE.

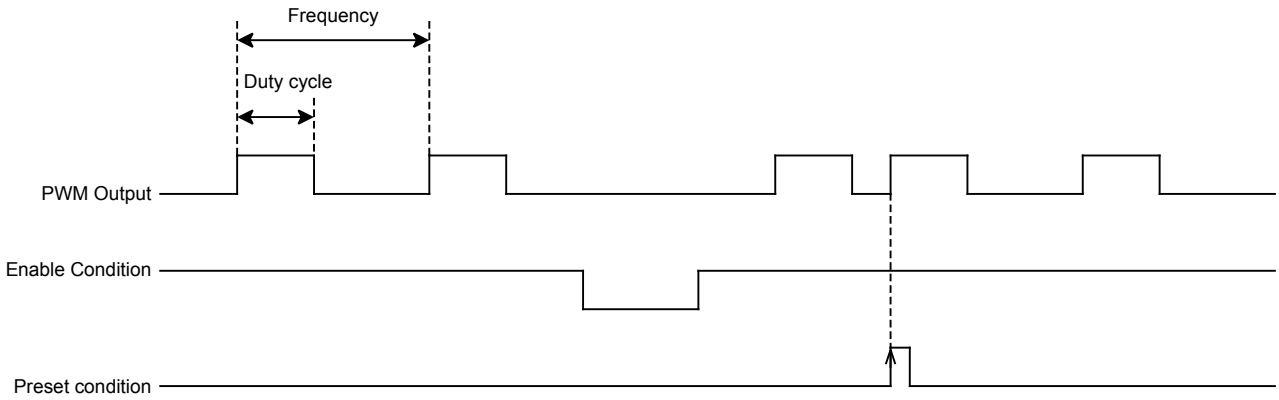
The frequency and the duty cycle are defined by the implicit data *PWMOutputFrequency and PWMOutputDuty*.

> **NOTE:** If the *PWMOutputFrequency* or *PWMOutputDuty* are modified while the **PWM Output** is active, the **PWM Output** cycle finishes before applying the modified parameters.

With the **PWM Output** function:

- The enable condition, page 112 is controlled with a software command or a physical input.
- The preset condition, page 113 is controlled with a software command or a physical input.

The following diagram describes the **PWM Output** function principle:



The following table describes the features of the **PWM Output** function:

Item	Description
Inputs	The **PWM Output** function requires a single fast output **PWM Location** to operate. An optional input can be assigned to **EN Location** and **SYNC Location**.
Output Frequency	0.01 Hz...20 kHz
Duty cycle	0.1...99.9%, with limits depending on the output frequency.

PWM Output Function Configuration

The following table presents the configuration parameters of the **PWM Output** function:

Name *Parameter Name*	Value	Data Type	Description
PWM Location *PWMOutputLocation*	255: **Disabled*** 0...3: **Q0...Q3** for NTSEHC0120H 0...7: **Q0...Q7** for NTSEHC0220	ENUM	Selects the output channel for the PWM signal.
EN Location *EnableInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the enable function.
EN Filter *EnableInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
SYNC Location *SyncInputLocation*	255: **Disabled*** 0...5: **I0...I5** for NTSEHC0100 and NTSEHC0120H 0...11: **I0...I11** for NTSEHC0220	ENUM	Sets the physical input used for the preset function.

Name *Parameter Name*	Value	Data Type	Description
SYNC Filter *SyncInputFilter*	0: **0** 1: **0.0005** 2: **0.001** 3: **0.002** 4: **0.005** 5: **0.01** 6: **0.05** 7: **0.1** 8: **0.25** 9: **0.5** 10: **1** 11: **2** 12: **4*** 13: **12**	ENUM	Allows reducing the effect of bounce on the input. Changes to the signal are only detected if the pulse width of the input signal is longer than the filter time (ms).
Preset Condition *PresetCondition*	0: **SYNC Rising Edge*** 1: **SYNC Falling Edge** 2: **SYNC Both Edges**	ENUM	Defines how the **SYNC Location** physical input is triggered.
* Parameter default value			

Implicit Data

The following table presents the input implicit data of the **PWM Output** function:

Name *Parameter Name*	Value	Data Type Size in Bytes R/W	Description
OperationalState	0...255	BYTE 1 R/-	Operational state of the **PWM Output** function. Bit 0 (Run), this bit indicates if the counter is active. • TRUE when the enable condition is TRUE. • FALSE when the enable condition is FALSE. Bit 1 (Valid), this bit indicates if the **PWM Output** parameters are valid. • TRUE when the frequency and duty cycle are within the valid ranges. • FALSE, when: ◦ Bit 0 (Run) is FALSE. ◦ The user input **PWM Output** frequency or duty cycle is not within the valid range. The **PWM Output** function remains active and uses the last valid value. Bit 3 (Preset Flag), this bit indicates if the preset condition bit was set to TRUE. • TRUE on the rising edge of the preset condition. • FALSE on the rising edge of the Acknowledge Preset bit. **NOTE:** After a configuration download, it may be necessary to acknowledge this Preset Flag. **NOTE:** Other bits are reserved.

The following table presents the output implicit data of the **PWM Output** function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes**	**Description**
OperationalCommand	0...65,535	INT 2 R/W	Bit 0 (Enable): When TRUE, the **EN Location** physical input can set the enable condition to TRUE. Bit 1 (Enable Preset): When TRUE, the **SYNC Location** physical input can set the preset condition to TRUE. Bit 7 (Force Enable): When TRUE, the enable condition is TRUE. Bit 8 (Force Preset): On a rising edge, the preset condition is TRUE. Bit 11 (Acknowledge Preset): On a rising edge, sets the Preset Flag to FALSE. **NOTE:** Other bits are reserved.
PWMOutputFrequency	0...2,000,000	INT32 4 R/W	Sets the pulse frequency for PWM output in percentiles. For example, *PWMOutputFrequency* = 174,654 is a PWM output pulse frequency of 1,746.54 Hz. 0 is not a valid value.
PWMOutputDuty	0...1,000	INT 2 R/W	Sets the pulse duty cycle for PWM output with the following limits: • 0.01 Hz ≤ *PWMOutputFrequency* ≤ 200 Hz, duty cycle: 0.1 %...99.9 %. • 200 Hz ≤ *PWMOutputFrequency* ≤ 1 kHz, duty cycle: 1 %...99 %. • 1 kHz < *PWMOutputFrequency* ≤ 10 kHz, duty cycle: 5 %...95 %. • 10 kHz < *PWMOutputFrequency* ≤ 20 kHz, duty cycle: 10 %...90 %. For example, *PWMOutputDuty* = 123 is a pulse duty cycle of 12.3 %. Duty step: 0.1 % 0 and 1,000 are not valid values.

Reflex Output Sub-Function

Description

The **Frequency Meter**, **Period Meter**, **Ratio Meter**, **Single Phase Counting**, **Single Event Counting** and **Dual Phase Counting** functions can manage up to 4 reflex outputs that can be triggered during the operation of the module.

A reflex output is enabled when assigning a physical output to the **Reflex 0: Location**...**Reflex 3: Location** parameters.

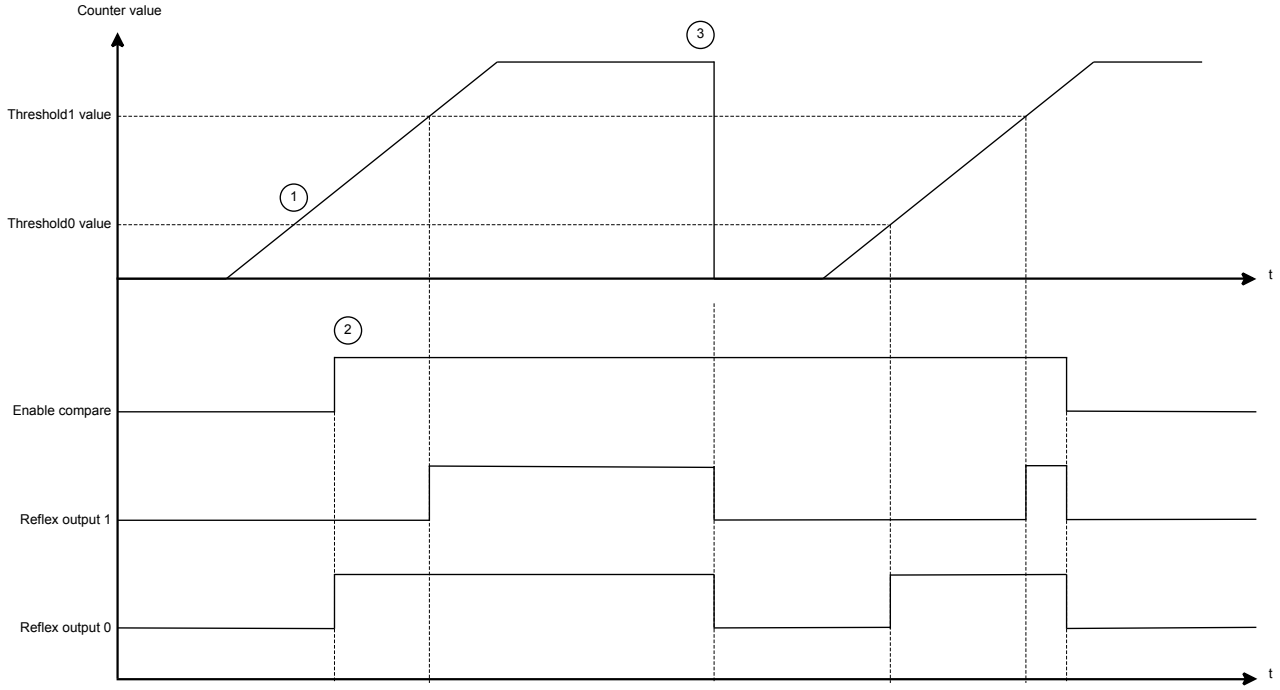
There are two ways to operate the configured reflex outputs:

- With the compare function, page 114. To enable the compare function, define a trigger condition for the **Reflex 0: Condition**...**Reflex 3: Condition** parameter:
  - **Reflex 0 Condition: Counter Within Threshold**...**Reflex 3 Condition: Counter Within Threshold**
  - **Reflex 0 Condition: Capture Within Threshold**...**Reflex 3 Condition: Capture Within Threshold**
  - **Reflex 0 Condition: Counter Cross Threshold**...**Reflex 3 Condition: Counter Cross Threshold**
- With the *ForceReflexOutput* command.

When using the compare function, the outputs are independent of the I/O bus cycle and have an update rate depending on the comparison trigger but less than 20 µs.

There are 4 configurable thresholds available that can define up to five counting zones.

The following diagram and table show an example of the behavior of 2 reflex outputs used with a **Single Phase Counting Function**:



Stage	Action
1	When enable compare is FALSE, the compare function is not activated.
2	In this example, 2 reflex outputs are configured: • Reflex output 0 with the **Reflex 0: Condition** parameter set to **Counter Within Threshold** and the **Reflex 0 Condition: Counter Within Threshold** value is 6. • Reflex output 1 with the **Reflex 1: Condition** parameter set to **Counter Within Threshold** and the **Reflex 1 Condition: Counter Within Threshold** value is 4. • **Threshold1**>**Preset** When the compare function is active and *EnableReflexOutput0* is TRUE, the reflex output 0 is set to TRUE when the counter value is above **Threshold0**. When the compare function is active and *EnableReflexOutput1* is TRUE, the reflex output 1 is set to TRUE when the counter value is above **Threshold1**.
3	A preset condition resets the counter.

Reflex Output Sub-Function Configuration

The following table describes the configuration parameters of the **Reflex Output** sub-function:

Name ***Parameter Name***	**Value**	**Data type**	**Description**
Reflex 0: Location *ReflexOutput0Location* ... **Reflex 3: Location** *ReflexOutput3Location*	255: **Disabled*** 0...3: **Q0...Q3** for NTSEHC0120H 0...7: **Q0...Q7** for NTSEHC0220	ENUM	Selects the physical output assigned as a reflex output.
Reflex 0: Condition *ReflexOutput0Condition* ... **Reflex 3: Condition** *ReflexOutput3Condition*	0: **Disabled*** 1: **Counter Within Threshold** 2: **Counter Cross Threshold** 3: **Capture Within Threshold** 4: **Counter Stop**	ENUM	Selects the trigger condition for the reflex output. **NOTE: Counter Stop** is only available with the **Single Phase Counting** function in the **One-Shot** sub-mode.
Reflex 0 Condition: Counter Within Threshold *ReflexOutput0Counter-WithinThreshold* ... **Reflex 3 Condition: Counter Within Threshold** *ReflexOutput3Counter-WithinThreshold*	**0*...31**	BYTE	Defines the counting zones when you want the reflex output to trigger (bit field). Set the bit to TRUE for the reflex output to trigger when the counter value is between: • Bit 0: Minimum value and threshold 0 • Bit 1: Threshold 0 + 1 and threshold 1 • Bit 2: Threshold 1 + 1 and threshold 2 • Bit 3: Threshold 2 + 1 and threshold 3 • Bit 4: Threshold 3 + 1 and the maximum value
Reflex 0 Condition: Capture Within Threshold *ReflexOutput0Capture-WithinThreshold* ... **Reflex 3 Condition: Capture Within Threshold** *ReflexOutput3Capture-WithinThreshold*	**0*...31**	BYTE	Defines the capture value zones when you want the reflex output to trigger (bit field). Set the bit to TRUE for the reflex output to trigger when the capture value is between: • Bit 0: Minimum value and threshold 0 • Bit 1: Threshold 0 + 1 and threshold 1 • Bit 2: Threshold 1 + 1 and threshold 2 • Bit 3: Threshold 2 + 1 and threshold 3 • Bit 4: Threshold 3 + 1 and the maximum value

Name *Parameter Name*	Value	Data type	Description
Reflex 0 Condition: Counter Cross Threshold *ReflexOutput0Counter-CrossThreshold* ... **Reflex 3 Condition: Counter Cross Threshold** *ReflexOutput3Counter-CrossThreshold*	0: **Pulse = Counter crosses TH0 downwards*** 1: **Pulse = Counter crosses TH0 upwards** 2: **Pulse = Counter crosses TH1 downwards** 3: **Pulse = Counter crosses TH1 upwards** 4: **Pulse = Counter crosses TH2 downwards** 5: **Pulse = Counter crosses TH2 upwards** 6: **Pulse = Counter crosses TH3 downwards** 7: **Pulse = Counter crosses TH3 upwards**	ENUM	Defines the threshold values to cross when you want the reflex output to trigger. Upwards: The trigger condition is TRUE on the rising edge of the *ThresholdState* bit 0...bit 3. Downward: The trigger condition is TRUE on the falling edge of the *ThresholdState* bit 0...bit 3.
Reflex 0: Pulse Width *ReflexOutput0Pulse-Width* ... **Reflex 3: Pulse Width** *ReflexOutput3Pulse-Width*	**1...65535 ms** **10***	INT	When the **Reflex 0 Condition: Counter Cross Threshold**...**Reflex 3 Condition: Counter Cross Threshold** trigger condition is TRUE, the reflex output is TRUE for the duration defined by this parameter.
Reflex 0 Condition: Counter Stop *ReflexOutput0OneShot-State* ... **Reflex 3 Condition: Counter Stop** *ReflexOutput3OneShot-State*	**Counter STOP*** **Counter RUN**	ENUM	**Counter STOP**: The reflex output is TRUE when the counter stops. **Counter RUN**: The reflex output is TRUE when the counter is running (Run bit is TRUE).
Threshold 0 Value *Threshold0Value*(1) ... **Threshold 3 Value** *Threshold3Value*(1)	**-2147483648... 2147483647**	INT32	Sets the value of the threshold 0...3. **NOTE:** Threshold 0 < Threshold 1 < Threshold 2< Threshold 3 and threshold values cannot exceed the measurement range of each counting function.

* Parameter default value

(1) Online modification is allowed and applied on the rising edge of the preset condition. For more information about online modifications, refer to Modicon Edge I/O - Configurator and Web Interface - User Guide.

Implicit Data

The following table presents the input implicit data of the **Reflex Output** sub-function:

Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
ReflexState	0...255	BYTE 1 R/-	For each physical output configured in the **Reflex 0: Location**...**Reflex 3: Location** parameters, each *ReflexState* bit returns the result of the comparison between the counter value and the configured **Reflex 0: Condition**...**Reflex 3: Condition** parameters (bit field). Bit 0...3 = TRUE when the comparison result for **Reflex 0: Location**... **Reflex 3: Location** is TRUE. **NOTE:** *ReflexState* bits are valid for **Reflex 0: Condition: Counter Within Threshold**...**Reflex 3: Condition: Counter Within Threshold** or **Reflex 0: Condition: Capture Within Threshold**... **Reflex 3: Condition: Capture Within Threshold**. Other bits are reserved.
ThresholdState	0...255	BYTE 1 R/-	Each *ThresholdState* bit returns the result of the comparison between the counter value and the threshold parameters (bit field). Bit 0...3 = TRUE when the counter value is greater than **Threshold 0 Value**...**Threshold 3 Value**. **NOTE:** Other bits are reserved.
OutputState	0...255	BYTE 1 R/-	Each bit sets the voltage of the configured physical output **Reflex 0: Location**...**Reflex 3: Location** to 24 Vdc when the *EnableReflexOutput* bit 0...3 is TRUE and the *ReflexState* bit 0...3 is TRUE. Bit 0...3 = TRUE when the voltage of the configured physical output **Reflex 0: Location**...**Reflex 3: Location** is 24 Vdc. **NOTE:** Other bits are reserved.

NOTE: The implicit data is updated at each I/O bus cycle.

The following table presents the output implicit data of the **Reflex Output** sub-function:

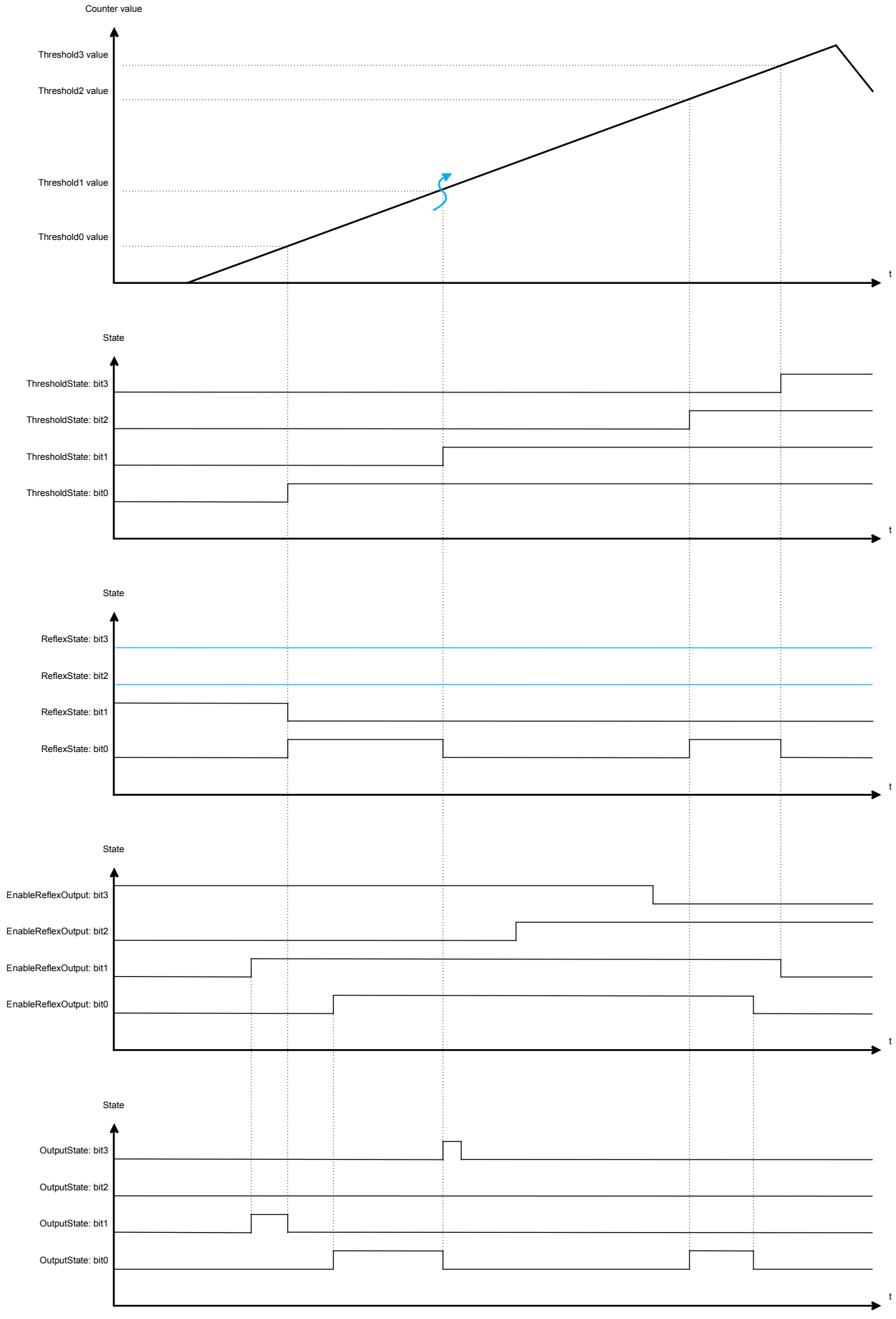
Name ***Parameter Name***	**Value**	**Data Type** **Size in Bytes** **R/W**	**Description**
EnableReflexOutput	0...255	BYTE 1 R/W	Each bit allows *OutputState* 0...3 to operate the physical output configured in **Reflex 0: Location**...**Reflex 3: Location**. Bit 0...3 = physical output configured in **Reflex 0: Location**...**Reflex 3: Location**. **NOTE:** Bits used inside *EnableReflexOutput* and bits used inside *ForceReflexOutput* operate the same physical output and must be mutually exclusive. Other bits are reserved.
ForceReflexOutput	0...255	BYTE 1 R/W	Each bit allows to force the voltage of the configured physical output **Reflex 0: Location**...**Reflex 3: Location** to 24 Vdc. • Set to TRUE to force the voltage of the configured physical output **Reflex 0: Location**...**Reflex 3: Location** to 24 Vdc. • Set to FALSE to unforce the configured physical output **Reflex 0: Location**...**Reflex 3: Location**. **NOTE:** Bits used inside *EnableReflexOutput* and bits used inside *ForceReflexOutput* operate the same physical output and must be mutually exclusive. Other bits are reserved.

Reflex Output Behavior Example

For this example, the reflex outputs are configured as shown in the following table:

Parameter	Reflex Output 0	Reflex Output 1	Reflex Output 2	Reflex Output 3
ReflexOutput●Location	Q0	Q1	Q2	Q3
ReflexOutput●Condition	**Counter Within Threshold**	**Counter Within Threshold**	**Counter Cross Threshold**	**Counter Cross Threshold**
ReflexOutput●CounterWithin-Threshold value	10	1	-	-
ReflexOutput●CounterCross-Threshold	-	-	**Pulse = Counter crosses TH1 upwards**	**Pulse = Counter crosses TH1 upwards**
ReflexOutput●PulseWidth	-	-	10	10

When the compare function is active, the parameters associated to the **Reflex Output** evolves as shown in the following diagram:



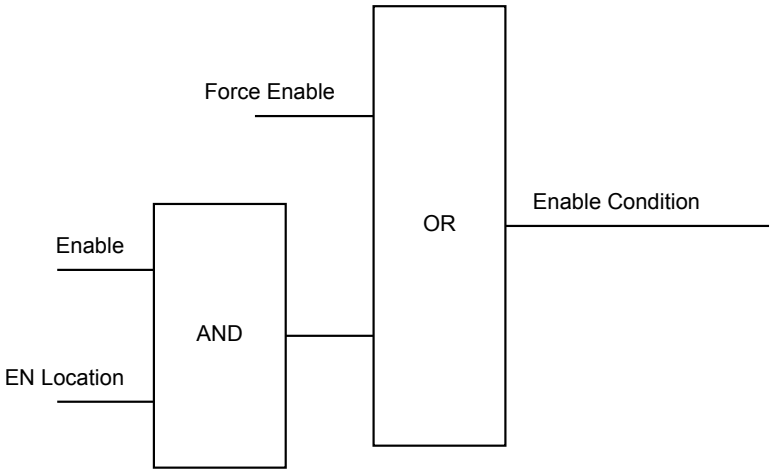
Other Functions

What's in This Chapter

Enable Function

Each counting function has an **Enable Function** that allows the counter to operate.

The **Enable Function** is activated by the enable condition which operates as shown in the following diagram:



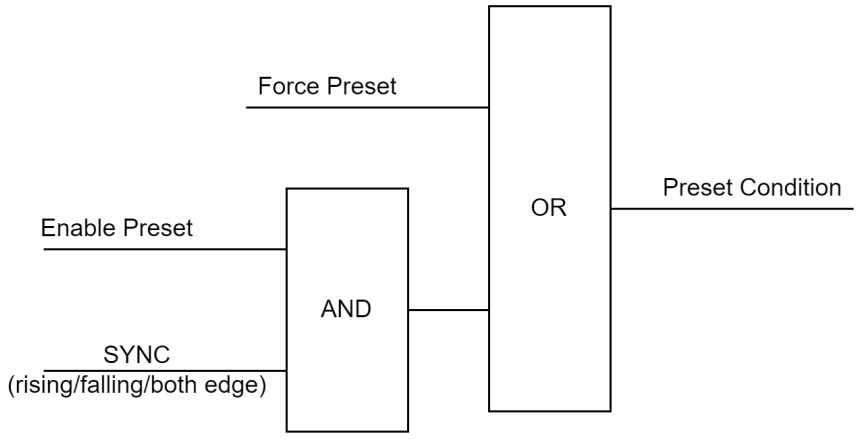
Force Enable: *OperationalCommand* bit 7.
Enable: *OperationalCommand* bit 0.
EN Location: Physical input assigned to the **EN Location** parameter.

NOTE: With the **Simple counting** function, the enable condition is operated with the *OperationalCommand* bit 0.

Preset Function

Each function has a **Preset Function** used to set, reset, or initialize the operation.

The **Preset Function** is activated by a rising edge of the preset condition which operates as shown on the following diagram:



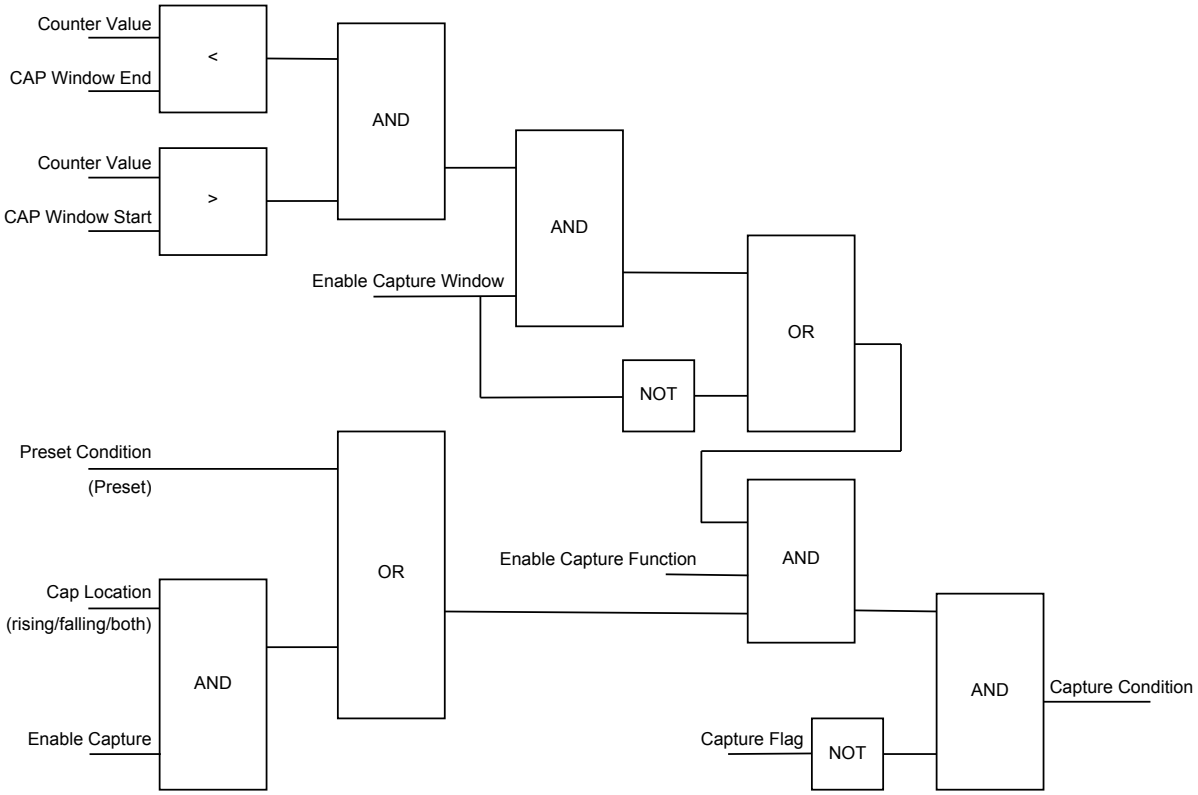
Force Preset: *OperationalCommand* bit 8.
Enable Preset: *OperationalCommand* bit 1.
SYNC: Physical input assigned to the **SYNC Location** parameter.
Rising / falling / both edge: **Preset Condition** parameter setting.

NOTE: With the **Simple counting** function, the preset condition is operated with the *OperationalCommand* bit 1.

Capture Function

The **Capture Function** stores the counter value in the capture register.

The **Capture Function** is activated when the capture condition is TRUE which operates as shown in the following diagram:



Enable Capture: *OperationalCommand* bit 2.
Enable Capture Function: *OperationalCommand* bit 3.
Enable Capture Window: *OperationalCommand* bit 4.
Capture Flag: *OperationalState* bit 4.
CAP Window Start: Value of the **CAP Window Start** parameter.
CAP Window End: Value of the **CAP Window End** parameter.
Preset/rising/fall/both edge: **Capture Condition** parameter setting.

Compare Function

The **Compare Function** allows the counter to operate the configured reflex outputs.

The **Compare Function** is activated when the Enable compare bit (*OperationalCommand* bit 5) is TRUE.

When the **Compare Function** is not activated, the parameters related to the **Compare Function**, *ReflexState*, *ThresholdState*, *OutputState* are set to FALSE.

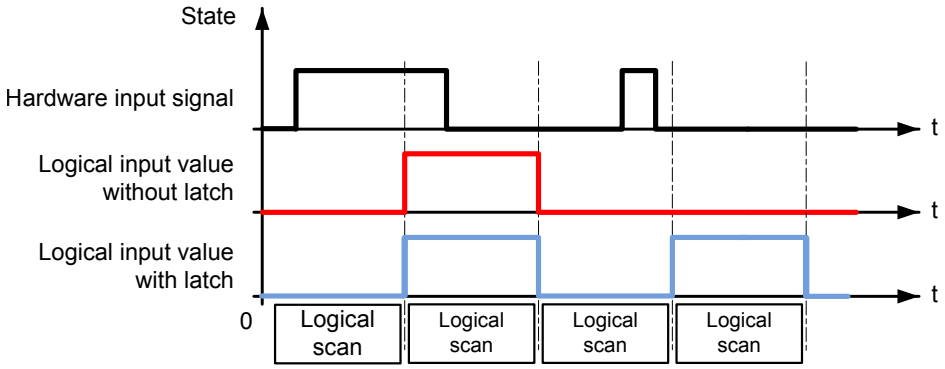
When Suspend compare (*OperationalCommand* bit 6) is set to TRUE, the **Compare Function** is suspended. The parameters related to the **Compare Function**, *ReflexState*, *ThresholdState*, *OutputState* are maintained at their value.

> **NOTE:** In the case of **Counter Cross Threshold**, if the **Compare Function** is suspended while the *OutputState* is TRUE, then the *OutputState* continues the normal operation and is set to FALSE at the end of the configured *ReflexOutput●PulseWidth* duration.

Input Latch

Overview

The **Latch** parameter allows incoming pulses with a pulse width shorter than the network interface module scan time to be captured and recorded as depicted in the following diagram:



The shortest input pulse detected is determined by the bounce filter time.

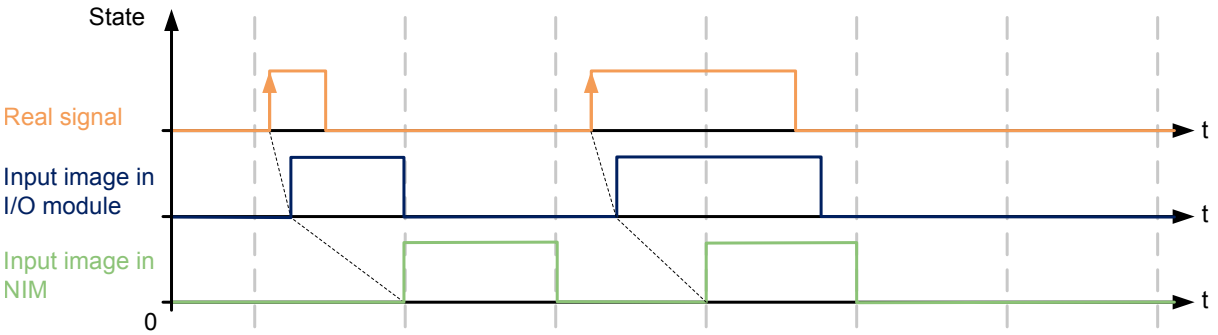
A pulse can be captured either on a rising edge, a falling edge or on both edges. An acknowledge action is necessary before a new latch value can be captured.

Automatic Acknowledge

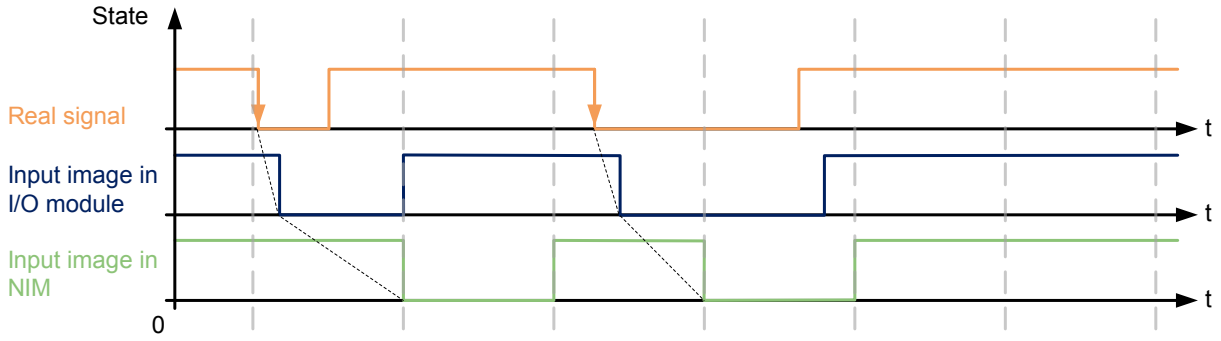
A rising edge on the **LatchAck** is done at each I/O bus cycle.

The following diagrams depicts the behavior of the input image in automatic acknowledge:

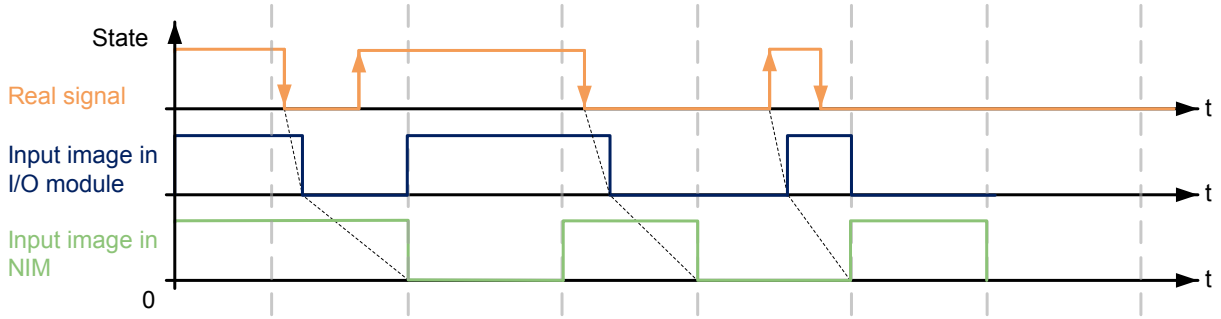
Rising Edge - Automatic Acknowledge:



Falling Edge - Automatic Acknowledge:



Both Edges - Automatic Acknowledge:



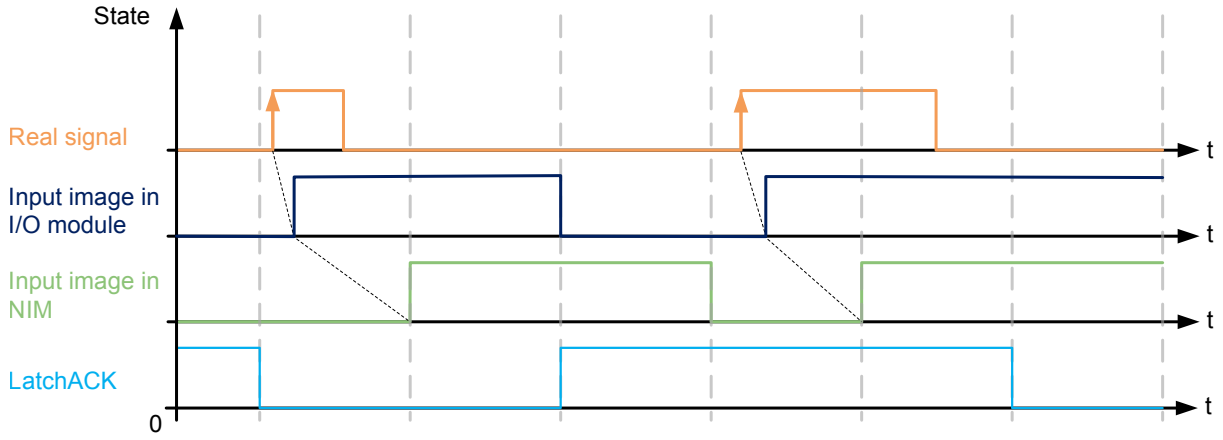
Manual Acknowledge

When an input value is latched, the input image in the I/O module is maintained at the latched value and a new value cannot be latched.

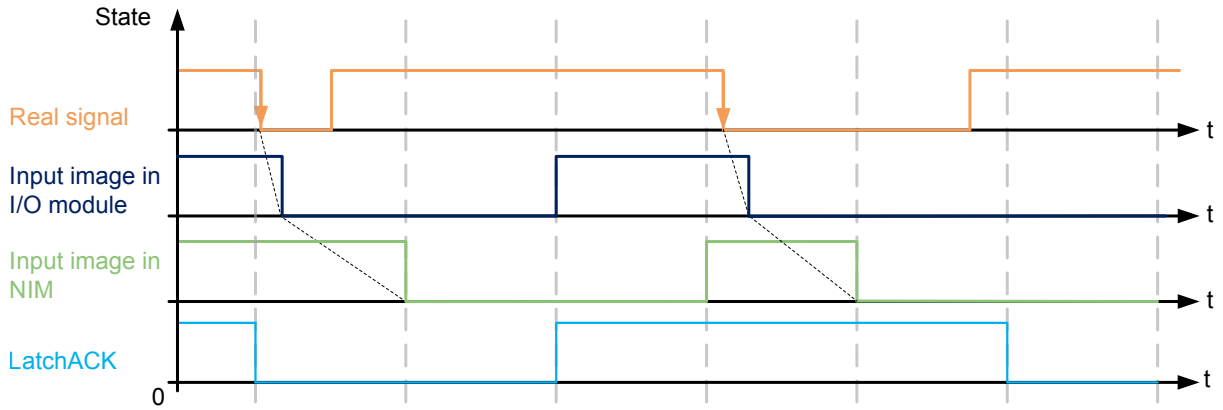
On a rising edge of the **LatchAck** bit, the input image in the I/O module is no longer maintained and a new value can be latched.

The following diagrams depict the behavior of the input image in manual acknowledge:

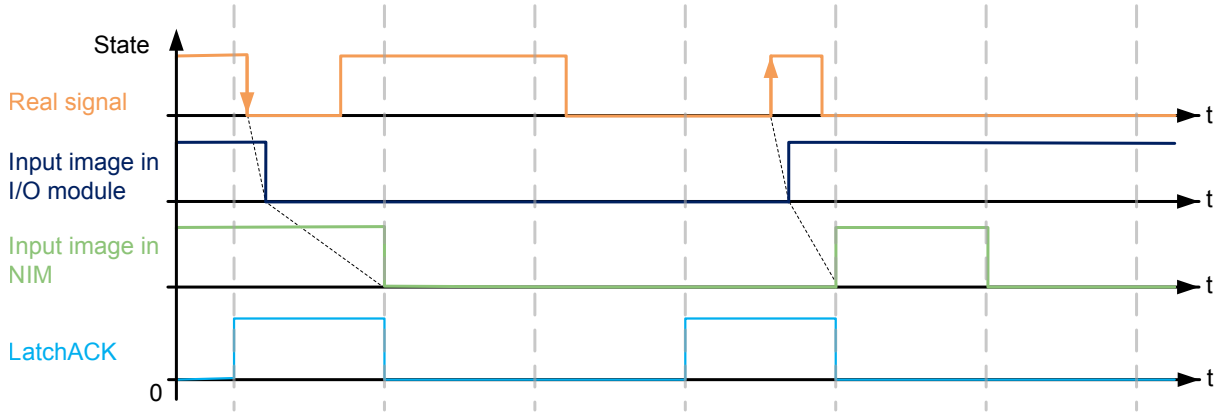
Rising Edge - Manual Acknowledge:



Falling Edge - Manual Acknowledge:



Both Edges - Manual Acknowledge:



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