



PS00016198A02

GL20-2HC Two-Channel High-Speed Counting Module User Guide

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Preface

■ Introduction

The GL20-2HC two-channel high-speed counting module supports two-channel phase A/B differential input (1x/2x/4x frequency), single-ended phase A/B, and single-phase pulse and direction. It supports up to 4 MHz signal input (up to 500 kHz for single-ended interface). Each channel of the module contains two probe inputs, one comparison output, two DIs, and one DO.

This guide describes the product information, specifications, mechanical installation, electrical installation, program commissioning, troubleshooting, and version matching information.

■ Standards Compliance

The following table lists the certifications, directives, and standards that the product may comply with. For details about the acquired certificates, see the certification marks on the product nameplate.

Certification name	Instruction		Standards compliance
CE certification	EMC	2014/30/EU	24 VDC products: EN 61131-2 220 VAC products: EN 61131-2 EN 61000-3-2 EN 61000-3-3
	LVD	2014/35/EU	EN 61010-1 EN 61010-2-201
	RoHS directive	2011/65/EU amended by (EU) 2015/863	EN IEC 63000
UL/cUL certification	-		UL 61010-1 UL 61010-2-201 CAN/CSA-C22.2 No. 61010-1 CSA C22.2 NO. 61010-2-201
KCC	-		-
EAC	-		-

Certification name	Instruction		Standards compliance
UKCA	Safety regulations	Electrical Equipment (Safety) Regulations 2016	EN 61010-1 EN 61010-2-201
	EMC regulations	Electromagnetic Compatibility Regulations 2016	24 VDC products: EN 61131-2 220 VAC products: EN 61131-2 EN 61000-3-2 EN 61000-3-3
	RoHS	Directive (RoHS) Regulations 2012	EN IEC 63000

■ More Data

Data name	Code	Description
GL20-RTU-PN Series Communication Interface Module User Guide	PS00007594	Introduces the product information, mechanical installation, electrical installation, programming commissioning, and troubleshooting of the product.
GL20-RTU-ECT32 Communication Interface Module User Guide	PS00013434	Introduces the product information, mechanical installation, electrical installation, programming commissioning, and troubleshooting of the product.
GL20-2HC Two-Channel High-Speed Counting Module User Guide (this guide)	PS00016198	Introduces the product information, mechanical installation, electrical installation, program commissioning, troubleshooting, and version matching information of the product.

■ Revision History

Date	Version	Revision
January 2025	A02	Added the following content: • Corrected some minor errors. • Added the function description section in "<i>Function Description</i>" on page 34. • Added the program commissioning section in "<i>6.2 Commissioning for Connection with Siemens PLC</i>" on page 79. • Added the object dictionary section in "<i>Object Dictionary</i>" on page 98. • Added the address space section in "<i>Address Space</i>" on page 107 and "<i>9.3 Output PDO Parameters</i>" on page 113. • Added "<i>Appendix 1: Parameter Description</i>" on page 118. Modified the following content: • Updated "<i>3.1 Installation Precautions</i>" on page 21. • Updated "<i>3.3 Installation Method</i>" on page 22. • Updated "<i>4.3 Wiring Diagram of Terminals</i>" on page 28. • Updated "<i>Fault Diagnosis</i>" on page 95. • Updated "<i>10.4 Appendix 4: Version Matching Information</i>" on page 131.
August 2024	A01	Corrected some minor errors.
April 2024	A00	First release.

■ Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version in the following ways

- Do keyword search under Service and Support at www.inovance.com.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install My Inovance app, where you can search for and download user guides.



■ **Warranty Disclaimer**

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. Maintenance will be charged after the warranty period expires.

Within the warranty period, maintenance fee will be charged for the following damage:

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or unusual voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see Product Warranty Card.

Fundamental Safety Instructions

■ Safety Precautions

1. Read and follow the safety instructions when installing, operating, and maintaining the equipment.
2. To ensure your safety and prevent damage to the equipment, follow the marks on the equipment and safety instructions in this guide when installing, operating, and maintaining the equipment.
3. "CAUTION", "WARNING", and "DANGER" items in the guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
4. Use this product according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
5. Inovance shall take no responsibility for any personal injury or property damage caused by improper use.

■ Safety Levels and Definitions



"DANGER" indicates that failure to comply with the notice will result in death or severe personal injuries.



"WARNING" indicates that failure to comply with the notice may result in death or severe personal injuries.



"CAUTION" indicates that failure to comply with the notice may result in minor or moderate personal injury or equipment damage. Keep this user guide properly for future use and deliver it to the end user.

Control System Design



- Provide a safety circuit outside the PLC so that the control system can still work safely once external power failure or PLC fault occurs.
- Add a fuse or circuit breaker because the module may smoke or catch fire due to long-time overcurrent caused by operation above rated current or load short-circuit.

**WARNING**

- An emergency stop circuit, a protection circuit, a forward/reverse operation interlocked circuit, and an upper position limit and lower position limit interlocked circuit must be set in the external circuits of PLC to prevent damage to the machine.
- To ensure safe operation, for the output signals that may cause critical accidents, please design an external protection circuit and safety mechanism.
- Once the CPU of the PLC detects an exception in the system, all outputs may be closed; however, when a fault occurs in the controller circuit, the output may not be under control. Therefore, it is necessary to design an appropriate external control circuit to ensure normal operation.
- If the PLC output units such as relays or transistors are damaged, the output may fail to switch between ON and OFF states according to the commands.
- The PLC is designed to be used in an indoor electrical environment (overvoltage category II). The power supply must have a system-level surge protector to ensure that overvoltage due to lightning shock will not be applied to power supply input terminals, signal input terminals, and control output terminals of the PLC, therefore preventing damage to the equipment.

Installation

**WARNING**

- Installation must be carried out by specialists who have received the necessary electrical training and understood enough electrical knowledge.
- Disconnect all external power supplies of the system before removing/installing the module. Failure to do so may result in electric shock, module fault or malfunction.
- Do not use the PLC in environments with dust, greasy smoke, conductive dust, corrosive or combustible gases, exposed to high temperature, condensation, wind & rain, or subject to vibration and shock. Electric shock, fire and malfunction may also result in damage or deterioration to the product.
- The PLC is open-type equipment that must be installed in a control cabinet with lock (cabinet housing protection > IP20). Only the skilled personnel who have undergone specialized electrical training and possess comprehensive electrical expertise can open the cabinet.

**CAUTION**

- Prevent metal filings and wire ends from dropping into ventilation holes of the PLC during installation. Failure to comply may result in fire, fault and malfunction.
- Ensure there are no foreign matters on ventilation surface. Failure to comply may result in poor ventilation, which may cause fire, fault and malfunction.
- Ensure the module is connected to the respective connector securely and hook the module firmly. Improper installation may result in malfunction, fault, or fall-off.

Wiring



- Wiring must be carried out by personnel who have received the necessary electrical training and understood enough electrical knowledge.
- Disconnect all external power supplies of the system before wiring. Failure to comply may result in electric shock, module fault or malfunction.
- Insulate the cable terminals properly to ensure the insulation distance between cables will not be shortened after cables are connected to the terminal block. Failure to comply may result in electric shock or damage to the equipment.



- To avoid electric shock, cut off the power supply before connecting the product to the power supply.
- The input power of the product must meet the specifications listed in this guide. If the power input does not meet the specifications, the equipment may be damaged. Thus, check regularly that the DC power provided by the switching-mode power supply unit is stable.

Operation and Maintenance



- Maintenance & inspection must be carried out by personnel who have the necessary electrical training and experience.
- Do not touch the terminals while the power is on. Failure to comply may result in electric shock or malfunction.
- Disconnect all external power supplies of the system before cleaning the module. Failure to comply may result in electric shock.
- Disconnect all external power supplies of the system before assembling/disassembling the module or connecting/removing the communication cables. Failure to comply may result in electric shock or malfunction.

Safety Recommendations

- In the position where the operator directly touches the machinery part, for example, where a machinery tool is loaded/unloaded, or where a machine runs automatically, the on-site manual operating devices and any other alternative means must be carefully arranged and designed so that they are independent of the PLC and can start or terminate the automatic running of the system.
- If modification on the program is needed during system operation, use the lock function or other protective measures. Ensure that only authorized personnel can make the necessary modifications.

Disposal



CAUTION

- Treat the scrapped product as industrial waste. Dispose of the battery according to local laws and regulations.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

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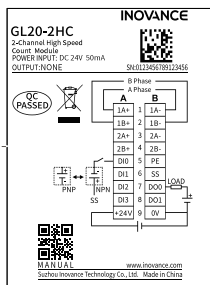
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1 Product Information

1.1 Model and Nameplate

G
①
L
②
20
③
-
④
2 HC
⑤

① Product Family G: Controller general-purpose module	④ Number of Counting Channels Two I/O channels
② Product Type L: Local module	⑤ Module Type AB high-speed counting module slave module
③ Series 20: 20 series module	-



The data for ordering the product is shown in the following table.

No.	Interface	Function			
①	Signal indicator	PR (POWER +RUN)	Power/Operation indicator	Yellow-green	• Steady ON: The module is operating normally. • Flashing quickly: The module is addressed successfully. • Slow flashing: The module is powered on but not addressed. • OFF: The module is not powered on or is abnormal.
		ERR	Fault indicator	Red	The indicator is on when 24 V power failure or error occurs. For details, see "4.2 Terminal Description" on page 27.
		1A/1B/ 2A/2B (left)	It is the 1A/1B/2A/2B differential signal input indicator. The indicator is steady on when the drive status is input; otherwise, the indicator is off.		
		DI0 to DI3 (left)	It is the DI0 to DI3 input channel indicator. The indicator is steady on when the drive status is input; otherwise, the indicator is off.		

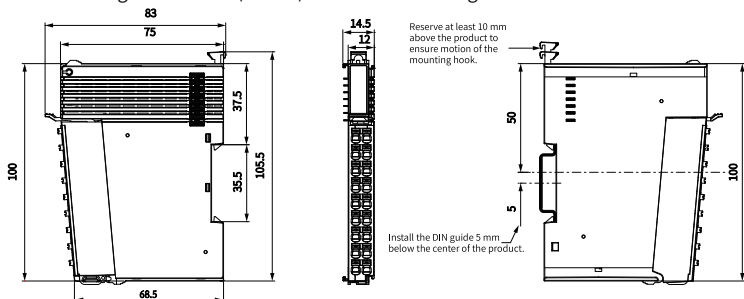
No.	Interface	Function	
①	Signal indicator	1A/1B/ 2A/2B (right)	It is the 1 A/1B/2 A/2B differential input disconnection indicator. The indicator is steady on when the disconnection signal is input; otherwise, the indicator is off. For details, see "4.2 Terminal Description" on page 27. - The GL20-2HC module only supports the disconnection detection function of differential wiring and does not support the disconnection detection function of single-ended wiring - The disconnection detection function can be disabled through the software. You can select whether to enable the disconnection detection function by setting 800nh:1 bit9. The function is disabled by default. If the disconnection detection function is enabled, you can determine the disconnection detection fault through the indicator (corresponding to the red indicator).
		DO0 to DO1 (right)	It is the DO0 to DO1 output channel indicator. The indicator is steady on when the drive status is input; otherwise, the indicator is off.
②	User terminal	For details, see "4.2 Terminal Description" on page 27 .	
③	Color identification	 Red: Digital output	 Orange: Analog output
		 Gray: Digital input	 Green: Analog input
		 White: Communication	 Blue: Other modules

Note

- Quick flashing: The indicator is on for 200 ms and off for 200 ms, repeating this cycle.
- Slow flashing: The indicator is on for 200 ms and off for 1 s, repeating this cycle.

1.3 Product Dimensions

The mounting dimensions (in mm) are shown in the figure below.

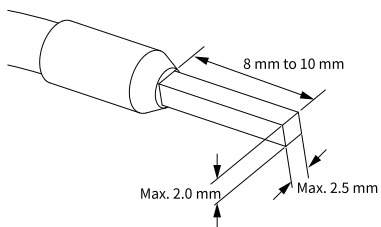


1.4 Spare Parts and Options

The cable lugs and diameters in the following table are only for reference.

Name	Applicable cross sectional area		KST		Suzhou Yuanli	
	mm ²	AWG	Model	Crimping tool	Model	Crimping tool
Tubular lug	0.3	22	E0308	KST2000L	0308	YAC-5
	0.5	20	E0508		0508	
	0.75	18	E7508		7508	
	1.0	18	E1008		1008	
	1.5	16	E1508		1508	

To use other types of tubular lugs, crimp the lug to the cables according to the shape and dimension requirements shown below.



2 Product Specifications

2.1 Electrical Specifications

■ Power supply specifications

Item	Specification
Rated voltage of bus input power supply	5 VDC (4.75 VDC to 5.25 VDC)
Rated current of bus input power supply	95 mA (typical value at 5 V)
Rated voltage of terminal input power supply	24 VDC (20.4 VDC to 28.8 VDC)
Rated current of terminal input power supply	50 mA (typical value @24 V)
Rated voltage of terminal output power supply	/
Rated current of terminal output power supply	/
Hot swap	Not supported

■ Differential counting input specifications

Item	Specification
Input type	Counter input (pulse+direction, phase A/B, CW/CCW)
Input mode	Differential input
Input channel	2
Differential input voltage class	RS422 level (logic 0 < 200 mV; logic 1 > 200 mV)
Maximum input frequency	4 MHz
Wire break detection	Supported
ON/OFF response time	100 ns/100 ns
Counting range	32-bit
Frequency measurement range	0.04 Hz to 4 MHz

Item	Specification
Counting accuracy	100 ppm
Isolation	Isolated
Input indicator	The input indicator turns on (controlled by software) when the input is in drive state.

■ Single-ended input specifications

Item	Specification
Input type	Digital input
Input mode	Single-ended input, sink (NPN)/source (PNP)
Input channel	4 (There are two counting channels, with each channel supporting phase A/B.)
Frequency measurement range	0.04 Hz to 500 kHz
Wire break detection	Not supported
Input voltage class	24 VDC (20.4 VDC to 28.8 VDC)
Input current (typical value)	50 mA (typical value @24 V)
ON voltage	> 15 VDC
OFF voltage	< 5 VDC
Hardware response time upon ON/OFF	250 ns/250 ns
Software filter time	Supported (filter parameter, default value)
Input impedance	Reference: 5.3 kΩ to 7.6 kΩ
Isolation	Isolated
Input indicator	The input indicator turns on (controlled by software) when the input is in drive state.
Input derating	/

■ Output specifications

Item	Specification
Output type	Digital output
Output mode	Source (NPN)
Number of output channels	2
Output voltage class	24 VDC (20.4 VDC to 28.8 VDC)
Resistive output load	0.5 A/channel; 1 A/module
Inductive output load	7.2 W/channel; 14.4 W/module
Lamp output load	5 W/channel; 10 W/module
Hardware response time upon ON/OFF	1 μ s/1 μ s
Leakage current upon OFF	$\leq 10 \mu$ A
Switch frequency	Resistive load: 100 Hz; inductive load: 0.5 Hz; lamp load: 10 Hz
Isolation	Isolated
Output indicator	The output indicator turns on (controlled by software) when the output is in drive state.
Output derating	/
Protective functions	Protection against short circuit; protection against overcurrent shared by two channels

2.2 Technical Specifications

■ General specifications

Item	Specification
IP rating	IP20
Dimensions (W x H x D)	12 mm x 100 mm x 75 mm
Weight	About 65 g

■ Software specifications

Item	Specification
Input PDO data volume	112 bytes
Output PDO data volume	120 bytes
Output state mode at stop due to faults	● 0: Output 0 ● 1: Output 1 ● 2: Keep current value Default: 0
Preset value output at stop due to faults	0 or 1
Output terminal fault detection and indication	/
Output channel logic level configuration	Supported
Independent channel enable configuration	Not supported
Diagnostic report configuration	Supported
Output in the stop mode	Output based on fault stop status mode and preset value, no longer updated
I/O mapping	Bitwise, bitwise, and wordwise supported

Note

Common fault reaction scenarios include:

- Background start/stop;
- Unplugging the network cable or manually switching states causing the GL20 communication interface module bus to be in a non-operational communication state; and
- Local bus stoppage.

2.3 Environmental Specifications

Item	Specification
Installation/Ambient environment	Free from conductive dust, conductive fibers, explosive dust, flammable gases, water mist/greasy dirt, corrosive dust/gases, strong vibration, and repetitive shock
Max. altitude	≤ 2000 m
Pollution degree	2
Interference immunity	2 kV on power supply cable (compliant with IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC61131-2
ESD protection level	Contact discharge +/-6 kV, air discharge +/-8 kV
Vibration resistance	● Application scenario: Tested according to IEC60068-2-6, 3.5 mm amplitude at 5 Hz to 8.4 Hz; 1 g gravitational acceleration at 8.4 Hz to 200 Hz; 10 cycles per axial direction ● Transportation scenario: Tested according to IEC60068-2-64, 0.01 g²/Hz power spectral density at 5 Hz to 100 Hz; 0.001 g²/Hz power spectral density at 200 Hz; 1.14 g Grms
Shock resistance	Application/Transportation scenario: Tested according to IEC60068-2-27; 15 g peak acceleration, 11 ms pulse width, 18 cycles in total in X, Y and Z axial directions
Operating temperature/humidity	● Temperature: -20°C to +55°C ● Humidity: < 95% RH (30°C), without condensation
Storage temperature/humidity	● Temperature: -20°C to +60°C ● Humidity: < 95% RH (30°C), without condensation
Transportation temperature/humidity	● Temperature: -40°C to +70°C ● Humidity: < 95% RH (40°C), without condensation

Note

- When the module operates at a temperature of +55°C, only the single-channel counting function can be used. The other channel needs to be reset. When the module operates at a temperature of +45°C, dual-channel counting is supported.
 - When the operating temperature exceeds +45°C, it is recommended to install a fan or air conditioner for cooling.
-

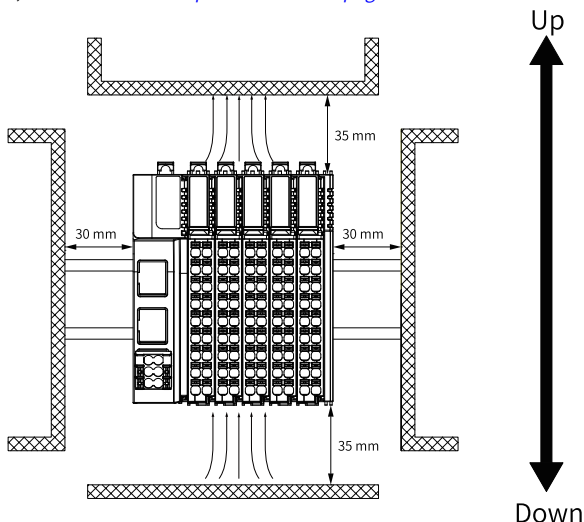
3 Mechanical Installation

3.1 Installation Precautions

- Before installing or removing the module, ensure that the module is powered off.
- Do not hot swap the modules. Otherwise, the modules may be damaged by overcurrent or overvoltage, and the communication interface module or PLC may be subject to restart, user data loss, or corruption.
- Prevent the enclosure or terminals of the module from dropping or being impacted to avoid damage to the module.

3.2 Installation Direction

The module supports only horizontal installation. To ensure normal ventilation and heat dissipation and allow sufficient wiring space, reserve enough clearance around the module, as shown in the following figure. There are also derating requirements. For details, see ["2.2 Technical Specifications" on page 17](#).

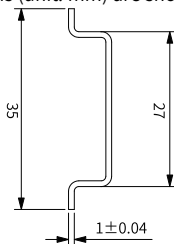


Note

If there is a high-temperature heating source (heater, transformer, large resistor and so on) around the product, keep the product away from the heating source by at least 100 mm.

3.3 Installation Method

The module is mounted onto a DIN rail in conformity with IEC 60715 (width: 35 mm, thickness: 1 mm). The dimensions (unit: mm) are shown below.

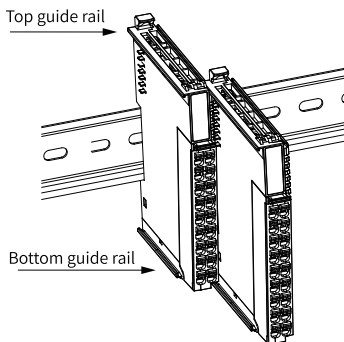


Caution

If the thickness of the DIN rail is not as required, the product cannot fit in or function properly as the DIN rail mounting hook does not work.

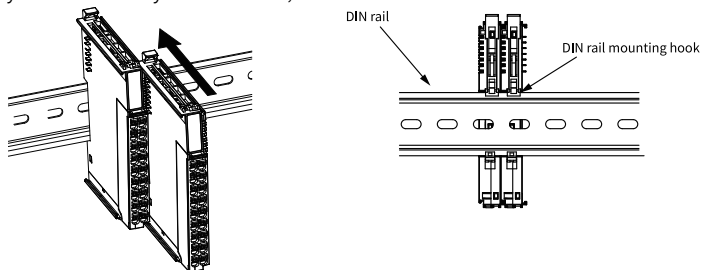
■ Installing modules side by side

Install modules side by side by sliding them along the top and bottom guide rails of the module, as shown below.

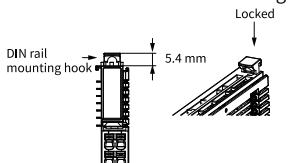


■ Installing modules onto the DIN rail

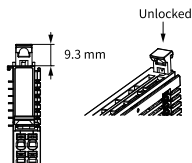
1. Align the module with the DIN rail and push the module in the direction indicated by the arrow until you hear a click, as shown below.



2. Make sure the DIN rail mounting hook of the module is locked. The locked and unlocked states of the mounting hook are shown below.



DIN rail mounting hook in the locked state



DIN rail mounting hook in the unlocked state

- If the mounting hook is pressed down, it is locked.
- If the mounting hook is lifted up, it is unlocked.

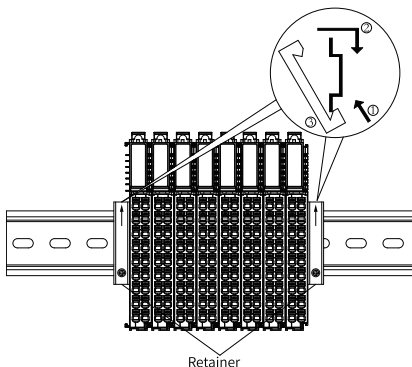
To lock the module to the DIN rail, press down the mounting hook.



When the module is not installed on the DIN rail, keep the rail hook in locked state. A hook that kept in unlocked state for a long period of time may fail to function properly.

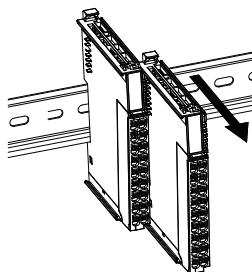
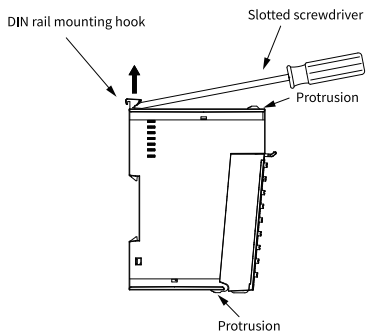
3. Install a DIN rail end plate on both sides of the PLC or the module.

To install the end plate, hook the bottom of it to the bottom of the DIN rail, rotate the end plate to hook the top of it to the top of the DIN rail, and then tighten the screw to lock the end plate in place.



■ Removing modules

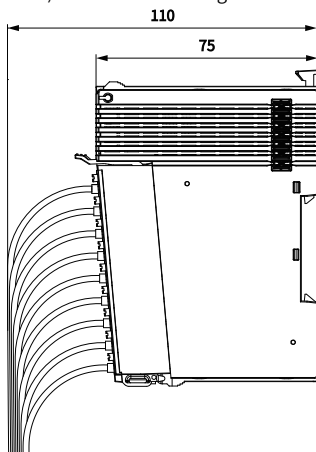
Pry the DIN rail mounting hook upwards with a tool such as a slotted screwdriver, hold the protrusions and pull the module out straight forward. Then, press down the top of the mounting hook.



4 Electrical Installation

4.1 Cable Connection

The cable dimensions (in mm) are shown in the figure below.



Note

To ensure the reliability, it is recommended to use different power supply modules for the 24 V input of the communication interface module and the 24 V input of other modules.

4.2 Terminal Description



Description	Left signal	Left terminal	Right terminal	Right signal	Description
Differential signal A+ of counter 1	1A+	A1	B1	1A-	Differential signal A- of counter 1
Differential signal B+ of counter 1	1B+	A2	B2	1B-	Differential signal B- of counter 1
Differential signal A+ of counter 2	2A+	A3	B3	2A-	Differential signal A- of counter 2
Differential signal B+ of counter 2	2B+	A4	B4	2B-	Differential signal B- of counter 2
Digital input channel 0	DI0	A5	B5	G	Counter differential signal shield
Digital input channel 1	DI1	A6	B6	SS	Digital input common terminal

Description	Left signal	Left terminal	Right terminal	Right signal	Description
Digital input channel 2	DI2	A7	B7	DO0	Digital output channel 0
Digital input channel 3	DI3	A8	B8	DO1	Digital output channel 1
24 V power supply input (+)	24V	A9	B9	0V	24 V power supply input (-)

The GL20-2HC module has two high-speed counting channels, each with different counting, DI and DO terminals, as shown in the following table.

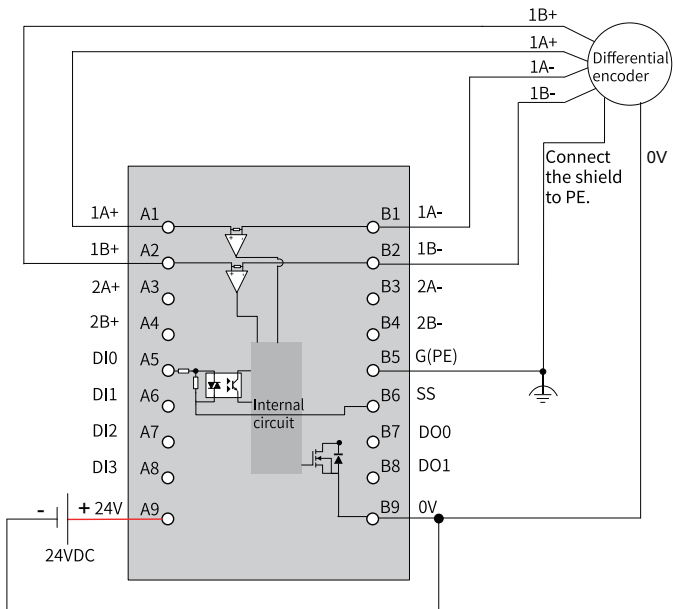
Counting channel	Differential input terminal	Single-ended input terminal	DI	DO
GH0	1A+, 1A-, 1B+, and 1B-	DI0 and DI1	DI0 and DI1	DO0
GH1	2A+, 2A-, 2B+, and 2B-	DI2 and DI3	DI2 and DI3	DO1

The GL20-2HC module has four DIs and two DOs, whose physical numbers are DI0, DI1, DI2, DI3, DO0, and DO1. Logical numbers are used in software function descriptions. The relationship between physical numbers and logical numbers is shown in the following table.

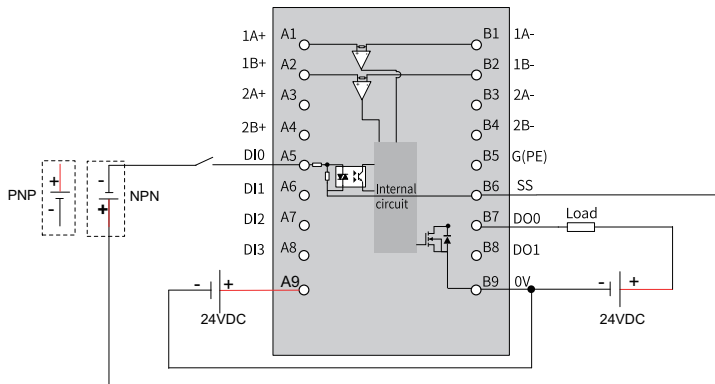
Channel	Physical number	Logical number
CH0	DI0	DI0
	DI1	DI1
	DO0	DO0
CH1	DI2	DI0
	DI3	DI1
	DO1	DO0

4.3 Wiring Diagram of Terminals

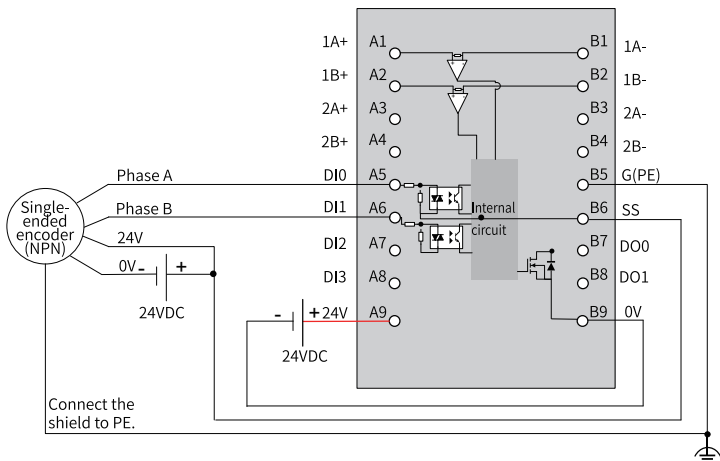
- The following figure shows the electrical wiring of the differential encoder that outputs 422 level.



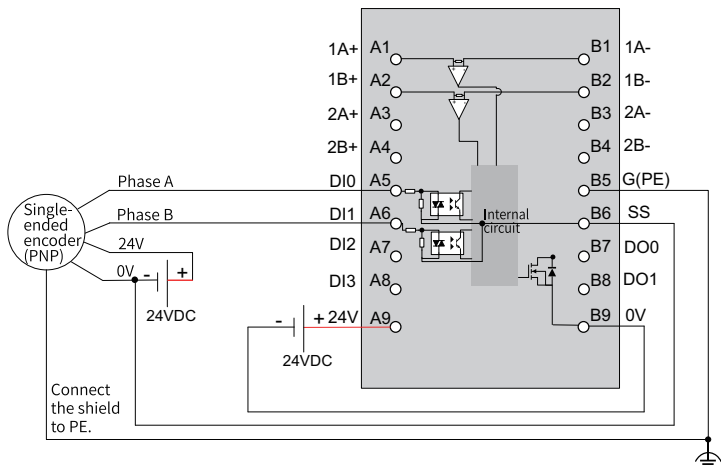
The following figure shows the digital input and output electrical wiring.



- The GL20-2HC module supports connection of up to two differential encoders. 1A and 1B and 2A and 2B are two pairs of interfaces for encoders. (The following figure takes connection of 1A and 1B as an example. Connection of 2A and 2B is the same as that of 1A and 1B.)
- The GL20-2HC module supports connection of up to four DIs: DI0, DI1, DI2, and DI3. (The following figure takes connection of DI0 as an example. Connection of DI1, DI2, and DI3 is the same as that of DI0.)
- The GL20-2HC module supports connection of up to two DOs: DO0 and DO1. (The following figure takes connection of DO0 as an example. Connection of DO1 is the same as that of DO0.)
- Use either differential connection or single-ended connection for the GL20-2HC module.
- Connect the shield to the PE terminal.
- The following figure shows the electrical wiring diagram of the single-ended encoder with the collector output transistor NPN type.



- The GL20-2HC module supports connection of up to two single-ended encoders. DI0 and DI1 and DI2 and DI3 are two pairs of interfaces for encoders. (The following figure takes connection of DI0 and DI1 as an example. Connection of DI2 and DI3 is the same as that of DI0 and DI1.)
- The common terminal SS of the GL20-2HC module is connected to 24 V power supply.
- The GL20-2HC module supports connection of up to two DOs: DO0 and DO1. (The following figure takes connection of DO0 as an example. Connection of DO1 is the same as that of DO0.)
- Use either differential connection or single-ended connection for the GL20-2HC module.
- The following figure shows the electrical wiring diagram of the single-ended encoder with the collector output transistor PNP type.



- The GL20-2HC module supports connection of up to two single-ended encoders. DI0 and DI1 and DI2 and DI3 are two pairs of interfaces for encoders. (The following figure takes connection of DI0 and DI1 as an example. Connection of DI2 and DI3 is the same as that of DI0 and DI1.)
- The common terminal SS of the GL20-2HC module is connected to 0 V power supply.
- The GL20-2HC module supports connection of up to two DOs: DO0 and DO1. (The following figure takes connection of DO0 as an example. Connection of DO1 is the same as that of DO0.)
- Use either differential connection or single-ended connection for the GL20-2HC module.
- Connect the shield to the PE terminal.



Caution

- The inrush current when a lamp load is connected to a channel must be less than the rated current when a resistive load is connected.
 - Inductive loads generate a large reverse electromotive force between contacts when stopping, leading to arcing discharge. Under a given current consumption, small power means great arc energy. Therefore, consider using an arc control device.
 - For inductive loads:
 - In a DC circuit, add a freewheel diode. The forward current of the freewheel diode must be greater than the load current. The reverse withstand voltage must be 5 to 10 times greater than the load voltage.
 - In an AC circuit, add an RC snubber circuit, where R is around 100 Ω to 200 Ω , and C is approximately 0.1 μF .
-

5 Function Description

5.1 Overview

If the GL20-2HC module is configured with the GL20-RTU-ECT32 communication interface module, up to four GL20-2HC modules are supported. The four GL20-2HC modules can be installed only in the first four slots in the configuration.

When the GL20-2HC module is used with the GL20-RTU-ECT32 communication interface module, data can be accessed through the object dictionary. The function description takes the first expansion slot of the communication interface module as an example. The second, third and fourth slots are defined in the same way as the first slot. The object dictionary is offset by 0x40 according to the definition of the communication interface module. The object dictionary of each slot is defined as follows.

Slot	Configuration parameter	PDO input parameter	PDO output parameter	Diagnostic parameter
1	800nh	600nh	700nh	A000h
2	804nh	604nh	704nh	A040h
3	808nh	608nh	708nh	A080h
4	80Cnh	60Cnh	70Cnh	A0C0h

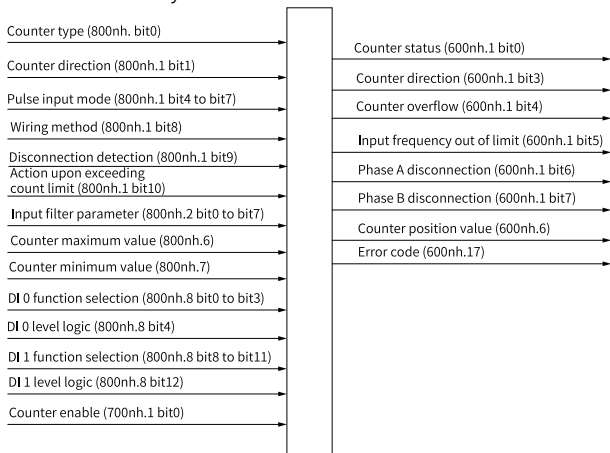
The letter n (range: 0 and 1) in the object dictionary represents the counting channel. For example, when the module is installed in the first slot, the object dictionary is defined as 800nh, 600nh, and 700nh. For channel 0, the object dictionary is defined as 8000h, 6000h, and 7000h. For channel 1, the object dictionary is defined as 8001h, 6001h, and 7001h.

5.2 Counter Function

The module supports two counters to enable differential pulse or single-ended pulse counting input from phase A port and phase B port. If single-ended signal input is used, the corresponding DI must be configured with the counting mode. Otherwise, the function cannot be used. Set the parameters and feedback information according to the following table.

■ Configuration parameter and feedback information

Take the first expansion slot of the communication interface module as an example to configure parameters and feedback information. The second, third, and fourth slots are defined in the same way as the first slot.



■ Parameter description

Parameter name	Parameter code	Value range	Default value	Description
Counter type	800nh.bit0	0: Linear 1: Annular	0	Each channel supports a 32-bit counting range, which can be changed by setting the maximum and minimum values. Linear type: The counting function ranges from the maximum value to the minimum value. If the maximum or minimum value is reached, operations can be performed according to the setting for the scenario when the maximum or minimum value is exceeded. Annular type: The counting function ranges from the maximum value to the minimum value. When the count-up exceeds the maximum, the value jumps to the minimum. When the count-down is lower than the minimum, the value jumps to the maximum.
Counter direction	800nh.1bit1	0: Phase A leads phase B (forward). 1: Phase B leads phase A (reverse).	0	This parameter sets the counting direction.

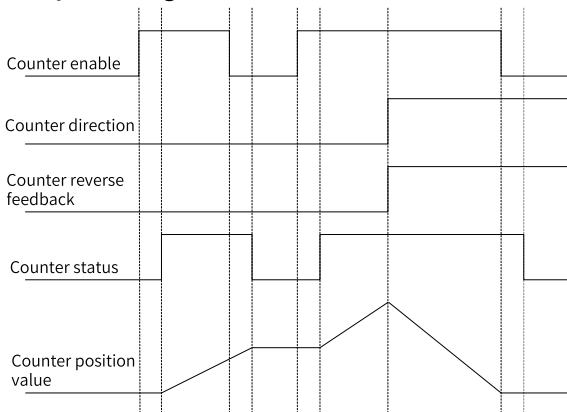
Parameter name	Parameter code	Value range	Default value	Description
Pulse input mode	800nh.1 bit4 to bit7	0: Phase A/B 1x frequency 1: Phase A/B 2x frequency 2: Phase A/B 4x frequency 3: Pulse +Direction 4: CW/CCW 5: Single-phase counting (A) 6: Single-phase counting (B)	0	This parameter sets the input mode based on the actual counter input signal. • Phase A/B: An incremental encoder that supports phase A/B signal can be connected. The phase difference between phase A signal and phase B signal must be 90°. • Pulse+direction: An incremental encoder that supports pulse and direction signals can be connected. • CW/CCW: An incremental encoder that supports CW/CCW signals can be connected. • Single-phase A: A pulse encoder without direction signal can be connected. • Single-phase B: A pulse encoder without direction signal can be connected.
Wiring method	800nh.1 bit8	0: Differential wiring 1: Single-ended wiring	0	Select the wiring method according to actual conditions by referring to section "Wiring Diagram of Terminals".
Disconnection detection	800nh.1 bit9	0: Disable 1: Enable	0	This function only supports detection of differential interface disconnection.

Parameter name	Parameter code	Value range	Default value	Description
Action upon exceeding count limit	800nh.1 bit10	0: Stop counting 1: Continue counting	0	This parameter is related to the configuration of the parameter "Counter type". - Line type: 0 (Stop counting): When the maximum or minimum counting value is reached, the counting stops and the counting value overflow alarm is generated. To start counting, you must enable the counter again. 1 (Continue counting): When the count-up exceeds the maximum, the value jumps to the minimum. When the count-down is lower than the minimum, the value jumps to the maximum. - Annual type: Invalid parameter
Input filter parameter	800nh.2 bit0 to bit7	1: 50 ns; 2: 100 ns; 3: 200 ns; 4: 500 ns; 5: 1 μ s; 6: 2 μ s; 7: 5 μ s; 8: 10 μ s; 9: 20 μ s; 10: 50 μ s; 11: 100 μ s; 12: 200 μ s; 13: 500 μ s; 14: 1 ms; 15: 2 ms; 16: 5 ms; 17: 10 ms; 18: 20 ms; 19: 50 ms; 20: 100 ms	2	This parameter is used to effectively suppress interference between phase A and phase B of the counter input. Signals whose holding time is shorter than the set time are suppressed. The filter parameter must be between 40% and 60% of the active signal. The filter parameter must meet the condition that the active input signal holding time is longer than the filter time. The larger the parameter, the stronger the anti-interference capability.
Counter maximum value	800nh.6	-2147483647 to +2147483647	2147483647	The maximum value of the counter can limit the counting range. You must enter a value larger than the minimum value of the counter.

Parameter name	Parameter code	Value range	Default value	Description
Counter minimum value	800nh.7	-2147483648 to +2147483646	-2147483648	The minimum value of the counter can limit the counting range. You must enter a value smaller than the maximum value of the counter.
DI function selection	800nh.8 bit0 to bit3	0: Common input 1: Probe function 2: Counting 3: Clear 4: Preset 5: Gating	0	This parameter is related to the parameter "Wiring method". Single-ended wiring: The corresponding DI must be configured with the counting function. Otherwise, the counter cannot work. Differential wiring: Invalid parameter
DI level logic	800nh.8 bit12	0: Positive logic 1: Negative logic	0	This parameter is related to the parameter "Wiring method". Single-ended wiring: This parameter defines the level logic of the DI signal. Differential wiring: Invalid parameter
Enable counter	700nh.1 bit0	0: Inactive 1: Active	-	When the signal is active and no other error occurs, the counter is enabled.
Counter status	600nh.1 bit0	0: Inactive 1: Active	-	The counter status is active when the counter is enabled and no other error occurs.
Counter direction	600nh.1 bit3	0: Inactive 1: Active	-	This parameter sets the counting direction.
Counter overflow	600nh.1 bit4	0: Inactive 1: Active	-	This parameter is related to the parameter "Counter type". Line type: Valid when the maximum or minimum value is exceeded. Annual type: Invalid parameter

Parameter name	Parameter code	Value range	Default value	Description
Input frequency out of limit	600nh.1 bit5	0: Inactive 1: Active	-	This parameter is related to the parameter "Wiring method". Differential wiring: Active when the input frequency is higher than 4 MHz. Single-ended wiring: Active when the input frequency is higher than 500 kHz.
Phase A disconnection	600nh.1 bit6	0: Inactive 1: Active	-	Phase A disconnection detection is active when disconnection detection is enabled and phase A of the differential interface is wired improperly.
Phase B disconnection	600nh.1 bit7	0: Inactive 1: Active	-	Phase B disconnection detection is active when disconnection detection is enabled and phase B of the differential interface is wired improperly.
Counter position value	600nh. bit6	-2147483648 to +2147483647	-	This parameter sets the counter position value.
Error code	600nh. bit17	0	-	This parameter specifies the error code returned when the counting channel is abnormal. For details, see "Fault Diagnosis" on page 95.

■ Time sequence diagram

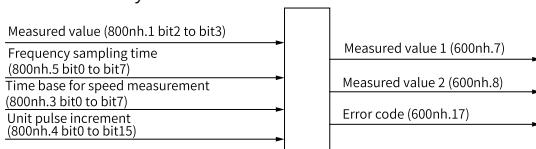


5.3 Signal Measurement

The module measures the phase A/B pulse frequency, cycle, and speed of each counter channel. Configure parameters related to the signal measurement function according to the following description.

■ Configuration parameter and feedback information

Take the first expansion slot of the communication interface module as an example to configure parameters and feedback information. The second, third, and fourth slots are defined in the same way as the first slot.



■ Parameter description

Parameter name	Parameter code	Value range	Default value	Description
Measured value	800nh.1 bit2 to bit3	0: Not measuring 1: Frequency 2: Cycle 3: Speed	0	The maximum frequency of the external input signal is affected by the wiring method (see section "Wiring Diagram of Terminals"). When the differential interface is used, the maximum input frequency is 4 MHz. When the single-ended interface is used, the maximum input frequency is 500 kHz. • Not measured: The signal measurement function and other related configuration parameters are invalid. • Frequency: Frequency of the counter input signal in the unit of Hz • Cycle: Cycle of the counter input signal in the unit of ms • Speed: Speed of the counter input signal. The unit depends on the time base of the speed measurement.

Parameter name	Parameter code	Value range	Default value	Description
Frequency sampling time	800nh.5 bit0 to bit7	3: 500 μ s; 4: 1 ms; 5: 2 ms; 6: 5 ms; 7: 10 ms; 8: 20 ms; 9: 50 ms; 10: 100 ms; 11: 200 ms; 12: 500 ms; 13: 1 s; 14: 2 s; 15: 5s; 16: 10s; 17: 20s; 18: 25s	10	The sampling time selected must meet the condition that the cycle of the input signal is smaller than the sampling time. The larger the parameter, the more stable and accurate the measured value. • Not measured: This parameter is invalid. • Frequency, cycle, and speed: The signal frequency is used to measure the cycle and speed. This parameter is strongly related to the frequency calculation. Count the number of input pulse signals within the set time and calculate the signal frequency. Select appropriate values when using the parameter. The sampling time must meet the condition that the input signal cycle is smaller than the sampling time. The larger the parameter, the more accurate the measured value.
Time base for speed measurement	800nh.3 bit0 to bit7	1: ms 2: 10 ms 3: 100 ms 4: 1s 5: 60s	2	This parameter is related to the parameter "Measured value". • Speed: This parameter determines the unit of speed, which is r/min by default. • Not measured, frequency, and cycle: This parameter is invalid.

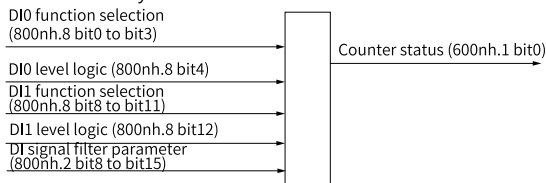
Parameter name	Parameter code	Value range	Default value	Description
Unit pulse increment	800nh.4 bit0 to bit15	0 to 65535	10	This parameter is related to the parameter "Measured value". • Speed: Number of pulses output per revolution. • Not measured, frequency, and cycle: This parameter is invalid.
Measured value 1	600nh.7	Frequency: 0 Hz to 16000000 Hz Cycle: 0 ms to 25000 ms Speed: Determined by the time base for speed measurement, unit pulse increment, and external input signal.	-	Measured value 1: Integer part of the measured value. Measured value = Measured value 1 + Measured value 2/10⁸.
Measured value 2	600nh.8	Frequency: 0 Hz to 16000000 Hz Cycle: 0 ms to 25000 ms Speed: Determined by the time base for speed measurement, unit pulse increment, and external input signal.	-	Measure value 2: Decimal part of the measured value. The value is the rounded actual value multiplied by 10⁸. Pay attention to the unit. Measured value = Measured value 1 + Measured value 2/10⁸.
Error code	600nh.17	0	-	This parameter specifies the error code returned when the measurement function is abnormal. For details, see "Fault Diagnosis" on page 95.

5.4 Gating Function

The module measures the phase A/B pulse frequency, cycle, and speed of each counter channel. Configure parameters related to the gating function according to the following description. With the parameters set correctly, when the counter enabling signal (refer to parameter descriptions in ["5.2 Counter Function" on page 34](#)) and gating signal are active, the counter is enabled. For details, see the parameters in the following table.

■ Configuration parameter and feedback information

Take the first expansion slot of the communication interface module as an example to configure parameters and feedback information. The second, third, and fourth slots are defined in the same way as the first slot.



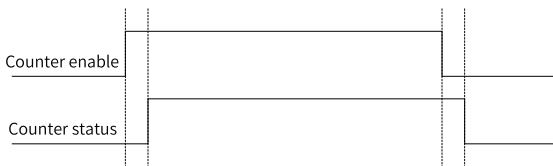
■ Parameter description

Parameter name	Parameter code	Value range	Default value	Description
DI function selection	800nh.8bit0 to bit3	0: Common input 1: Probe function 2: Counting 3: Clear 4: Preset 5: Gating	0	When the DI is set to the gating function, the gating function is enabled.
DI level logic	800nh.8bit12	0: Positive logic 1: Negative logic	0	This parameter defines the level logic of the DI signal.

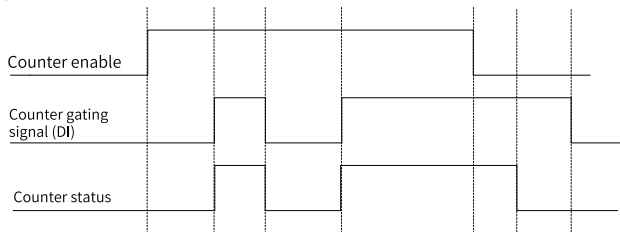
Parameter name	Parameter code	Value range	Default value	Description
DI signal filter parameter	800nh.2bit8 to bit15	0: No filtering Filter type 1 1: 100 ns; 2: 500 ns; 3: 1 µs; 4: 100 µs; 5: 250 µs; 6: 500 µs; 7: 1 ms; 8: 2 ms 9: 4 ms; 10: 8 ms; 11: 16 ms; 12: 32 ms Filter type 2 32: 100 ns; 33: 500 ns; 34: 1 µs; 35: 100 µs; 36: 250 µs; 37: 500 µs; 38: 1 ms; 39: 2 ms; 40: 4 ms; 41: 8 ms; 42: 16 ms; 43: 32 ms	7	This parameter is used to suppress input interference. Signals whose holding time is shorter than the set time are suppressed. The filter parameter must be between 40% and 60% of the active signal. Two different filter types are set for DI signals. You can select a filter type based on actual conditions. The filter parameter must meet the condition that the active input signal holding time is longer than the filter time. The larger the parameter, the stronger the anti-interference capability.
Counter status	600nh.1bit0	0: Inactive 1: Active	-	The counter status is active when the counter is enabled, the gating signal is active, and no other error occurs. When multiple DIs are configured with the gating function, the counter can be started only when the gating signals of multiple terminals are active simultaneously.

■ Time sequence diagram

The following figure shows the counter enabling sequence when the gating function is not used.



The following figure shows the counter enabling sequence when the gating function is used.

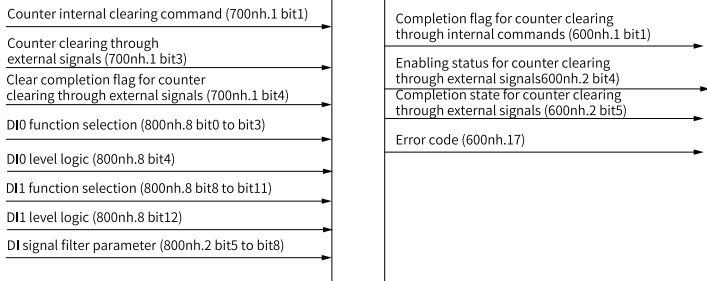


5.5 Clearing Function

Each counter supports the clearing function. You can clear the counter through internal commands or external DI signals. If you select external DI signals to clear the counter, configure at least one DI to be the clearing mode. Configure parameters related to the clearing function according to the following description. With the parameters set correctly, when the trigger signal is input through the DI or there is an internal trigger command, the position value of the counter is reset to 0. For details, see the parameter description in the following table.

■ Configuration parameter and feedback information

Take the first expansion slot of the communication interface module as an example to configure parameters and feedback information. The second, third, and fourth slots are defined in the same way as the first slot.



Note

- The internal clearing command has higher priority than the external clearing command. When both internal and external clearing commands are enabled, only the internal clearing command is valid.
- The clearing function has higher priority than the preset function.

Parameter description

Parameter name	Parameter code	Value range	Default value	Description
Counter internal clearing command	700nh.1 bit1	0: Inactive 1: Active	-	When the signal is active, the counter is cleared.
Counter clearing through external signals	700nh.1 bit3	0: Inactive 1: Active	-	The counter is cleared through external signals when the signal is active and no other error occurs. This function is disabled when the counter is cleared through internal commands.

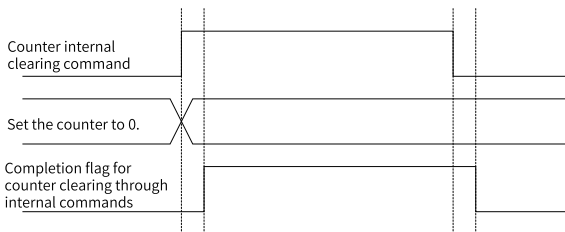
Parameter name	Parameter code	Value range	Default value	Description
Clear completion flag for counter clearing through external signals	700nh.1 bit4	0: Inactive 1: Active	-	This parameter is used to clear the flag for completion of counter clearing through external signals. If the completion flag is not cleared after triggering, the next clearing action will not be executed.
DI function selection	800nh.8 bit0 to bit3	0: Common input 1: Probe function 2: Counting 3: Clear 4: Preset 5: Gating	0	When you need to clear the counter through external signals, configure at least one DI with the clearing function. Otherwise, the function cannot work and an error will occur.
DI level logic	800nh.8 bit12	0: Positive logic 1: Negative logic	0	This parameter defines the level logic of the DI signal.

Parameter name	Parameter code	Value range	Default value	Description
DI signal filter parameter	800nh.2 bit8 to bit15	0: No filtering Filter type 1: 1: 100 ns; 2: 500 ns; 3: 1 µs; 4: 100 µs; 5: 250 µs; 6: 500 µs; 7: 1 ms; 8: 2 ms 9: 4 ms; 10: 8 ms; 11: 16 ms; 12: 32 ms; Filter type 2: 32: 100 ns; 33: 500 ns; 34: 1 µs; 35: 100 µs; 36: 250 µs; 37: 500 µs; 38: 1 ms; 39: 2 ms; 40: 4 ms; 41: 8 ms; 42: 16 ms; 43: 32 ms	7	This parameter is used to suppress input interference. Signals whose holding time is shorter than the set time are suppressed. The filter parameter must be between 40% and 60% of the active signal. Two different filter types are set for DI signals. You can select a filter type based on actual conditions. The filter parameter must meet the condition that the active input signal holding time is longer than the filter time. The larger the parameter, the stronger the anti-interference capability.
Completion flag for counter clearing through internal commands	600nh.1 bit11	0: Inactive 1: Active	-	When the internal clearing command is valid and no other error occurs, this parameter is active. When the internal clearing command is invalid, the completion flag for counter clearing through internal commands is cleared automatically.
Enabling status for counter clearing through external signals	600nh.2 bit4	0: Inactive 1: Active	-	When the internal clearing command of the counter is invalid, counter clearing through external signals is enabled, and no other error occurs, this parameter is active.

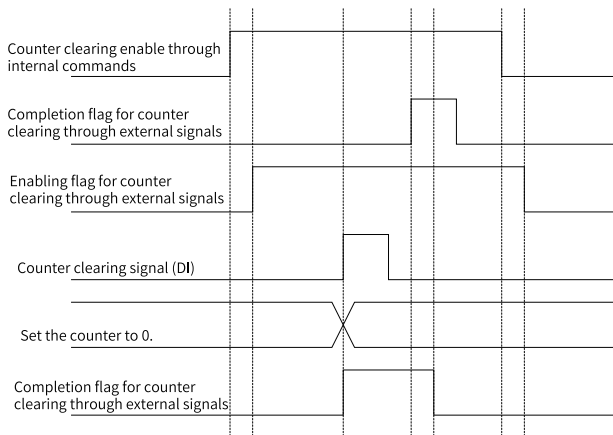
Parameter name	Parameter code	Value range	Default value	Description
Completion flag for counter clearing through external signals	600nh.2 bit5	0: Inactive 1: Active	-	When counter clearing through external signals is enabled the DI inputs active signals, clear the completion flag for counter preset through external signals. Otherwise, the next clearing action will not be executed.
Error code	600nh.bit17	0	-	This parameter specifies the error code returned when the clearing function is abnormal. For details, see " Fault Diagnosis " on page 95.

■ Time sequence diagram

The time sequence diagram of counter clearing through internal commands is as follows.



The time sequence diagram of counter clearing through external signals is as follows.

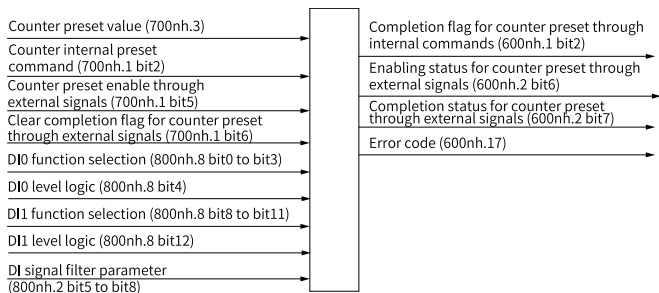


5.6 Preset Function

Each counter supports the preset function. You can preset the counter through internal commands or external DI signals. If you select external DI signals to preset the counter, configure at least one DI to be the preset mode. Configure parameters related to the preset function according to the following description. With the parameters set correctly, when the trigger signal is input through the DI or there is an internal trigger command, the position value of the counter is reset to the preset value. For details, see the parameter description in the following table.

■ Configuration parameter and feedback information

Take the first expansion slot of the communication interface module as an example to configure parameters and feedback information. The second, third, and fourth slots are defined in the same way as the first slot.



Note

- The internal preset command has higher priority than the external preset command. When both internal and external preset commands are enabled, only the internal preset command is valid.
- The clearing function has higher priority than the preset function.

Parameter description

Parameter name	Parameter code	Value range	Default value	Description
Counter preset value	700nh.3	-2147483648 to +2147483647		The preset value must be between the maximum value and the minimum value.
Counter internal preset command	700nh.1 bit2	0: Inactive 1: Active		When the signal is active, the counter is preset.
Counter preset enable through external signals	700nh.1 bit5	0: Inactive 1: Active		The counter is preset through external signals when the signal is active and no other error occurs. This function is disabled when the counter is preset through internal commands.

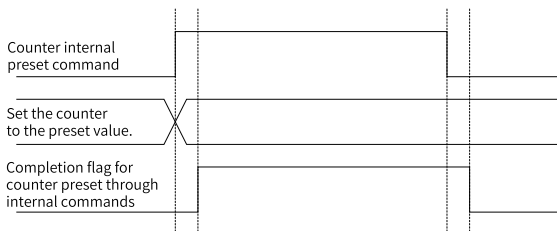
Parameter name	Parameter code	Value range	Default value	Description
Clear completion flag for counter preset through external signals	700nh.1 bit6	0: Inactive 1: Active		This parameter is used to clear the flag for completion of counter preset through external signals. If the completion flag is not cleared after triggering, the next preset action will not be executed.
DI function selection	800nh.8 bit0 to bit3	0: Common input 1: Probe function 2: Counting 3: Clear 4: Preset 5: Gating	0	When you need to preset the counter through external signals, configure at least one DI with the preset function. Otherwise, the function cannot work and an error will occur.
DI level logic	800nh.8 bit12	0: Positive logic 1: Negative logic	0	This parameter defines the level logic of the DI signal.

Parameter name	Parameter code	Value range	Default value	Description
DI signal filter parameter	800nh.2-bit8 to bit15	0: No filtering Filter type 1: 1: 100 ns; 2: 500 ns; 3: 1 μ s; 4: 100 μ s; 5: 250 μ s; 6: 500 μ s; 7: 1 ms; 8: 2 ms 9: 4 ms; 10: 8 ms; 11: 16 ms; 12: 32 ms Filter type 2: 32: 100 ns; 33: 500 ns; 34: 1 μ s; 35: 100 μ s; 36: 250 μ s; 37: 500 μ s; 38: 1 ms; 39: 2 ms; 40: 4 ms; 41: 8 ms; 42: 16 ms; 43: 32 ms	7	This parameter is used to suppress input interference. Signals whose holding time is shorter than the set time are suppressed. The filter parameter must be between 40% and 60% of the active signal. Two different filter types are set for DI signals. You can select a filter type based on actual conditions. The filter parameter must meet the condition that the active input signal holding time is longer than the filter time. The larger the parameter, the stronger the anti-interference capability.
Completion flag for counter preset through internal commands	600nh.1 bit11	0: Inactive 1: Active	-	This parameter is active when the internal preset command of the counter is valid and no other error occurs. When the internal preset command is invalid, the completion flag for counter preset through internal commands is cleared automatically.
Enabling status for counter preset through external signals	600nh.2 bit4	0: Inactive 1: Active	-	When the internal preset command of the counter is invalid, counter preset through external signals is enabled, and no other error occurs, this parameter is active.

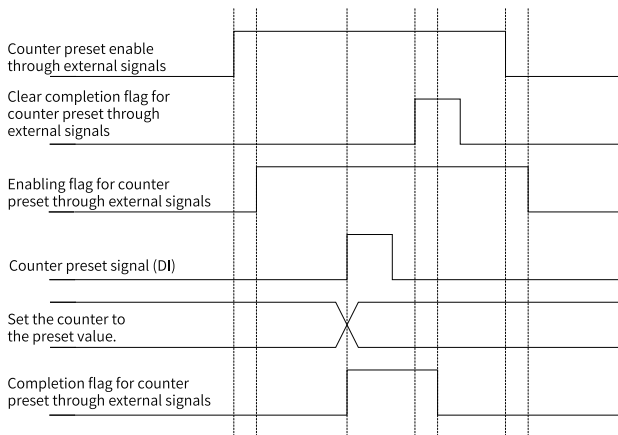
Parameter name	Parameter code	Value range	Default value	Description
Completion flag for counter preset through external signals	600nh.2 bit5	0: Inactive 1: Active	-	When counter preset through external signals is enabled the DI inputs active signals, clear the completion flag for counter preset through external signals. Otherwise, the next preset action will not be executed.
Error code	600nh. bit17	0	-	This parameter specifies the error code returned when the preset function is abnormal. For details, see " Fault Diagnosis " on page 95.

■ Time sequence diagram

The time sequence diagram of counter preset through internal commands is as follows.



The time sequence diagram of counter preset through external signals is as follows.

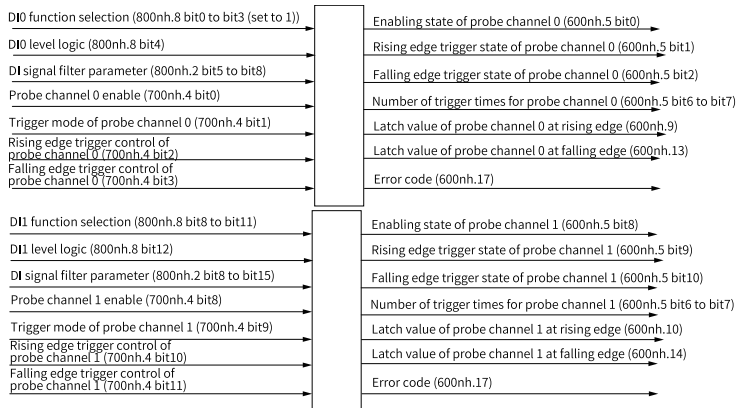


5.7 Probe Function

Each counter can be configured with two probe functions. The probe signal input terminal can be the DI, after which is configured with the probe input mode. Configure parameters related to the probe function according to the following description. With the parameters set correctly, when the trigger signal is input through the DI or there is an internal trigger command, the position value of the counter is reset to the preset value. For details, see the parameter description in the following table.

■ Configuration parameter and feedback information

Take the first expansion slot of the communication interface module as an example to configure parameters and feedback information. The second, third, and fourth slots are defined in the same way as the first slot.



Note

- Before using the probe function, read the probe function description in detail and the relationship between external input signals and configurations (see "[Fault Diagnosis](#)" on page 95).
- The time interval between two probe triggers must be greater than 8 ms.

■ Parameter description

Parameter name	Parameter code	Value range	Default value	Description
DI function selection	800nh.8 bit0 to bit3	0: Common input 1: Probe function 2: Counting 3: Clear 4: Preset 5: Gating	0	When used for the probe function, the DI terminal needs to be configured with the probe function. Otherwise, the probe function cannot be used.
DI level logic	800nh.8 bit12	0: Positive logic 1: Negative logic	0	This parameter defines the level logic of the DI signal.
DI signal filter parameter	800nh.2 bit8 to bit15	0: No filtering Filter type 1 1: 100 ns; 2: 500 ns; 3: 1 µs; 4: 100 µs; 5: 250 µs; 6: 500 µs; 7: 1 ms; 8: 2 ms 9: 4 ms; 10: 8 ms; 11: 16 ms; 12: 32 ms Filter type 2 32: 100 ns; 33: 500 ns; 34: 1 µs; 35: 100 µs; 36: 250 µs; 37: 500 µs; 38: 1 ms; 39: 2 ms; 40: 4 ms; 41: 8 ms; 42: 16 ms; 43: 32 ms	7	This parameter is used to suppress input interference. Signals whose holding time is shorter than the set time are suppressed. The filter parameter must be between 40% and 60% of the active signal. Two different filter types are set for DI signals. You can select a filter type based on actual conditions. The filter parameter must meet the condition that the active input signal holding time is longer than the filter time. The larger the parameter, the stronger the anti-interference capability.

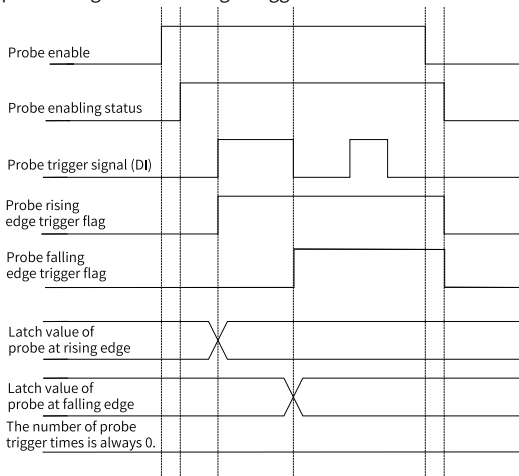
Parameter name	Parameter code	Value range	Default value	Description
Probe enable	700nh.4 bit0	0: Inactive 1: Active	-	The probe function is enabled when the signal is active and no other error occurs.
Probe trigger mode	700nh.4 bit1	0: Single trigger 1: Continuous trigger	-	Single trigger: If the rising edge trigger enabling bit is active, the position value is latched upon the first rising edge of the DI. If the falling edge trigger enabling bit is active, the position value is latched upon the first falling edge of the DI. Continuous triggering: If the rising edge trigger enabling bit is active, the position value is locked at each rising edge of the DI. If the falling edge trigger enabling bit is active, the position value is locked at each falling edge of the DI.
Probe rising edge trigger control	700nh.4 bit2	0: Inactive 1: Active	-	The probe rising edge latch function is enabled when the signal is active and no other error occurs.
Probe falling edge trigger control	700nh.4 bit3	0: Inactive 1: Active	-	The probe falling edge latch function is enabled when the signal is active and no other error occurs.
Probe enabling status	600nh.5 bit0	0: Inactive 1: Active	-	It is active when the probe enabling bit is active and no other error occurs.

Parameter name	Parameter code	Value range	Default value	Description
Probe rising edge trigger flag	600nh.5 bit1	0: Inactive 1: Active	-	It is active only upon the first rising edge trigger of the DI and the status remains unchanged. It is inactive when the probe enabling bit is inactive or when other errors occur.
Probe falling edge trigger flag	600nh.5 bit2	0: Inactive 1: Active	-	It is active only upon the first falling edge trigger of the DI and the status remains unchanged. It is inactive when the probe enabling bit is inactive or when other errors occur.
Number of probe trigger times	600nh.5 bit6 to bit7	0-3	-	This parameter is related to the parameter "Probe trigger mode". Single trigger: Invalid parameter Continuous trigger: When the DI is triggered once and the latch function is active, the parameter is added by 1. The parameter is cyclically added in the range of 0 to 3.
Latch value of probe at rising edge	600nh.9	-2147483648 to +2147483647	-	This parameter indicates the latch position value upon the rising edge trigger of the DI.

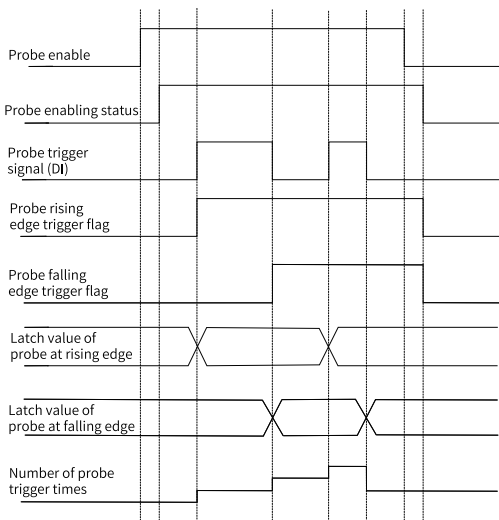
Parameter name	Parameter code	Value range	Default value	Description
Latch value of probe at falling edge	600nh.13	-2147483648 to +2147483647	-	This parameter indicates the latch position value upon the falling edge trigger of the DI.
Error code	600nh.17	0	-	This parameter specifies the error code returned when the probe function channel is abnormal. For details, see " Fault Diagnosis " on page 95.

■ Time sequence diagram

The time sequence diagram of the single trigger mode is as follows.



The time sequence diagram of the continuous trigger mode is as follows.

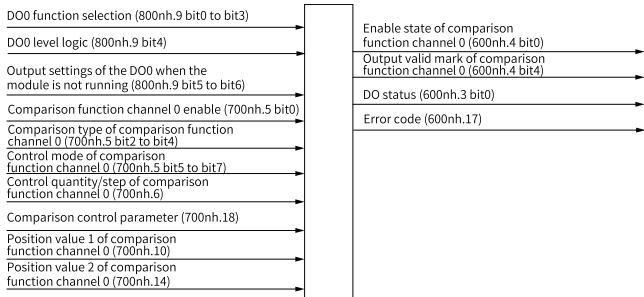


5.8 Comparison Function

Each counter can be configured with one comparison output. The comparison signal output terminal can be the DO, after which is configured with the comparison output mode. Configure parameters related to the comparison function according to the following description. After the parameters are set correctly, the comparison signal is output through DO when the current position and comparison position are the same. For details, see the parameter descriptions in the following table.

■ Configuration parameter and feedback information

Take the first expansion slot of the communication interface module as an example to configure parameters and feedback information. The second, third, and fourth slots are defined in the same way as the first slot.



■ Parameter description

Parameter name	Parameter code	Value range	Default value	Description
DO0 function selection	800nh.8 bit0 to bit3	0: Common output 1: Comparison output	0	When used for comparison, the DO0 terminal needs to be configured with the comparison function. Otherwise, the comparison function cannot be used.
DO0 level logic	800nh.8 bit12	0: Positive logic 1: Negative logic	0	This parameter defines the level logic of the DO0 signal.
Output settings of the DO0 when the module is not running	800nh.9 bit5 to bit6	0: Output 0 1: Output 1 2: Hold	0	This parameter sets the output state of the DO0 when the module is not running.
Comparison function channel 0 enable	700nh.5 bit0	0: Inactive 1: Active	0	The comparison function is enabled when the signal is active and no other error occurs.

Parameter name	Parameter code	Value range	Default value	Description
Comparison type of comparison function channel 0	700nh.5 bit2 to bit4	1: Multi-point comparison 2: Uniformly-spaced comparison	0	- Multi-point comparison: The comparison output is based on the comparison position sent by the user. Multiple comparison points (maximum: 1024) can be output in sequence. Note: The time interval between two comparison points should not be less than eight times the bus communication cycle. - Uniformly-spaced comparison: The start/stop range and comparison step for comparison are specified by the user. The module outputs comparison control signals according to the parameters set. The stop position is not used for comparison output.
Control mode of comparison function channel 0	700nh.5 bit5 to bit7	1: Time control 2: Pulse control 3: Level control	0	- Time control: The active signal is used to output specified holding time. - Pulse control: The holding time of the active signal is determined by the number of pulses input to the counter. - Level control: When the comparison point matches the comparison output, the level of the active signal is inverted.

Parameter name	Parameter code	Value range	Default value	Description
Control quantity/step of comparison function channel 0	700nh.6	Quantity: 1 to 1024 Step: -32768 to -1, 1 to 32767	0	This parameter is related to the configuration of the parameter "Comparison type of comparison function channel 0". • Multi-point comparison: Number of comparison points. • Uniformly-spaced comparison: Interval between comparison points (step)

Parameter name	Parameter code	Value range	Default value	Description
Comparison control parameter	700nh.18	0	0	This parameter is related to the configuration of the parameter "Comparison type of comparison function channel 0". Note: The two comparison output signals cannot overlap. Otherwise, the function execution is abnormal. • Time control: Holding time (in the unit of μs) of the comparison output signal, with the minimum of 10 μs. • Pulse control: Number of pulses input to the counter. In this case, the holding time of the comparison output signal equals the number of counter pulses multiplied by the pulse cycle. • Level control: The value is the initial level. Only the lowest bit is active. When the value is 0, it indicates low level. When the value is 1, it indicates high level. The output level is inverted when the comparison output is active.

Parameter name	Parameter code	Value range	Default value	Description
Position value 1 of comparison function channel 0	700nh.10	-21474836-48 to +21474836-47	0	This parameter is related to the configuration of the parameter "Comparison type of comparison function channel 0". • Multi-point comparison: Comparison position value • Uniformly-spaced comparison: Comparison start position
Position value 2 of comparison function channel 0	700nh.14	-21474836-48 to +21474836-47	0	This parameter is related to the configuration of the parameter "Comparison type of comparison function channel 0". • Multi-point comparison: Invalid parameter • Uniformly-spaced comparison: Comparison end position
Enable state of comparison function channel 0	600nh.4 bit0	0: Inactive; 1: Active	-	This parameter is valid when the comparison function channel 0 enable bit is active and no other error occurs.

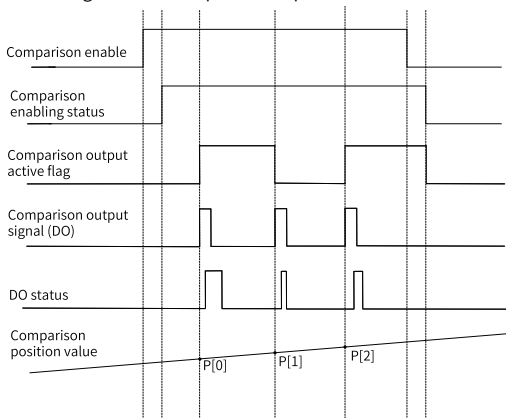
Parameter name	Parameter code	Value range	Default value	Description
Output valid mark of comparison function channel 0	600nh.4 bit4	0/1	-	This parameter is related to the configuration of the parameter "Comparison type of comparison function channel 0". ● Multi-point comparison: When the comparison point meets the conditions and the comparison output starts, the bit is inverted once. ● Uniformly-spaced comparison: When the last comparison point that meets the conditions starts output, the bit is inverted once.
DO0 status	600nh.3 bit0	0/1	-	This parameter indicates the DO0 output status. If the holding time of the comparison output signal is too short or the interval between comparison output signals is too short, the DO0 status may not be feed back in real time due to signal delay. The status change may not be detected in the PLC task, but DO0 output is normal.
Error code	600nh.17	0	-	This parameter specifies the error code returned when the comparison function is abnormal. For details, see "Fault Diagnosis" on page 95.

Note

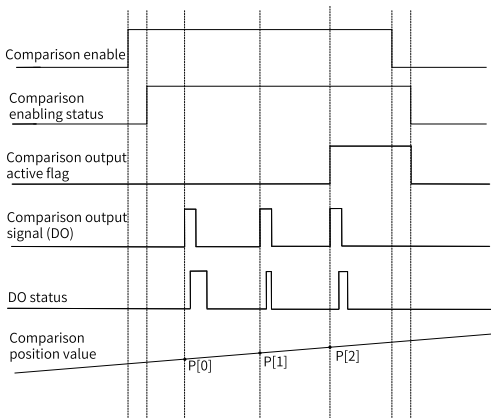
The time data related to the preceding parameters and comparison function is affected by the bus communication cycle and configuration of the communication interface module. The larger the communication cycle or configuration value, the larger the time data. Therefore, when the function is used, ensure the time interval is long enough based on the actual situation. The preceding time is measured when two GL20-2HC modules are expanded after the communication interface module is installed and when the bus communication cycle is 6 ms. For the relationship between configurations and communication cycles, see ["10.2 Appendix 2: Relationship Between Different Module Configurations and Communication Cycles" on page 129](#).

■ Time sequence diagram

The time sequence diagram of multi-point comparison is as follows.



The time sequence diagram of uniformly-spaced comparison is as follows.

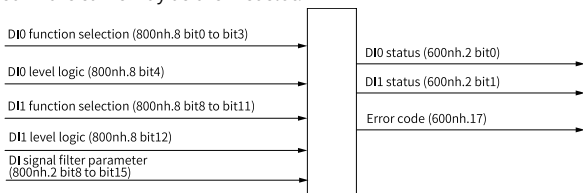


5.9 DI Function

Each counter is configured with two DIs. When the DI is used as a common input function, configure the terminal to the normal input mode. Configure parameters related to the DI function according to the following description.

■ Configuration parameter and feedback information

Take the first expansion slot of the communication interface module as an example to configure parameters and feedback information. The second, third, and fourth slots are defined in the same way as the first slot.

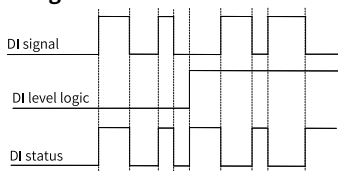


■ Parameter description

Parameter name	Parameter code	Value range	De- fault value	Description
DI function selection	800nh.8 bit0 to bit3	0: Common input 1: Probe function 2: Counting 3: Clear 4: Preset 5: Gating	0	When used as a normal DI, the DI terminal must be configured as standard input.
DI level logic	800nh.8 bit12	0: Positive logic 1: Negative logic	0	This parameter defines the level logic of the DI signal.
DI signal filter parameter	800nh.2 bit8 to bit15	0: No filtering Filter type 1 1: 100 ns; 2: 500 ns; 3: 1 μ s; 4: 100 μ s; 5: 250 μ s; 6: 500 μ s; 7: 1 ms; 8: 2 ms 9: 4 ms; 10: 8 ms; 11: 16 ms; 12: 32 ms Filter type 2 32: 100 ns; 33: 500 ns; 34: 1 μ s; 35: 100 μ s; 36: 250 μ s; 37: 500 μ s; 38: 1 ms; 39: 2 ms; 40: 4 ms; 41: 8 ms; 42: 16 ms; 43: 32 ms	7	This parameter is used to suppress input interference. Signals whose holding time is shorter than the set time are suppressed. The filter parameter must be between 40% and 60% of the active signal. Two different filter types are set for DI signals. You can select a filter type based on actual conditions. The filter parameter must meet the condition that the active input signal holding time is longer than the filter time. The larger the parameter, the stronger the anti-interference capability.
DIO status	600nh.2 bit0	0 1	-	This parameter indicates the DIO input status.

Parameter name	Parameter code	Value range	De-fault value	Description
DI1 status	600nh.2 bit1	0 1	-	This parameter indicates the DI1 input status.
Error code	600nh.17	0	-	This parameter specifies the error code returned when the DI function is abnormal. For details, see " Fault Diagnosis " on page 95.

■ Time sequence diagram

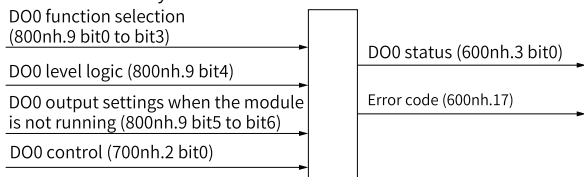


5.10 DO Function

Each counter is configured with one DO. When the DO is used as a common input function, configure the terminal to the normal output mode. Configure parameters related to the DO function according to the following description.

■ Configuration parameter and feedback information

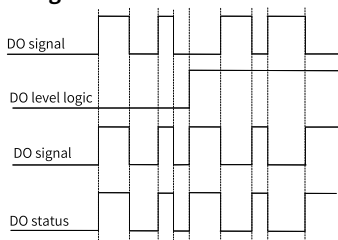
Take the first expansion slot of the communication interface module as an example to configure parameters and feedback information. The second, third, and fourth slots are defined in the same way as the first slot.



■ Parameter description

Parameter name	Parameter code	Value range	Default value	Description
DO0 function selection	800nh.9 bit0 to bit3	0: Common output 1: Comparison output	0	When used as a normal DO, the DO terminal must be configured as standard output.
DO0 level logic	800nh.9 bit4	0: Positive logic 1: Negative logic	0	This parameter defines the level logic of the DO0 signal.
DO0 output settings when the module is not running	800nh.9 bit5 to bit6	0: Output 0 1: Output 1	0	This parameter sets the output state of the DO0 when the module is not running.
DO0 control	700nh.2 bit0	0/1	-	This parameter is used to control DO0 output signals.
DO0 status	600nh.3 bit0	0/1	-	This parameter indicates the DO0 output status.
Error code	600nh.17	0	-	This parameter specifies the error code returned when the DO function is abnormal. For details, see " Fault Diagnosis " on page 95 .

■ Time sequence diagram



6 Program Commissioning

6.1 Commissioning for Connection with AC800 PLC

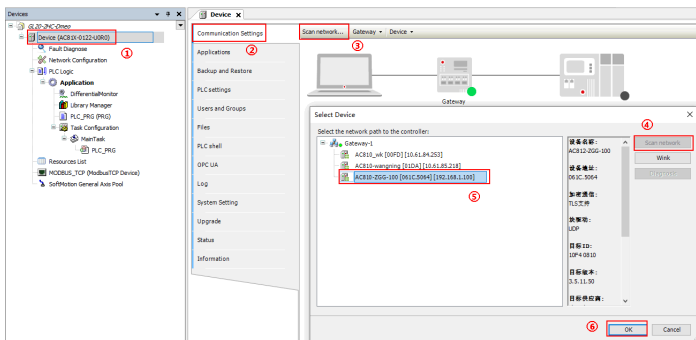
■ Prerequisites

- The cables are connected correctly.
- The PLC has been powered on and started running.

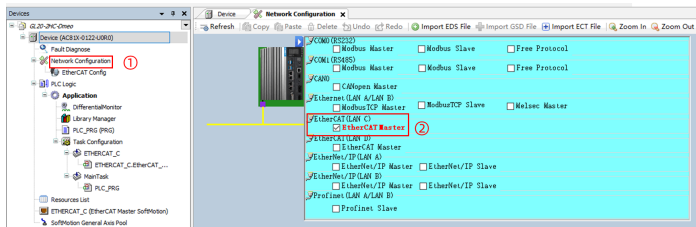
■ Operating procedure

1. Connect to the master PLC.

- a. In the left **Devices** pane, double-click **Device (AC81X-0122-U0R0)**. On the right **Device** tab, select **Communication Settings** to enter the communication settings interface. Select **Scan network > Scan network**. Select the target device that needs to be connected from the scanned online device and click **OK**, as shown in the following figure.



- b. In the left **Devices** pane, double-click **Network Configuration**. On the **Network Configuration** tab, check **EtherCATMaster**.

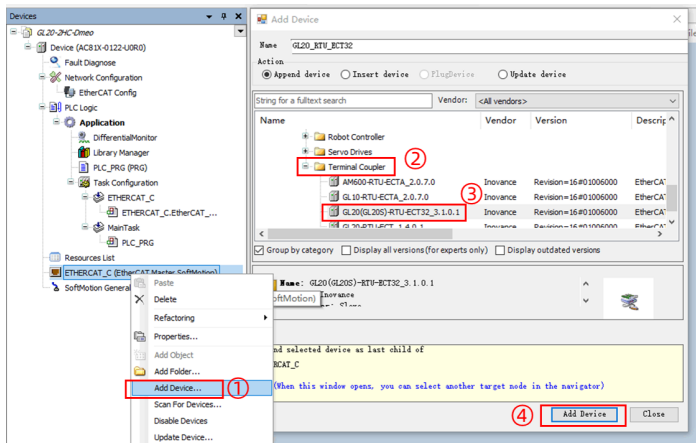


2. Add the slave.

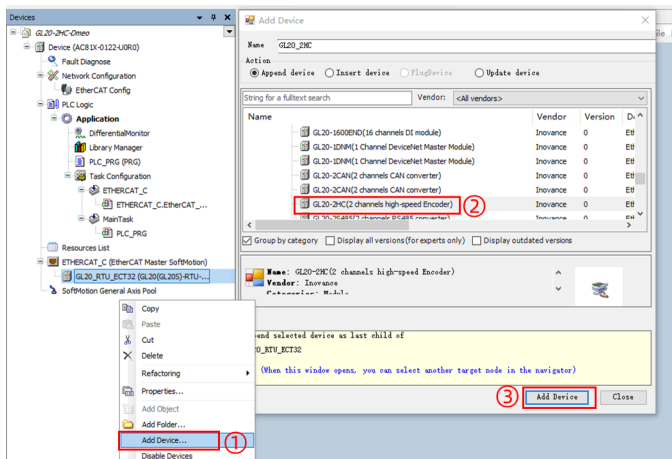
- a. In the left **Devices** pane, right-click **ETHERCAT_C (EtherCAT Master SoftMotion)** and select **Add Device**. In the displayed dialog box, select **Terminal Coupler > GL20-RTU-ECT32_x.x.x.x** and click **Add Device**, as shown in the figure below.

Note

x indicates the XML file version.



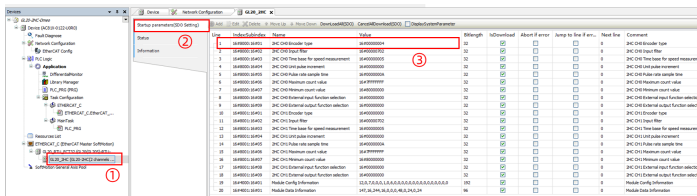
- b. In the left **Devices** pane, right-click **GL20_RTU_ECT32** and select **Add Device**. In the **Add Device** dialog box, select **GL20-2HC** and click **Add Device**, as shown in the figure below.



3. Run the device.

The following example describes how to enable the counting and frequency measurement functions of channel CH0.

- a. In the left **Devices** pane, double-click **GL20-2HC** to enter the **GL20-2HC** tab. On the **GL20-2HC** tab, click **Startup parameters(SDO Settings)**. Enter the correct parameter according to the object dictionary definition (see ["8.3 Output PDO Parameters" on page 104](#) for details), as shown in the following figure.



Variable	Mapping	Channel	Address	Type	Current Value
GL20_2HC 2HC Ch0 Encoder status			%B12	USINT	1
GL20_2HC 2HC Ch0 Dt status			%B13	USINT	0
GL20_2HC 2HC Ch0 Dt status			%B14	USINT	0
GL20_2HC 2HC Ch0 Compare status			%B15	USINT	0
GL20_2HC 2HC Ch0 Probe status			%D4	LOINT	0
GL20_2HC 2HC Ch0 Encoder present position			%D5	DINT	90
GL20_2HC 2HC Ch0 Measure value 1			%D6	LOINT	9
GL20_2HC 2HC Ch0 Measure value 2			%D7	LOINT	99994000
GL20_2HC 2HC Ch0 Probe 1 positive value			%D8	DINT	0
GL20_2HC 2HC Ch0 Probe 1 positive value			%D9	DINT	0
GL20_2HC 2HC Ch0 Reserve600			%D10	DINT	0
GL20_2HC 2HC Ch0 Reserve601			%D11	DINT	0
GL20_2HC 2HC Ch0 Probe 0 negative value			%D12	DINT	0
GL20_2HC 2HC Ch0 Probe 1 negative value			%D13	DINT	0
GL20_2HC 2HC Ch0 Reserve602			%D14	DINT	0
GL20_2HC 2HC Ch0 Reserve603			%D15	DINT	0
GL20_2HC 2HC Ch0 Errorcode			%D16	LOINT	0
GL20_2HC 2HC Ch1 Encoder status			%B68	USINT	0

6.2 Commissioning for Connection with Siemens PLC

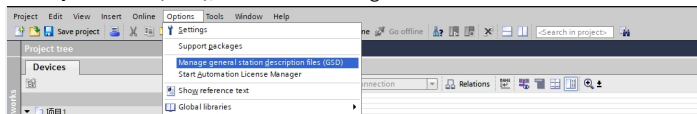
■ Prerequisites

- The cables are connected correctly.
- The PLC has been powered on and started running.

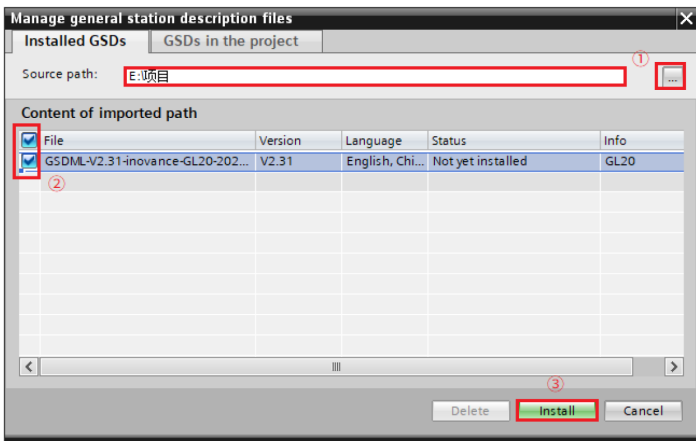
■ Operating procedure

1. Import the GSD file.

- a. In the TIA Portal menu bar, select **Options > Manage general station description files (GSD)**, as shown in the figure below.

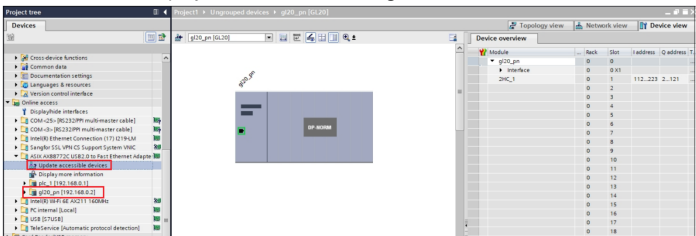


- b. In the dialog box displayed, click , locate the GSD file (the software automatically indexes the file), select the GSD file, and then click **Install**.

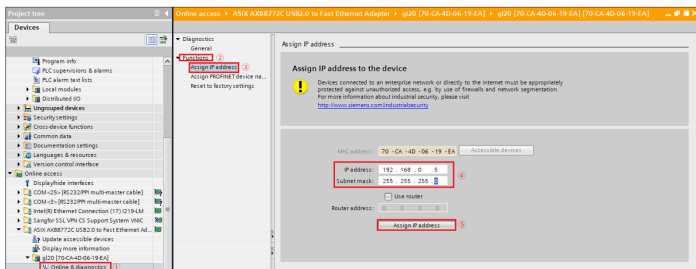


2. Connect the GL20-RTU-PN communication interface module.

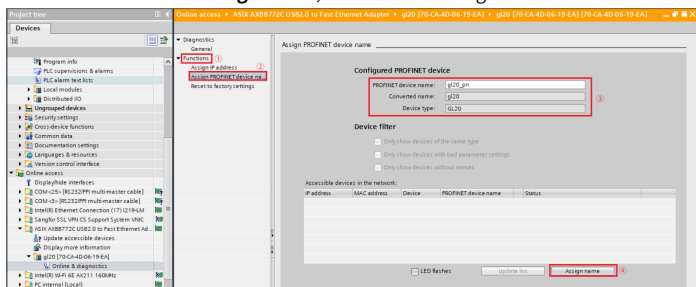
- On the main interface, select **Project tree > Devices > Online access**, and then double-click **Update accessible devices** under the corresponding network card of the PLC to scan for the online GL20-RTU-PN module. The module "gl20_pn [192.168.0.2]" is displayed, as shown in the figure below.



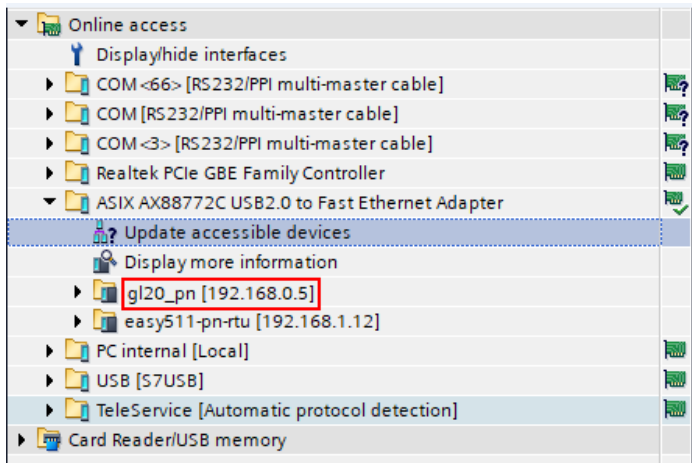
- Assign an IP address and PROFINET device name to the GL20-RTU-PN module. Double-click **Online & diagnostics** under the scanned GL20-RTU-PN module. In the middle pane, select **Functions > Assign IP address**. In the right pane, configure the IP address and subnet mask for the GL20-RTU-PN module, and then click **Assign IP address**, as shown in the figure below.



c. Select **Functions > Assign PROFINET device name**. Configure the PROFINET device name and click **Assign name**, as shown in the figure below.



d. Check the configuration result. Upon successful configuration, the PROFINET device name and IP address will be displayed under the corresponding network card of the PLC in the left project tree, as shown in the figure below.

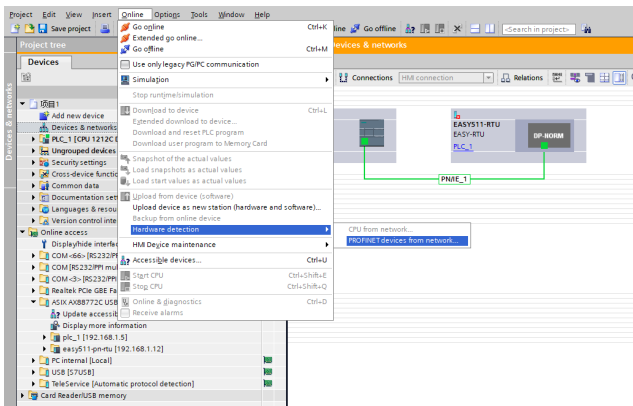


3. Add an expansion module.

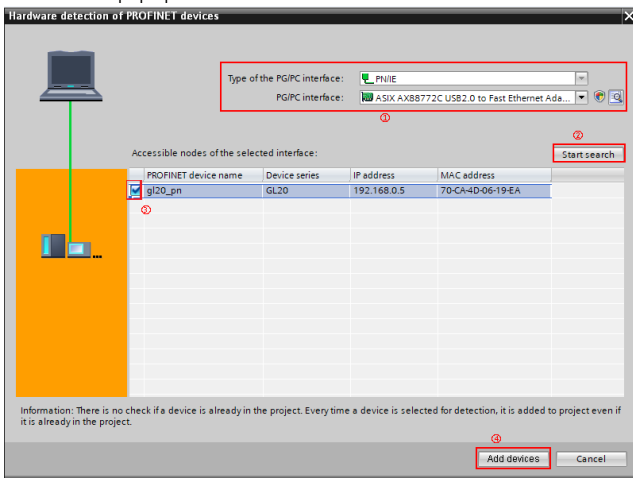
a. Configure the GL20-RTU-PN module and expansion module using one of the two methods below.

- Automatic configuration

1). In the menu bar, select **Online > Hardware detection > PROFINET devices from network**, as shown in the figure below.



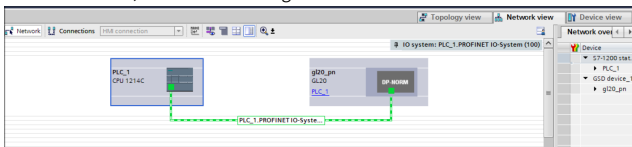
- 2). Select the corresponding network card, click **Start search**, check the GL20-RTU-PN communication interface module to be configured, and click **Add devices**. After successful adding, a prompt box indicating successful hardware detection will pop up.



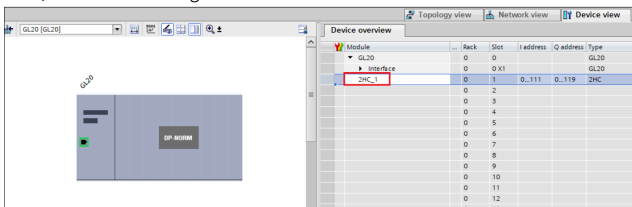
Note

If the device fails to be added, disconnect the network cable between the PLC and the GL20-RTU-PN module and follow the automatic configuration procedure for reconnection.

- 3). Hold down the left mouse button and drag the green frame of the PLC to the green frame of the GL20-RTU-PN module to connect the PLC and the GL20-RTU-PN module, as shown in the figure below.

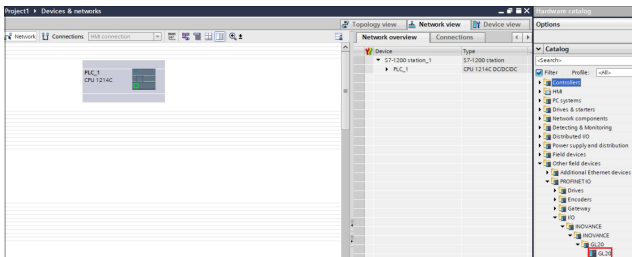


- 4). Double-click the GL20-RTU-PN module in the network view to open the device view, as shown in the figure below.

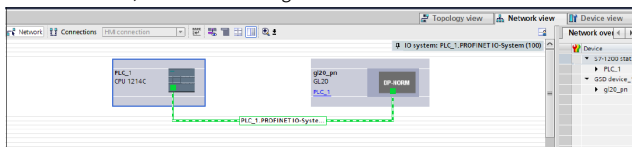


- Manual configuration

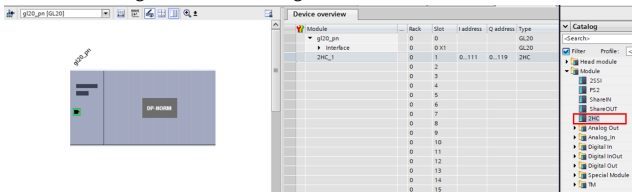
- 1). Double-click **GL20** or drag **GL20** to the network view in the hardware catalog, as shown in the figure below.



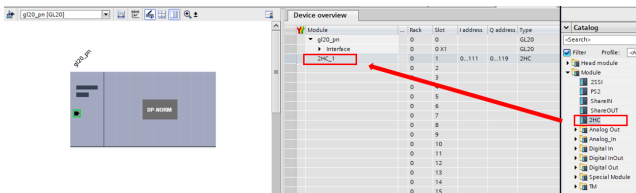
- 2). Hold down the left mouse button and drag the green frame of the PLC to the green frame of the GL20-RTU-PN module to connect the PLC and the GL20-RTU-PN module, as shown in the figure below.



- 3). Double-click the GL20-RTU-PN module in the network view to open the hardware catalog, as shown in the figure below.



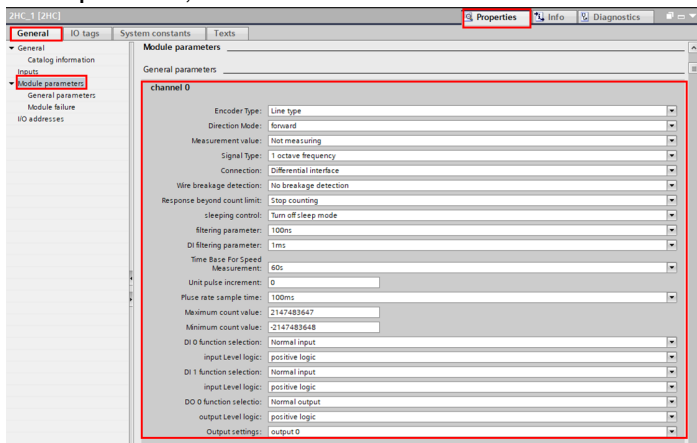
- 4). According to the actual module installation sequence, double-click the expansion modules in the hardware catalog on the right side to add them and automatically assign addresses.



4. Run the device.

The following example describes the counting and frequency measurement functions of channel CH0 at an input of 10 Hz differential signal in phases A/B 1x frequency signal mode.

- In the network view, click the expansion module to be configured, and then configure the corresponding module parameters under **Properties > General > Module parameters**, as shown below.



Parameter	Value	Description
Encoder type	Line type Annual type	Line type and annual type are supported. Each channel supports a 32-bit counting range, which can be changed by setting the maximum and minimum values. ● Line type: The counting function ranges from the maximum value to the minimum value. If the maximum or minimum value is reached, operations can be performed according to the setting for the scenario when the maximum or minimum value is exceeded. ● Annual type: The counting function ranges from the maximum value to the minimum value. When the count-up exceeds the maximum, the value jumps to the minimum. When the count-down exceeds the minimum, the value jumps to the maximum.
Direction Mode	forward: Phase A leads phase B. reverse: Phase B leads phase A.	This parameter sets the counting direction.
Measurement value	● 0: Not measuring ● 1: frequency ● 2: cycle ● 3: rotary speed	● frequency: Frequency of the input signal of the counter, in the unit of Hz ● cycle: Cycle of the input signal of the counter, in the unit of ms ● rotary speed: Speed of the input signal of the counter. The unit depends on the time base of the speed measurement.

Parameter	Value	Description
Signal Type	• 1 octave frequency • 2 octave frequency • 4 octave frequency • Pulse direction • CW/CCW • Single-phase counting (A) • Single-phase counting (B)	This parameter sets the input mode based on the actual counter input signal. • Phase A/B n (n=1, 2, 4) octave frequency: An incremental encoder that supports phase A/B signal can be connected. The phase difference between phase A signal and phase B signal must be 90°. • Pulse direction: An incremental encoder that supports pulse and direction signals can be connected. • CW/CCW: An incremental encoder that supports CW/CCW signals can be connected. • Single-phase counting (A): A pulse encoder without direction signal can be connected. • Single-phase counting (B): A pulse encoder without direction signal can be connected.
Connection	Differential interface Single ended wiring	Select the wiring method according to actual conditions by referring to section "Wiring Diagram of Terminals".
Wire breakage detection	No breakage detection breakage detection	This function only supports detection of disconnection of differential interfaces.
Response beyond count limit	Stop counting Continue counting	This parameter is related to the parameter "Encoder type". • Line type: Stop counting: When the maximum or minimum counting value is reached, the counting stops and the counting value overflow alarm is generated. To start counting, you must enable the counter again. Continue counting: When the forward counting value exceeds the maximum value, the value jumps to the minimum value. When the reverse counting value is lower than the minimum value, the value jumps to the maximum value. • Annual type: Invalid parameter

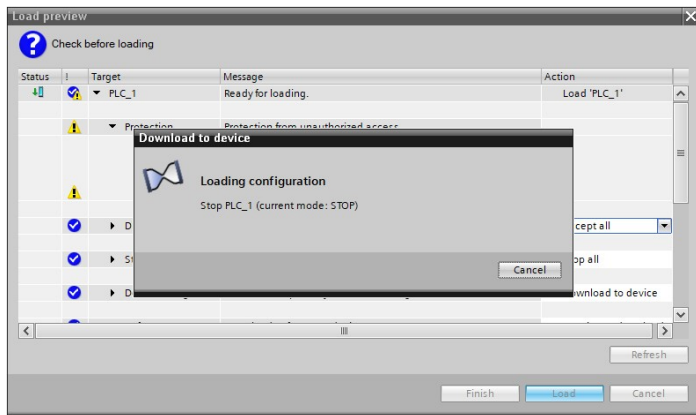
Parameter	Value	Description
sleeping control	Turn off sleep mode Turn on sleep mode	The sleep function can reduce the power consumption of the module, thus reducing the heat output of the module.
filtering parameter	50 ns; 100 ns; 200 ns; 500 ns; 1 μ s; 2 μ s; 5 μ s; 10 μ s; 20 μ s; 50 μ s; 100 μ s; 200 μ s; 500 ms; 1 ms; 2 ms; 5 ms; 10 ms; 20 ms; 50 ms; 100 ms	This parameter is used to effectively suppress interference between phase A and phase B of the counter input. Signals whose holding time is shorter than the set time are suppressed. The filter parameter must be between 40% and 60% of the active signal. The filter parameter must meet the condition that the active input signal holding time is longer than the filter time. The larger the parameter, the stronger the anti-interference capability.
DI filtering parameter	100 ns; 500 ns; 1 μ s; 100 μ s; 250 μ s; 500 μ s; 1 ms; 2 ms; 4 ms; 8 ms; 16 ms; 32 ms	This parameter is used to suppress input interference. Signals whose holding time is shorter than the set time are suppressed. The filter parameter must be between 40% and 60% of the active signal. Two different filter types are set for DI signals. You can select a filter type based on actual conditions. The filter parameter must meet the condition that the active input signal holding time is longer than the filter time. The larger the parameter, the stronger the anti-interference capability.
Time Base For Speed Measurement	1 ms; 10 ms; 100 ms; 1s; 60s	Speed: This parameter determines the unit of speed, which is r/min by default. Frequency and cycle: Invalid parameter
Unit pulse increment	0 to 65535	Speed: Number of pulses output per revolution Frequency and cycle: Invalid parameter
Pulse rate sample time	500 μ s; 1 ms; 2 ms; 5 ms; 10 ms; 20 ms; 50 ms; 100 ms; 200 ms; 500 ms; 1s; 2s; 5s; 10s; 20s; 25s	The sampling time selected must meet the condition that the cycle of the input signal is smaller than the sampling time. The larger the parameter, the more stable and accurate the measured value.

Parameter	Value	Description
Maximum count value	2147483647	The maximum value of the counter can limit the counting range. You must enter a value larger than the minimum value of the counter.
Minimum count value	-2147483648	The minimum value of the counter can limit the counting range. You must enter a value smaller than the maximum value of the counter.
DI 0 function selection	• Normal input • Probe function • count • Clear • preset • gating	When used as a normal DI, the DI terminal must be configured as standard input.
input Level logic	positive logic nti-logical	This parameter defines the level logic of the DI0 signal.
DI 1 function selection	• Normal input • Probe function • count • Clear • preset • gating	When used as a normal DI, the DI terminal must be configured as standard input.
input Level logic	positive logic nti-logical	This parameter defines the level logic of the DI1 signal.
DO 0 function selection	Normal output Compare Output	When used as a normal DO, the DO terminal must be configured as standard input.
output Level logic	positive logic nti-logical	This parameter defines the level logic of the DO0 signal.
Output settings	output 0 output 1 holding	This parameter sets the output state of the DO0 when the module is not running.

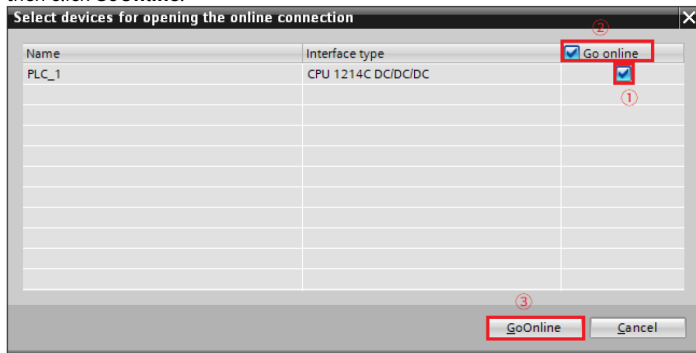
b. Speed: Number of pulses output per revolution

Frequency and cycle: Invalid parameter

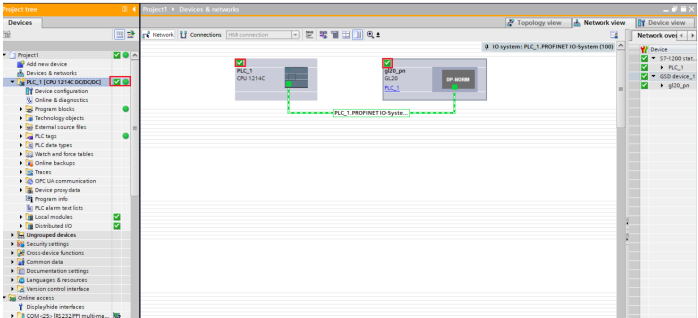
Click  in the toolbar to open the **Load preview** dialog box, as shown in the figure below.



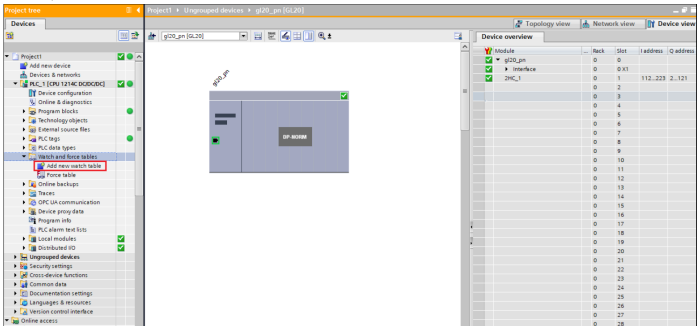
- c. Click **Load** to download the program to the device. Click  **Go online** in the toolbar to open the following dialog box. Check **PLC_1** and **Go online**, and then click **GoOnline**.



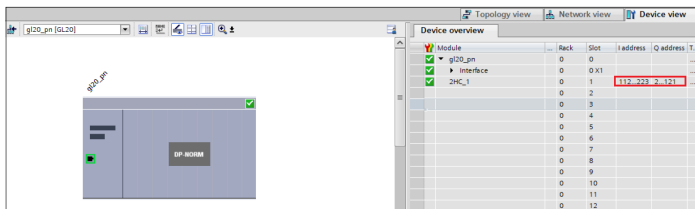
d. As shown in the following figure, green icons are displayed in both the project tree and the network view. This indicates that the GL20-RTU-PN communication interface module is configured successfully. Otherwise, the GL20-RTU-PN communication interface module fails the configuration.



e. In the **Project tree** pane, select **Watch and force tables > Add new watch table**, as shown below.



f. Assign the IP address to the IO module according to the module type, as shown in the figure below.



The variable address of the monitoring data is determined based on the I/O first address assigned by the module and the offset address of the process data of the module.

The offset address of the process data can be queried through the data definition used to apply to the GL20-RTU-PN communication interface module. For details, see ["9.2 Input PDO Parameters" on page 107](#) and ["9.3 Output PDO Parameters" on page 113](#).

The first address of the I address in the preceding figure is 112. The counter channel state offset address of counter channel 0 is 0. The data type is USINT. You can obtain the data through address %IB112. The offset address of the counter position value is 8. The data type is DINT. You can obtain the data through address %ID120. In the same way, the measured values can be obtained through addresses %ID124 and %ID128. The first address of the Q address is 2, the counter channel control command offset address of counter channel 0 is 0, and the data type is UINT. You can obtain the data through address %QW2.

As shown in the following figure, after the counter channel is enabled through counter control commands, the counter channel status is displayed as "Enable". The position values and measured values of the counters display the current position value and frequency.

Devices

Project1

- Add new device
- Devices & networks
 - PLC1 (CPU 1214C-2 DP)
 - Device configuration
 - Online & diagnostics
 - Program blocks
 - Technology objects
 - External source files
 - PLC tags
 - PLC data types
 - Watch and force tables
 - Add new watch table
 - Force table
- Online backups
- Traces
- OPC UA communication
- Device proxy data
- Program info
- PLC alarm text lists
- Local modules
- Unassigned devices
- Security settings
- Cross-device functions
- Common data
- Documentation settings

Watch table 1

Name	Address	Display format	Monitor value	Modify value	Comment	Tag comment
%QV0	16#0000	Hex	16#0000			
%B112	16#00	Hex	16#00			
%B120	16#00	Hex	16#00			
%B124	16#00	Hex	16#00			
%B128	16#00	Hex	16#00			

%B112 (Tag)

General

General

Name:

Address: %B112

Display format: Hex

Value:

Comment:

7 Fault Diagnosis

When the module fails, you can view the fault code through the configuration software.

● Module fault code

Code	Description	Solution
5003h	External 24 V power failure	Unstable module power supply or power failure
Others	-	See the communication interface guide for fault description.

● Module channel fault code

Code	Description	Cause
2100h	Preset value out of range	The preset value is larger than the maximum value or smaller than the minimum value.
2101h	Counter configuration error	● The single-ended counting function is enabled through commands, but the DI is not configured with the counting function. ● The single-ended interface enabled by the command is inconsistent with the counting interface configured by the DI. ● Both DI0 and DI1 are configured with the counting mode. ● The counter is configured as a differential interface, but DI0 or DI1 is configured with the counting mode.
2102h	Signal type not supported	The signal type is not set to the allowed value, which includes phase A/B 1x frequency, phase A/B 2x frequency, phase A/B 4x frequency, pulse+direction, CW/CCW, single-phase counting (A), and single-phase counting (B).
2103h	Counter limit error	The maximum value is smaller than or equal to the minimum value.
2104h	Incorrect setting of unit pulse increment	The unit pulse increment is smaller than 1.

Code	Description	Cause
2105h	Incorrect setting of time base for speed measurement	The time base is not set to the allowed value. For allowed values, see 800nh.3.
2106h	Incorrect setting of input filter parameter	The input filter parameter is not set to the allowed value. For allowed values, see 800nh.2.
2107h	Incorrect setting of frequency sampling time	The frequency sampling time is not set to the allowed value. For allowed values, see 800nh.5.
2108h	Incorrect setting of the clearing function	The clearing function is enabled through commands, but the DI is not configured with the clearing function.
2109h	Incorrect setting of the preset function	The preset function is enabled through commands, but the DI is not configured with the preset function.
210Ah	Incorrect function setting of comparison function channel 0	The comparison function is enabled through commands, but the DO is not configured with the comparison function.
210Eh	Incorrect function setting of probe function channel 0	The probe function is enabled through commands, but the DI is not configured with the probe function.
2112h	DO0 parameter error	The parameter is not set to the allowed value, which includes normal output and comparison output.
2116h	DI0 parameter error	The parameter is not set to the allowed value, which includes normal input, probe function, counting, clear, preset, and gating.
2117h	DI1 parameter error	The parameter is not set to the allowed value, which includes normal input, probe function, counting, clear, preset, and gating.
6800h	Phase A disconnection	Phase A disconnection
6801h	Phase B disconnection	Phase B disconnection

Code	Description	Cause
6802h	Frequency out of limit	Differential interface: Frequency of 4 MHz x frequency multiplication coefficient; single-end interface: Frequency of 500 kHz x frequency multiplication coefficient
6803h	Counting value overflow	The counting value is larger than the maximum value.
6804h	Counting value underflow	The counting value is smaller than the minimum value.
6805h	Quantity/step out of range for comparison function channel 0	The quantity is larger than 1024 or smaller than 1, or the step equals 0.
6809h	Incorrect setting of holding time/pulse number output by comparison function channel 0	The holding time is smaller than 10 or the pulse number is smaller than 1.
680Dh	Incorrect setting of start/stop position and step direction output by comparison function channel 0	The start and stop positions are the same. The start position is smaller than the stop position. The step is smaller than 0. The start position is larger than the end position, but the step is 0.
6811h	Comparison value of comparison function channel 0 out of range	The comparison value is larger than the maximum value or smaller than the minimum value.
6815h	Type error of comparison function channel 0	The comparison type is not set to the allowed value, which includes multi-point comparison and uniformly-spaced comparison.
6819h	Error in control mode output by comparison function channel 0	The control mode is not set to the allowed value, which includes time control, pulse control, and level control.
681Dh	DO0 short circuit	DO0 short circuit

8 Object Dictionary

8.1 Configuration Parameters

In-dex	Sub-index	Data type	Description	Access type	Default	Definition
800-nh	1	UDINT	CHn Encoder type	RW	0x00000-000	800nh.1 See detailed information in "10.1.1 Counter Type (CHn Encoder type)" on page 118.
	2	UDINT	CHn Input filter	RW	0x00000-702	800nh.2 See detailed information in "10.1.2 Input Filter Parameter (CHn Input filter)" on page 119.
	3	UDINT	CHn Time base for speed measurement	RW	0x00000-005	800nh.3 See detailed information in "10.1.3 Time Base for Speed Measurement (CHn Time base for speed measurement)" on page 120.
	4	UDINT	CHn Unit pulse increment	RW	0x00000-000	800nh.4 See detailed information in "10.1.4 Unit Pulse Increment (CHn Unit pulse increment)" on page 120.

Index	Sub-index	Data type	Description	Access type	Default	Definition
800-nh	5	UDINT	CHn Pulse rate sample time	RW	0x00000-00A	800nh.5 See detailed information in "10.1.5 Pulse Frequency Sampling Time (CHn Pulse rate sample time)" on page 120.
	6	DINT	CHn Maximum count value	RW	0x7FFFF-FFF	800nh.6 See detailed information in "10.1.6 Maximum Counter Value (CHn Maximum count value)" on page 120.
	7	DINT	CHn Minimum count value	RW	0x80000-000	800nh.7 See detailed information in "10.1.7 Minimum Counter Value (CHn Minimum count value)" on page 120.
	8	UDINT	CHn External input function selection	RW	0x00000-000	800nh.8 See detailed information in "10.1.8 External Input Function Selection (CHn External input function selection)" on page 121.
	9	UDINT	CHn External output function selection	RW	0x00000-000	800nh.9 See detailed information in "10.1.9 External Output Function Selection (CHn External output function selection)" on page 121.

8.2 Input PDO Parameters

Index	Sub-index	Data type	Description	Access type	Definition
600nh	1	USINT	CHn Encoder status	RO	600nh.1 See detailed information in <i>"10.1.10 Counter Status (CHn Encoder status)" on page 122.</i>
	2	USINT	CHn DI status	RO	600nh.2 See detailed information in <i>"10.1.11 DI Status (CHn DI status)" on page 122.</i>
	3	USINT	CHn DO status	RO	600nh.3 See detailed information in <i>"10.1.12 DO Status (CHn DO status)" on page 123.</i>
	4	USINT	CHn Compare status	RO	600nh.4 See detailed information in <i>"10.1.13 Comparison Function Status (CHn Compare status)" on page 123.</i>

Index	Sub-index	Data type	Description	Access type	Definition
600nh	5	UDINT	CHn Probe status	RO	600nh.5 See detailed information in <i>"10.1.14 Probe Function Status (CHn Probe status)" on page 123.</i>
	6	DINT	CHn Encoder present position	RO	600nh.6 See detailed information in <i>"10.1.15 Counter Position Value (CHn encoder present position)" on page 124.</i>
	7	UDINT	CHn Measure value 1	RO	600nh.7 See detailed information in <i>"10.1.16 Measured Value 1 (CHn Measure value 1)" on page 124.</i>
	8	UDINT	CHn Measure value 2	RO	600nh.8 See detailed information in <i>"10.1.17 Measured Value 2 (CHn Measure value 2)" on page 124.</i>

Index	Sub-index	Data type	Description	Access type	Definition
600nh	9	DINT	CHn Probe 0 positive value	RO	600nh.9 See detailed information in <i>"10.1.18 Latching Value at Rising Edge for Probe Function Channel 0 (CHn Probe 0 positive value)" on page 124.</i>
	10	DINT	CHn Probe 1 positive value	RO	600nh.10 See detailed information in <i>"10.1.19 Latching Value at Rising Edge for Probe Function Channel 1 (CHn Probe 1 positive value)" on page 124.</i>
	11	DINT	CHn Reserve600	-	-
	12	DINT	CHn Reserve601	-	-
	13	DINT	CHn Probe 0 negative value	RO	600nh.13 See detailed information in <i>"10.1.20 Latching Value at Falling Edge for Probe Function Channel 0 (CHn Probe 0 negative value)" on page 125.</i>

Index	Sub-index	Data type	Description	Access type	Definition
600nh	14	DINT	CHn Probe 1 negative value	RO	600nh.14 See detailed information in <i>"10.1.21 Latching Value at Falling Edge for Probe Function Channel 1 (CHn Probe 1 negative value)" on page 125.</i>
	15	DINT	CHn Reserve602	-	-
	16	DINT	CHn Reserve603	-	-
	17	DINT	CHn Error code	RO	600nh.17 See detailed information in <i>"10.1.22 Error Code (CHn Error code)" on page 125.</i>

8.3 Output PDO Parameters

Index	Sub-index	Data type	Description	Access type	Definition
700nh	9	INT	CHn Reserve702	-	-
	10	DINT	CHn Compare 0 position value 1	RW	700nh.10 See detailed information in "10.1.29 Position Value 1 of Comparison Function Channel 0 (CHn Compare 0 position value 1)" on page 127.
	11	DINT	CHn Reserve703	-	-
	12	DINT	CHn Reserve704	-	-
	13	DINT	CHn Reserve705	-	-
	14	DINT	CHn Compare 0 position value 2	RW	700nh.14 See detailed information in "10.1.30 Position Value 2 of Comparison Function Channel 0 (CHn Compare 0 position value 2)" on page 128.
	15	DINT	CHn Reserve706	-	-
	16	DINT	CHn Reserve707	-	-
	17	DINT	CHn Reserve708	-	-
	18	UDINT	CHn Compare function command parameter	RW	700nh.18 See detailed information in "10.1.31 Comparison Function Control Parameter (CHn Compare function command parameter)" on page 128.

Index	Sub-index	Data type	Description	Access type	Definition
700nh	9	INT	CHn Reserve702	-	-
	10	DINT	CHn Compare 0 position value 1	RW	700nh.10 See detailed information in "10.1.29 Position Value 1 of Comparison Function Channel 0 (CHn Compare 0 position value 1)" on page 127.
	11	DINT	CHn Reserve703	-	-
	12	DINT	CHn Reserve704	-	-
	13	DINT	CHn Reserve705	-	-
	14	DINT	CHn Compare 0 position value 2	RW	700nh.14 See detailed information in "10.1.30 Position Value 2 of Comparison Function Channel 0 (CHn Compare 0 position value 2)" on page 128.
	15	DINT	CHn Reserve706	-	-
	16	DINT	CHn Reserve707	-	-
	17	DINT	CHn Reserve708	-	-
	18	UDINT	CHn Compare function command parameter	RW	700nh.18 See detailed information in "10.1.31 Comparison Function Control Parameter (CHn Compare function command parameter)" on page 128.

8.4 Diagnostic Parameters

Index	Sub-index	Data type	Description	Access type	Definition
A00nh	1	UINT	Module Diagnosis information	RO	Module error See the module channel fault code in " <i>Fault Diagnosis</i> " on page 95.
	2	UINT	Ch0 Diagnostic information	RO	
	3	UINT	Ch1 Diagnostic information	RO	

9 Address Space

9.1 Overview

If the GL20-2HC module is configured with the GL20-RTU-PN coupler, up to four GL20-2HC modules are supported. The four GL20-2HC modules can be installed only in the first four slots in the configuration.

When the GL20-2HC module is used with the GL20-RTU-PN coupler, the process data of the module is accessed in the form of the first address plus the offset address. The offset address of the process data for different slots is the same. The first address is assigned automatically or manually in the TIA Portal software. For offset addresses, see ["9.2 Input PDO Parameters" on page 107](#) and ["9.3 Output PDO Parameters" on page 113](#).

9.2 Input PDO Parameters

Offset address	Data type	Description	Access type	Definition
0	USINT	CH0 Encoder status	RO	600nh.1 See detailed information in "10.1.10 Counter Status (CHn Encoder status)" on page 122 .
1	USINT	CH0 DI status	RO	600nh.2 See detailed information in "10.1.11 DI Status (CHn DI status)" on page 122 .
2	USINT	CH0 DO status	RO	600nh.3 See detailed information in "10.1.12 DO Status (CHn DO status)" on page 123 .

Offset address	Data type	Description	Access type	Definition
3	USINT	CH0 Compare status	RO	600nh.4 See detailed information in " 10.1.13 Comparison Function Status (CHn Compare status) " on page 123.
4 to 7	UDINT	CH0 Probe status	RO	600nh.5 See detailed information in " 10.1.14 Probe Function Status (CHn Probe status) " on page 123.
8 to 11	DINT	CH0 Encoder present position	RO	600nh.6 See detailed information in " 10.1.15 Counter Position Value (CHn encoder present position) " on page 124.
12 to 15	UDINT	CH0 Measure value 1	RO	600nh.7 See detailed information in " 10.1.16 Measured Value 1 (CHn Measure value 1) " on page 124.
16 to 19	UDINT	CH0 Measure value 2	RO	600nh.8 See detailed information in " 10.1.17 Measured Value 2 (CHn Measure value 2) " on page 124.

Offset address	Data type	Description	Access type	Definition
20 to 23	DINT	CH0 Probe 0 positive value	RO	600nh.9 See detailed information in " 10.1.18 Latching Value at Rising Edge for Probe Function Channel 0 (CHn Probe 0 positive value) " on page 124.
24 to 27	DINT	CH0 Probe 1 positive value	RO	600nh.10 See detailed information in " 10.1.19 Latching Value at Rising Edge for Probe Function Channel 1 (CHn Probe 1 positive value) " on page 124.
28 to 35	DINT	Reserved	-	-
36 to 39	DINT	CH0 Probe 0 negative value	RO	600nh.13 See detailed information in " 10.1.20 Latching Value at Falling Edge for Probe Function Channel 0 (CHn Probe 0 negative value) " on page 125.
40 to 43	DINT	CH0 Probe 1 negative value	RO	600nh.14 See detailed information in " 10.1.21 Latching Value at Falling Edge for Probe Function Channel 1 (CHn Probe 1 negative value) " on page 125.
44 to 51	DINT	Reserved	-	-

Offset address	Data type	Description	Access type	Definition
52 to 55	UDINT	CH0 Error code	RO	600nh.17 See detailed information in " 10.1.22 Error Code (CHn Error code) " on page 125.
56	USINT	CH1 Encoder status	RO	600nh.1 See detailed information in " 10.1.10 Counter Status (CHn Encoder status) " on page 122.
57	USINT	CH1 DI status	RO	600nh.2 See detailed information in " 10.1.11 DI Status (CHn DI status) " on page 122.
58	USINT	CH1 DO status	RO	600nh.3 See detailed information in " 10.1.12 DO Status (CHn DO status) " on page 123.
59	USINT	CH1 Compare status	RO	600nh.4 See detailed information in " 10.1.13 Comparison Function Status (CHn Compare status) " on page 123.
60 to 63	UDINT	CH1 Probe status	RO	600nh.5 See detailed information in " 10.1.14 Probe Function Status (CHn Probe status) " on page 123.

Offset address	Data type	Description	Access type	Definition
64 to 67	DINT	CH1 Encoder present position	RO	600nh.6 See detailed information in " 10.1.15 Counter Position Value (CHn encoder present position) " on page 124.
68 to 71	UDINT	CH1 Measure value 1	RO	600nh.7 See detailed information in " 10.1.16 Measured Value 1 (CHn Measure value 1) " on page 124.
72 to 75	UDINT	CH1 Measure value 2	RO	600nh.8 See detailed information in " 10.1.17 Measured Value 2 (CHn Measure value 2) " on page 124.
76 to 79	DINT	CH1 Probe 0 positive value	RO	600nh.9 See detailed information in " 10.1.18 Latching Value at Rising Edge for Probe Function Channel 0 (CHn Probe 0 positive value) " on page 124.
80 to 83	DINT	CH1 Probe 1 positive value	RO	600nh.10 See detailed information in " 10.1.19 Latching Value at Rising Edge for Probe Function Channel 1 (CHn Probe 1 positive value) " on page 124.
84 to 91	DINT	Reserved	-	-

Offset address	Data type	Description	Access type	Definition
92 to 95	DINT	CH1 Probe 0 negative value	RO	600nh.13 See detailed information in " 10.1.20 Latching Value at Falling Edge for Probe Function Channel 0 (CHn Probe 0 negative value) " on page 125.
96 to 99	DINT	CH1 Probe 1 negative value	RO	600nh.14 See detailed information in " 10.1.21 Latching Value at Falling Edge for Probe Function Channel 1 (CHn Probe 1 negative value) " on page 125.
100 to 107	DINT	Reserved	-	-
108 to 111	UDINT	CH1 Error code	RO	600nh.17 See detailed information in " 10.1.22 Error Code (CHn Error code) " on page 125.

9.3 Output PDO Parameters

Offset address	Data type	Description	Access type	Definition
0 to 1	UINT	CH0 Encoder command value	RW	700nh.1 See detailed information in " 10.1.23 Counter Control Command Value (CHn Encoder command value) " on page 125.
2 to 3	UINT	CH0 DO function command value	RW	700nh.2 See detailed information in " 10.1.24 DO Function Command Value (CHn DO function command value) " on page 126.
4 to 7	DINT	CH0 Encoder preset value	RW	700nh.3 See detailed information in " 10.1.25 Counter Preset Value (CHn Encoder preset value) " on page 126.
8 to 11	UDINT	CH0 Probe function command value	RW	700nh.4 See detailed information in " 10.1.26 Probe Function Command Value (CHn Probe function command value) " on page 126.

Offset address	Data type	Description	Access type	Definition
12 to 15	UDINT	CH0 Compare function command value	RW	700nh.5 See detailed information in " 10.1.27 Comparison Function Command Value (CHn Compare function command value) " on page 127.
16 to 17	INT	CH0 Compare 0 command size/step	RW	700nh.6 See detailed information in " 10.1.28 Command Number or Step of Comparison Function Channel 0 (CHn Compare 0 command size or step) " on page 127.
18 to 23	INT	Reserved	-	-
24 to 27	DINT	CH0 Compare 0 position value 1	RW	700nh.10 See detailed information in " 10.1.29 Position Value 1 of Comparison Function Channel 0 (CHn Compare 0 position value 1) " on page 127.
28 to 39	DINT	Reserved	-	-
40 to 43	DINT	CH0 Compare 0 position value 2	RW	700nh.14 See detailed information in " 10.1.30 Position Value 2 of Comparison Function Channel 0 (CHn Compare 0 position value 2) " on page 128.
44 to 55	DINT	Reserved	-	-

Offset address	Data type	Description	Access type	Definition
56 to 59	UDINT	CH0 Compare command parameter	RW	700nh.18 See detailed information in " 10.1.31 Comparison Function Control Parameter (CHn Compare function command parameter) " on page 128.
60 to 61	UINT	CH1 Encoder command value	RW	700nh.1 See detailed information in " 10.1.23 Counter Control Command Value (CHn Encoder command value) " on page 125.
62 to 63	UINT	CH1 DO function command value	RW	700nh.2 See detailed information in " 10.1.24 DO Function Command Value (CHn DO function command value) " on page 126.
64 to 67	DINT	CH1 Encoder preset value	RW	700nh.3 See detailed information in " 10.1.25 Counter Preset Value (CHn Encoder preset value) " on page 126.
68 to 71	UDINT	CH1 Probe function command value	RW	700nh.4 See detailed information in " 10.1.26 Probe Function Command Value (CHn Probe function command value) " on page 126.

Offset address	Data type	Description	Access type	Definition
72 to 75	UDINT	CH1 Compare function command value	RW	700nh.5 See detailed information in " 10.1.27 Comparison Function Command Value (CHn Compare function command value) " on page 127.
76 to 77	INT	CH1 Compare 0 command size/step	RW	700nh.6 See detailed information in " 10.1.28 Command Number or Step of Comparison Function Channel 0 (CHn Compare 0 command size or step) " on page 127.
78 to 83	INT	Reserved	-	-
84 to 87	DINT	CH1 Compare 0 position value 1	RW	700nh.10 See detailed information in " 10.1.29 Position Value 1 of Comparison Function Channel 0 (CHn Compare 0 position value 1) " on page 127.
88 to 99	DINT	Reserved	-	-
100 to 103	DINT	CH1 Compare 0 position value 2	RW	700nh.14 See detailed information in " 10.1.30 Position Value 2 of Comparison Function Channel 0 (CHn Compare 0 position value 2) " on page 128.

Offset address	Data type	Description	Access type	Definition
104 to 115	DINT	Reserved	-	-
116 to 119	UDINT	CH1 Compare command parameter	RW	700nh.18 See detailed information in "10.1.31 Comparison Function Control Parameter (CHn Compare function command parameter)" on page 128.

10 Appendix

10.1 Appendix 1: Parameter Description

10.1.1 Counter Type (CHn Encoder type)

Bit	Description	Default
0	Counter type 0: Linear 1: Annular	0
1	Counting direction 0: Phase A leads phase B (forward). 1: Phase B leads phase A (reverse).	0
3 to 2	Measured value 0: Not measuring 1: Frequency 2: Cycle 3: Speed	0
7 to 4	Pulse input mode 0: Phase A/B 1x frequency 1: Phase A/B 2x frequency 2: Phase A/B 4x Frequency 3: Pulse+Direction 4: CW/CCW 5: Single-phase counting (A) 6: Single-phase counting (B)	0
8	Wiring method 0: Differential interface 1: Single-ended interface	0

Bit	Description	Default
9	Disconnection detection (valid only for differential interface) 0: Disable 1: Enable	0
10	Action upon exceeding count limit 0: Stop counting 1: Continue counting	0
13 to 11	Reserved	0
14	Sleep control (When this function is enabled, all functions of the entire channel are disabled.) 0: Disable sleep mode 1: Enable sleep mode	0
31 to 15	Reserved	0

10.1.2 Input Filter Parameter (CHn Input filter)

Bit	Description	Default
7 to 0	Counting signal filter parameter 1: 50 ns; 2: 100 ns; 3: 200 ns; 4: 500 ns; 5: 1 μ s; 6: 2 μ s; 7: 5 μ s; 8: 10 μ s; 9: 20 μ s; 10: 50 μ s; 11: 100 μ s; 12: 200 μ s; 13: 500 μ s; 14: 1 ms; 15: 2 ms; 16: 5 ms; 17: 10 ms; 18: 20 ms; 19: 50 ms; 20: 100 ms	2
15 to 8	DI signal filter parameter 0: No filtering Filter type 1 1: 100 ns; 2: 500 ns; 3: 1 μ s; 4: 100 μ s; 5: 250 μ s; 6: 500 μ s; 7: 1 ms; 8: 2 ms; 9: 4 ms; 10: 8 ms; 11: 16 ms; 12: 32 ms Filter type 2 32: 100 ns; 33: 500 ns; 34: 1 μ s; 35: 100 μ s; 36: 250 μ s; 37: 500 μ s; 38: 1 ms; 39: 2 ms; 40: 4 ms; 41: 8 ms; 42: 16 ms; 43: 32 ms	7
31 to 16	Reserved	0

10.1.3 Time Base for Speed Measurement (CHn Time base for speed measurement)

Bit	Description	Default
7 to 0	Time base for speed measurement 1: 1ms; 2: 10 ms; 3: 100 ms; 4: 1s; 5: 60s	5
31 to 8	Reserved	0

10.1.4 Unit Pulse Increment (CHn Unit pulse increment)

Bit	Description	Default
15 to 0	The value must be smaller than or equal to 65535.	0
31 to 16	Reserved	0

10.1.5 Pulse Frequency Sampling Time (CHn Pulse rate sample time)

Bit	Description	Default
7 to 0	3: 500 us; 4: 1 ms; 5: 2 ms; 6: 5 ms; 7: 10 ms; 8: 20 ms; 9: 50 ms; 10: 100 ms; 11: 200 ms; 12: 500 ms; 13: 1s; 14: 2s 15: 5s; 16: 10s; 17: 20s; 18: 25s	10
31 to 8	Reserved	0

10.1.6 Maximum Counter Value (CHn Maximum count value)

Bit	Description	Default
31 to 0	Maximum counter value, which needs to be set to a value smaller than or equal to 2147483647	2147483647

10.1.7 Minimum Counter Value (CHn Minimum count value)

Bit	Description	Default
31 to 0	Minimum counter value, which needs to be set to a value greater than or equal to -2147483648	-2147483648

10.1.8 External Input Function Selection (CHn External input function selection)

Bit	Description	Default
3 to 0	DI0 function selection 0: Standard input 1: Probe function 2: Counting 3: Clear 4: Preset 5: Gating	0
4	DI0 level logic 0: Positive logic 1: Negative logic	0
7 to 5	Reserved	0
15 to 8	DI1 function selection (same as DI0)	0
31 to 16	Reserved	0

10.1.9 External Output Function Selection (CHn External output function selection)

Bit	Description	Default
3 to 0	DO0 function selection 0: Common output 1: Comparison output	0
4	DO0 level logic 0: Positive logic 1: Negative logic	0
6 to 5	Output settings when the module is not running 0: Output 0 1: Output 1 2: Hold	0
31 to 7	Reserved	0

10.1.10 Counter Status (CHn Encoder status)

Bit	Description
0	Counter status 0: Stop counting 1: Counter operating normally
1	Completion flag for counter clearing through internal commands 0: Inactive 1: Completed
2	Completion flag for counter preset through internal commands 0: Inactive 1: Completed
3	Counting direction 0: Same direction 1: Reverse direction
4	Counter overflow
5	Frequency out of limit
6	Phase A disconnection
7	Phase B disconnection

10.1.11 DI Status (CHn DI status)

Bit	Description
0	DI0 status
1	DI1 status
2	Reserved
3	Reserved
4	Counter clearing enabling through external signals
5	Completion for counter clearing through external signal

Bit	Description
6	Counter preset enabling through external signals
7	Completion for counter preset through external signal

10.1.12 DO Status (CHn DO status)

Bit	Description
0	DO0 status
7 to 1	Reserved

10.1.13 Comparison Function Status (CHn Compare status)

Bit	Note
0	Comparison function channel 0 enable
3 to 1	Reserved
4	Comparison function channel 0 output valid
7 to 5	Reserved

10.1.14 Probe Function Status (CHn Probe status)

Bit	Description
0	0: Disable the probe function 1: Enable the probe function
1	Probe rising edge trigger flag 0: Not triggered 1: Triggered
2	Probe falling edge trigger flag 0: Not triggered 1: Triggered
5 to 3	Reserved
7 to 6	Number of trigger times for probe function channel 0, ranging from 0 to 3. In continuous trigger mode, the number is increased by 1 each triggering action.

Bit	Description
15 to 8	Functions of probe function channel 1 (same as functions of probe function channel 0)
31 to 16	Reserved

10.1.15 Counter Position Value (CHn encoder present position)

Bit	Description
31 to 0	Current counter position value

10.1.16 Measured Value 1 (CHn Measure value 1)

Bit	Description
31 to 0	Integer part of the measured value

10.1.17 Measured Value 2 (CHn Measure value 2)

Bit	Description
31 to 0	The decimal part of the measured value equals the value after the actual value is multiplied by 10^8 and then rounded.

10.1.18 Latching Value at Rising Edge for Probe Function Channel 0 (CHn Probe 0 positive value)

Bit	Description
31 to 0	Latching value at rising edge for probe function channel 0

10.1.19 Latching Value at Rising Edge for Probe Function Channel 1 (CHn Probe 1 positive value)

Bit	Description
31 to 0	Latching value at rising edge for probe function channel 1

10.1.20 Latching Value at Falling Edge for Probe Function Channel 0 (CHn Probe 0 negative value)

Bit	Description
31 to 0	Latching value at falling edge for probe function channel 0

10.1.21 Latching Value at Falling Edge for Probe Function Channel 1 (CHn Probe 1 negative value)

Bit	Description
31 to 0	Latching value at falling edge for probe function channel 1

10.1.22 Error Code (CHn Error code)

Bit	Description
31 to 0	Error code. For details, see " <i>Fault Diagnosis</i> " on page 95.

10.1.23 Counter Control Command Value (CHn Encoder command value)

Bit	Description
0	Counter enable 0: Disable 1: Enable
1	Counter clearing through internal commands
2	Counter preset enabling through internal commands
3	Counter clearing enabling through external signals
4	Clear completion flag for counter clearing through external signals
5	Counter preset enabling through external signals
6	Clear completion flag for counter preset through external signals
15 to 7	Reserved

10.1.24DO Function Command Value (CHn DO function command value)

Bit	Description
0	DO0 output control
15 to 1	Reserved

10.1.25Counter Preset Value (CHn Encoder preset value)

Bit	Description
31 to 0	The value is between the maximum value and the minimum value of the counter.

10.1.26Probe Function Command Value (CHn Probe function command value)

Bit	Description
0	Probe function channel 0 enable 0: Disable 1: Enable
1	Trigger mode of probe function channel 0 0: Single trigger 1: Continuous trigger
2	Latching control at rising edge for probe function channel 0 0: Disable latching at rising edge 1: Enable latching at rising edge
3	Latching control at falling edge for probe function channel 0 0: Disable latching at falling edge 1: Enable latching at falling edge
7 to 4	Reserved
15 to 8	Probe function channel 1 (same as probe function channel 0)
31 to 16	Reserved

10.1.27 Comparison Function Command Value (CHn Compare function command value)

Bit	Description
0	Comparison function channel 0 enable 0: Disable 1: Enable
1	Reserved
4 to 2	Comparison type of comparison function channel 0 1: Multi-point comparison 2: Uniformly-spaced comparison
7 to 5	Control mode of comparison function channel 0 1: Time control 2: Pulse control 3: Level control
31 to 8	Reserved

10.1.28 Command Number or Step of Comparison Function Channel 0 (CHn Compare 0 command size or step)

Bit	Description
15 to 0	Multi-point comparison: Number of comparison points Uniformly-spaced comparison: Interval between comparison points (step)

10.1.29 Position Value 1 of Comparison Function Channel 0 (CHn Compare 0 position value 1)

Bit	Description
31 to 0	Multi-point comparison: Comparison position value Uniformly-spaced comparison: Comparison start position

10.1.30 Position Value 2 of Comparison Function Channel 0 (CHn Compare 0 position value 2)

Bit	Description
31 to 0	Multi-point comparison: Invalid parameter Uniformly-spaced comparison: Comparison end position

10.1.31 Comparison Function Control Parameter (CHn Compare function command parameter)

Bit	Description
31 to 0	Time control: Holding time (in the unit of μs) of the comparison output signal, with the minimum of 10 μs . Pulse control: Number of pulses input to the counter. In this case, the holding time of the comparison output signal equals the number of counter pulses multiplied by the pulse cycle. Level control: The value is the initial level. Only the lowest bit is active. When the value is 0, it indicates low level. When the value is 1, it indicates high level. The output level is inverted when the comparison output is active.

10.1.32 Module Fault Information (Module Diagnosis information)

Bit	Description
16 to 0	Record the fault information of the module. For details, see " Fault Diagnosis " on page 95.

10.1.33 Channel 0 Fault Information (Ch0 Diagnosis information)

Bit	Description
16 to 0	Record the fault information of channel 0. For details, see " Fault Diagnosis " on page 95.

10.1.34 Channel 1 Fault Information (Ch1 Diagnosis information)

Bit	Description
16 to 0	Record the fault information of channel 1. For details, see " Fault Diagnosis " on page 95.

10.2 Appendix 2: Relationship Between Different Module Configurations and Communication Cycles

When the GL20-2HC module is used with the GL20-RTU-ECT32 communication interface module, the relationship between different configurations and communication cycles is shown in the following table.

Configuration	Number of modules	Minimum cycle (μ s) of EtherCAT communication
N*2HC	n = 1	3000
	n = 2	5000
	n = 3	6000
	n = 4	7000
n x 2Hc + m x IO(16)	n = 1, m = 15	4000
	n = 2, m = 14	6000
	n = 3, m = 13	7000
	n = 4, m = 12	8000
n x 2HC + m x IO(32)	n = 1, m = 31	5000
	n = 2, m = 30	6000
	n = 3, m = 29	8000
	n = 4, m = 28	9000
4*2HC+n*2S485+m*IO(16)	n = 1, m = 11	8000
	n = 2, m = 10	9000
	n = 3, m = 9	9000
	n = 4, m = 8	9000
4*2HC+n*2S485+m*IO(32)	n = 1, m = 27	9000
	n = 2, m = 26	10000
	n = 3, m = 25	10000
	n = 4, m = 24	10000

Note

The I/O module refers to the DI/DO module, analog module, and temperature module.

10.3 Appendix 3: Relationship Between External Input Signals and Module Configuration When the Probe Function Is Used

The following table shows the relationship between external input signals and configurations when the probe function is enabled for the GL20-2HC module used with the GL20-RTU-PN module.

Configuration	Number of modules	External minimum input cycle (μ s)
n x 2HC	n = 1	5000
	n = 2	6000
	n = 3	7000
	n = 4	7000
n x 2HC + m x IO (16)	n = 1; m = 15	8000
	n = 2; m = 14	8000
	n = 3; m = 13	9000
	n = 4; m = 12	9000
n x 2HC + m x IO (32)	n = 1; m = 31	10000
	n = 2; m = 30	11000
	n = 3; m = 29	11000
	n = 4; m = 28	12000

Note

The I/O module refers to the DI/DO module, analog module, and temperature module.

10.4 Appendix 4: Version Matching Information

Contact Inovance technical support to obtain the firmware of the GL20-2HC module and the firmware of the communication interface module. XML files and the AutoShop/InoProShop software can be downloaded from the <https://www.inovance.com>. The following table describes the version matching information.

Module firmware version	Communication interface module firmware version	XML/GSD file version	InoProShop version
Board software: 1.2.3.0 and later	- GL20-RTU-ECT32: Board software 3.0.1.0 and later - GL20-RTU-PN: Board software 2.2.3.0 and later	- GL20-RTU-ECT32: 3.0.7.0 and later - GL20-RTU-PN: GSDML-V2.31-inovance-GL20-20230901 and later	InoProShopV1.8.1.3