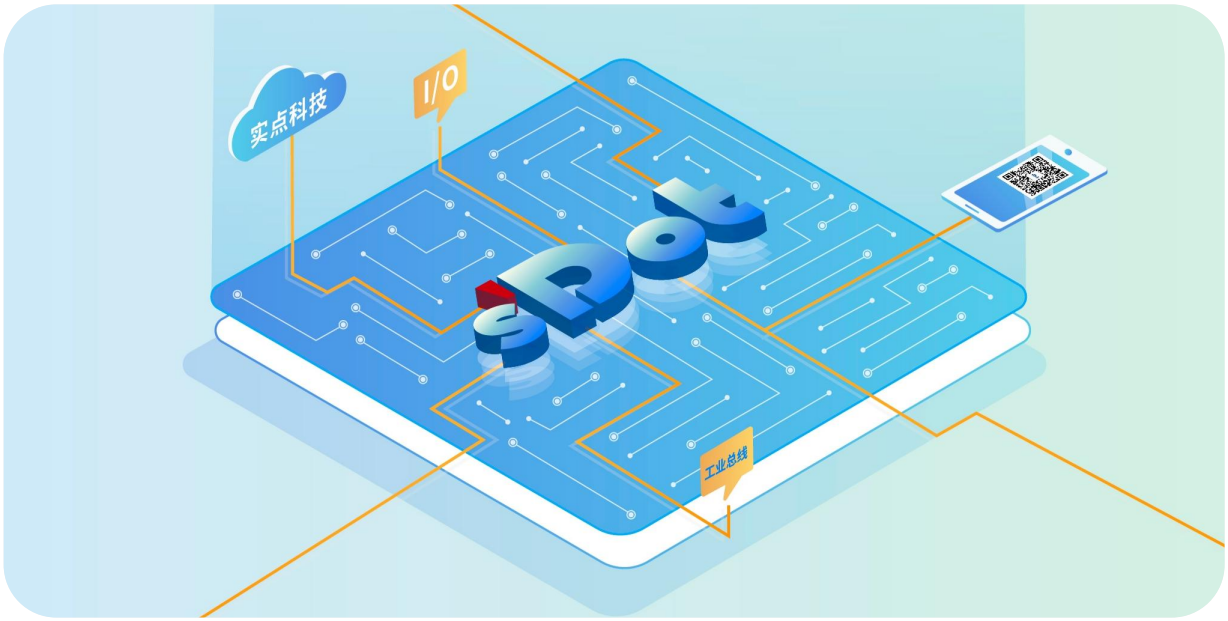

PN4-GW2MR

Integrated Gateway Module

User Manual

Nanjing Solidot Electronic Technology Co., Ltd.

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Nanjing Solidot Electronic Technology Co., Ltd.
Address: 11th Floor, Angying Building, No. 91 Shengli Road, Jiangning District, Nanjing City, Jiangsu Province
Postal code: 211106
Telephone: 4007788929
Website:http://www.solidotech.com

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1 Product Overview

1.1 Product Introduction

The PN4-GW2MR is an integrated PROFINET to 2-port Modbus RTU gateway module that enables data communication between PROFINET and Modbus RTU networks. It can connect two Modbus networks to the PROFINET network respectively and supports different Modbus communication baud rates and other settings, effectively converting Modbus devices into PROFINET devices.

1.2 Product Features

- Wide range of applications
  This product is widely used in frequency converters, intelligent high and low voltage electrical appliances, power measurement devices, intelligent field measurement equipment, instruments, PLCs, DCSs, FCSs, etc. that support serial communication interfaces.
- Simple configuration
  Simply refer to the manual and configure the gateway according to the requirements; no complex programming is needed to achieve connectivity in a short time.
- Easy to diagnose
  The innovative channel indicator light design is placed close to the channel, making the channel status clear at a glance and facilitating inspection and maintenance.
- Easy configuration
  It is easy to configure and supports mainstream master sites.
- Easy to install
  DIN 35 mm standard rail mounting
  It adopts spring-loaded terminal blocks, making wiring convenient and quick.

2 Product Parameters

2.1 General parameters

Interface parameters	
Product Model	PN4-GW2MR
System power supply	24 VDC (18V~36V)
Bus protocol	PROFINET
Input/output process data volume	Maximum 1440 bytes
Bus interface	2×RJ45
Technical parameters	
Serial communication interface	Route 2
Serial communication interface type[1]	RS232, RS485, RS422
Modbus communication type	Master station or slave station
baud rate	1200bps~115200bps
working methods	Half-duplex, Full-duplex
Verification method	No parity, odd parity, even parity
Data bits	7-bit, 8-bit, 9-bit
Stop bit	1st digit, 2nd digit
Function code	As a Modbus master station, it supports functions numbered 01H, 02H, 03H, 04H, 05H, 06H, 0FH, and 10H.
Power consumption	Maximum 3.5W

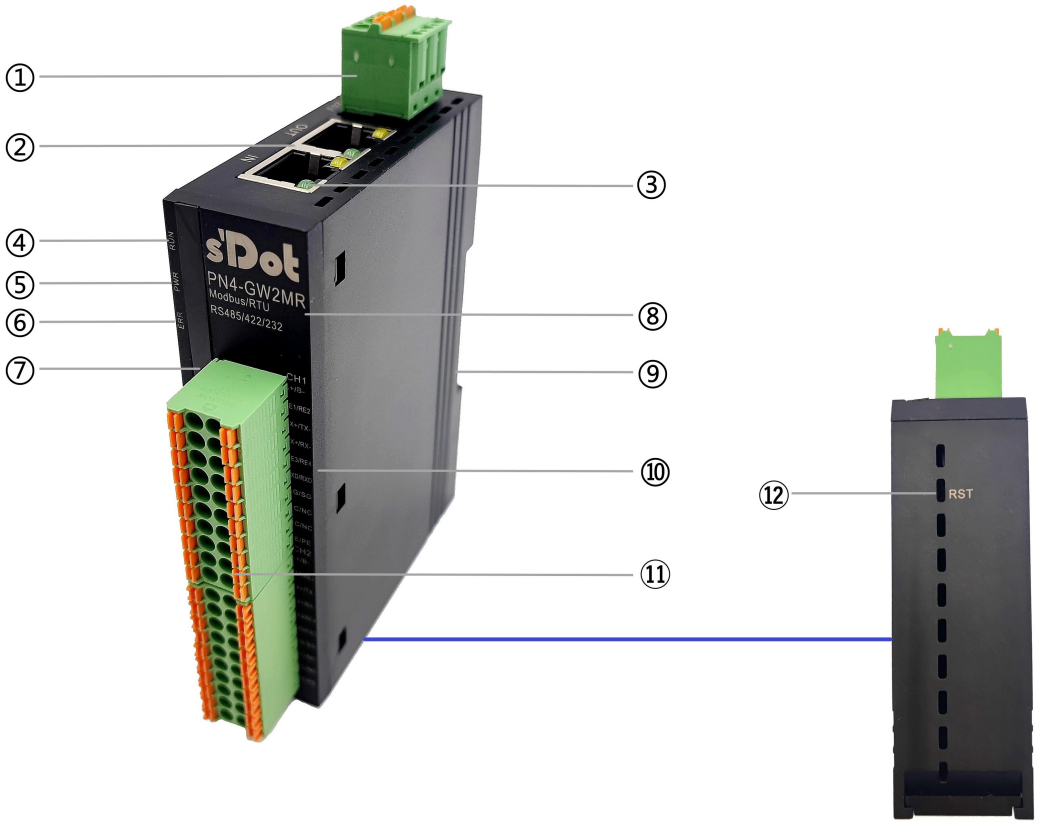
weight	140g
size	102×72×25 mm
Installation method	DIN 35mm rail mounting
Operating temperature	-25℃ to +55℃
relative humidity	95%, no condensation
Protection level	IP20

Note [1]: Two serial communication interfaces can be connected to different Modbus networks.

3 Panel

3.1 Panel structure

Product Parts Names



Serial Number	Name	Illustrate
①	Power interface	3P terminal
②	Bus interface	2×RJ45
③	Network port indicator	Link and data transmission/reception status

④	Operation indicator light	Module running status
⑤	Power indicator light	Module power status
⑥	Alarm indicator	Indicator module alarm status
⑦	Channel signal indicator	Indicates the status of the corresponding channel
⑧	Module identifier	Mark module model and function
9	Guide rail slot	Fixed module
⑩	Channel signage	Signal corresponding channel identifier
⑪	Channel Interface	2×20P terminal
⑫	Clear gateway configuration switch	Press and hold the power button for 2 seconds, then release to clear the gateway configuration.

3.2 Indicator light function

Name	Logo	Color	State	Status Description
Power indicator light	PWR	green	ON	Power supply is normal
			Extinguish	The product is not powered on or the power supply is abnormal.
Communication indicator light	RUN	green	ON	PN communication is normal
			Extinguish	The system is not working.
Fault indicator light	ERR	red	ON	PN communication error
			blinking	PN communication connection failed.
Input channel indicator	RX	green	blinking	The channel is receiving data.
			Extinguish	No data received from the channel
Output channel indicator	TX	green	blinking	Data is being sent through the channel.
			Extinguish	No data sent from the channel

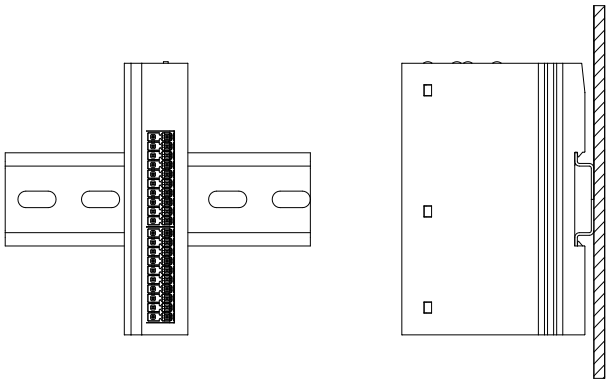
4 Installation and removal

Installation/Removal Precautions

- Ensure that the server rack has good ventilation (such as installing exhaust fans in the server rack).
- Do not install this device next to or above equipment that may cause overheating.
- Make sure the module is installed vertically and that there is sufficient clearance between the module and surrounding equipment.
- Installation/removal must be performed with the power off.

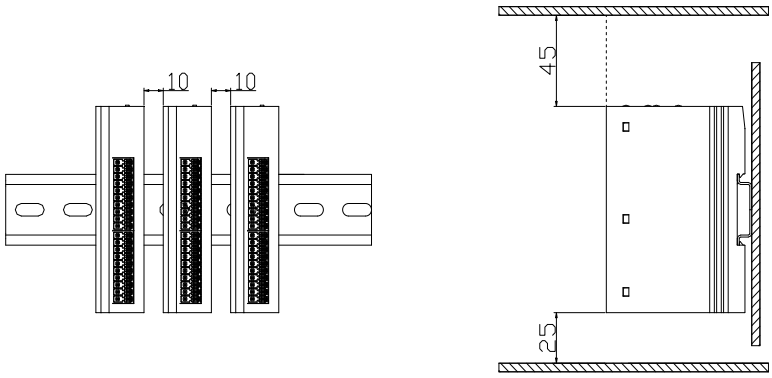
Installation direction

To ensure proper heat dissipation, the module must be installed vertically to ensure unobstructed airflow inside the module.



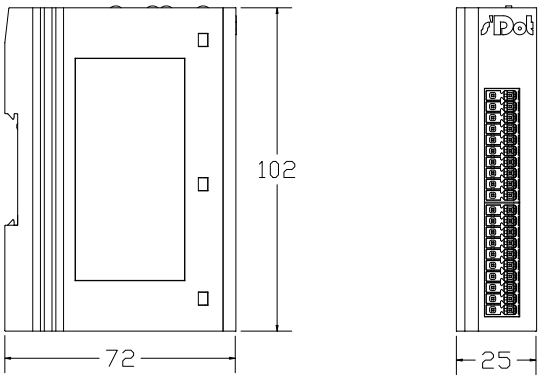
Minimum spacing

The module has an IP20 protection rating and must be installed inside a box or cabinet. During installation, please maintain the minimum spacing (unit: mm) between the module and other modules or heat-generating devices, or between the module and other devices or wiring channels above and below it, as shown in the diagram below.



4.1 External dimensions

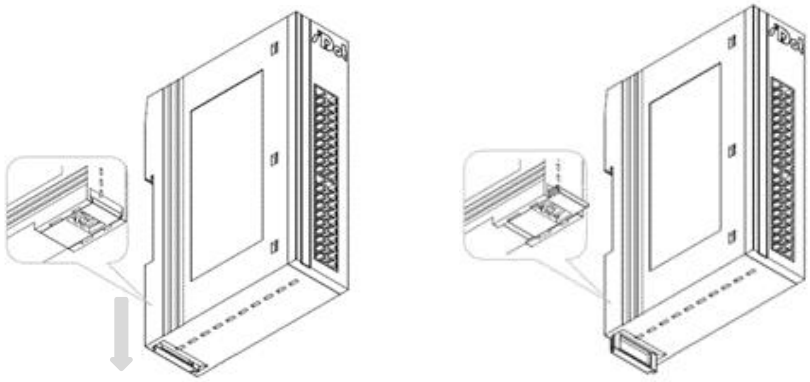
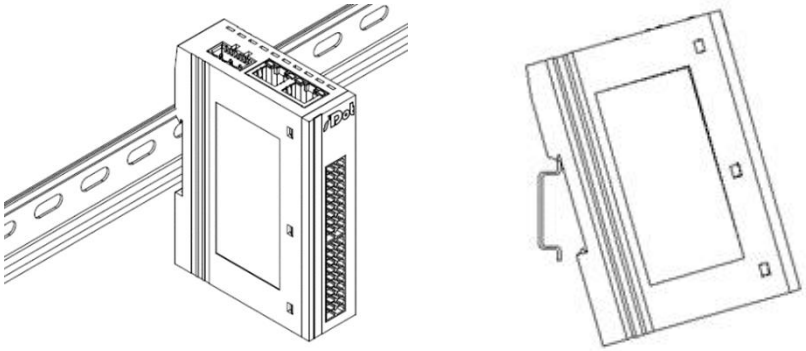
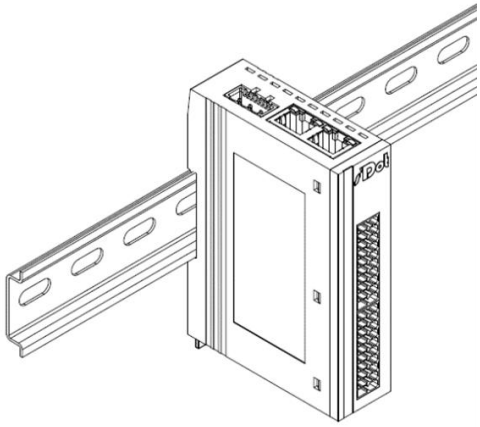
External dimensions (unit: mm)

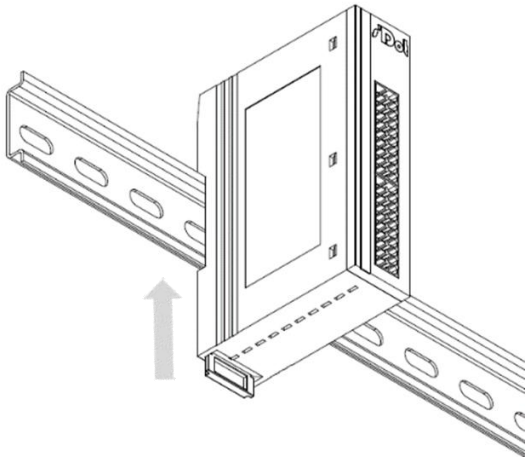


Installation method:

1. Top and bottom aligned;
2. DIN 35 mm guide rail, snap-on installation.

4.2 Installation and removal

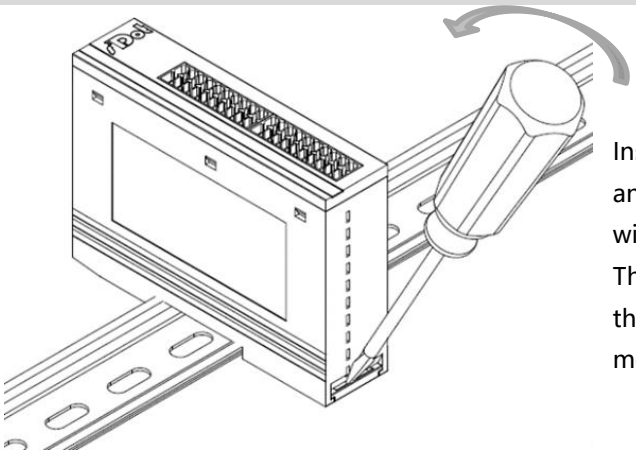
Install	step
	Push the latch at the bottom of the module outwards, as shown in Figure ①, until you hear a "click" sound.
①②	
	Align the upper edge of the module clip with the upper edge of the guide rail, and place the module into the guide rail, as shown in Figures ③ and ④.
③ ④	
	The modules are positioned as shown in Figure ⑤.
⑤	



Push the clip along the guide rail until you hear a click, indicating that the module installation is complete, as shown in Figure 6.

⑥

Disassembly	step



Insert the flathead screwdriver into the clip and apply force towards the module (you will hear a sound), as shown in Figure 7. Then, remove the module by performing the reverse operation of installing the module.

⑦

5 Wiring

5.1 Terminal blocks

Terminal blocks		
Signal line terminals	Extreme number	2 × 20 P
	wire diameter	22~17 AWG 0.3~1.0 mm²
Power terminals	series	3 P
	wire diameter	22~16 AWG 0.3~1.5 mm2
Bus interface	2 × RJ45	UTP or STP of Category 5 or higher (STP recommended)

5.2 Wiring instructions and requirements

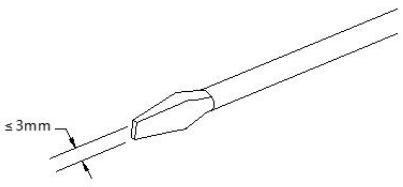
Power connection precautions

- The power supply for the module system side and the power supply for the field side should be configured and used separately. Do not mix them.
- The PE element must be reliably grounded.

Wiring tool requirements

The terminals feature a screwless design, allowing for easy installation and removal of cables.

Flathead screwdriver operation (size: ≤3mm).



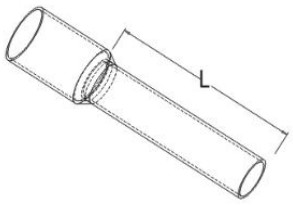
Stripping length requirements

Recommended stripping length: 10 mm.

Wiring method

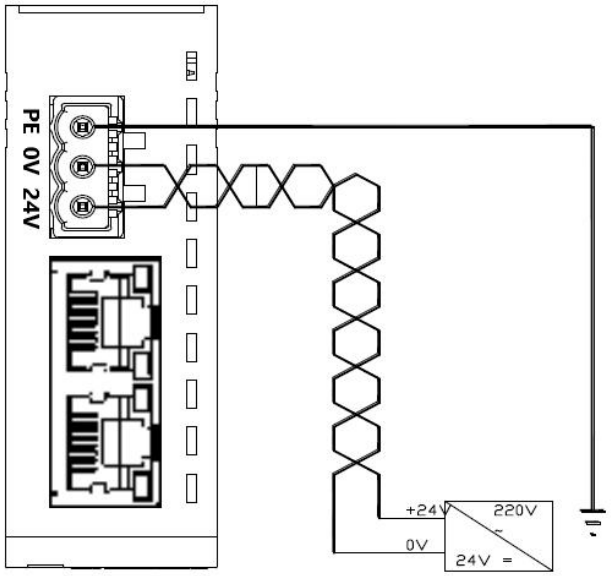
For a single-strand rigid wire, after stripping the wire to the corresponding length, press the button to insert the single-strand wire.

After stripping the wire to the corresponding length, use the corresponding standard cold-pressed terminal (tubular insulated terminal, see the table below for reference specifications) and press the button to insert the wire.

Specifications of tubular insulated ends		
Specifications	model	conductor cross-sectional area (mm^2)
 Tubular insulated terminalsLThe length is10mm	E0310	0.3
	E0510	0.5
	E7510	0.75
	E1010	1.0
	E1510	1.5

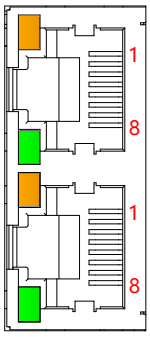
Power wiring

The module uses DC24V power, and twisted-pair cable is recommended for the power supply. The power connection is shown in the figure below.



Bus wiring

It uses a standard RJ45 network interface and a standard crystal connector, and the pin assignment is shown in the figure below.

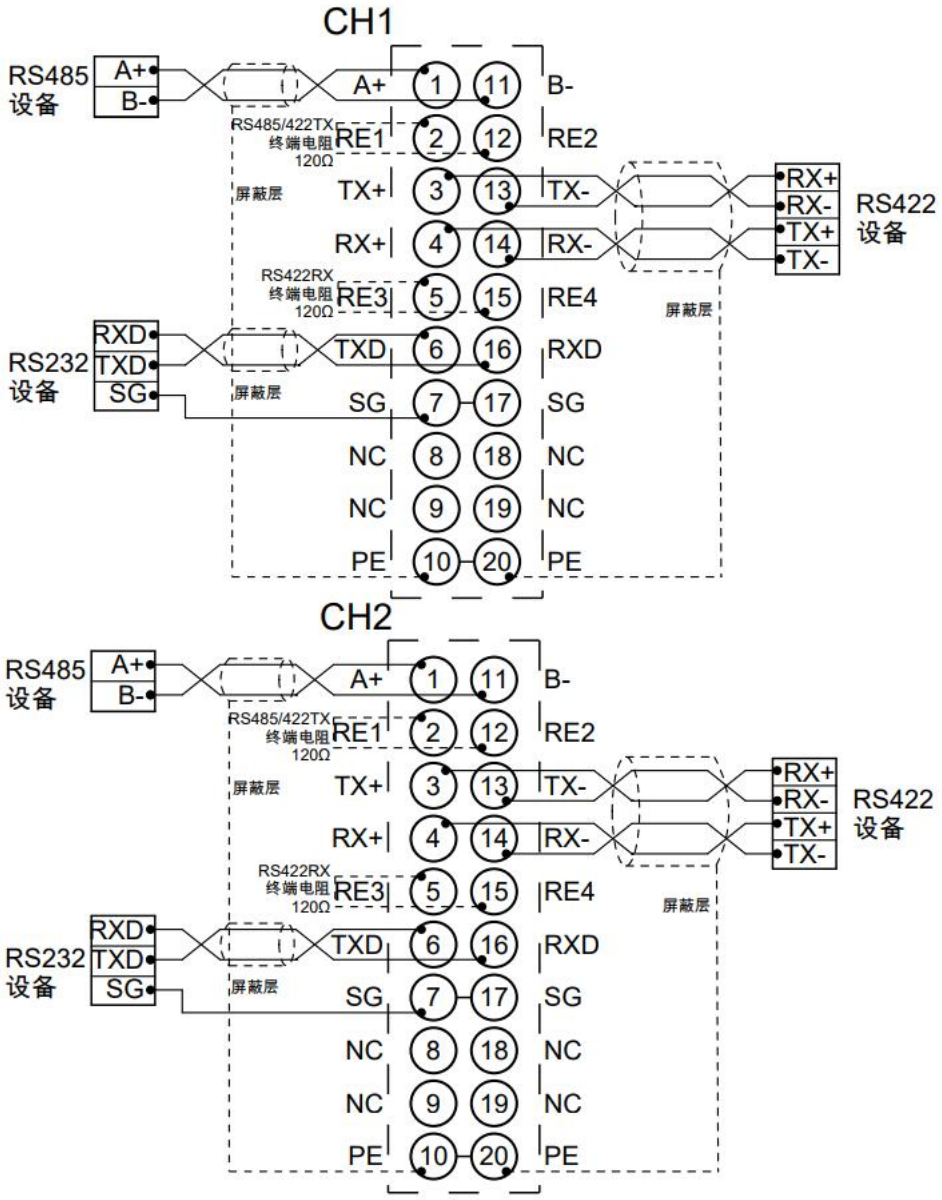


pin number	Signal
1	TD+
2	TD-
3	RD+
4	one
5	one
6	RD-
7	one
8	one

☛ Precautions

- Category 5 or higher double-shielded (braided mesh + aluminum foil) STP cables are recommended for use as communication cables.
- The length of cables between devices must not exceed 100 m.

5.3 Wiring diagram



*SG is signal ground, internally conductive; PE is shielding ground, internally conductive.

*When matching resistors are required in RS485 mode, RE1 and RE2 can be shorted.

*When matching resistors are required in RS422 mode, RE1, RE2, RE3, and RE4 can be shorted respectively.

*The cable should be a shielded twisted pair and reliably grounded.

5.4 Terminal block definition

CH1					
Terminal markings	**Terminal Definition**	**illustrate**	**Terminal markings**	**Terminal Definition**	**illustrate**
1	A+	RS485 send+	11	B-	RS485 transmission -
2	RE1	RS485/422TX terminating resistor 120Ω	12	RE2	RS485/422TX terminating resistor 120Ω
3	TX+	RS422 send+	13	TX-	RS422 transmit -
4	RX+	RS422 receiver +	14	RX-	RS422 receiver -
5	RE3	RS422TX terminating resistor 120Ω	15	RE4	RS422TX terminating resistor 120Ω
6	TXD	RS232 transmitter	16	RXD	RS232 receiver
7	SG	RS232 signal ground	17	SG	RS232 signal ground
8	NC	Empty terminal	18	NC	Empty terminal
9	NC	Empty terminal	19	NC	Empty terminal
10	PE	Shielding	20	PE	Shielding
CH2					
Terminal markings	**Terminal Definition**	**illustrate**	**Terminal markings**	**Terminal Definition**	**illustrate**
1	A+	RS485 send+	11	B-	RS485 transmission -
2	RE1	RS485/422TX terminating resistor 120Ω	12	RE2	RS485/422TX terminating resistor 120Ω
3	TX+	RS422 send+	13	TX-	RS422 transmit -
4	RX+	RS422 receiver +	14	RX-	RS422 receiver -
5	RE3	RS422TX terminating resistor 120Ω	15	RE4	RS422TX terminating resistor 120Ω
6	TXD	RS232 transmitter	16	RXD	RS232 receiver
7	SG	RS232 signal ground	17	SG	RS232 signal ground
8	NC	Empty terminal	18	NC	Empty terminal
9	NC	Empty terminal	19	NC	Empty terminal
10	PE	Shielding	20	PE	Shielding

6 Use

6.1 Process data

6.1.1 Data exchange

The data conversion between the PROFINET network and the serial port of the PN4-GW2MR is established through a "mapping" relationship. The PN4-GW2MR has two data buffers: one is an input buffer (1500 bytes), with an address range of 0x000~0x5DB; the other is an output buffer (1500 bytes), with an address range of 0x5DC~0xBB7.

6.1.2 PROFINET slave station

Assuming the length of the user-configured input data is L1 and the length of the output data is L2, the PN4-GW2MR will send data in the address range [0x000, L1] to the PROFINET network. When data is received from the PROFINET network, the PN4-GW2MR will write the data to the address range [0x5DC, 0x5DC+L2].

6.1.3 Modbus main station

When a serial port is running the Modbus master protocol, for all write register and write coil commands supported by the PN4-GW2MR, data can be retrieved from the address range of 0x000~0x5DB and 0x5DC~0xBB7 and sent to the Modbus slave. For all read register and read coil commands supported by the PN4-GW2MR, the PN4-GW2MR will write the data returned from the Modbus slave to the range of 0x000~0x5DB.

Note: Each Modbus master can be configured with 32 commands, and each command can read a set of consecutive Modbus registers.

6.1.4 Modbus slave station

When a serial port runs the Modbus slave protocol, no commands need to be configured. The module retrieves data from the address range of 0x000~0x5DB and 0x5DC~0xBB7 and sends it to the Modbus master.

6.1.5 General Pattern - Question and Answer

When a serial port is running a general-mode query-response protocol, the command request portion can retrieve data from any location in the buffer (0x000~0x5DB, 0x5DC~0xBB7) and then send it to the slave serial device. When the slave device responds, if the response contains data, the PN4-GW2MR will write the data portion of the response to the range 0x000~0x5DB; the amount of data depends on the user's configuration.

6.1.6 Universal Mode - Receiver

When a serial port is running in general mode - receive protocol, the PN4-GW2MR's serial port only receives data sent by the user's serial master device and does not respond in any way. In this mode, the PN4-GW2MR writes the received data to a region within the address range of 0x000~0x5dB.

6.1.7 Command output mode

This section applies only to the Modbus master protocol and the general-mode question-and-answer protocol. Command execution process:

1. Set the number of timeout retransmissions to 0;
2. A request frame to send a command. After sending, a response timeout timer begins counting down.
3. Waiting for the response frame of the command;
4. If a response frame is received within the response timeout period, a response is considered received. Whether the response is correct depends on the specific response format. If the response frame is correct, command execution ends. If no response frame is received within the response timeout period, a response timeout is considered received. In case of response error or response timeout, proceed to step 5.
5. Check if the retransmission count is 3. If it is 3, the command execution ends. Otherwise, increment the timeout retransmission count by one and proceed to step 2.

Continuous output mode:

In the master station protocol, each command has a unique command index number within each subnet.

When the master station protocol operates in continuous output mode (output command polling mode), it executes in the following manner:

1. Execute command number n;
2. After command n is executed, increment n by one. If the number of commands exceeds the maximum number of commands, set n to 0. Re-enter step 1.

Change output mode:

When the master station protocol operates in a changing output mode, it executes as follows:

1. If command n is a read command, execute command n. Otherwise, check if the memory data mapping data contained in the request frame of command n has changed; if it has changed, execute command n.

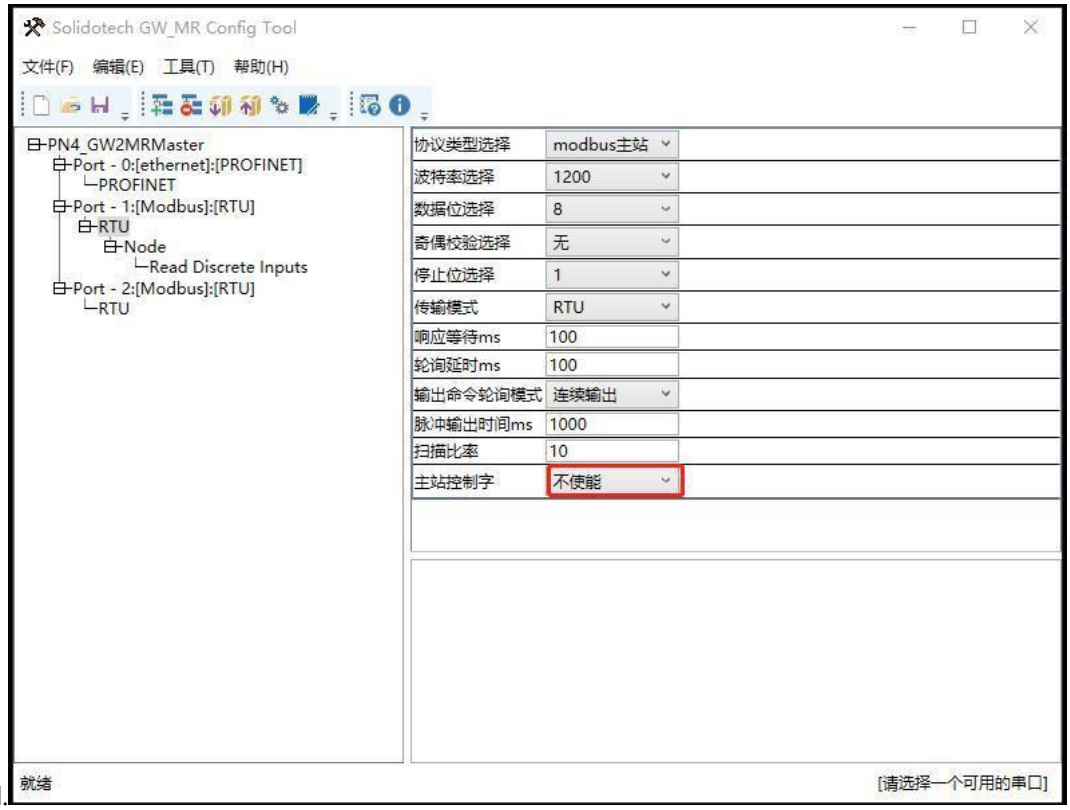
2. If command n is executed, wait for command n to complete, increment n by one, and if the number of commands exceeds the maximum number of commands, set n to 0. Re-enter step 1.

6.1.8 control word

To enable users to control Modbus networks via PROFINET, the concept of control words has been introduced in Modbus configuration. If control words are enabled, the output data of the control word in PROFINET occupies 2 words, as shown in the table below:

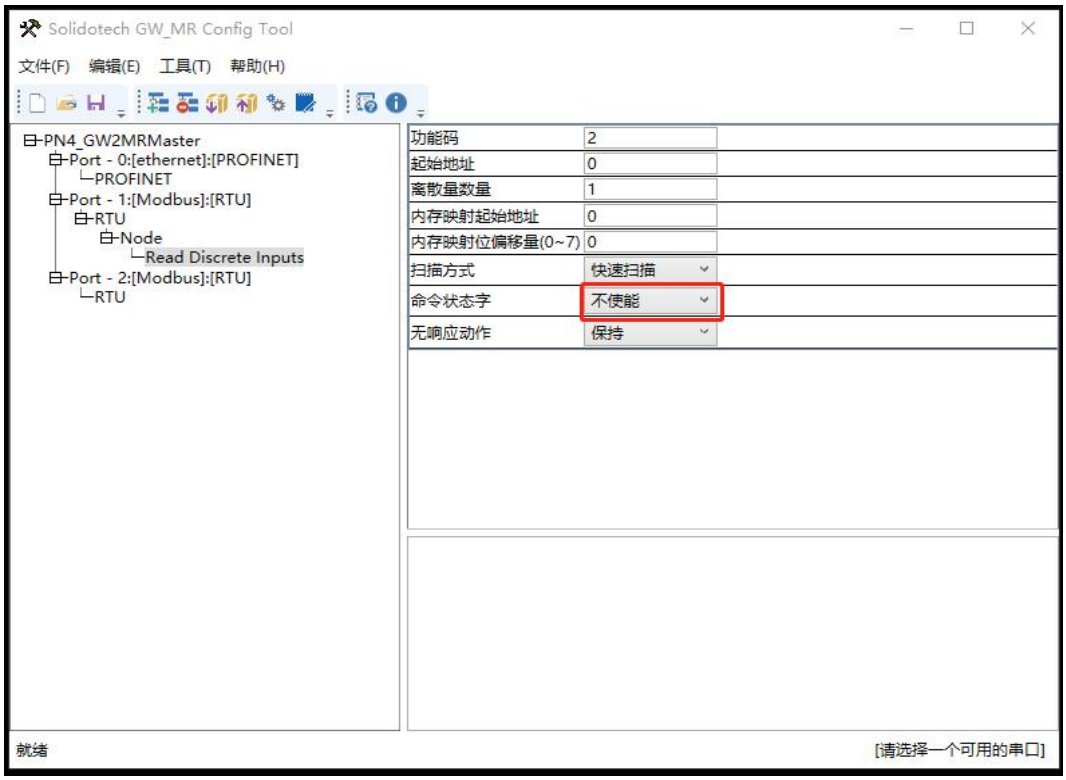
Word1	High byte	Low Byte
	Port2 control bit	Port1 control bit
Word2	High byte	Low Byte
	reserve	Port3 control bit

Portx control bit: 0, Modbus master for this port is not started; 1, Modbus master for this port is started.



6.1.9 status word

To facilitate obtaining the execution status of each command under each master station, a status word is introduced. The status word is only applicable to the Modbus master station protocol.



The status word uses each bit to indicate whether each command was executed successfully or not. When a command is executed successfully, the corresponding bit is set to 1, otherwise it is set to 0.

If a status word for a command is enabled, space is allocated for the input data of that command in PROFINET, with each command occupying one bit. The allocation of status words is in units of words, and the number of input data areas occupied (words) = (number of commands with enabled status words + 15) / 16.

For example, two nodes were added, and nine commands were added to each node, for a total of 18 commands.

- For example, if all commands in node1 and node2 enable status words, then the number of input data areas occupied is (18+15)/16=2, which means two words are needed.

		7th	6th position	Position 5	4th position	Position 3	Position 2	Bit 1	Bit 0
Word1	Low Byte	Node1_ cmd8	Node1_ cmd7	Node1_ cmd6	Node1_ cmd5	Node1_ cmd4	Node1_ cmd3	Node1_ cmd2	Node1_ cmd1
	High	Node2_	Node2_	Node2_	Node2_	Node2_	Node2_	Node2_	Node1_
	Byte	cmd7	cmd6	cmd5	cmd4	cmd3	cmd2	cmd1	cmd9
	Low Byte	reserve	reserve	reserve	reserve	reserve	reserve	Node2_ cmd9	Node2_ cmd8

Word2	High Byte	reserve	reserve	reserve	reserve	reserve	reserve	reserve	reserve

- For example, if command 1, command 4 and command 8 of node1 enable the status word, and command 3 and command 7 of node2 enable the status word, while other commands are not enabled, then the number of input data areas occupied = ((3+2)+15)/16 = 1, that is, 1 word is required.

		7th	6th position	Position 5	4th position	Position 3	Position 2	Bit 1	Bit 0
Word1	Low Byte	reserve	reserve	reserve	Node2_ cmd7	Node2_ cmd3	Node1_ cmd8	Node1_ cmd4	Node1_ cmd1
	High Byte	reserve	reserve	reserve	reserve	reserve	reserve	reserve	reserve

If no status word is enabled for any command, no input data space is occupied.

6.2 Module configuration instructions

6.2.1 Applications under the TIA Portal V17 software environment

1、Preparation

- **Hardware environment**
  - **Module model PN4-GW2MR**
  - **One computer, pre-installed with TIA Portal V17 software.**
  - **PROFINET dedicated shielded cable**
  - **One Siemens PLC is required. This instruction manual uses the Siemens S7-1500 CPU 1511-1 PN as an example.**
  - **One switching power supply**
  - **Module mounting rails and rail fasteners**
  - **Device configuration file**

    Configuration file retrieval address:https://www.solidotech.com/cn/resources/configuration-files
- **Hardware configuration and wiring**

  Please follow the instructions.4 Installation and Removal"5. Wiring"Required Operation"

2、New construction projects

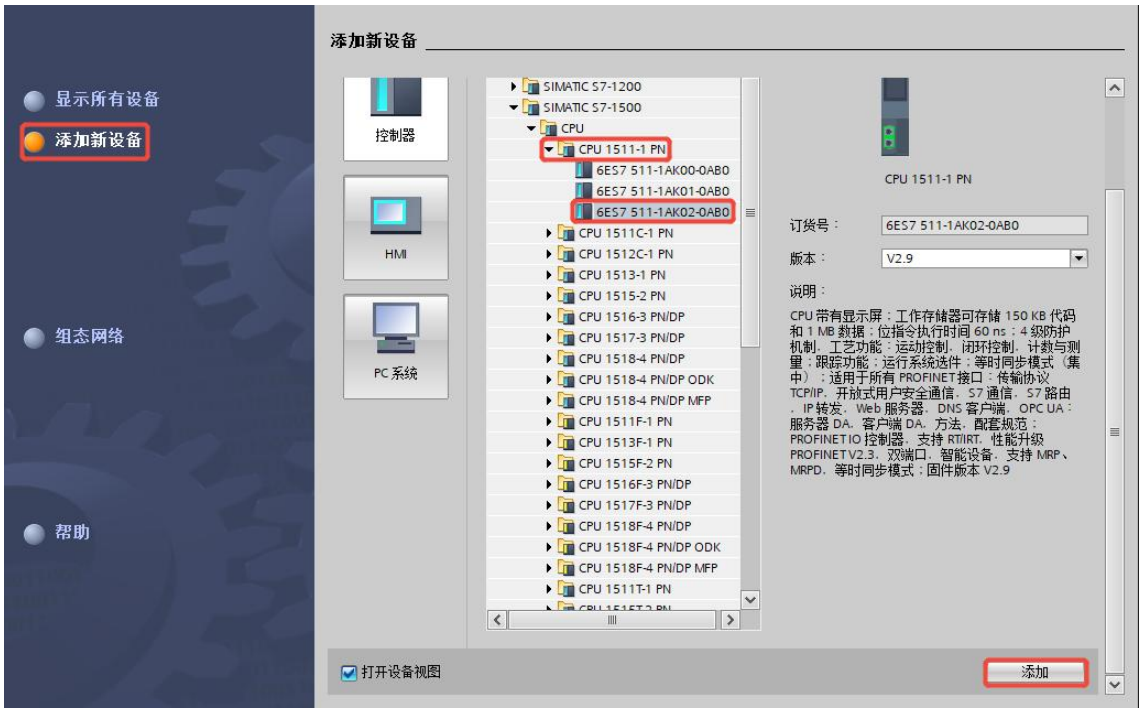
a. Open the TIA Portal V17 software, click "Create New Project", enter all the information and click the "Create" button, as shown in the figure below.

- Project name: Custom, you can keep the default.
- Path: Keep the project path; you can keep the default.
- Version: You can keep the default.
- Author: You can keep the default setting.
- Note: This is customizable and can be left blank.

3、 Add PLC controller

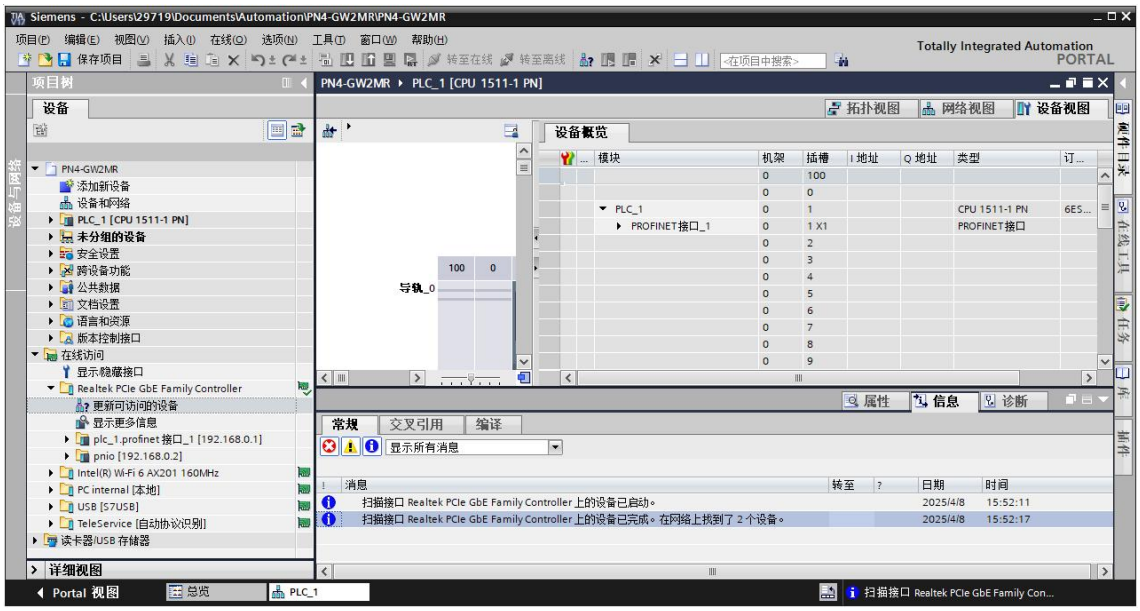
a. Click "Configure Devices", as shown in the figure below.

b. Click "Add New Device", select the PLC model you are currently using, and click "Add", as shown in the image below. After adding, you can see that the PLC has been added to the device navigation tree.



4、Scan connection device

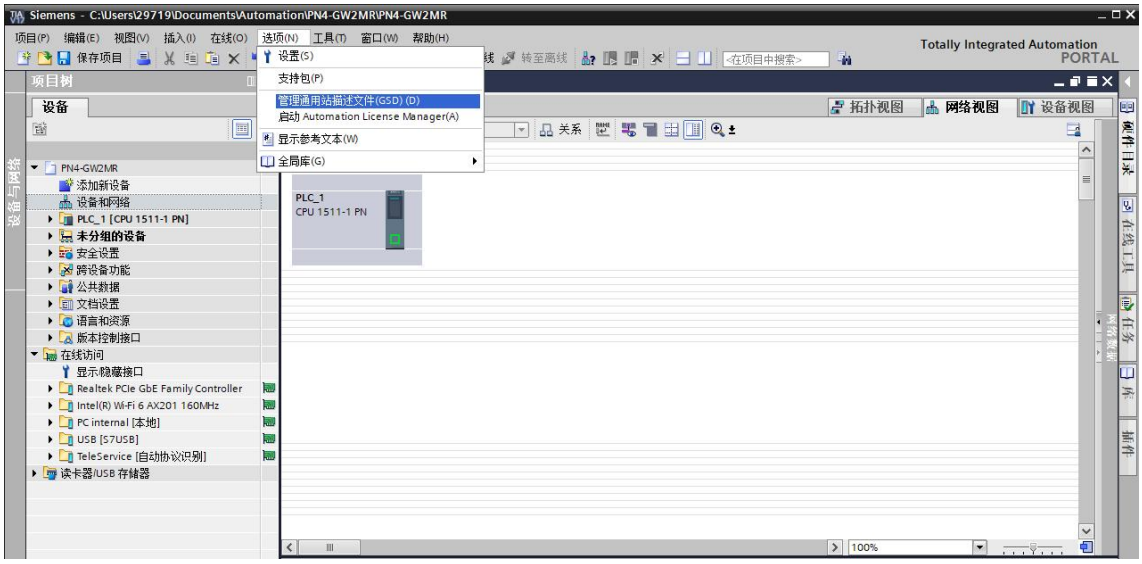
a. Click "Online Access -> Update Accessible Devices" in the left navigation tree, as shown in the image below. Once the update is complete, the connected slave devices will be displayed, as shown in the image below.



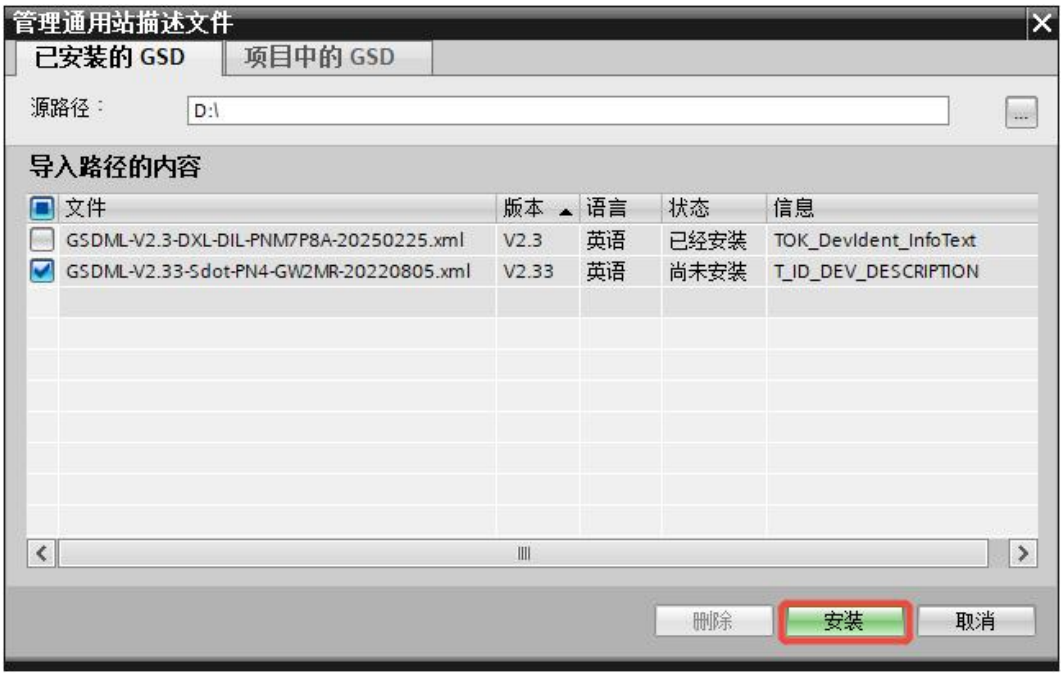
The computer's IP address must be on the same network segment as the PLC. If they are not on the same network segment, change the computer's IP address and repeat the above steps.

5、Add GSD configuration file

a. In the menu bar, select "Options -> Manage General Station Description Files (GSDML)(D)", as shown in the figure below.

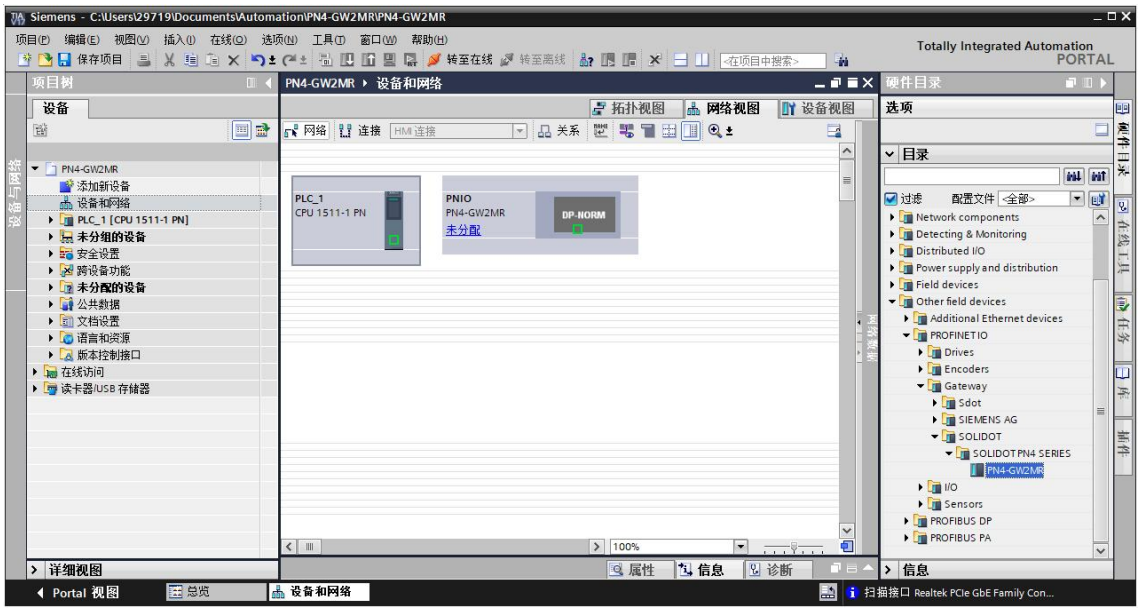


b. Click "Source Path" to select the folder, and check if the status of the GSD file to be added is "Not Installed". If not, click the "Install" button; if already installed, click "Cancel" to skip the installation steps.As shown in the figure below.

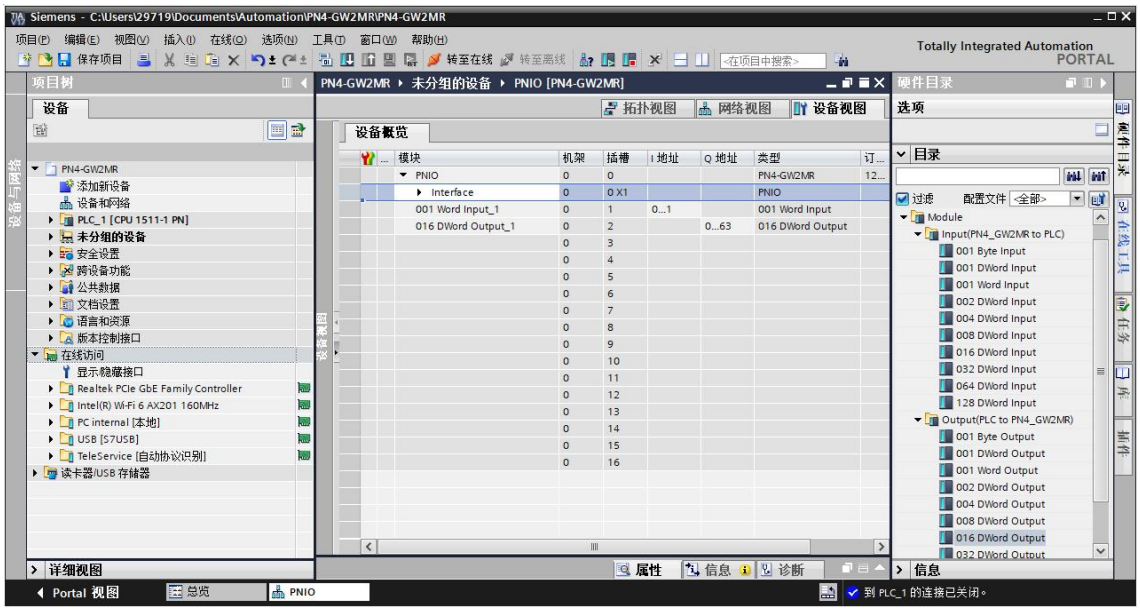


6、Add gateway module

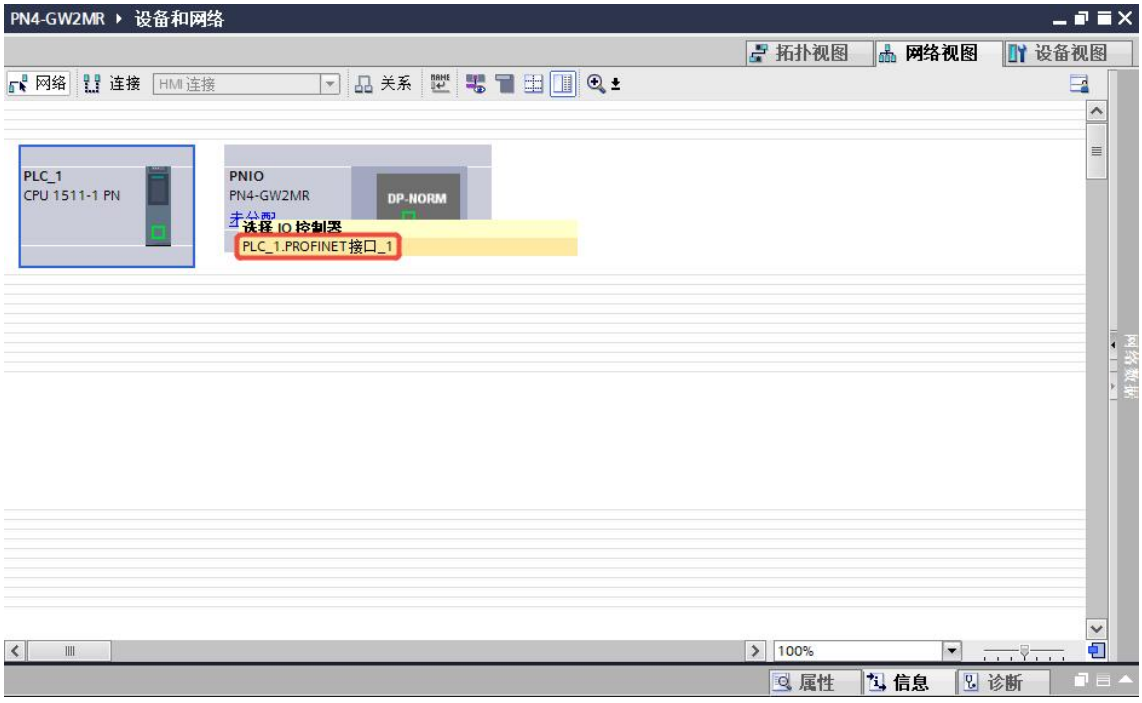
a. Double-click "Device and Network" in the left navigation bar, click the vertical button in the "Hardware Catalog" on the right, select "Other field devices -> PROFINET IO -> Gateway -> SOLIDOT -> SOLIDOT PN4 SERIES -> PN4-GW2MR", and drag or double-click PN4-GW2MR to "Network View", as shown in the figure below.



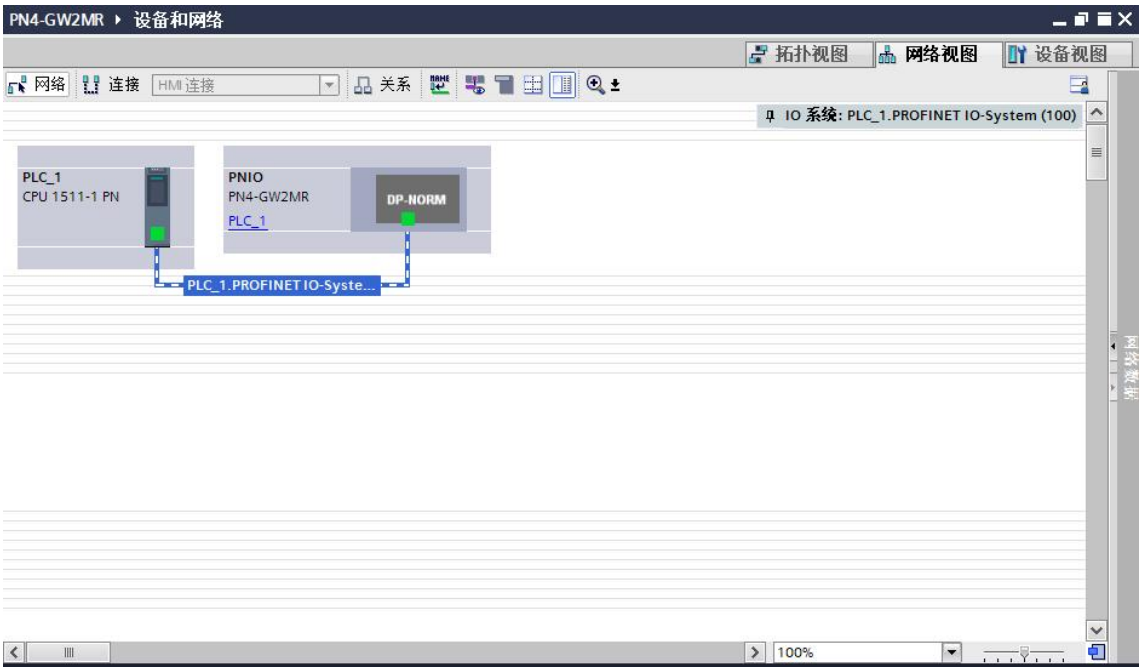
b. Select the gateway module, switch to the device view, and in the hardware directory, double-click or drag Input modules / Output modules to add input and output bytes, as shown in the figure below.



c. Switch to network view, click "Unassigned (blue text)" on the gateway module (slave device), and select "PLC_1.PROFINET interface_1", as shown in the figure below.

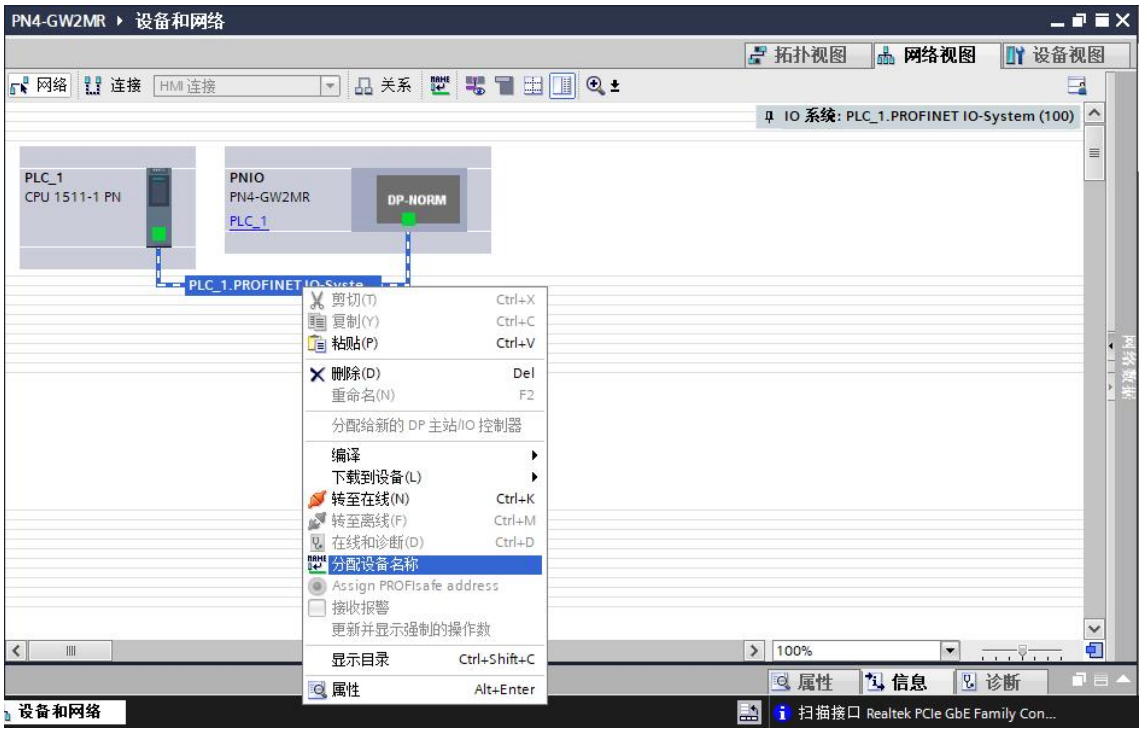


d. Once the connection is complete, it will look like the image below.

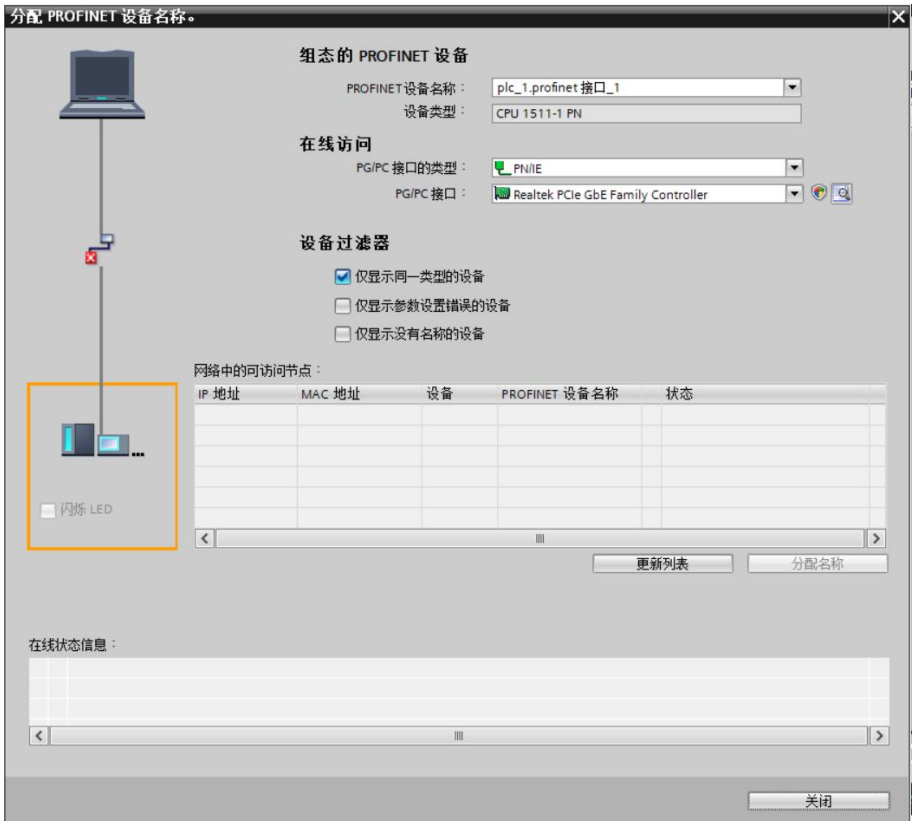


7、Assign device name

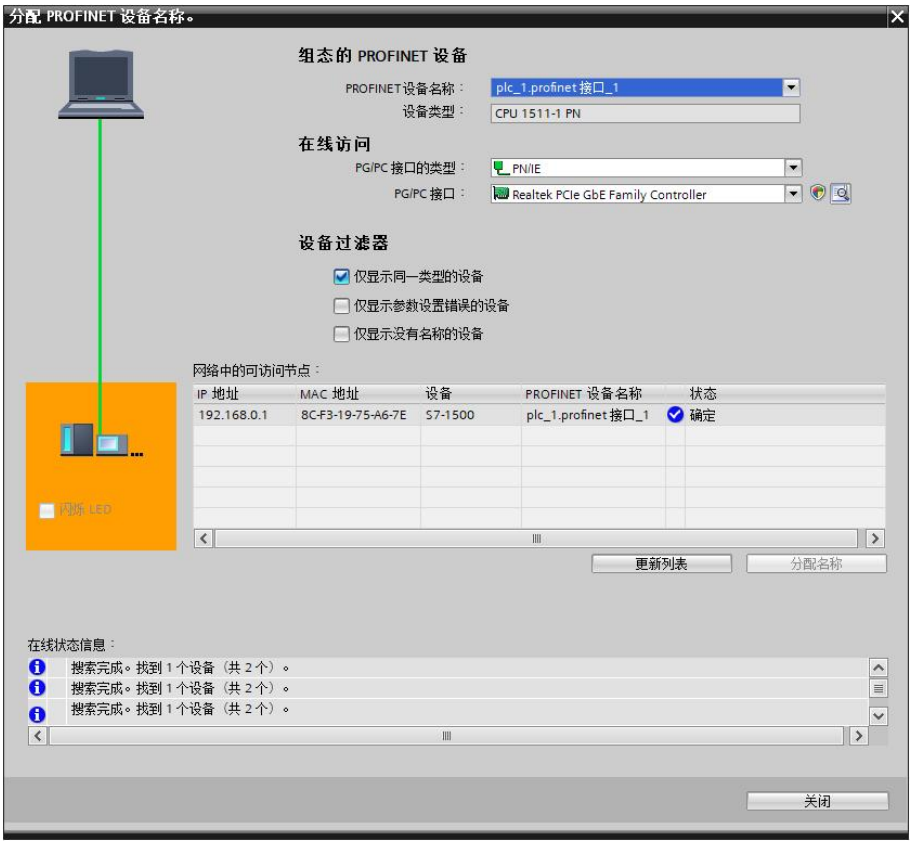
a. In the network view, right-click the connection cable between the PLC and the gateway module, and select "Assign Device Name", as shown in the figure below.



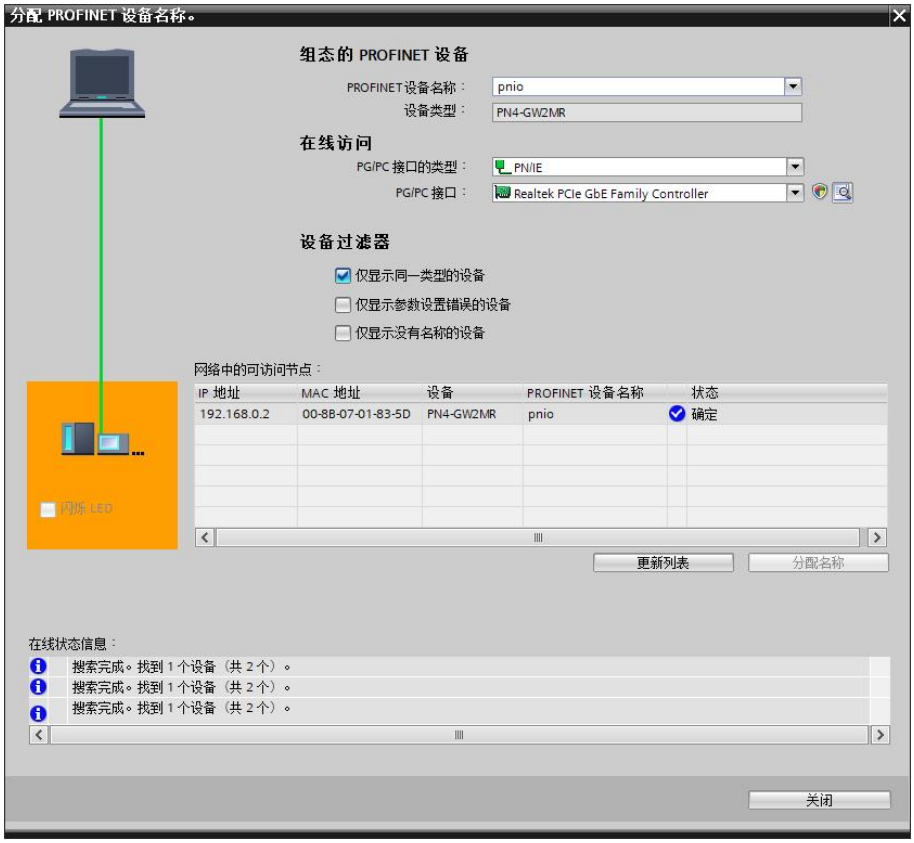
b. A "Assign PROFINET Device Name" window will pop up, as shown in the figure below.



c. Select PLC as the device name and click "Update List". After the update is complete, check if the node status in "Accessible Nodes in the Network" is "OK". If it is not "OK", select the device and click "Assign Name", as shown in the figure below.



d. Select the gateway module as the device name, click "Update List", and assign a name using the same method after updating, as shown in the figure below.

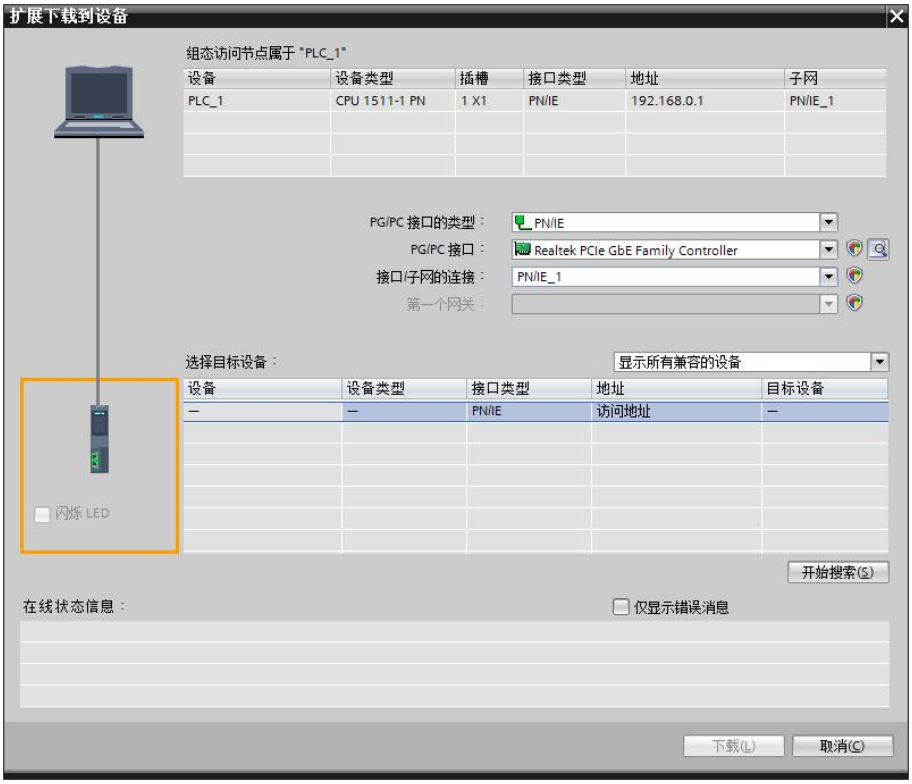


e. Check if the MAC address on the module's silkscreen matches the MAC address of the assigned device name. Click "Close".

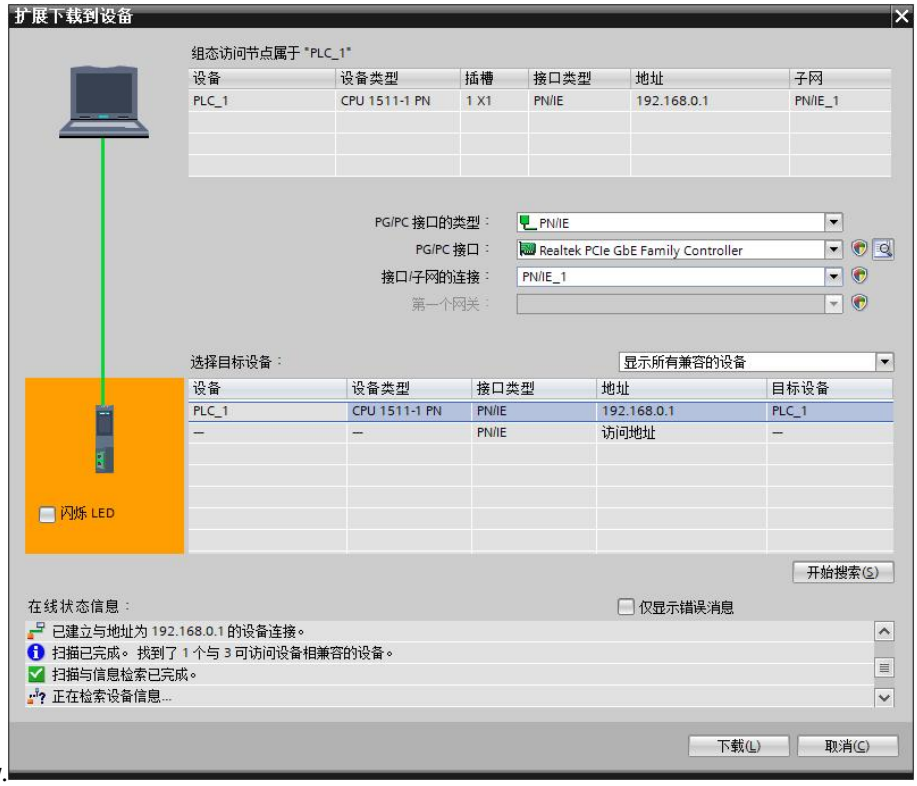
8、Download configuration structure

a. In the network view, select the PLC. First, click the Compile button in the menu bar, then click the Download button to download the current configuration to the PLC.

b. In the pop-up "Download extension to device" interface, configure as shown in the image below.



c. Click the "Start Search" button, as shown in the image below.



d. Click "Download" to bring up the download preview window, as shown in the image below.

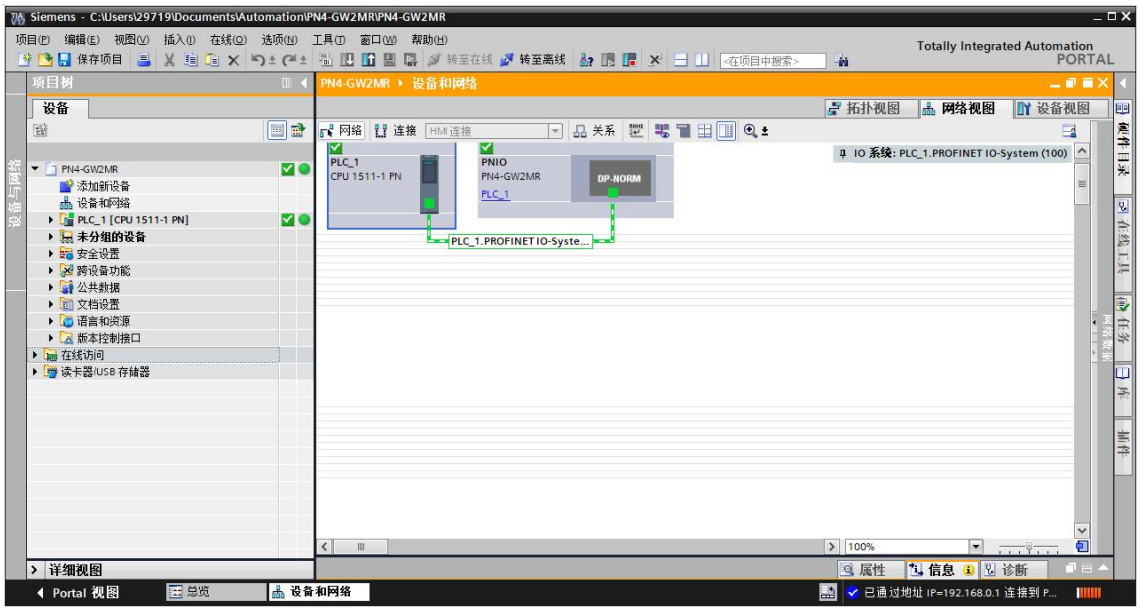
e. Click "Load".

f. Click "Finish".

g. Power on the device again.

9、Communication connection

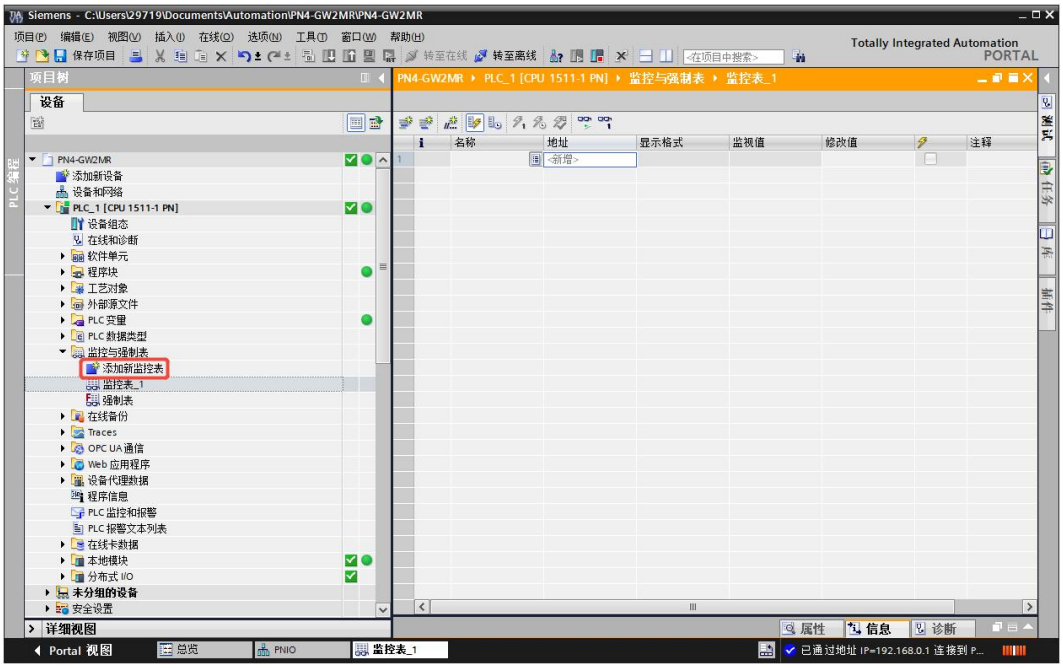
a. Click the "Start CPU" button in the menu bar, then click the "Go to Online" button. If both icons are green, the connection is successful, as shown in the image below.



For detailed gateway module parameter configuration, please refer to [link/reference].6.2.2 How to use the Solidotech GW_MR Config Tool.

10、 Functional verification

a. Expand the project navigation on the left and select "Monitoring & Enforcement Tables".Double-click "Add New Monitoring Table" to add a new monitoring table, as shown in the figure below.



b. Open "Device View" and view the module's channel I address (channel address of input signal) and Q address (channel address of output signal) in the device overview.

For example, the "I address" of the module is 130 to 161, and the "Q address" is 0 to 31, as shown in the figure below.

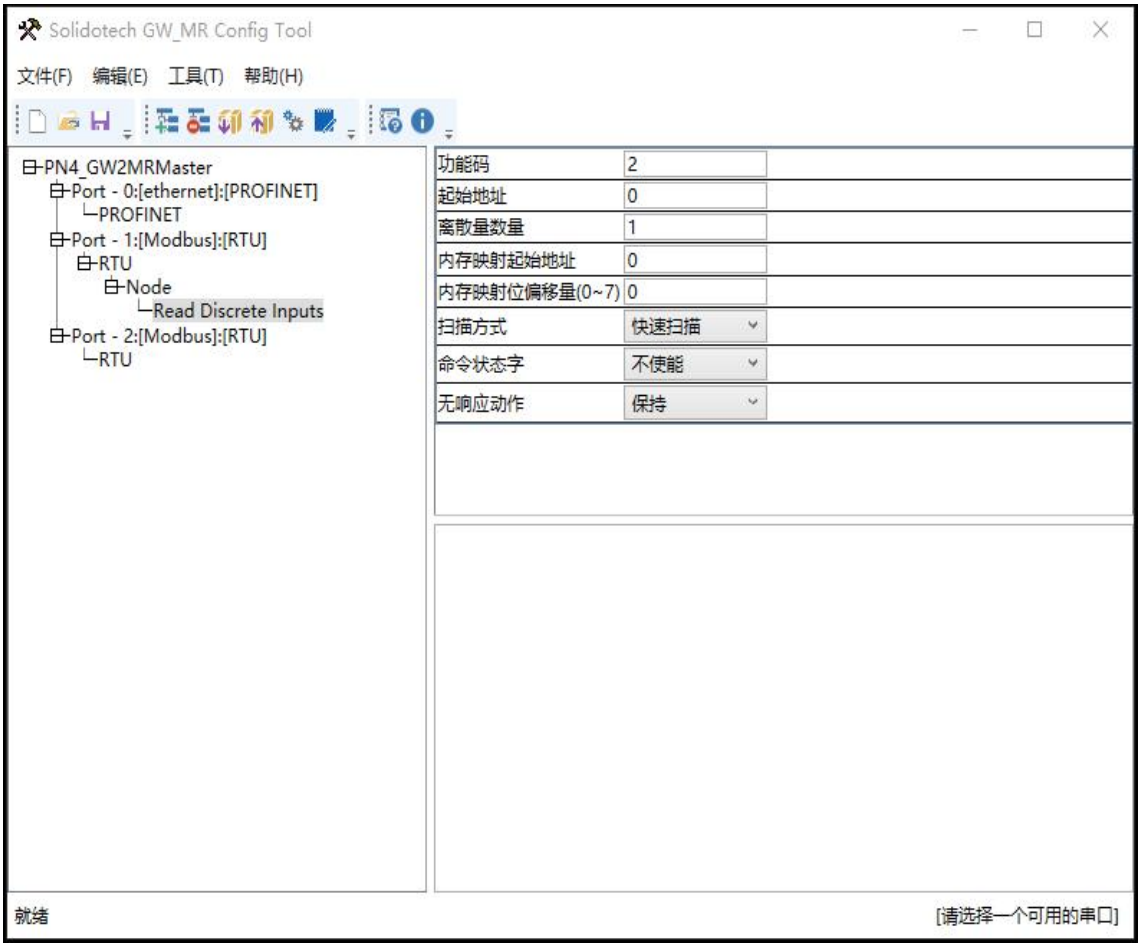
	...	模块	机架	插槽	I 地址	Q 地址	类型	订货号
✓		PNIO	0	0			PN4-GW2MR	1234567
✓		Interface	0	0 X1			PNIO	
✓		008 DWord Input_1	0	1	130...161		008 DWord Input	
✓		008 DWord Output_1	0	2		0...31	008 DWord Output	
			0	3				
			0	4				
			0	5				

c. In the address cells of the monitoring table, enter the input/output channel addresses, such as "IB130" to "IB161", "QB0" to "QB31", and press "Enter". After completing all the entries, click [link to entry].  The button allows you to monitor the data.

Note: For the specific mapping relationship of channel addresses, please refer to "PN4-GW2MR Mapping Address Calculation Tool.xlsx".

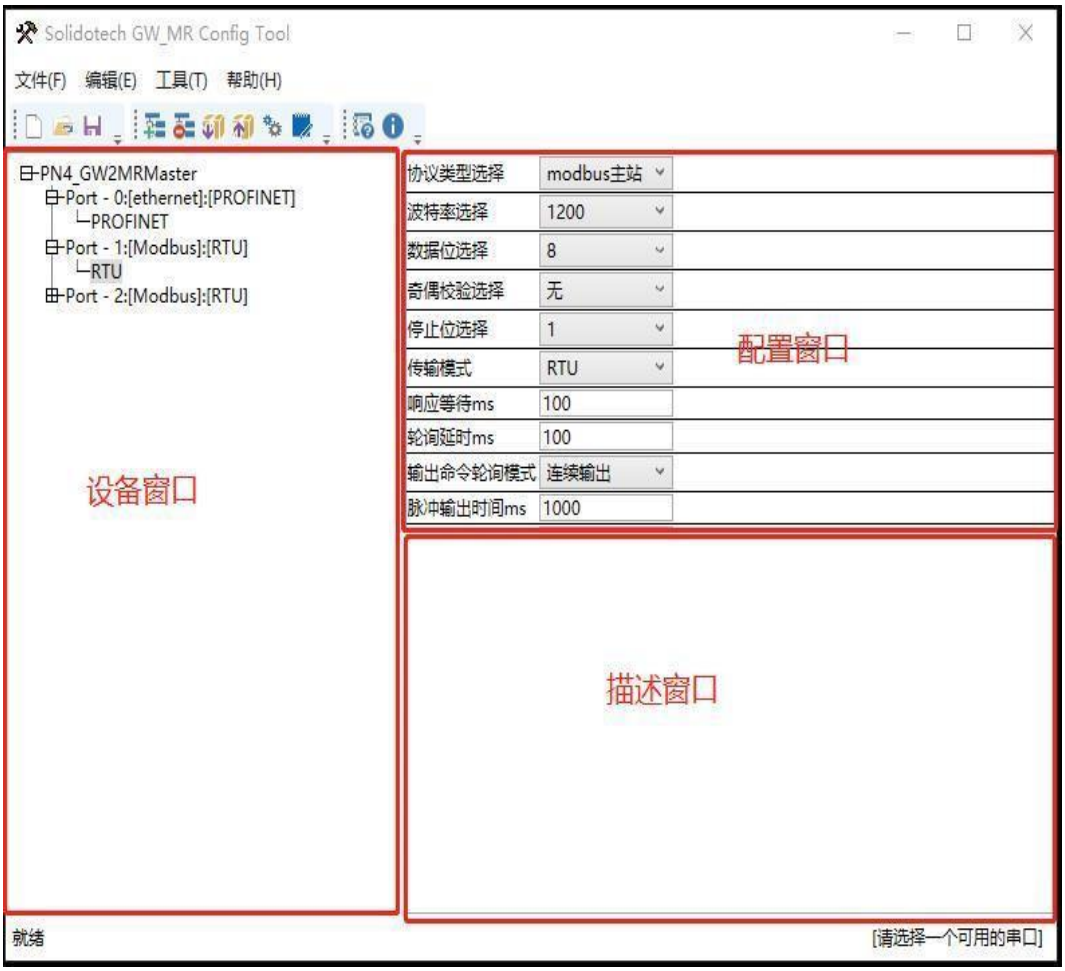
6.2.2 How to use the Solidotech GW_MR Config Tool

a. The configuration module requires configuration software, which users can obtain and install from a CD or website. Users can easily configure the PN4-GW2MR using the gateway configuration software, including device IP address, subnet mask, gateway address and device name, serial port baud rate, parity, stop bits, communication protocol selection and protocol parameters, etc. It can also perform conflict detection on gateway memory-mapped data, as shown in the figure below.



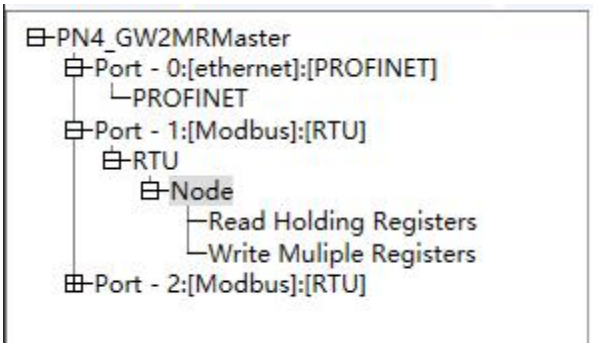
b. The user interface consists of three main parts, as shown in the figure below.

- Device window: Used to list device information, including: port, protocol, command, etc.;
- Configuration window: Used to configure parameters;
- Description window: Used to display description information.



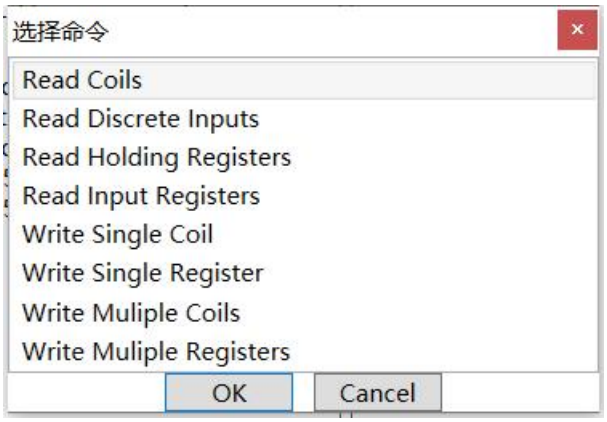
c. The device window uses a tree structure, with the root node being the selected gateway device. Each actual physical interface of the gateway device corresponds to a Port in the device's child nodes. Each Port child node corresponds to the protocol type supported by that Port. Depending on the protocol, the nodes can be further subdivided, or the protocol can be used as a leaf node (end node).

For example, in the Modbus RTU protocol, when acting as a master station, the child nodes are the various Modbus slave stations under this master station, and the child nodes of the slave stations contain the commands configured for that slave station. To set the parameters for each level of node, simply click on the node; the configuration window on the right will display its parameters. The device window is shown in the following figure.

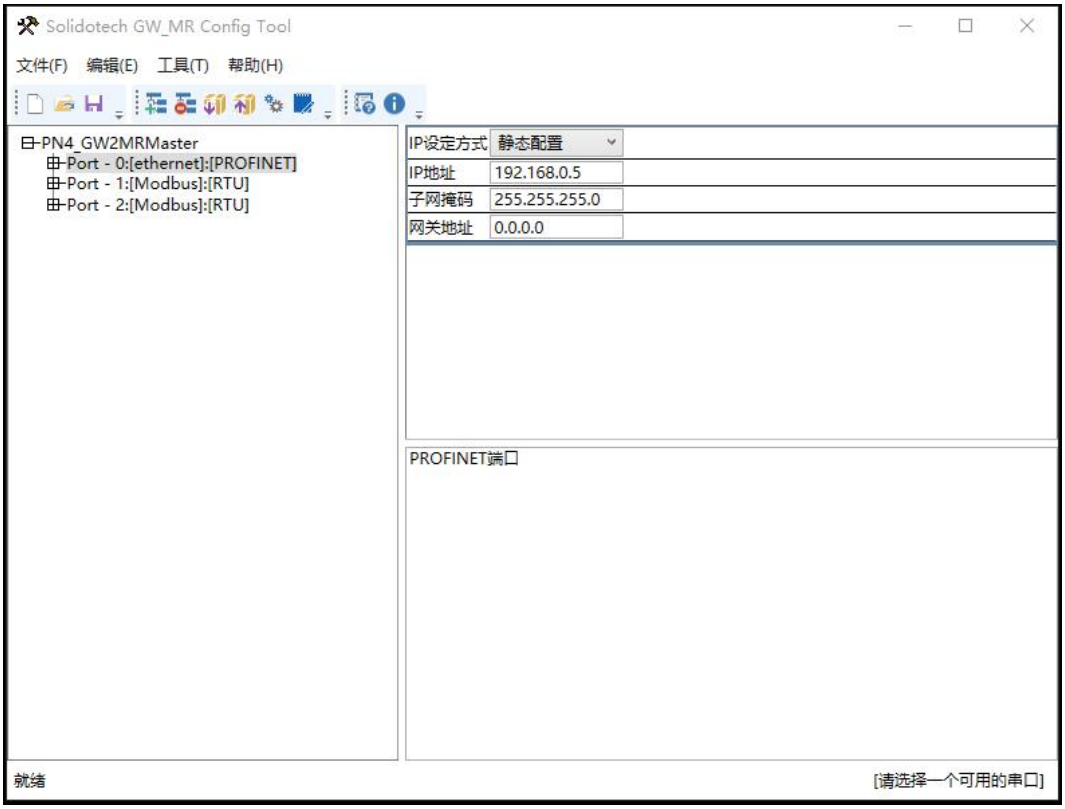


d. Device window operation.

- Adding a node: Left-click on the subnet or node to select it, and then perform the "Add Node" operation. For example, add a node named "Node" to the subnet.
- To delete a node: Click the left mouse button to select the node to be deleted, and then execute the delete node operation. The node and its parent command nodes will be deleted.
- Add a command operation: Click the left mouse button on the node, and then execute the "Add Command" operation to add a command to the node. A dialog box will pop up for the user to select the command, as shown in the figure below.
- To delete a command: Click the left mouse button to select the command to be deleted, and then execute the delete command operation. The command will be deleted.



e. The PROFINET configuration parameters are shown in the figure below.



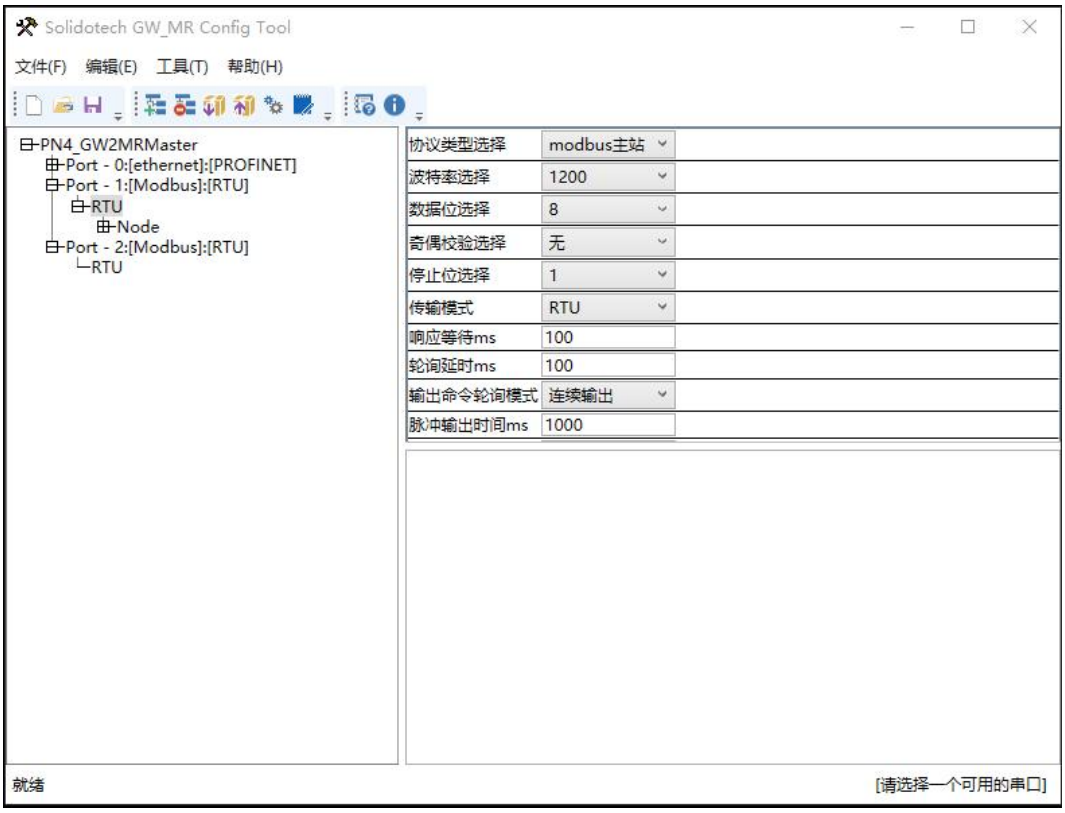
The above parameters are described as follows:

IP address: Device IP address; (Note: This must be consistent with the IP address set in the TIA Portal software)

Subnet mask: Device subnet mask;

Gateway address: The gateway address on the local area network.

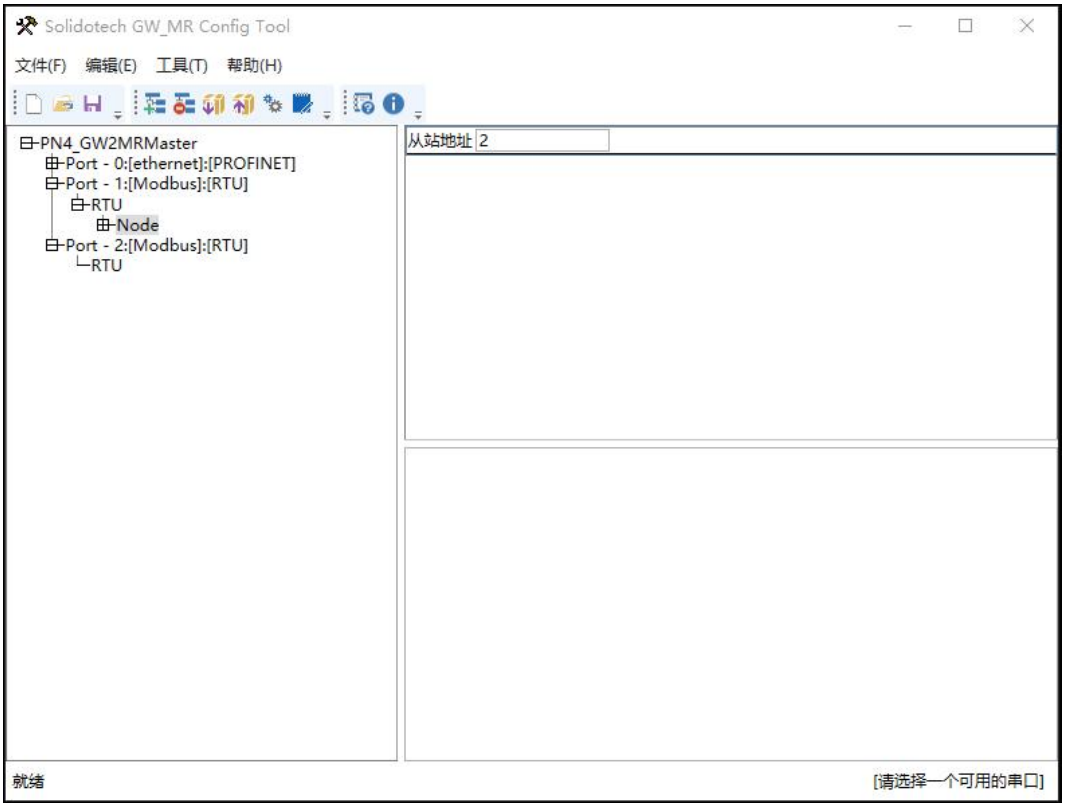
f. The Modbus master station can be configured with the following parameters: Modbus communication baud rate, data bits, parity check mode, stop bits, communication transmission mode, response wait time, polling delay time, output command polling mode, pulse output time, scan ratio, and master station control word. The configuration interface is shown in the figure below.



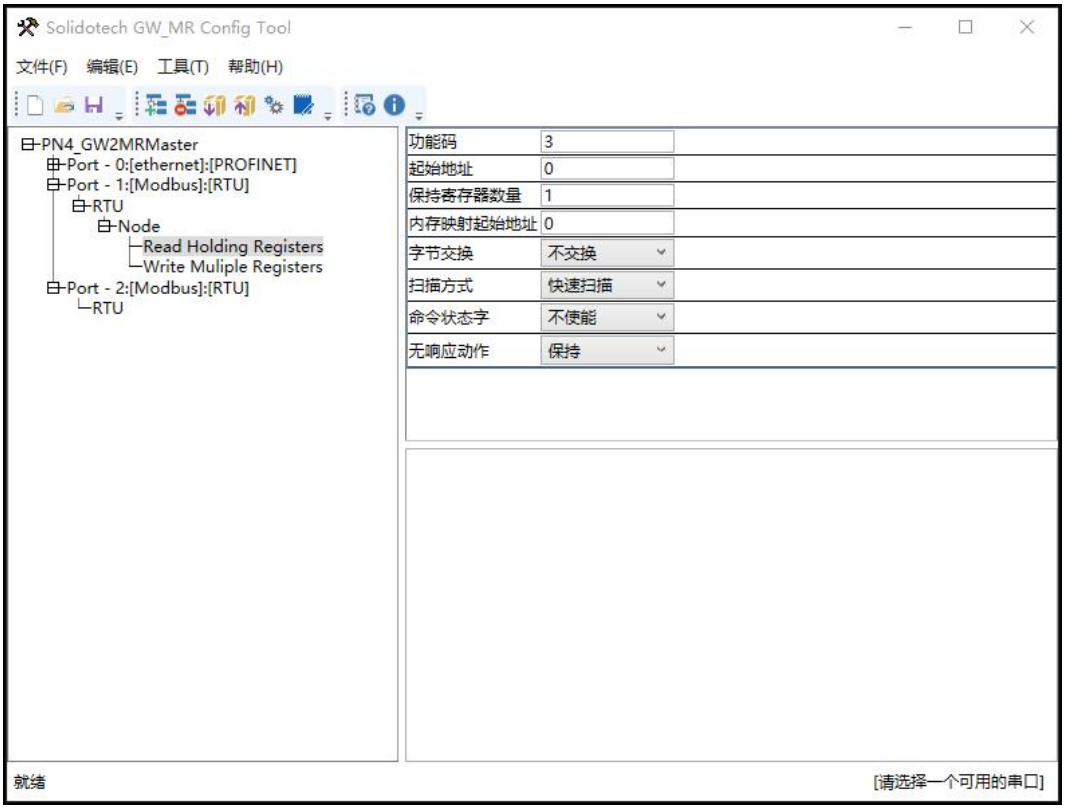
- Modbus communication baud rates: 1200bit/s, 2400bit/s, 4800bit/s, 9600bit/s, 19200bit/s, 38400bit/s, 57600bit/s, 115200bit/s.
- Data bits: 7, 8, and 9.
- Parity check methods: None, Odd, Even.
- Stop bits: 1 bit, 2 bits.
- Communication transmission mode: RTU.
- Response wait time: The time to wait for the slave station to respond after the Modbus master station sends a command, ranging from 100ms to 50000ms.
- Polling delay time: The delay time before sending the next Modbus command after the Modbus master sends a command and receives a correct response or the response times out. Range: 0~2500ms.
- Output command polling mode: Modbus write commands have four output modes: continuous output, output disabled, output on change, and pulse output.
  Continuous output: Similar to the Modbus read command output method, it performs scanning output according to the scan ratio;
  Suppress output: Suppress the output of Modbus write commands;
  Output on Change: When the output data changes, output a write command and stop outputting after receiving the correct response data;
  Pulse output: Outputs the write command according to the pulse period.
- Pulse output time: The pulse duration in pulse output mode.
- Scan ratio.
- Status word: Status word switch. If enabled, this subnet will be configured with a status word; if disabled, this subnet will not be configured with a status word.

- Control word: Control word switch. If enabled, this subnet will be configured with a control word; if disabled, this subnet will not be configured with a control word.

g. Node configuration: In "Modbus Master" mode, click on a node in the device window interface. The configuration window interface will be displayed as shown in the figure below.

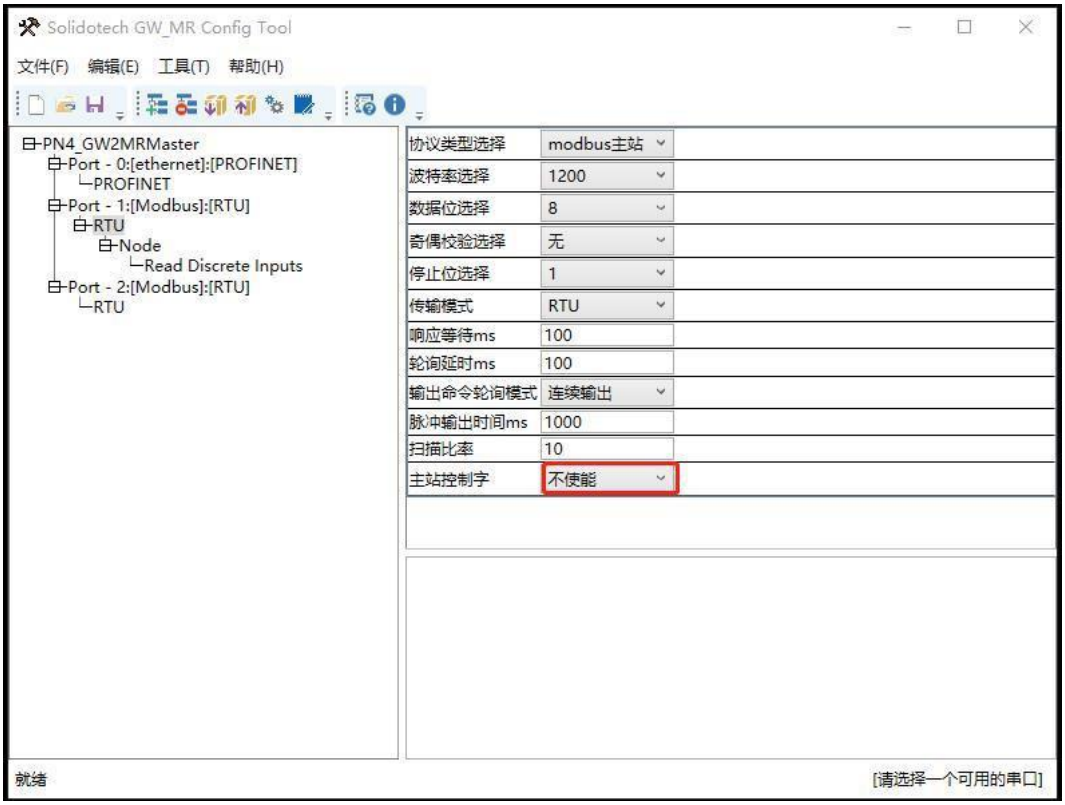


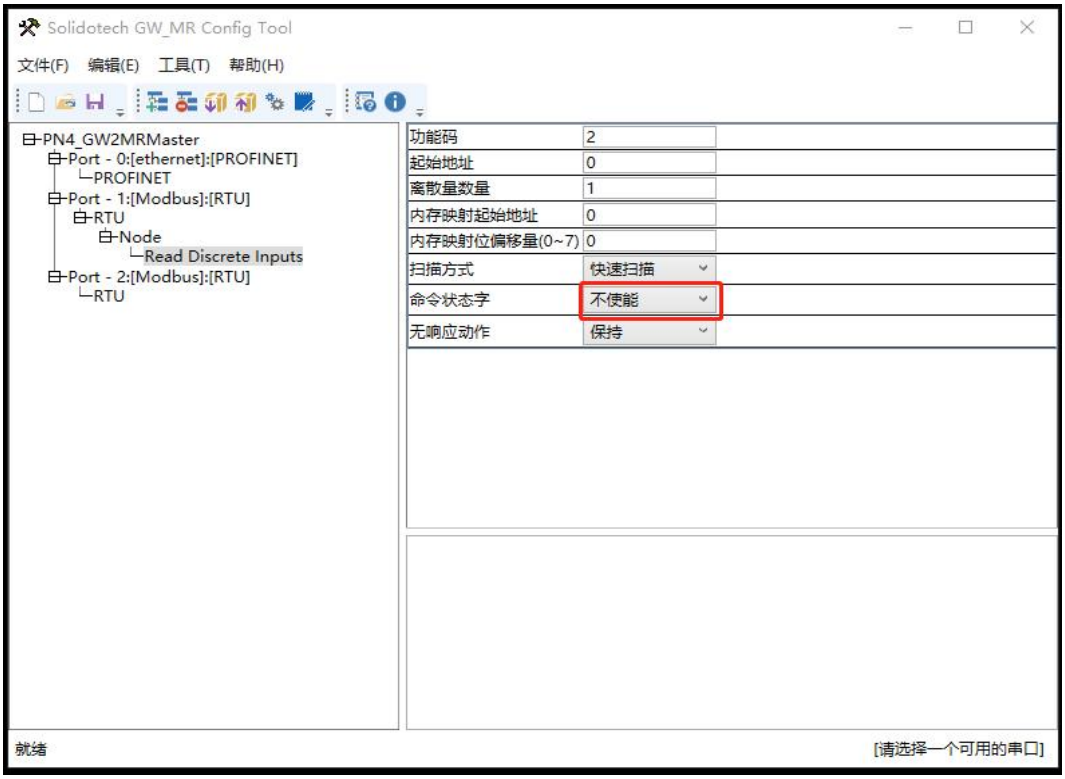
h. Command configuration interface: In the device window interface, when the protocol type is selected as Modbus Master, click the newly created command, and the configuration window interface will be displayed as shown in the figure below.



- Modbus register start address: The starting address of registers, switches, coils, etc. in Modbus slave devices, with a range of 0~65535;
- Number of registers: The number of registers, switches, and coils in a Modbus slave device;
- Memory mapping start address: The starting address of the data in the module's memory buffer. The address range of the data mapped in the gateway memory: Read command: 0x000~0x5DB (0~1499)
  Write command: 0x5DC~0xBB7 (1500~2999)
  The write command can also be used for local data exchange: 0x000~0x5DB (0~1499).

i. Control word and status word: This device supports control words and status words, used to control whether the Modbus port is working and to obtain the status of each Modbus command, respectively. The controller and status word are disabled by default; users can enable them through the configuration software, as shown in the figure below.



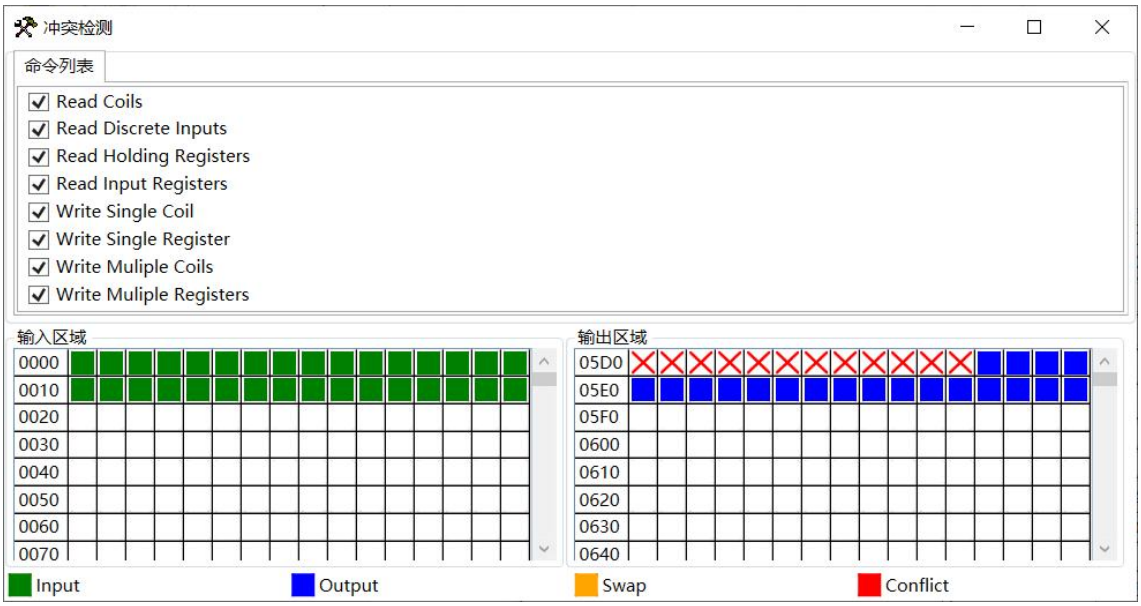


For example, the gateway module PN4-GW2MR maps the output address to QB374-405 and the input address to IB354-385. In the configuration software, the PN4-GW2MR enables the control words for port1, port2, and port3: port_1_CtrlWord occupies QB374, port_2_CtrlWord occupies QB375, and port_3_CtrlWord occupies QB376.

The status words for enabling commands 1-4 are shown in the diagram below (one node is inserted for port1 and port2, two commands are inserted for each node, and the status word occupies one word).

Control words are accessed byte-by-byte. When a port's control word is 0, the port is working normally; when it is 1, the port is not working. Status words are accessed bit-by-bit. When a command's status word is 0, it indicates a communication error; when it is 1, the command communication is normal.

j. Conflict detection: Select "Check" in "Tools" to detect if there are conflicts in memory-mapped data. If there are conflicts, they can be adjusted in time, as shown in the figure below.



k. Command list operation: The command list lists all supported commands. The checkbox before each command is used to select each type of command. It is checked by default. If it is not checked, the command of this type will not participate in the memory mapping check, as shown in the figure below.

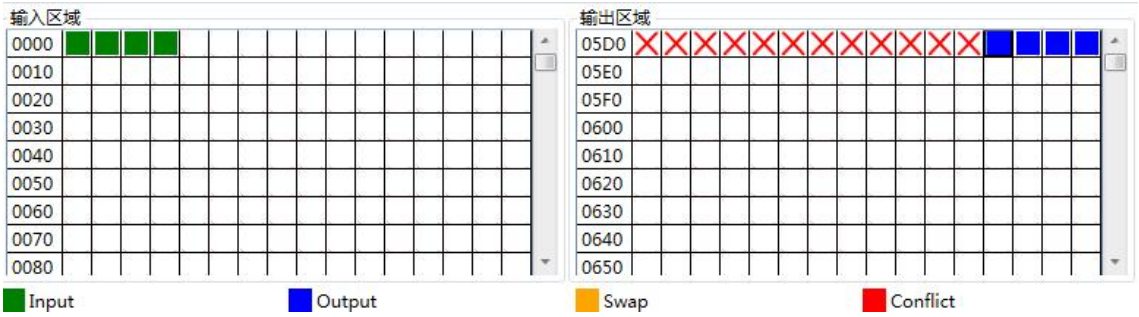
l. Memory mapping operation: Memory mapping distinguishes between the input area and the output area, and each square represents a byte address.

Input The read command is displayed in the input mapping area, and is shown in green when there is no conflict;

Output When the address mapping area is located in the output area and there is no conflict, it is displayed in blue;

Swap The write command is displayed in yellow when the address mapping area is located in the input area and there is no conflict;

Conflict In the input or output area, different commands occupy the same byte address, and this byte area is displayed in red.



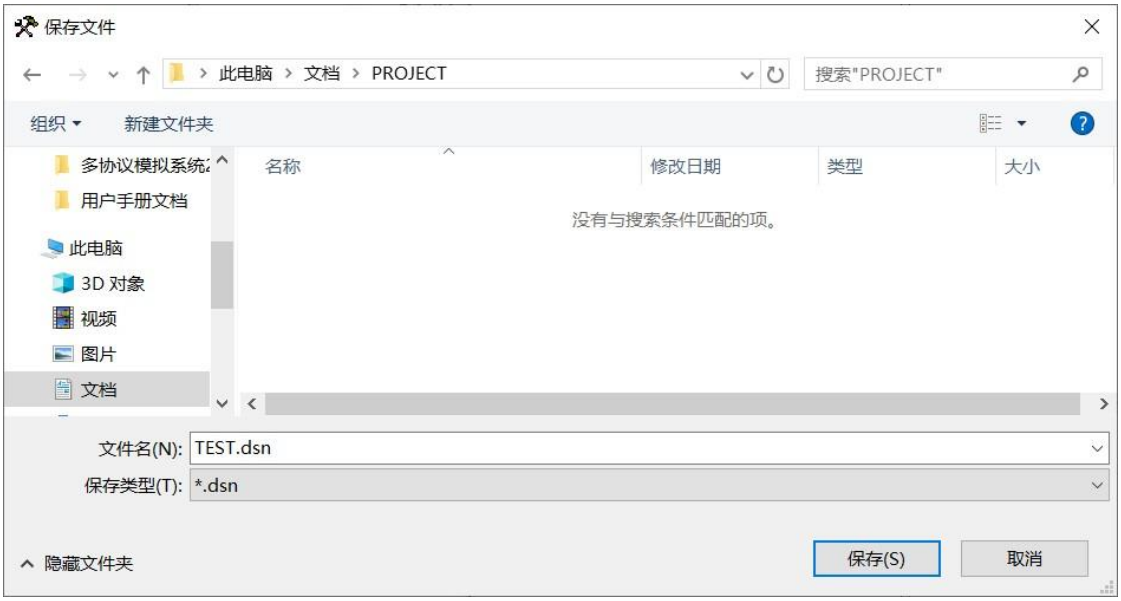
m. Download serial port settings: Select "Communication Settings" in "Tools". The software will automatically search for available serial ports on the PC. If no available serial port is found on the PC, a dialog box will pop up as shown in the figure below.

n. Selecting the TCP interface will display the communication settings dialog box. Click the "Search" button to search for the Ethernet information of the corresponding gateway, and then click the "Select" button.

o. Download Configuration: Select Download Configuration to download the configured gateway information to the gateway device;

p. Upload Configuration: Select Download Configuration to download the configured gateway information to the gateway device;

q. Save the configuration project: Select "Save" in "File" to save the configured project as a .dsn file, as shown in the figure below.



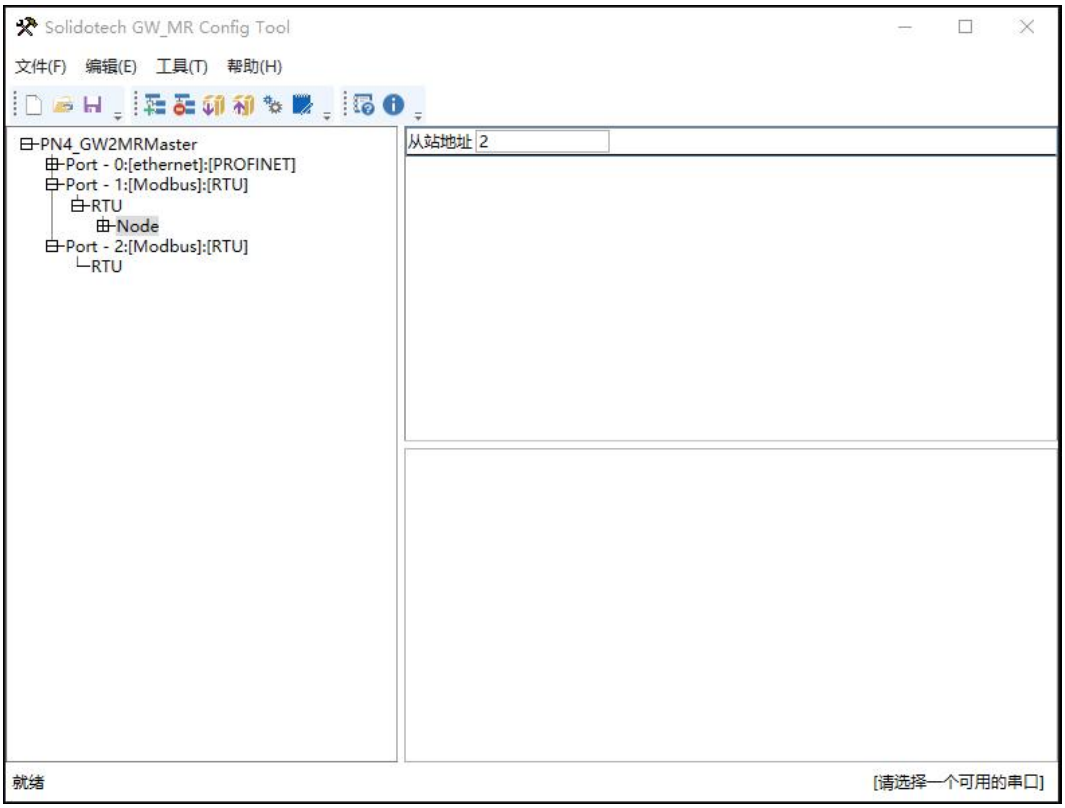
r. Load the configuration project: Select "Open" in "File" to open the saved .dsn file.

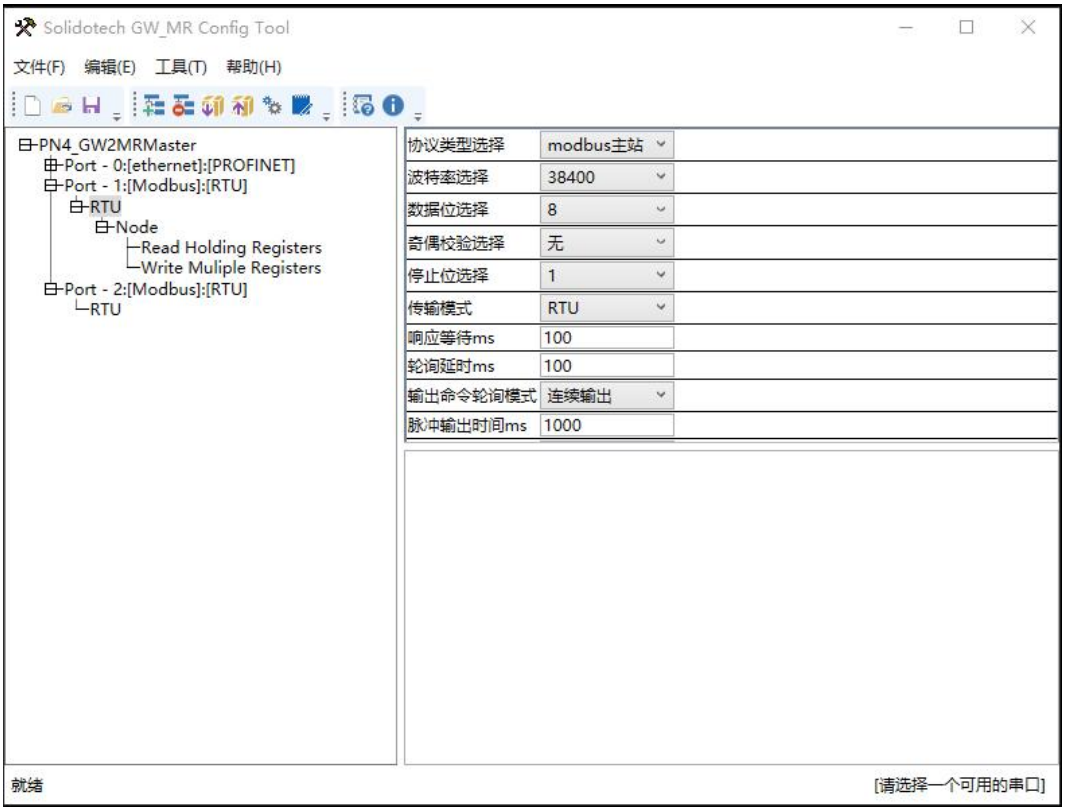
s. To set or change the encryption password for the project, follow these steps:
- In the SCT interface, a "Permission Settings" item has been added to the "Tools" menu;
- Click "Permission Settings" to bring up the "Permission Settings" dialog box;
- If this is the first time encryption is performed, the "Existing Password" field will be grayed out and cannot be edited.
- If this is not the first time the encryption has been performed, changing the password requires first entering the current password for comparison. The password can only be changed successfully if the comparison is successful and the two new passwords match.

- After successfully setting the password, downloading the project will encrypt the project stored in the gateway.
- If you click the "Upload" item in the "Tools" menu, the project will open directly if no project password has been set. If a project password has been set, a password dialog box will pop up first. After entering the password, you can open the project.

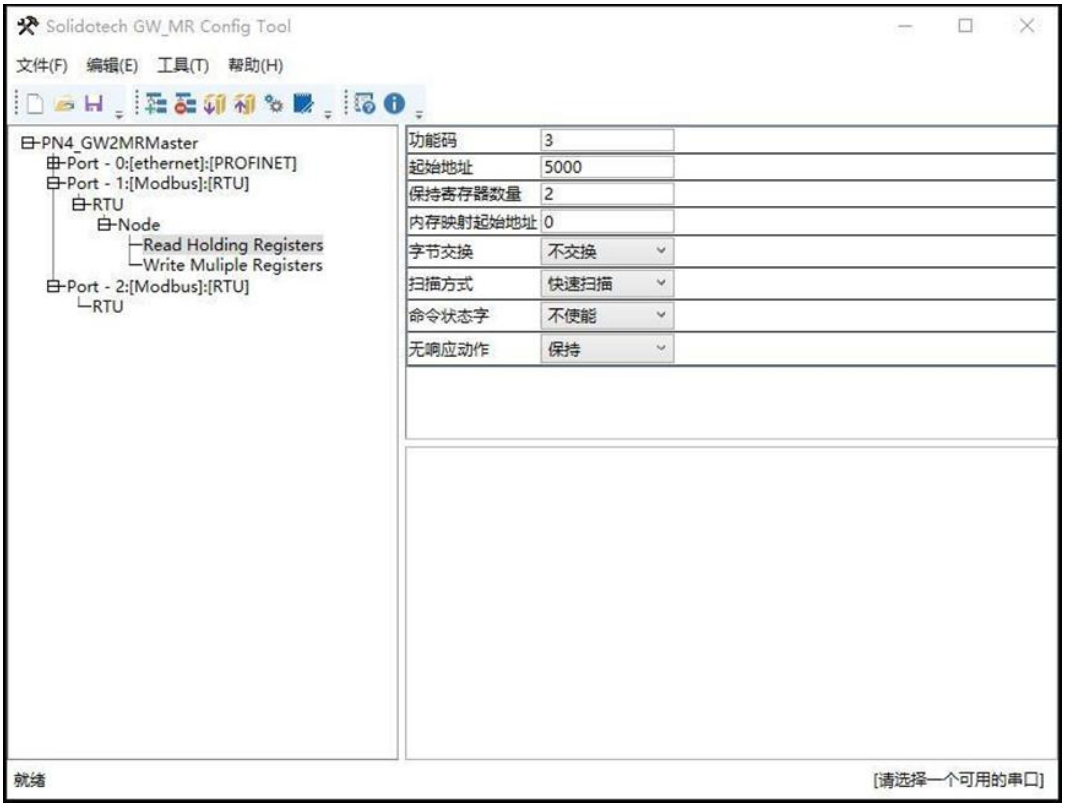
6.2.3 Example description

a. Parameter settings. Slave device: Set slave address: 2. Modbus master parameters: Baud rate: 38400, Data bits: 8, Parity: None, Stop bits: 1. See the diagram below.

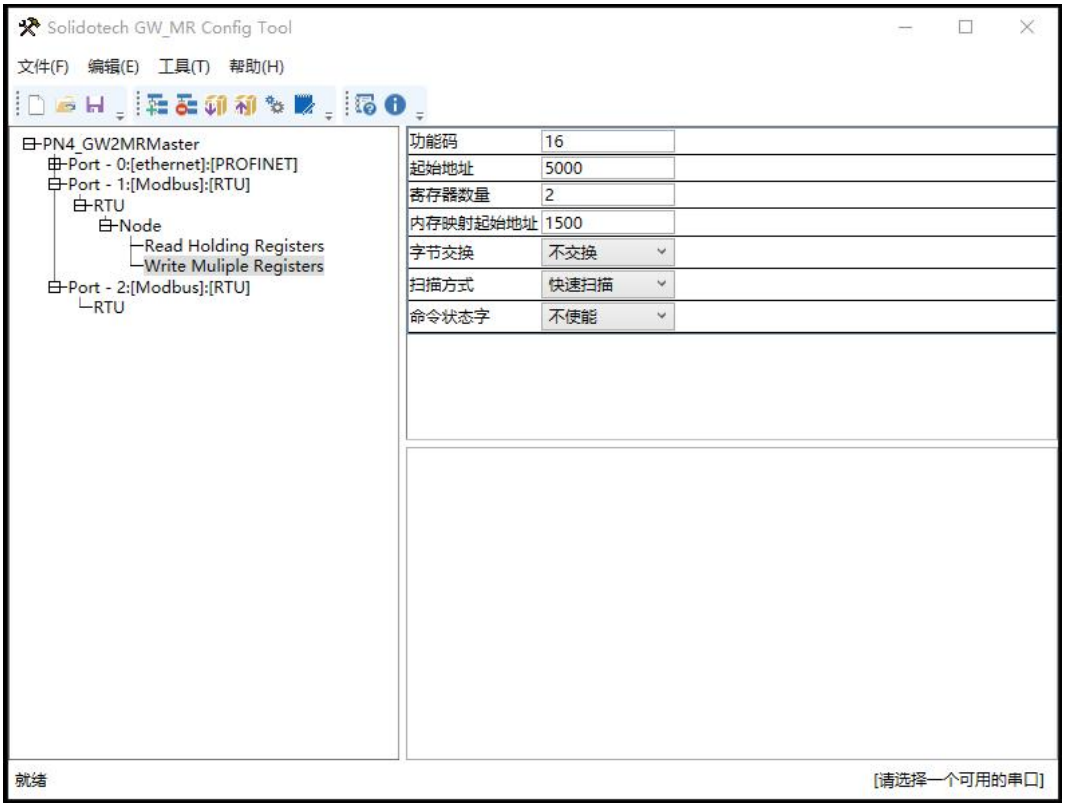




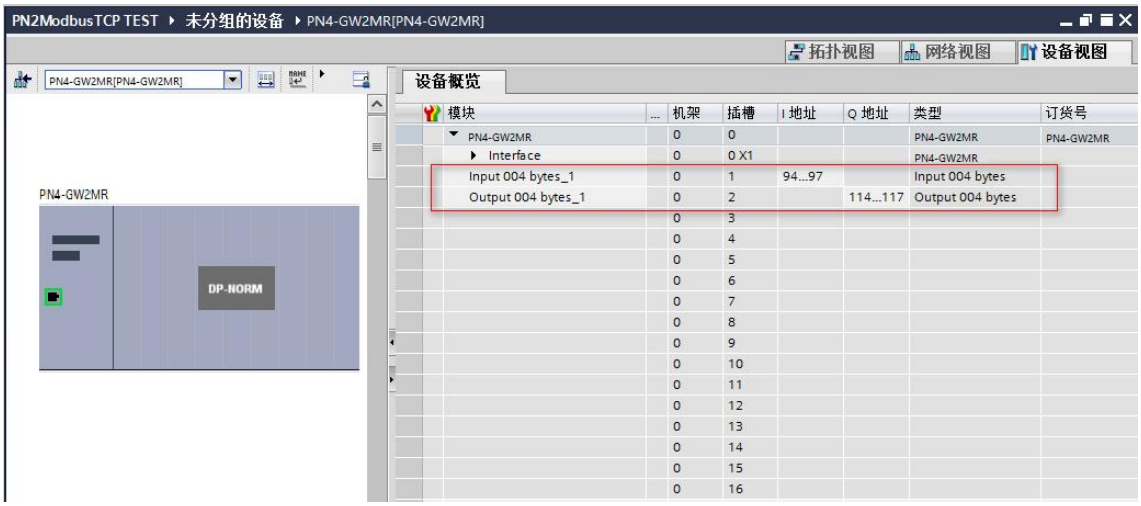
b. Data mapping. For the PN4-GW2MR gateway, insert the command as shown in the image below. Read holding register starting address: 5000, length: 2, memory mapping starting address: 0.



Write multiple registers starting address: 5002, length: 2, memory mapping starting address: 1500.



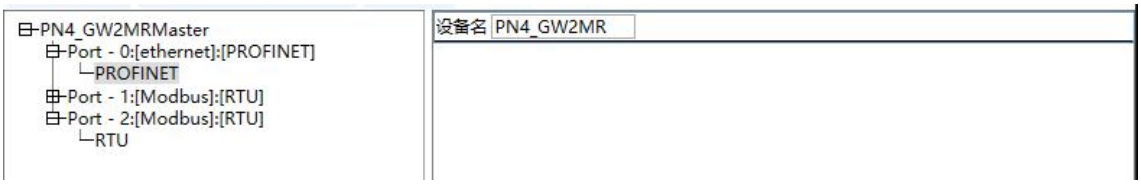
c. The IP address, device name, and submodule address of the gateway module are configured in the TIA Portal software as shown in the figure below.



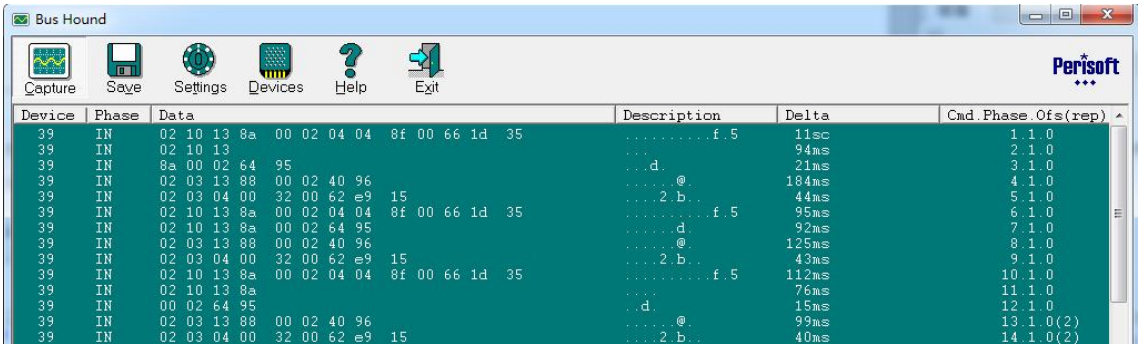
d. The configuration software settings for PN4-GW2MR are the same as those in TIA Portal, including the IP address and device name.

IP address:

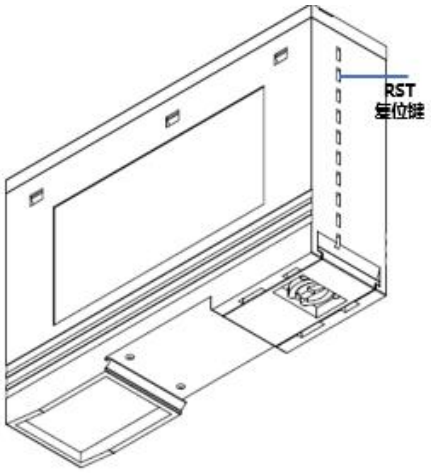
Equipment Name:



e. After downloading the configurations for each module, the monitored data is shown in the following figure.



6.3 Clear gateway configuration



- **To clear the gateway configuration, press and hold the power button for 2 seconds, then release.**
- **For resetting, please use insulated tools with a diameter or thickness of less than 1.2mm.**