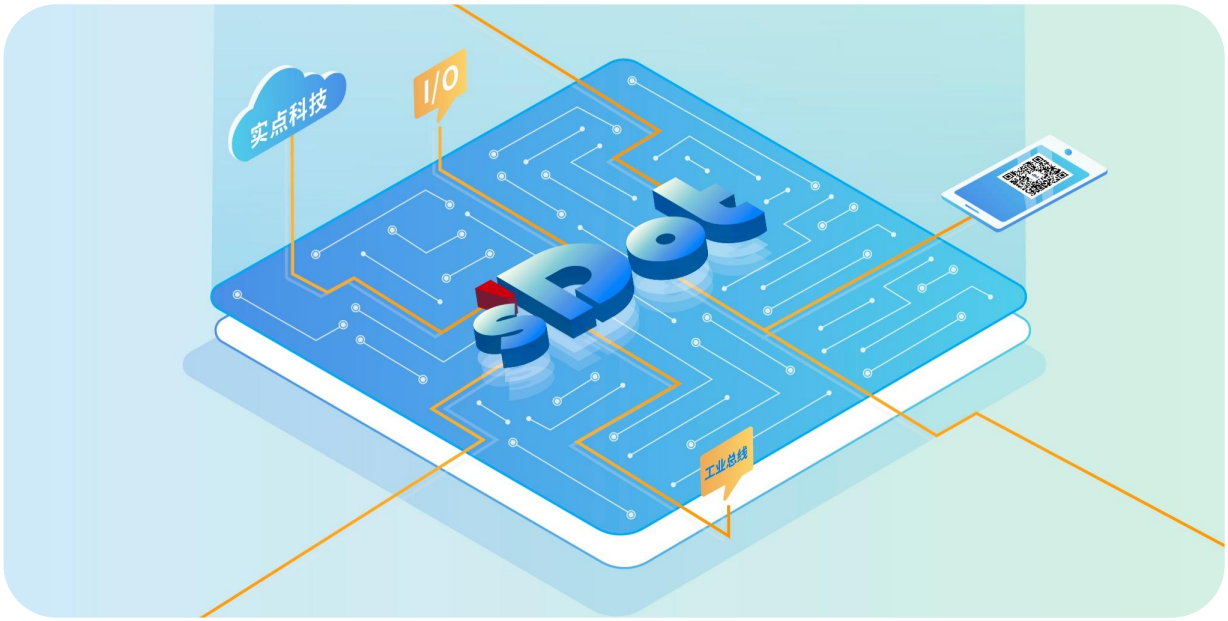

XB6S-C01SP

Serial communication module

User Manual

Nanjing Solidot Electronic Technology Co., Ltd.

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1 Product Overview

1.1 Product Introduction

The XB6S-C01SP is a plug-in 1-channel serial communication module that uses the X-bus bottom bus and is compatible with our XB6S series coupler modules. It can realize Modbus master-slave and Freeport serial communication functions. The module occupies little space, and the data interaction processing is simple, which can meet the serial communication needs of different application scenarios.

1.2 Product Features

- Supports multiple communication modes Eight modes can be set: MRM/MRS/MAM/MAS/FP_Request/FP_Input_Output/FP_Input/FP_Output. See details6.1 Configuration Parameters).
- Supports three communication interfaces
  Three interfaces: RS485, RS422, and RS232.
- Supports three communication protocols
  Modbus RTU/ Modbus ASCII/Freeport.
- Small size
  It has a compact structure and occupies little space.
- 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	XB6S-C01SP
bus protocol	X-bus
Bus input power supply rated voltage	5VDC (4.5V~5.5V)
Rated current consumption	230mA
Power consumption	1.15W
Technical parameters	
Number of channels	1 channel
Communication interface type [1]	RS232, RS485, RS422
Communication Protocol	Modbus RTU, Modbus ASCII, Freeport
Baud Rate	1200bps~115200bps
Weight	90g
Size	106.4×25.7×72.3mm
Wiring method	Screwless quick connector
Installation method	DIN 35mm rail mounting
Operating temperature	-20℃~+60℃
Storage temperature	-40℃~+80℃
relative humidity	95%, no condensation
Protection level	IP20

Note [1]: Only one of the RS232, RS485 and RS422 interfaces can be used at a time.

3 Panel

3.1 Panel structure

Product Parts Names

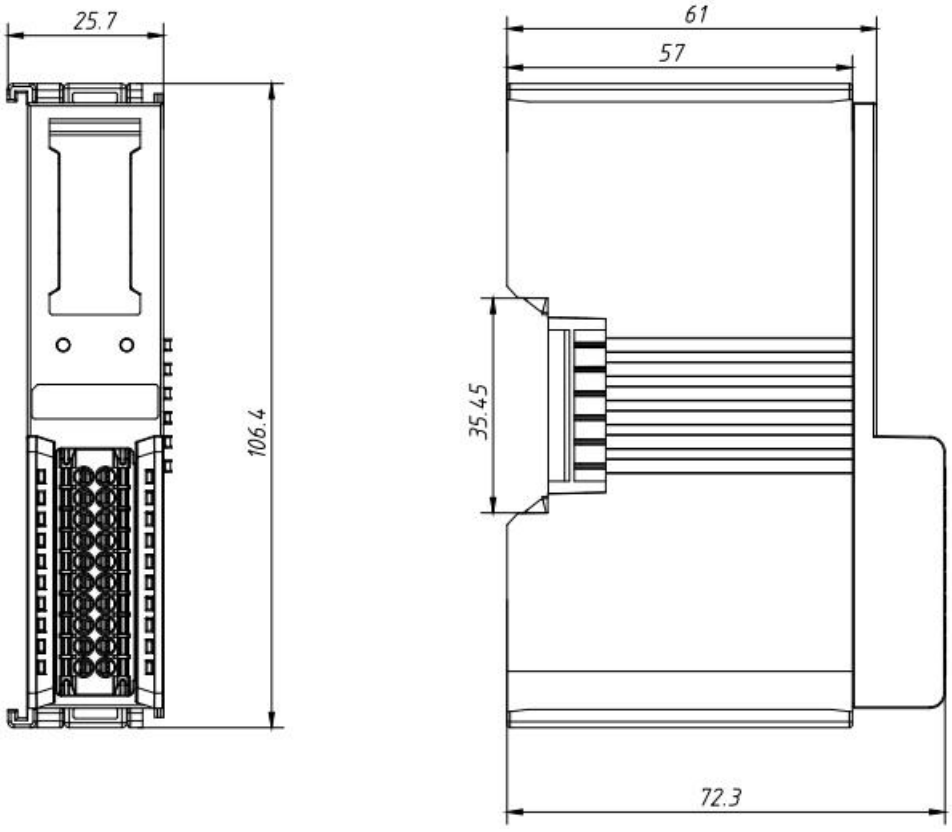
3.2 Indicator light function

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	SYS	GREEN	ON	The system is running normally.
			flickering 1Hz	No business data interaction; waiting to establish business data interaction.
			10Hz flicker	Firmware upgrade
			Extinguish	The system is not working.
Input channel indicator	0 (right side)	GREEN	blinking	The channel is receiving data.
			Extinguish	No data received from the channel
Output channel indicator	0 (left side)	GREEN	blinking	Data is being sent through the channel.
			Extinguish	No data sent from the channel

4 Installation and removal

4.1 External dimensions

External dimensions (unit: mm)



4.2 Installation Guide

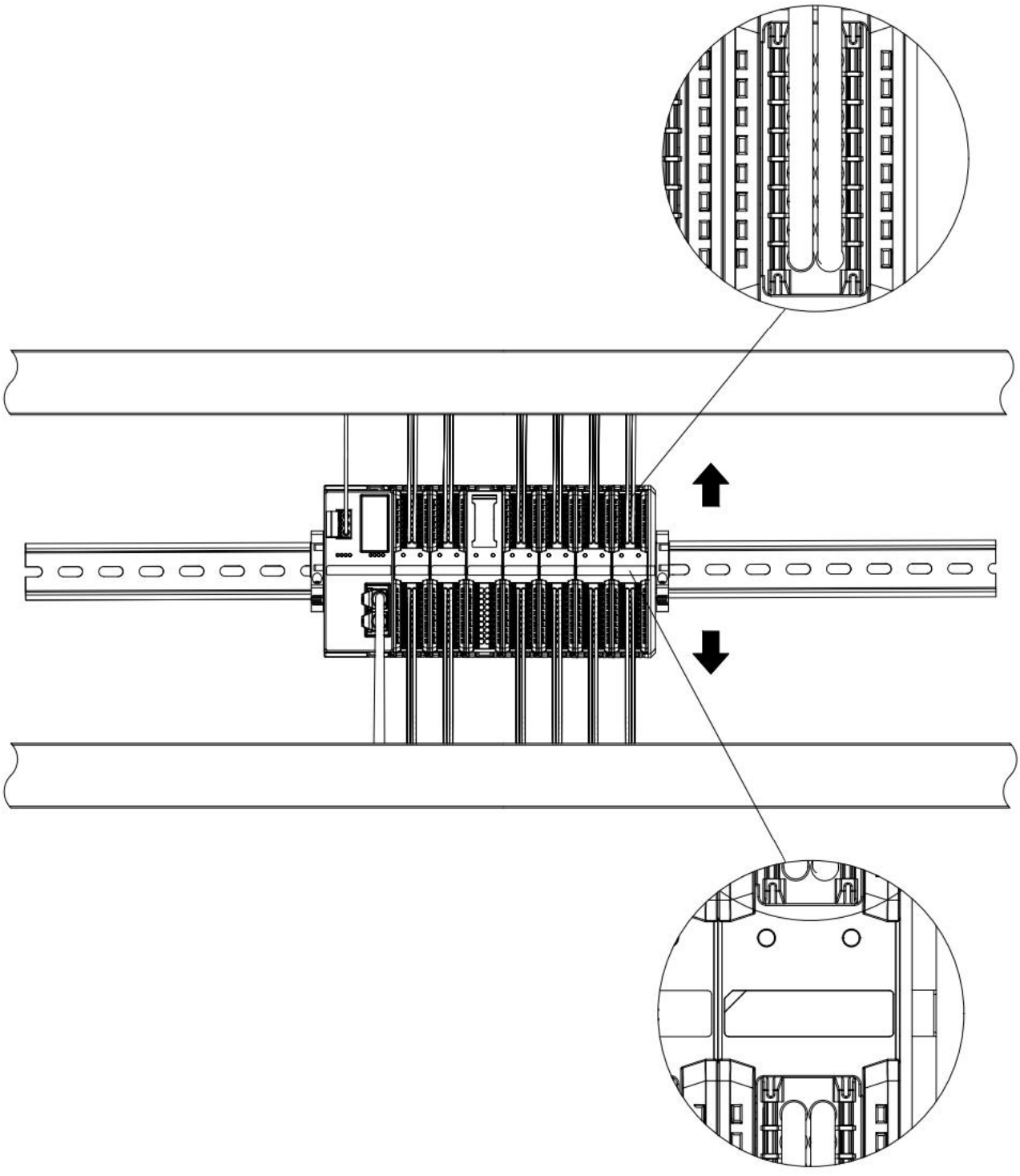
Installation/Removal Precautions

- **The module has an IP20 protection rating and must be installed in a cabinet for indoor use.**
- **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 to install the module vertically on the fixed guide rail and ensure that there is air circulation around it (there should be at least 50mm of air circulation space above and below the module).**
- **After the module is installed, be sure to install guide rail fasteners at both ends to secure the module.**
- **Installation/removal must be performed with the power off.**
- **After the module is installed, it is recommended to connect and wire the cables using a top-to-bottom wiring method.**

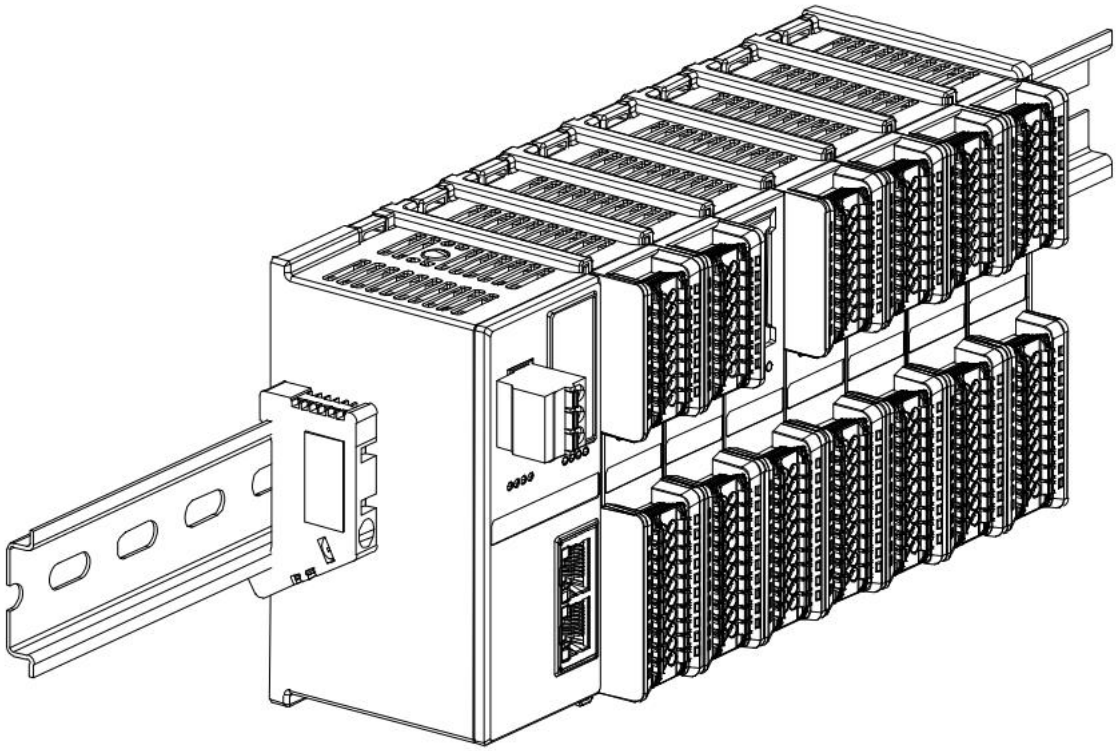
⚠ warn

- If the device is not used in accordance with the product user manual, the protection it provides may be compromised.

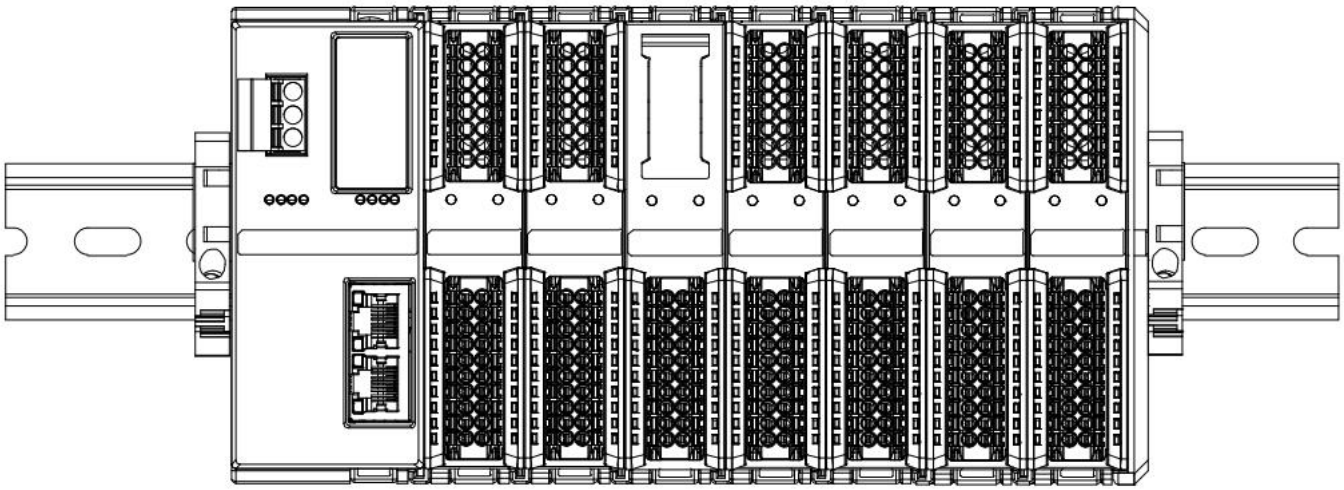
Module installation diagram, minimum vertical clearance (≥50mm)



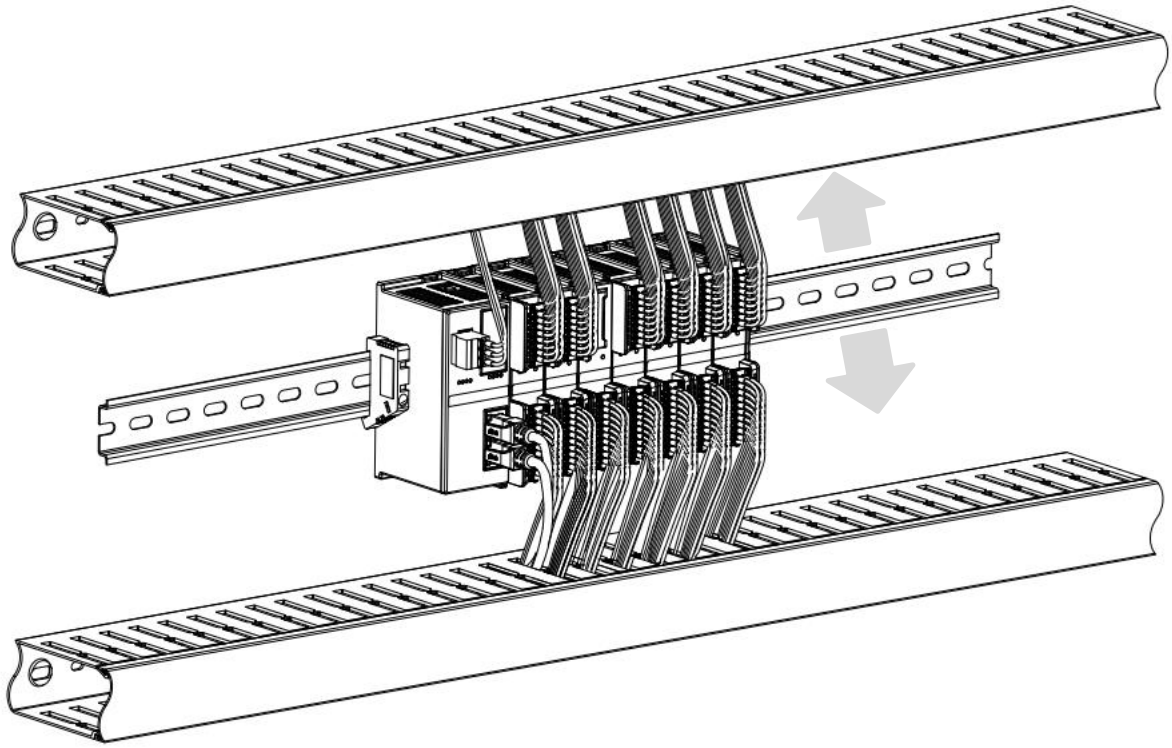
Ensure the module is installed vertically on the fixed guide rail.



Be sure to install the guide rail fasteners.



Module top and bottom wiring diagram



4.3 Installation and disassembly steps

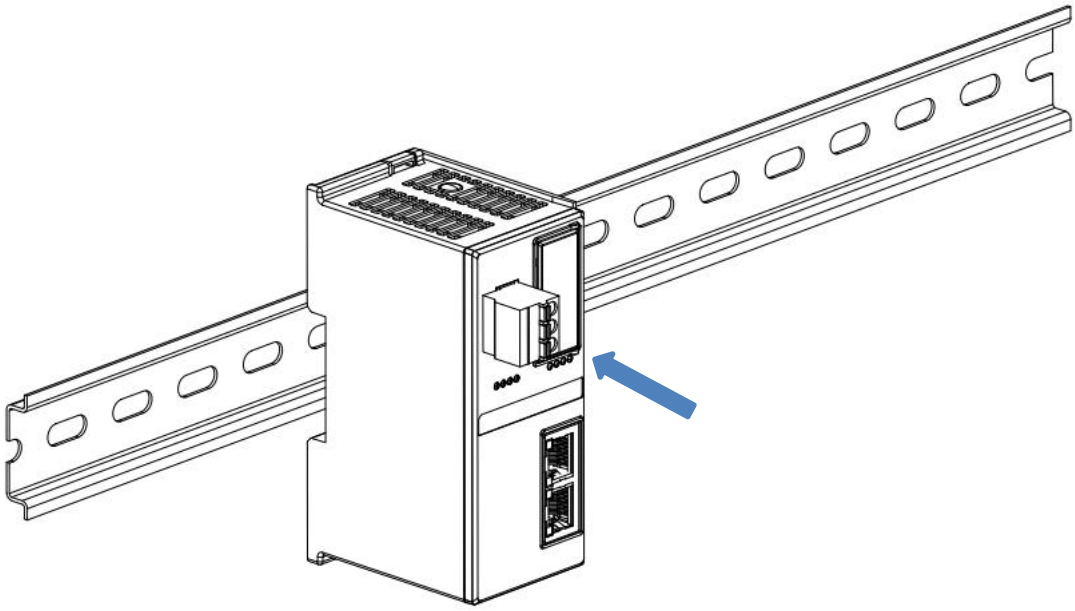
Module installation and removal	
Module installation steps	1. First, install the coupler module on the fixed guide rail.
	2. Install the required I/O modules or functional modules sequentially on the right side of the coupler module.
	3. After installing all the necessary modules, install the terminal cover to complete the module assembly.
	4. Install guide rail fasteners at both ends of the coupler module and the terminal cover to fix the module.
Module disassembly steps	1. Loosen the guide rail fasteners at both ends of the module.
	2. Use a flathead screwdriver to pry open the module clips.
	3. Remove the disassembled module.

4.4 Installation and disassembly diagram

Coupler module installation

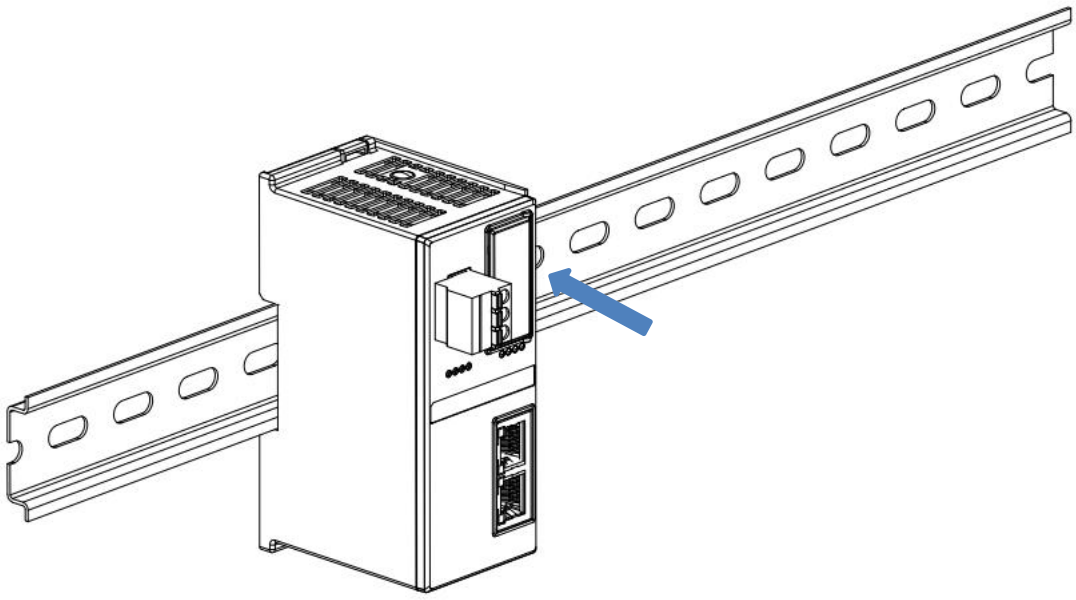
- Align the coupler module vertically with the guide rail slot, as shown in Figure ① below.

①



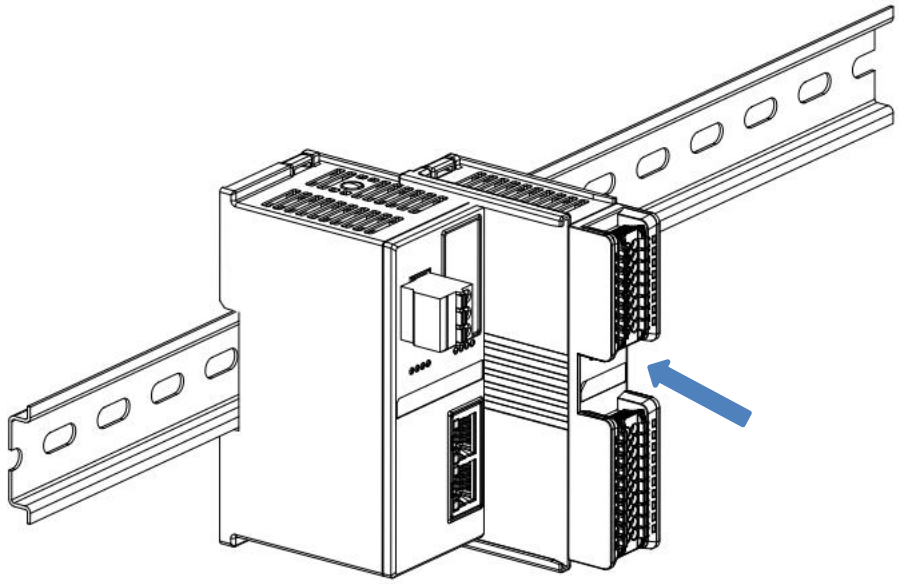
- Press the coupler module firmly into the guide rail direction until you hear a "click" sound, indicating that the module is installed in place, as shown in Figure ② below.

②

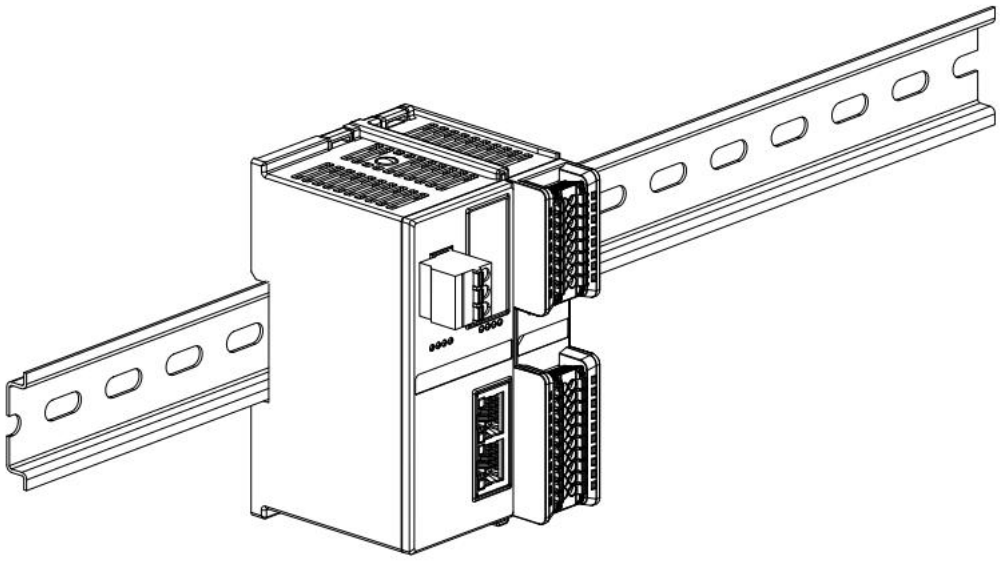


I/O module installation

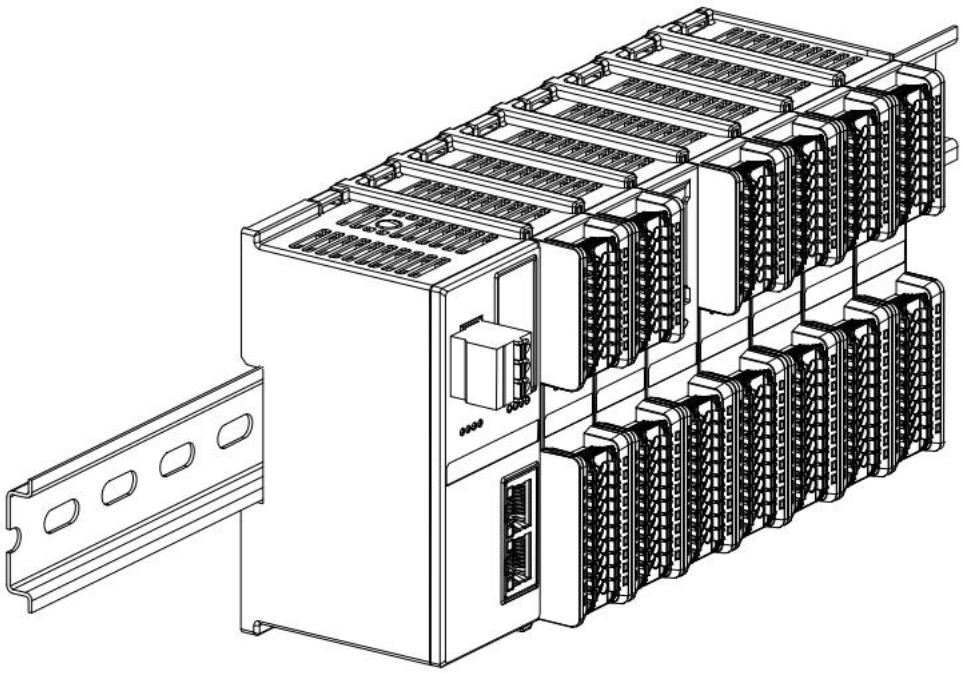
- Following the steps described above for installing the coupler module, install the required I/O modules or functional modules one by one, as shown in Figures ③, ④, and ⑤. Push them in until you hear a "click" sound, indicating that the module is installed in place.



③



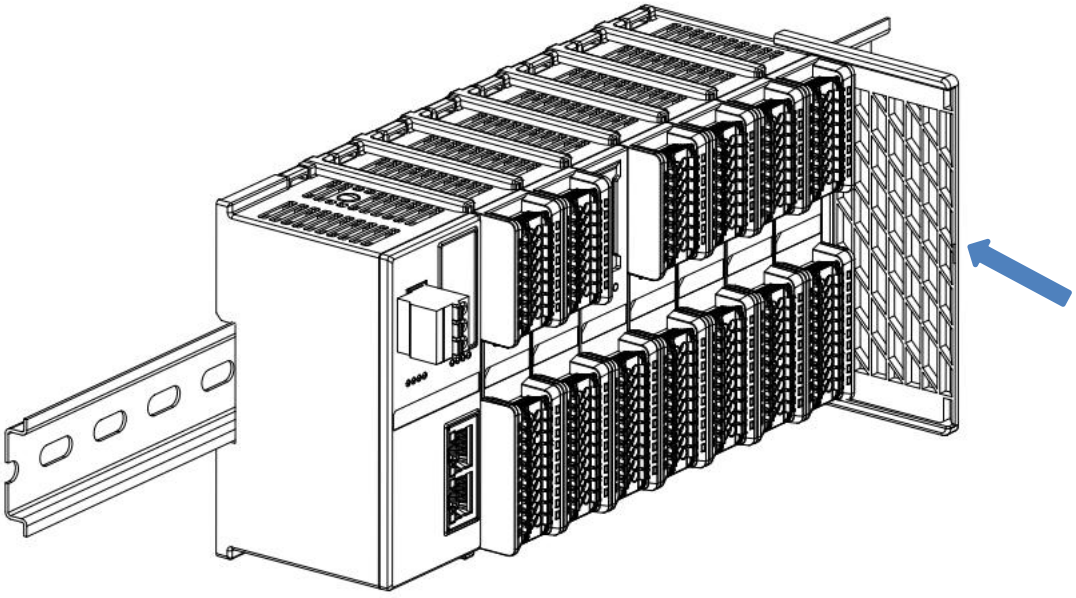
④



⑤

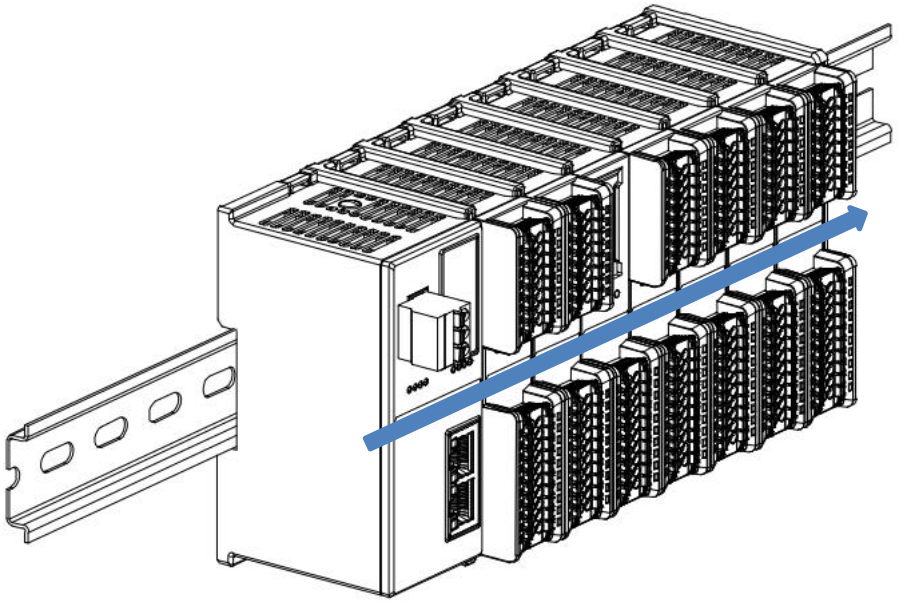
Terminal cover installation

- Install the terminal cover on the right side of the last module. Align the groove side of the terminal cover with the guide rail. For the installation method, please refer to the installation method of the I/O module. Push the terminal cover inward into place, as shown in Figure 6 below.



⑥

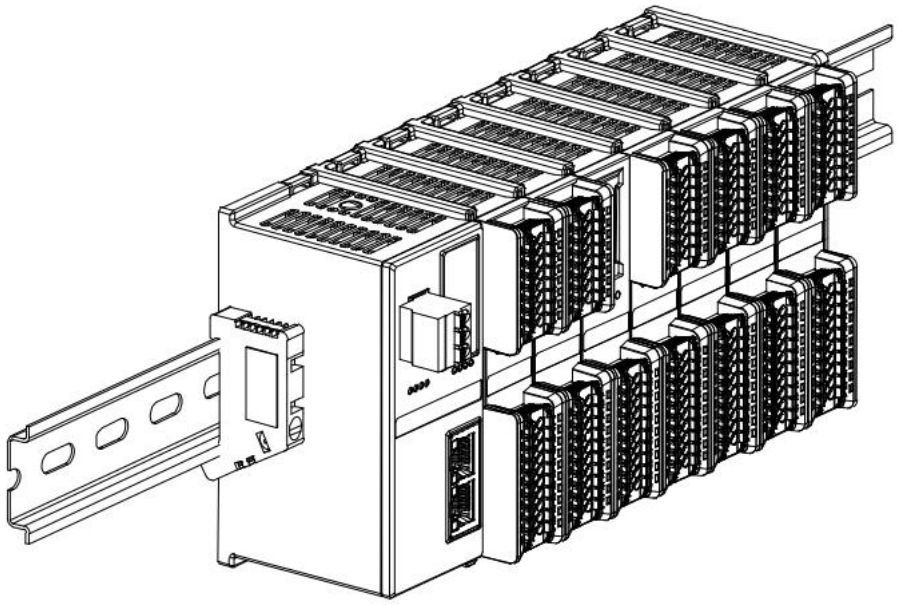
- After the terminal cover is installed, check whether the front of the entire module is flat, and ensure that all modules and end covers are installed in place and the front is flush, as shown in Figure 7 below.



⑦

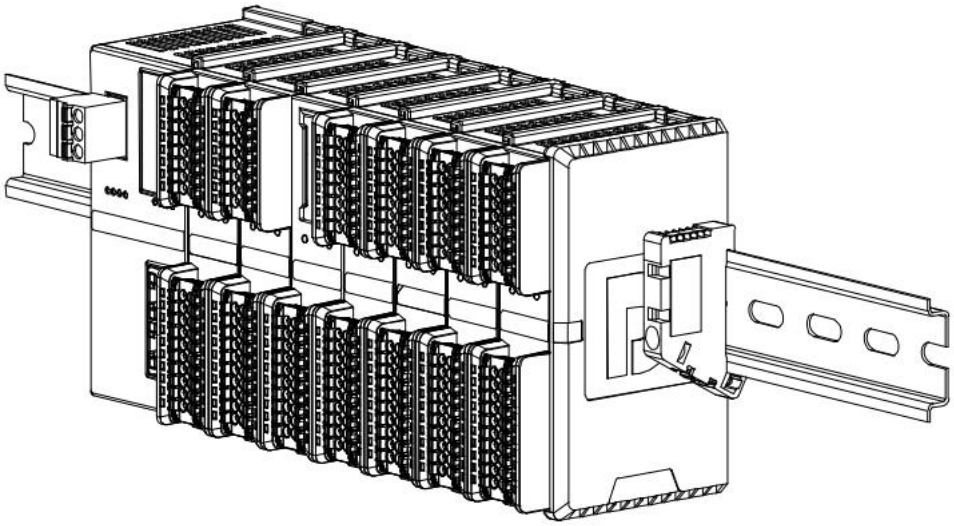
Guide rail fastener installation

- Install and tighten the guide rail fastener close to the left side of the coupler, as shown in Figure 8 below.



⑧

- Install the guide rail fastener on the right side of the terminal cover. First, push the guide rail fastener towards the coupler to ensure that the module is installed securely, and then tighten the guide rail fastener with a screwdriver, as shown in Figure 9 below.

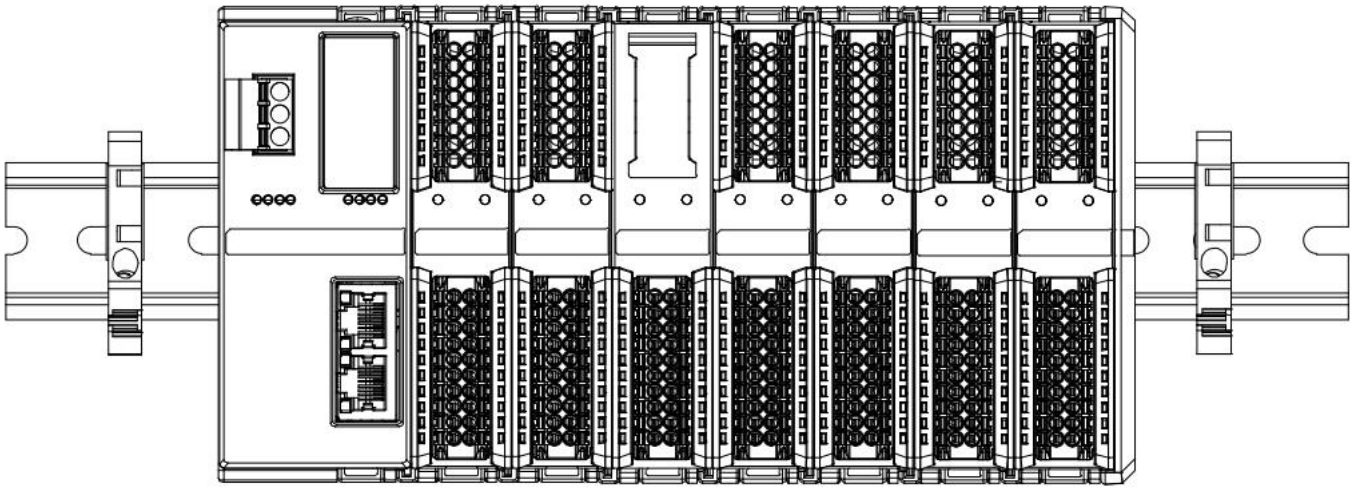


9

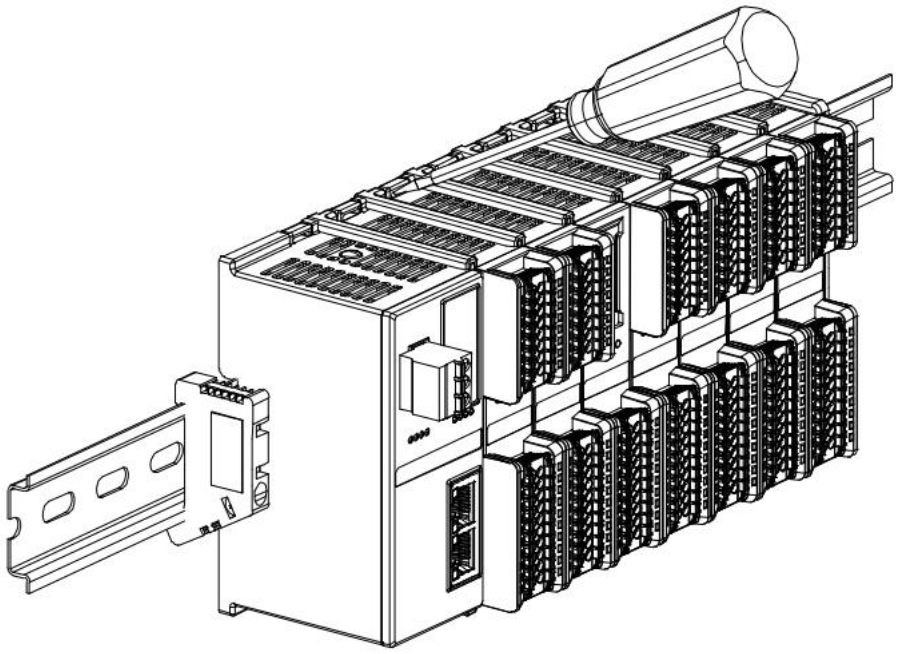
Disassembly

- Loosen the guide rail fastener at one end of the module with a screwdriver and move it to one side, ensuring there is a gap between the module and the guide rail fastener, as shown in Figure 10 below.

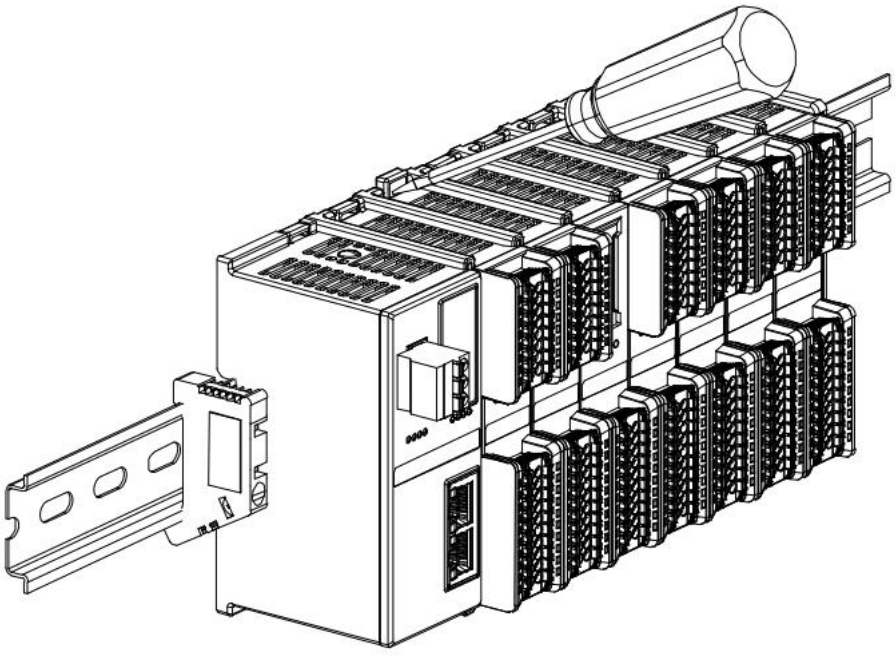
⑩



- Insert the flathead screwdriver into the clips of the module to be removed, and apply force from the side towards the module (you will hear a click), as shown in the picture below.⑪and⑫As shown. Note: Each module has a latch at the top and bottom; operate in the same way for all of them.

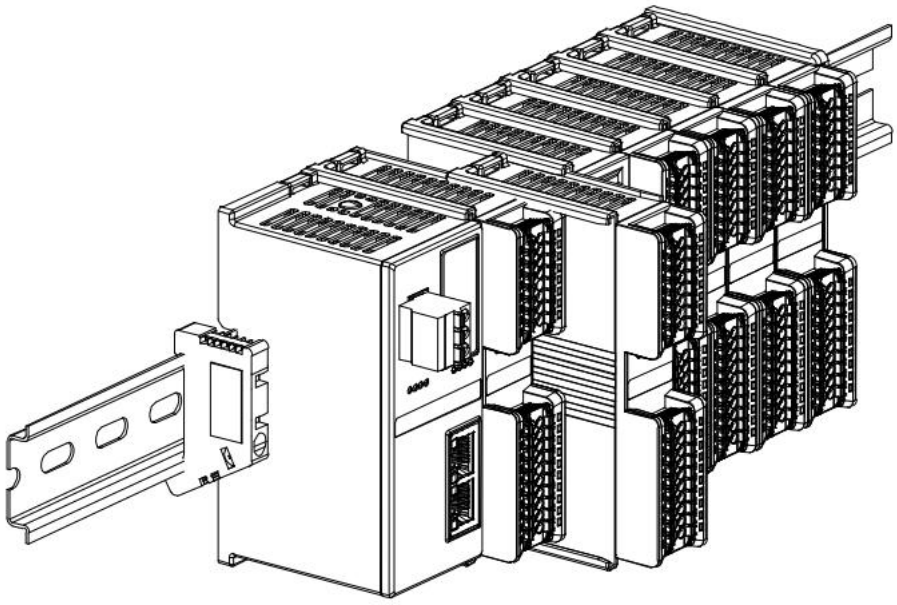


⑪



⑫

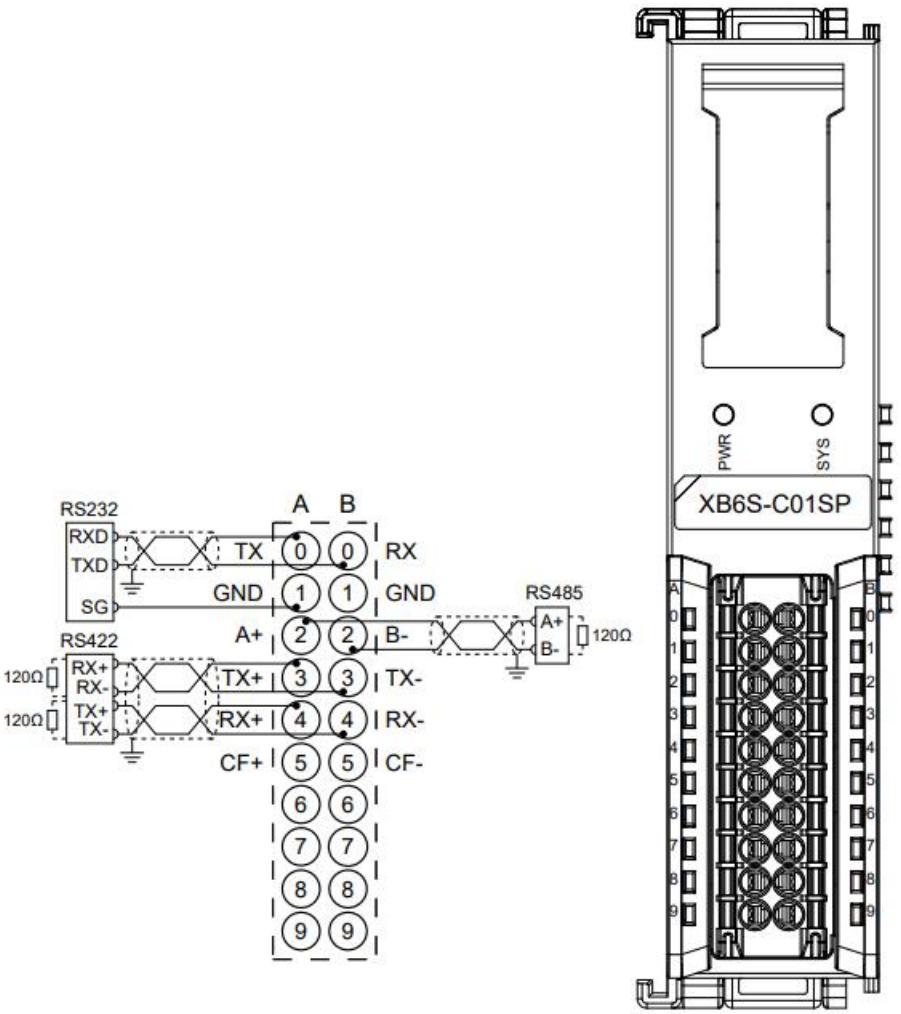
- Disassemble the module following the reverse procedure of installing the module, as shown in the following figure.⑬As shown.



⑬

5 Wiring

5.1 Wiring diagram



*GND is RS232 signal ground, internally conductive.

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

*CF+/CF- provides a debugging interface for the module, but it is not yet enabled.

5.2 Terminal block definition

A			B		
Terminal markings	**Terminal Definition**	**illustrate**	**Terminal markings**	**Terminal Definition**	**illustrate**
0	TX	RS232 transmitter	0	RX	RS232 receiver
1	GND	RS232 signal ground	1	GND	RS232 signal ground
2	A+	RS485 send+	2	B-	RS485 transmission -
3	TX+	RS422 send+	3	TX-	RS422 transmit -
4	RX+	RS422 receiver +	4	RX-	RS422 receiver -
5	CF+	Reserved	5	CF-	Reserved
6	NC	Empty terminal	6	NC	Empty terminal
7	NC	Empty terminal	7	NC	Empty terminal
8	NC	Empty terminal	8	NC	Empty terminal
9	NC	Empty terminal	9	NC	Empty terminal

6 Use

6.1 Configuration parameter definition

Parameter name	Describe	Range of values	Illustrate
Communication Mode	Communication mode	0	NoSelect means no selection.
		1	Modbus RTU Master, also known as RTU master mode
		2	Modbus RTU Slave, i.e., RTU slave mode
		3	Modbus ASCII Master, also known as ASCII master mode.
		4	Modbus ASCII Slave, also known as ASCII slave mode.
		5	FP_Request, or Freeport Request mode
		6	FP_Input_Output refers to the free-port input/output mode.
		7	FP_Input, or free-port input mode
		8	FP_Output is the free port output mode.
		9	SetPDOLength32Bytes [1]
		10	SetPDOLength64Bytes
		11	SetPDOLength 128Bytes
		12	SetPDOLength255Bytes
Baud Rate	Serial port baud rate	0	1200 bps
		1	2400 bps
		2	4800 bps
		3	9600 bps
		4	19200 bps
		5	38400 bps
		6	57600 bps
		7	115200 bps

Stop Bit	Stop bit	0	1 Bit
		1	2 Bits
Word Format	Character format	0	8 Bits
		1	7 Bits
Parity	Parity bit	0	Parity None (no validation)
		1	Parity Odd odd check
		2	Parity Even parity
Control Mode	Control and State Mode	0	Disable means loss of control and status.
		1	Level refers to control and state enable - high-level trigger.
		2	Rising Edge, or Control and State Enable - Rising Edge Triggering
Node Output Mode	Node output mode	0	Poll refers to the round-robin process.
		1	Change Trigger means encountering change.
Communication Error Behavior	Communication error behavior	0	Clear means empty.
		1	Hold means to maintain.
Respond Timeout	Response time	5~3000	The unit is milliseconds (ms), with a default value of 50.
Poll Delay	Polling Delay	5~3000	The unit is milliseconds (ms), with a default value of 10.
Slave ID	Modbus station number	1~247	Valid in slave mode, default value is 1.
Slave Respond Delay	Slave response delay	0~3000	The unit is milliseconds (ms), with a default value of 10.
Frame Interval	Frame interval	0	1.5T
		1	3.5T
		2	5T
		3	10T
		4	20T
		5	50T
		6	100T
		7	200T
Node_1_Param_01	Node 1 parameter 1	0~FFFFFFFF	The default value is 0. See details.Node code parameters
Node_1_Param_02	Node 1 Parameter 2	0~FFFFFFFF	The default value is 0. See details.Node code parameters
...	...	...	...
Node_16_Param_01	Node 16 Parameter 1	0~FFFFFFFF	The default value is 0. See details.Node code parameters
Node_16_Param_02	Node 16 Parameter 2	0~FFFFFFFF	The default value is 0. See details.Node code parameters

Note [1]: The module supports manual switching of the corresponding PDO data length. For details on PDO data length settings, please refer to [link/reference].6.3 Process Data.

6.2 Node code parameters

6.2.1 Modbus master station functions

In Modbus master mode, parameter 1 (Param_01) consists of a 2-byte start address parameter and a 2-byte node code parameter, while parameter 2 (Param_02) consists of a 2-bit byte swap parameter and a 1-byte slave station number parameter.

Param_01			
BIT31~BIT16	BIT15~BIT0		
Start Address	See Node Code for details.Modbus master node code		
Param_02			
BIT31~BIT16	BIT15~BIT10	BIT9~BIT8	BIT7~BIT0
Reserve		SeeByte swap ExByte Flag	Slave Station Number

Note: The starting address parameter range is 0000~FFFFH, and the slave station number parameter range is 1~247.

6.2.2 Modbus master station functional node code

SubModule Grouping	SubModule	SubModule ID (10#)	SubModule ID (16#)
Modbus Master Read Coils That is, the Modbus master station reads the coil.	Read 8 bits	257	0x0101
	Read 16 bits	258	0x0102
	Read 24 bits	259	0x0103
	Read 32 bits	260	0x0104
	Read 40 bits	261	0x0105
	Read 48 bits	262	0x0106
	Read 56 bits	263	0x0107
	Read 64 bits	264	0x0108
	Read 72 bits	265	0x0109
	Read 80 bits	266	0x010A
	Read 88 bits	267	0x010B
	Read 96 bits	268	0x010C
	Read 104 bits	269	0x010D
	Read 112 bits	270	0x010E
	Read 120 bits	271	0x010F
	Read 128 bits	272	0x0110
Modbus Master Read Discrete That is, the Modbus master station reads discrete inputs.	Read 8 bits	513	0x0201
	Read 16 bits	514	0x0202
	Read 24 bits	515	0x0203
	Read 32 bits	516	0x0204
	Read 40 bits	517	0x0205
	Read 48 bits	518	0x0206

	Read 56 bits	519	0x0207
	Read 64 bits	520	0x0208
	Read 72 bits	521	0x0209
	Read 80 bits	522	0x020A
	Read 88 bits	523	0x020B
	Read 96 bits	524	0x020C
	Read 104 bits	525	0x020D
	Read 112 bits	526	0x020E
	Read 120 bits	527	0x020F
	Read 128 bits	528	0x0210
Modbus Master Read Hold That is, Modbus master station read holding register	Read 1 Reg	769	0x0301
	Read 2 Regs	770	0x0302
	Read 3 Regs	771	0x0303
	Read 4 Regs	772	0x0304
	Read 5 Regs	773	0x0305
	Read 6 Regs	774	0x0306
	Read 7 Regs	775	0x0307
	Read 8 Regs	776	0x0308
	Read 9 Regs	777	0x0309
	Read 10 Regs	778	0x030A
	Read 11 Regs	779	0x030B
	Read 12 Regs	780	0x030C
	Read 13 Regs	781	0x030D
	Read 14 Regs	782	0x030E
	Read 15 Regs	783	0x030F
	Read 16 Regs	784	0x0310
Modbus Master Read Input That is, Modbus master station read input register	Read 1 Reg	1025	0x0401
	Read 2 Regs	1026	0x0402
	Read 3 Regs	1027	0x0403
	Read 4 Regs	1028	0x0404
	Read 5 Regs	1029	0x0405
	Read 6 Regs	1030	0x0406
	Read 7 Regs	1031	0x0407
	Read 8 Regs	1032	0x0408
	Read 9 Regs	1033	0x0409
	Read 10 Regs	1034	0x040A
	Read 11 Regs	1035	0x040B
	Read 12 Regs	1036	0x040C
	Read 13 Regs	1037	0x040D
	Read 14 Regs	1038	0x040E
	Read 15 Regs	1039	0x040F
	Read 16 Regs	1040	0x0410
Modbus Master Write	Write 8 bits	1281	0x0501

Coils That is, Modbus master station write coil	Write 16 bits	1282	0x0502
	Write 24 bits	1283	0x0503
	Write 32 bits	1284	0x0504
	Write 40 bits	1285	0x0505
	Write 48 bits	1286	0x0506
	Write 56 bits	1287	0x0507
	Write 64 bits	1288	0x0508
	Write 72 bits	1289	0x0509
	Write 80 bits	1290	0x050A
	Write 88 bits	1291	0x050B
	Write 96 bits	1292	0x050C
	Write 104 bits	1293	0x050D
	Write 112 bits	1294	0x050E
	Write 120 bits	1295	0x050F
	Write 128 bits	1296	0x0510
	Write Single bit	1535	0x05FF
Modbus Master Write Hold That is, Modbus master write holding register	Write 1 Reg	1537	0x0601
	Write 2 Regs	1538	0x0602
	Write 3 Regs	1539	0x0603
	Write 4 Regs	1540	0x0604
	Write 5 Regs	1541	0x0605
	Write 6 Regs	1542	0x0606
	Write 7 Regs	1543	0x0607
	Write 8 Regs	1544	0x0608
	Write 9 Regs	1545	0x0609
	Write 10 Regs	1546	0x060A
	Write 11 Regs	1547	0x060B
	Write 12 Regs	1548	0x060C
	Write 13 Regs	1549	0x060D
	Write 14 Regs	1550	0x060E
	Write 15 Regs	1551	0x060F
	Write 16 Regs	1552	0x0610
	Write Single Reg	1791	0x06FF

6.2.3 Modbus slave function

In Modbus slave mode, parameter 1 (Param_01) consists of a 2-byte start address parameter and a 2-byte node code parameter, while parameter 2 (Param_02) consists of a 2-bit byte swap parameter.

Param_01		
BIT31~BIT16	BIT15~BIT0	
Start Address	See Node Code for details.Modbus slave node code	
Param_02		
BIT31~BIT16	BIT15~BIT2	BIT1~BIT0
Reserve		SeeByte swap ExByte Flag

Note: The starting address parameter range is 0000~FFFFH

6.2.4 Modbus slave function node code

SubModule Grouping	SubModule	SubModule ID (10#)	SubModule ID (16#)
Modbus Slave Read Coils That is, Modbus slave station read coil	Read 8 bits	1793	0x0701
	Read 16 bits	1794	0x0702
	Read 24 bits	1795	0x0703
	Read 32 bits	1796	0x0704
	Read 40 bits	1797	0x0705
	Read 48 bits	1798	0x0706
	Read 56 bits	1799	0x0707
	Read 64 bits	1800	0x0708
	Read 72 bits	1801	0x0709
	Read 80 bits	1802	0x070A
	Read 88 bits	1803	0x070B
	Read 96 bits	1804	0x070C
	Read 104 bits	1805	0x070D
	Read 112 bits	1806	0x070E
	Read 120 bits	1807	0x070F
	Read 128 bits	1808	0x0710
Modbus Slave Read Hold That is, Modbus slave reads holding register	Read 1 Reg	2049	0x0801
	Read 2 Regs	2050	0x0802
	Read 3 Regs	2051	0x0803
	Read 4 Regs	2052	0x0804
	Read 5 Regs	2053	0x0805
	Read 6 Regs	2054	0x0806
	Read 7 Regs	2055	0x0807
	Read 8 Regs	2056	0x0808
	Read 9 Regs	2057	0x0809
	Read 10 Regs	2058	0x080A

	Read 11 Regs	2059	0x080B
	Read 12 Regs	2060	0x080C
	Read 13 Regs	2061	0x080D
	Read 14 Regs	2062	0x080E
	Read 15 Regs	2063	0x080F
	Read 16 Regs	2064	0x0810
Modbus Slave Write Coils That is, Modbus slave write coil	Write 8 bits	2305	0x0901
	Write 16 bits	2306	0x0902
	Write 24 bits	2307	0x0903
	Write 32 bits	2308	0x0904
	Write 40 bits	2309	0x0905
	Write 48 bits	2310	0x0906
	Write 56 bits	2311	0x0907
	Write 64 bits	2312	0x0908
	Write 72 bits	2313	0x0909
	Write 80 bits	2314	0x090A
	Write 88 bits	2315	0x090B
	Write 96 bits	2316	0x090C
	Write 104 bits	2317	0x090D
	Write 112 bits	2318	0x090E
	Write 120 bits	2319	0x090F
	Write 128 bits	2320	0x0910
Modbus Slave Write Discrete That is, Modbus slave station writes discrete input.	Write 8 bits	2561	0x0A01
	Write 16 bits	2562	0x0A02
	Write 24 bits	2563	0x0A03
	Write 32 bits	2564	0x0A04
	Write 40 bits	2565	0x0A05
	Write 48 bits	2566	0x0A06
	Write 56 bits	2567	0x0A07
	Write 64 bits	2568	0x0A08
	Write 72 bits	2569	0x0A09
	Write 80 bits	2570	0x0A0A
	Write 88 bits	2571	0x0A0B
	Write 96 bits	2572	0x0A0C
	Write 104 bits	2573	0x0A0D
	Write 112 bits	2574	0x0A0E
	Write 120 bits	2575	0x0A0F
	Write 128 bits	2576	0x0A10
Modbus Slave Write Hold That is, Modbus slave write holding register	Write 1 Reg	2817	0x0B01
	Write 2 Regs	2818	0x0B02
	Write 3 Regs	2819	0x0B03
	Write 4 Regs	2820	0x0B04
	Write 5 Regs	2821	0x0B05

	Write 6 Regs	2822	0x0B06
	Write 7 Regs	2823	0x0B07
	Write 8 Regs	2824	0x0B08
	Write 9 Regs	2825	0x0B09
	Write 10 Regs	2826	0x0B0A
	Write 11 Regs	2827	0x0B0B
	Write 12 Regs	2828	0x0B0C
	Write 13 Regs	2829	0x0B0D
	Write 14 Regs	2830	0x0B0E
	Write 15 Regs	2831	0x0B0F
	Write 16 Regs	2832	0x0B10
Modbus Slave Write Input That is, Modbus slave write input register	Write 1 Reg	3073	0x0C01
	Write 2 Regs	3074	0x0C02
	Write 3 Regs	3075	0x0C03
	Write 4 Regs	3076	0x0C04
	Write 5 Regs	3077	0x0C05
	Write 6 Regs	3078	0x0C06
	Write 7 Regs	3079	0x0C07
	Write 8 Regs	3080	0x0C08
	Write 9 Regs	3081	0x0C09
	Write 10 Regs	3082	0x0C0A
	Write 11 Regs	3083	0x0C0B
	Write 12 Regs	3084	0x0C0C
	Write 13 Regs	3085	0x0C0D
	Write 14 Regs	3086	0x0C0E
	Write 15 Regs	3087	0x0C0F
	Write 16 Regs	3088	0x0C10

6.2.5 Byte swap

byte number	Function	length
0	No exchange	2 bits
1	2 Bytes Exchange	2 bits
2	4 Bytes Register Exchange	2 bits
3	4Bytes Big-Little-Endian Exchange	2 bits

2-Byte Exchange:

When using 2-byte swaps, the number of bytes swapped must be a multiple of 2. 2-byte swaps are performed in units of 2 bytes, as shown in the table below.

Before the exchange		After the exchange	
Byte Index	**byte value**	**Byte Index**	**byte value**
0	0x12	0	0x34
1	0x34	1	0x12

4-Byte Register Exchange:

When using 4-byte register swapping, the number of bytes swapped must be a multiple of 4. 4-byte register swapping is performed in units of two registers, as shown in the table below.

Before the exchange		After the exchange	
Byte Index	**byte value**	**Byte Index**	**byte value**
0	0x12	0	0x56
1	0x34	1	0x78
2	0x56	2	0x12
3	0x78	3	0x34

4Bytes Big-Little-Endian Exchange:

When using 4-byte endianness swapping, the number of bytes swapped must be a multiple of 4. 4-byte endianness swapping is performed in units of 4 bytes, as shown in the table below.

Before the exchange		After the exchange	
Byte Index	**byte value**	**Byte Index**	**byte value**
0	0x12	0	0x78
1	0x34	1	0x56
2	0x56	2	0x34
3	0x78	3	0x12

6.2.6 Freeport functionality

In Freeport mode, parameter 1 (Param_01) consists of 2 bytes of node code parameters.

Param_01	
BIT31~BIT16	BIT15~BIT0
Reserve	See Node Code for details.Freeport node code
Param_02	
BIT31~BIT0	
Reserve	

6.2.7 Freeport feature node code

SubModule Grouping	SubModule	SubModule ID (10#)	SubModule ID (16#)
Freeport Input	Input 1 byte	3329	0x0D01
	Input 2 bytes	3330	0x0D02
	Input 4 bytes	3331	0x0D03
	Input 8 bytes	3332	0x0D04
	Input 16 bytes	3333	0x0D05
	Input 32 bytes	3334	0x0D06
	Input 64 bytes	3335	0x0D07
	Input 128 bytes	3336	0x0D08
	Input 160 bytes	3337	0x0D09
	Input 192 bytes	3338	0x0D0A
	Input 224 bytes	3339	0x0D0B
	Input 255 bytes	3340	0x0D0C
Freeport Output	Output 1 byte	3585	0x0E01
	Output 2 bytes	3586	0x0E02
	Output 4 bytes	3587	0x0E03
	Output 8 bytes	3588	0x0E04
	Output 16 bytes	3589	0x0E05
	Output 32 bytes	3590	0x0E06
	Output 64 bytes	3591	0x0E07
	Output 128 bytes	3592	0x0E08
	Output 160 bytes	3593	0x0E09
	Output 192 bytes	3594	0x0E0A
	Output 224 bytes	3595	0x0E0B
	Output 255 bytes	3596	0x0E0C
Freeport Parity (Freeport Parity Check)	CRC8	3841	0x0F01
	CRC16	3842	0x0F02
	XOR	3843	0x0F03
	SUM8	3844	0x0F04
	LRC	3845	0x0F05

6.2.8 Control and State Node Code

When the configuration parameter Control Mode is set to disable, no control and status node code needs to be configured; when the configuration parameter Control Mode is set to Level or Rising Edge, node code must first be configured in Node 1 parameter 1 (Node_1_Param_01).

The node codes are shown in the table below:

SubModule Grouping	SubModule	SubModule ID (10#)	SubModule ID (16#)	Remark
Control & Status	1 Node	1	0x0001	Configuration in master mode
	2 Node	2	0x0002	
	3 Node	3	0x0003	
	4 Node	4	0x0004	
	5 Node	5	0x0005	
	6 Node	6	0x0006	
	7 Node	7	0x0007	
	8 Node	8	0x0008	
	9 Node	9	0x0009	
	10 Node	10	0x000A	
	11 Node	11	0x000B	
	12 Node	12	0x000C	
	13 Node	13	0x000D	
	14 Node	14	0x000E	
	15 Node	15	0x000F	
	Freeport Req	32	0x0020	Configuration in free port mode
	Freeport Input_Output	33	0x0021	
	Freeport Input	34	0x0022	
	Freeport Output	35	0x0023	
	Modbus Slave	48	0x0030	Configuration in slave mode

6.3 Process data

The module defaults to XB6S-C01SP-32Bytes at the factory, with uplink and downlink data lengths each of 32 bytes. When the PDO data volume generated by the module's communication node parameter configuration reaches a certain range (either the uplink or downlink data volume reaches the limit), the coupler module will issue an alarm 0x5002. Manually switch the corresponding PDO data length, power on again, and scan the module. For detailed steps, please refer to [link to detailed steps].6.4.1 Example of switching PDO data length(Users are advised to estimate the PDO data length in advance and switch to the appropriate length accordingly.)

Module PDO length range and model matching table:

Module PDO Length Range and Model Matching Table		
Module model	Uplink data length (Bytes)	Downlink data length (Bytes)
XB6S-C01SP-32Bytes	0~32	0~32
XB6S-C01SP-64Bytes	33~64	33~64
XB6S-C01SP-128Bytes	65~128	65~128
XB6S-C01SP-255Bytes	129~255	129~255

The following section uses model XB6S-C01SP-32Bytes as an example to introduce the configuration parameters.

- **When the Control Mode configuration parameter is set to disable, the uplink and downlink process data are shown in the table below.**

Uplink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	Input data	Serial communication module input data	32 bytes
2	Input data		
…	…		
32	Input data		
Downlink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	Output data	Serial communication module outputs data	32 bytes
2	Output data		
…	…		
32	Output data		

- **When the configuration parameter Control Mode is set to Level or Rising Edge, the uplink and downlink process data are shown in the table below.**

6.3.1 Modbus master station process data

Uplink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	status word	Bit0: Idle state	1 byte
		Bit1: Busy state, i.e., data is being transmitted.	
		Bit2: Completion status, i.e., data transmission is complete.	
2	Alarm codes	SeeAlarm codes	1 byte
3	Input data	Serial communication module input data	The last 30 bytes
4	Input data		
...	...		
32	Input data		
Downlink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	control word	When the configuration parameter Control Mode is set to Level, data is sent when set to 1.	1 byte
		When the configuration parameter Control Mode is set to Rising Edge, data is sent from 0 to 1.	
2	Output data	Serial communication module outputs data	The last 31 bytes
3	Output data		
...	...		
32	Output data		

Note: The process data in the table above is configured with one node in Level or Rising Edge mode. If two nodes are configured, bytes 1 and 2 of the uplink data are the status bits and alarm codes of node 1, bytes 3 and 4 are the status bits and alarm codes of node 2, and the remaining bytes are data bits; bytes 1 of the downlink data are the control bits of node 1, bytes 2 are the control bits of node 2, and the remaining bytes are data bits. A maximum of 15 nodes can be configured.

6.3.2 Modbus slave process data

Uplink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	Alarm codes	SeeAlarm codes	1 byte
2	Input data	Serial communication module input data	The last 31 bytes
3	Input data		
...	...		
32	Input data		
Downlink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	control word	Bit0: Alarm code clearing	1 byte
2	Output data	Serial communication module outputs data	The last 31 bytes
3	Output data		
...	...		
32	Output data		

6.3.3 Freeport_Request process data

Uplink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	status word	Bit0: Idle state	1 byte
		Bit1: Busy state, i.e., data is being transmitted.	
		Bit2: Completion status, i.e., data transmission is complete.	
2	Alarm codes	Bit0: Error in received data length	1 byte
		Bit1: Checksum error	
		Bit2: Timeout error	
3	Received data length	0~255	1 byte
4~5	Received anomaly count	0~65535	2 bytes
6~7	Received data count	0~65535	2 bytes
8	Input data	Serial communication module input data	The last 25 bytes
9	Input data		
…	…		
32	Input data		
Downlink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	control word	Bit0: Enable	1 byte
		Bit1: Status word cleared	
		Bit2: Clear received data	
2	Send data length	0~255	1 byte
3	Reset the counter	Bit0: Clear the receive error count.	1 byte
		Bit1: Data Receiver Counter Cleared	
		Bit2: Received data length cleared to zero	
4	Error code clearing	Bit0: Clear abnormal length	1 byte
		Bit1: Clear checksum errors	
		Bit2: Timeout error clearing	
5	Output data	Serial communication module outputs data	The last 28 bytes
6	Output data		
…	…		
32	Output data		

6.3.4 Freeport_Input process data

Uplink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	Alarm codes	Bit0: Error in received data length	1 byte
		Bit1: Checksum error	
2	Received data length	0~255	1 byte
3~4	Received anomaly count	0~65535	2 bytes
5~6	Received data count	0~65535	2 bytes
7	Input data	Serial communication module input data	The last 26 bytes
8	Input data		
…	…		
32	Input data		
Downlink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	control word	Bit0: Enable	1 byte
		Bit1: Status word cleared	
		Bit2: Clear received data	
2	Reset the counter	Bit0: Clear the receive error count.	1 byte
		Bit1: Data Receiver Counter Cleared	
		Bit2: Received data length cleared to zero	
3	Error code clearing	Bit0: Clear if receive length error	1 byte
		Bit1: Clear checksum errors	
4	Output data	Serial communication module outputs data	The last 29 bytes
5	Output data		
…	…		
32	Output data		

6.3.5 Freeport_Output process data

Downlink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	control word	Bit0: Enable	1 byte
2	Send data length	0~255	1 byte
3	Output data	Serial communication module outputs data	The last 30 bytes
4	Output data		
…	…		
32	Output data		

6.3.6 Freeport_Input_Output process data

Uplink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	Alarm codes	Bit0: Error in received data length	1 byte
		Bit1: Checksum error	
2	Received data length	0~255	1 byte
3~4	Received anomaly count	0~65535	2 bytes
5~6	Received data count	0~65535	2 bytes
7	Input data	Serial communication module input data	The last 26 bytes
8	Input data		
…	…		
32	Input data		
Downlink data (32 bytes)			
byte number	**Function**	**meaning**	**Address range**
1	control word	Bit0: Enable	1 byte
		Bit1: Status word cleared	
		Bit2: Clear received data	
2	Send data length	0~255	1 byte
3	Reset the counter	Bit0: Clear the receive error count.	1 byte
		Bit1: Data Receiver Counter Cleared	
		Bit2: Received data length cleared to zero	
4	Error code clearing	Bit0: Clear if receive length error	1 byte
		Bit1: Clear checksum errors	
5	Output data	Serial communication module outputs data	The last 28 bytes
6	Output data		
…	…		
32	Output data		

6.3.7 Modbus alarm codes

Fault codes	Notes
0x00	No errors
0x01	Device address error
0x02	Function code error
0x03	CRC check error
0x04	Response byte count error
0x05	Coil register data error
0x06	Holding register data error
0x07	Illegal data address
0x08	Equipment failure
0x09	LRC check error
0x0C	Data length error
0x0D	Data conversion error
0x0E	ASCII frame error
0x0F	Response timeout

6.4 Module configuration instructions

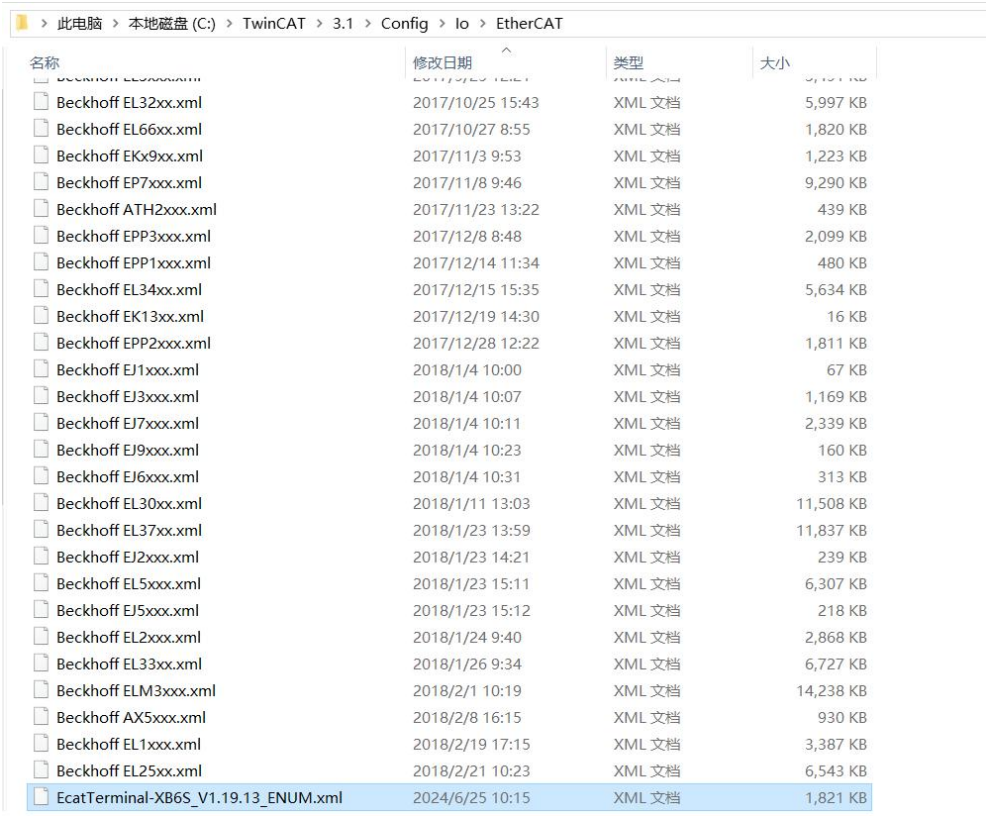
6.4.1 Application in the TwinCAT3 software environment

1、Preparation

- **Hardware environment**
  - **Module model XB6S-C01SP**
  - **EtherCAT bus coupler module, end cap**
    This instruction uses the XB6S-EC2002 coupler module as an example.
  - **One computer, pre-installed with TwinCAT3 software.**
  - **EtherCAT dedicated shielded cable**
  - **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-wire connection"Required Operation"

2、Pre-configured configuration files

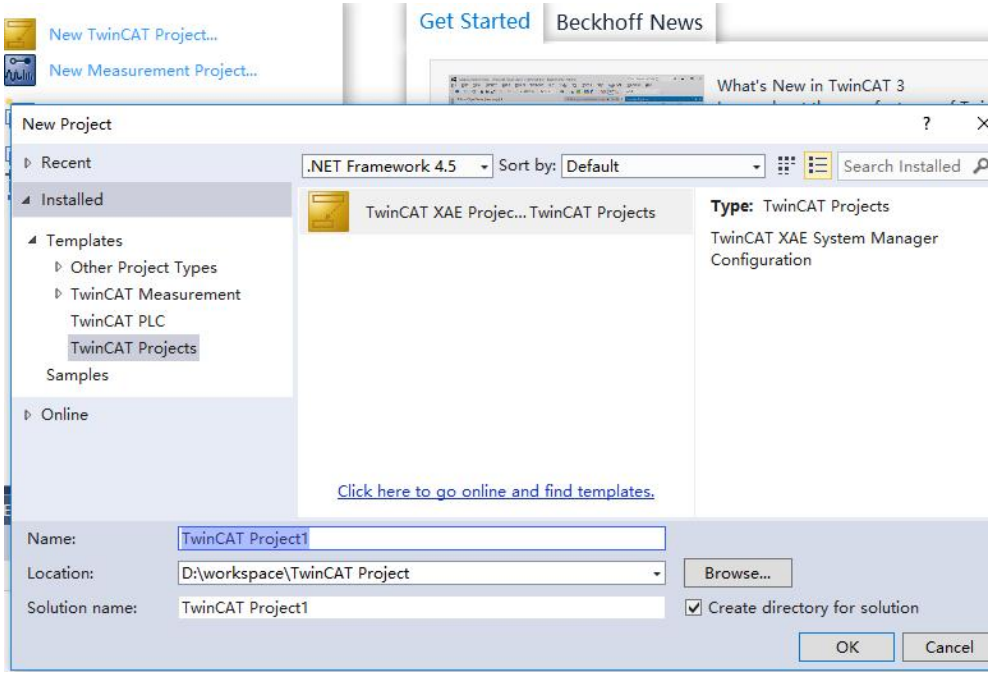
Place the ESI configuration file (EcatTerminal-XB6S_V1.19.13_ENUM.xml) in the TwinCAT installation directory "C:\TwinCAT\3.1\Config\Io\EtherCAT", as shown in the image below.



3、Create a project

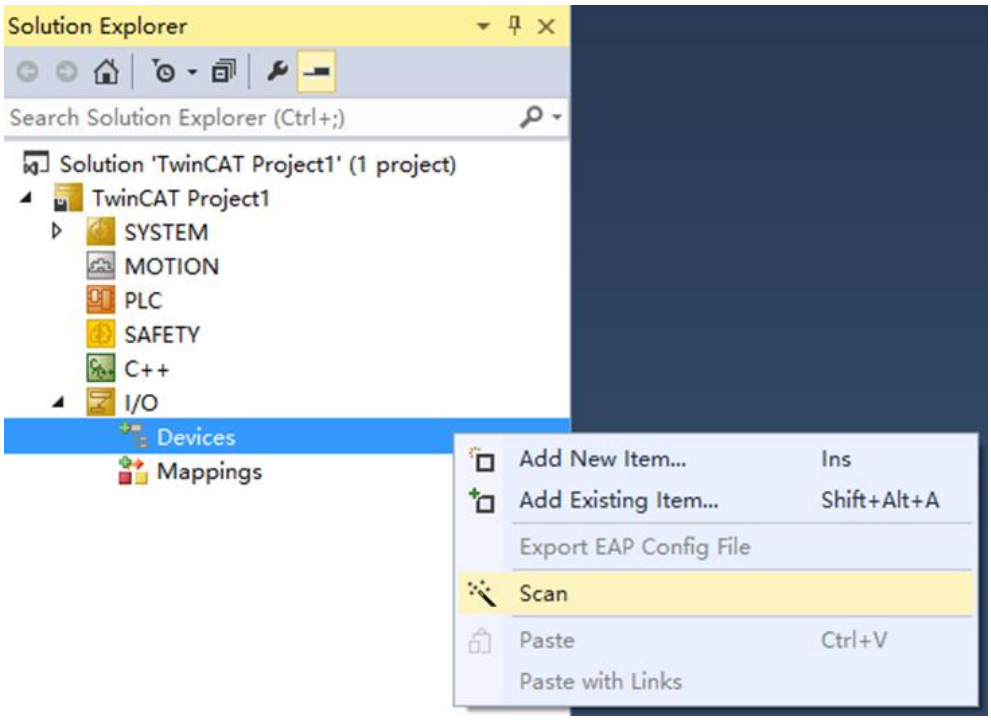
a. Click the TwinCAT icon in the lower right corner of the desktop, select "TwinCAT XAE (VS xxxx)" to open the TwinCAT software, as shown in the image below.

b. Click "New TwinCAT Project". In the pop-up window, "Name" and "Solution name" correspond to the project name and solution name, respectively, and "Location" corresponds to the project path. These three items can be left as default. Then click "OK". The project will be created successfully, as shown in the figure below.

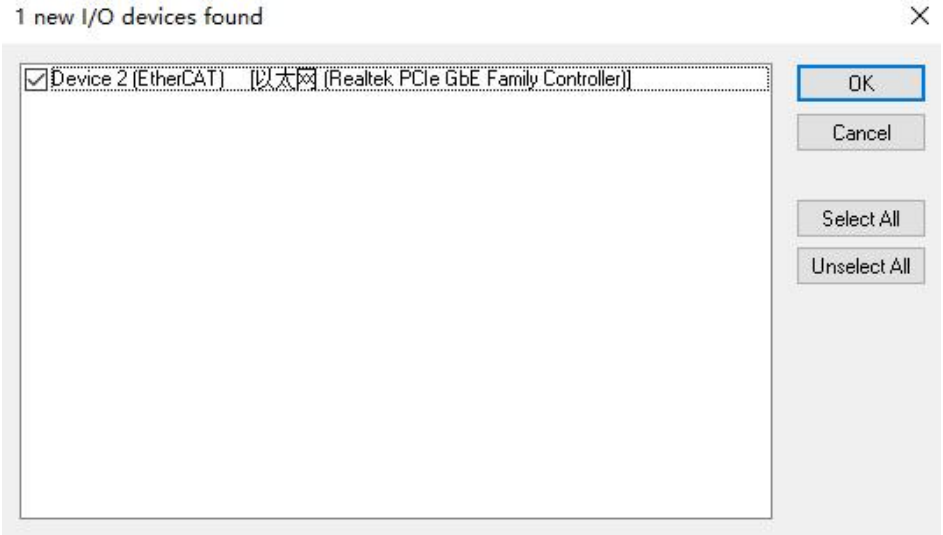


4、Scanning equipment

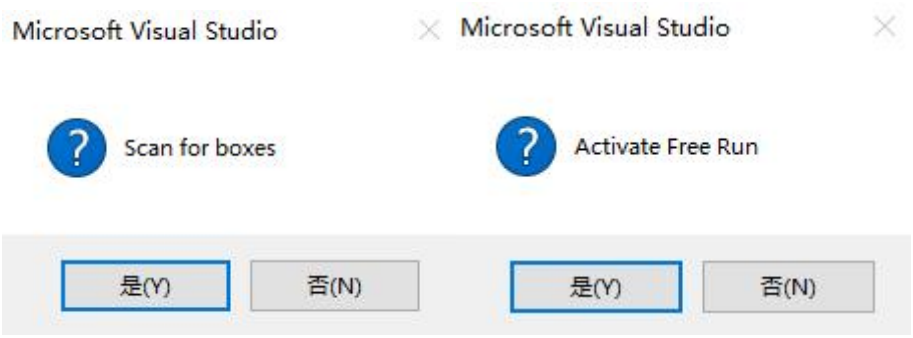
a. After creating the project, right-click the "Scan" option under "I/O -> Devices" to scan for slave devices, as shown in the figure below.



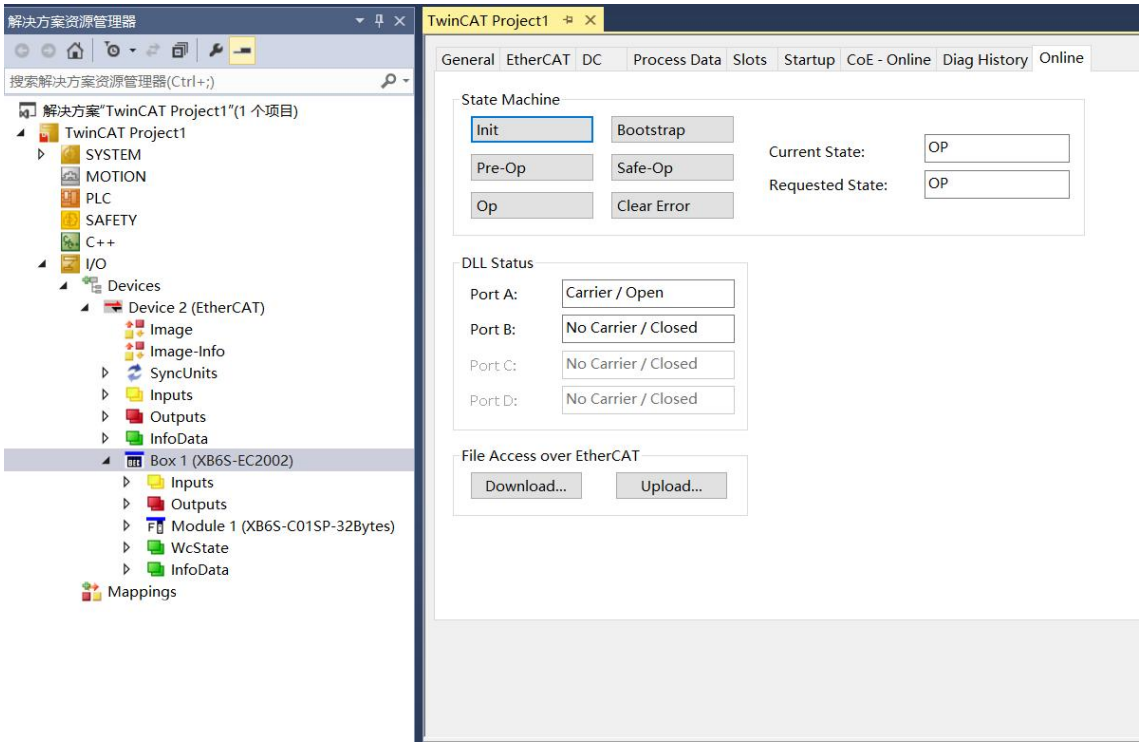
b. Select the "Local Area Connection" network adapter, as shown in the image below.



c. In the pop-up window "Scan for boxes", click "Yes"; in the pop-up window "Activate Free Run", click "Yes", as shown in the image below.

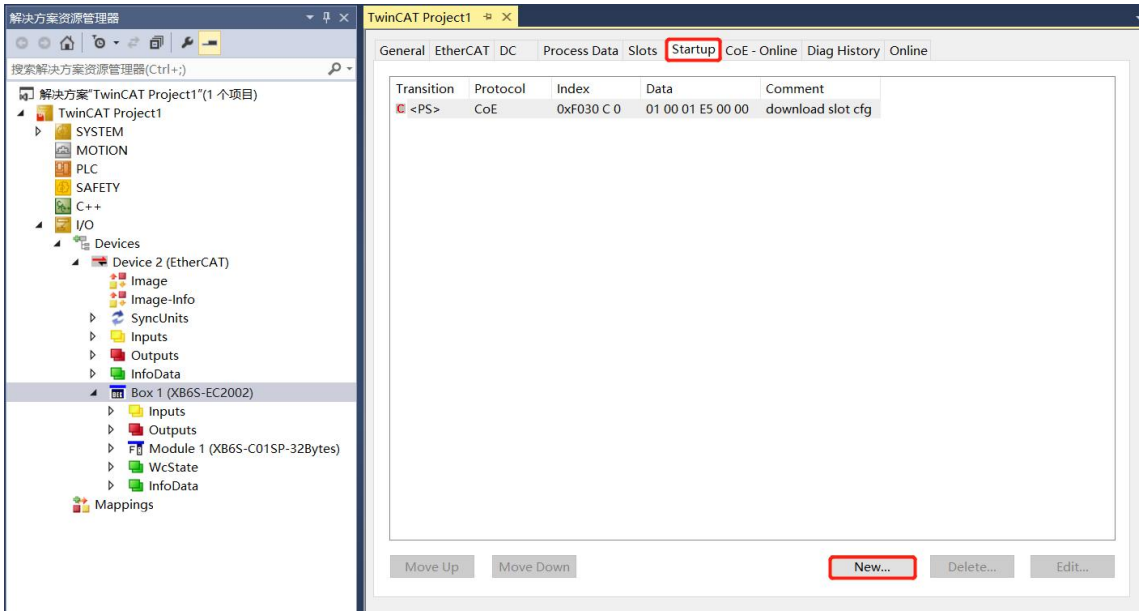


d. After the device is scanned, you can see Box1 (XB6S-EC2002) and Module1 (XB6S-C01SP-32Bytes) in the left navigation tree. Under "Online", you can see that TwinCAT is in "OP" state. You can observe that the RUN light of the slave device is always on, as shown in the figure below.

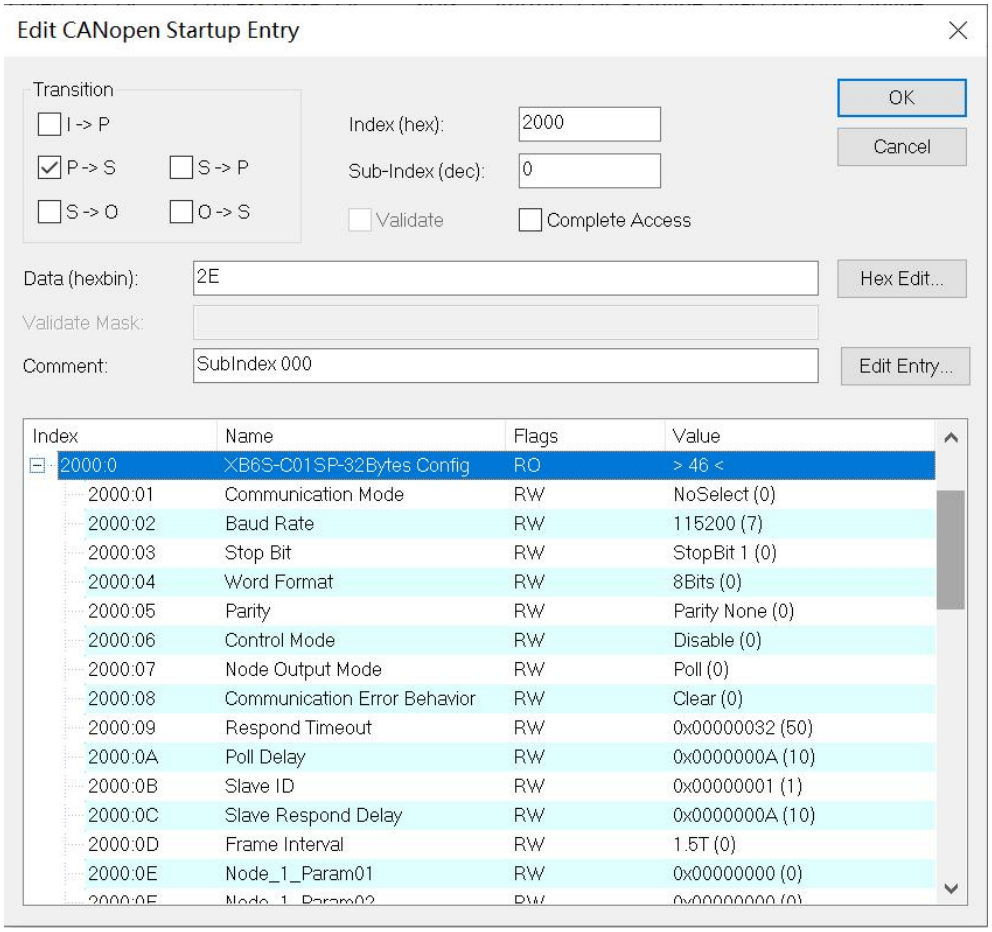


5、Verify basic functions

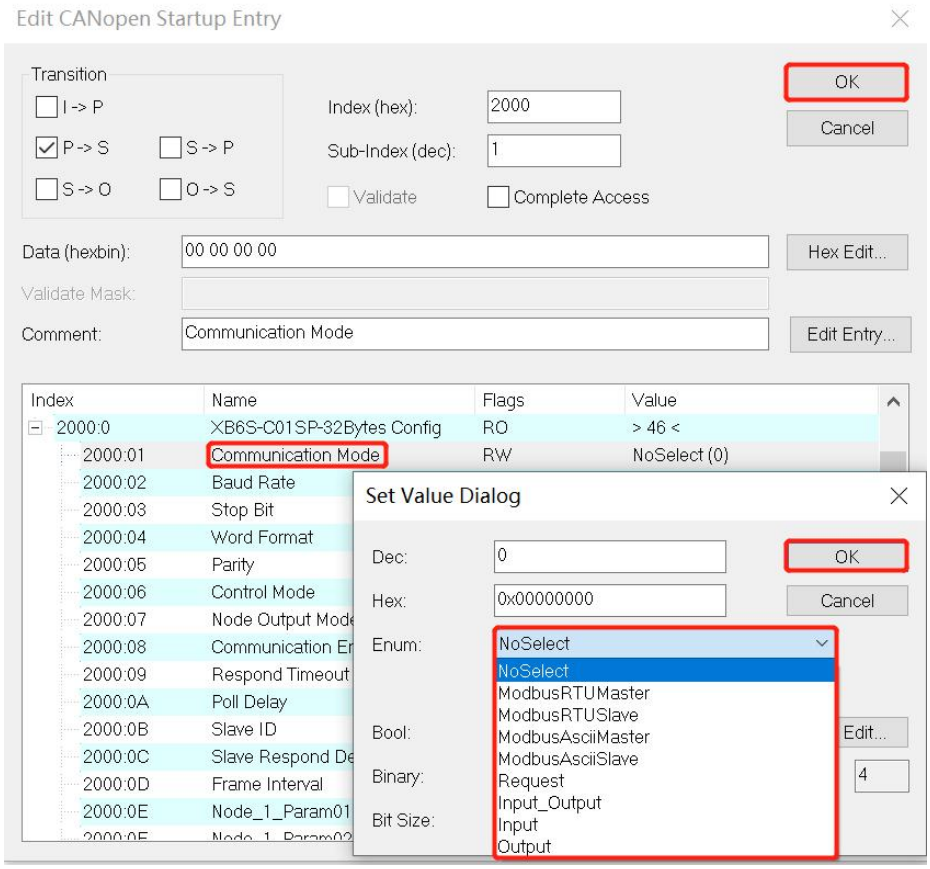
a. Clicking "Box1 -> Startup -> New" in the left navigation tree will take you to the configuration parameter editing page, as shown in the image below.



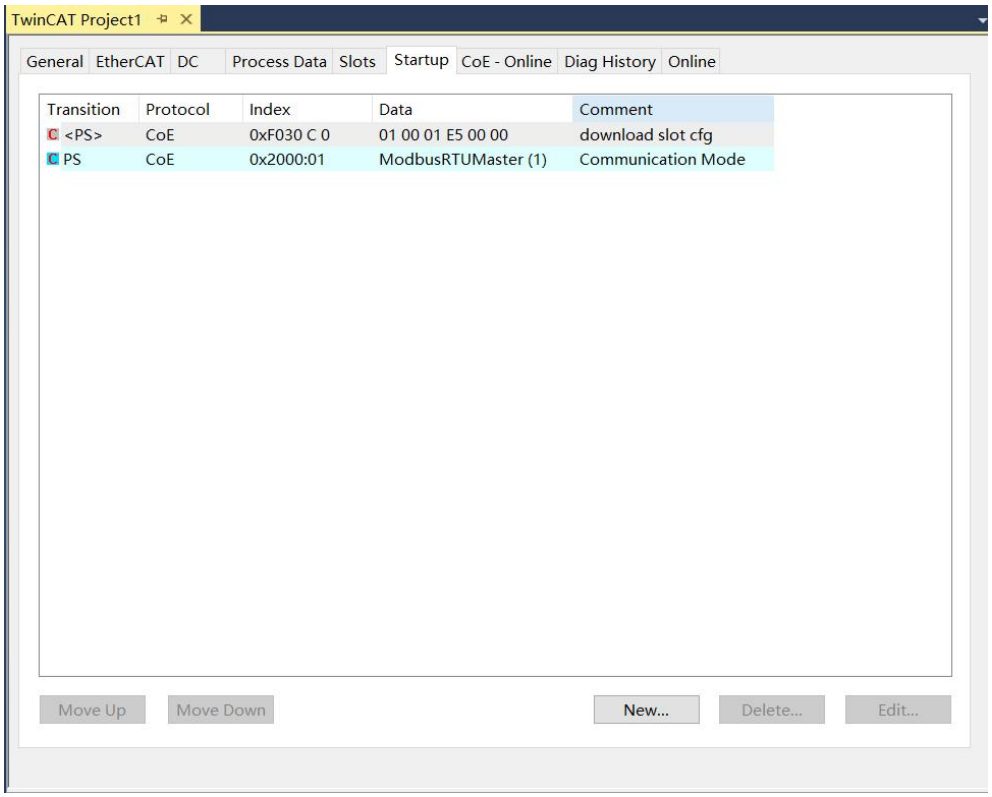
b. In the Edit CANopen Startup Entry pop-up window, click the "+" in front of Index 2000:0 to expand the configuration parameter menu. You can see 45 configuration parameters. Click on any parameter to set the relevant configuration, as shown in the figure below.



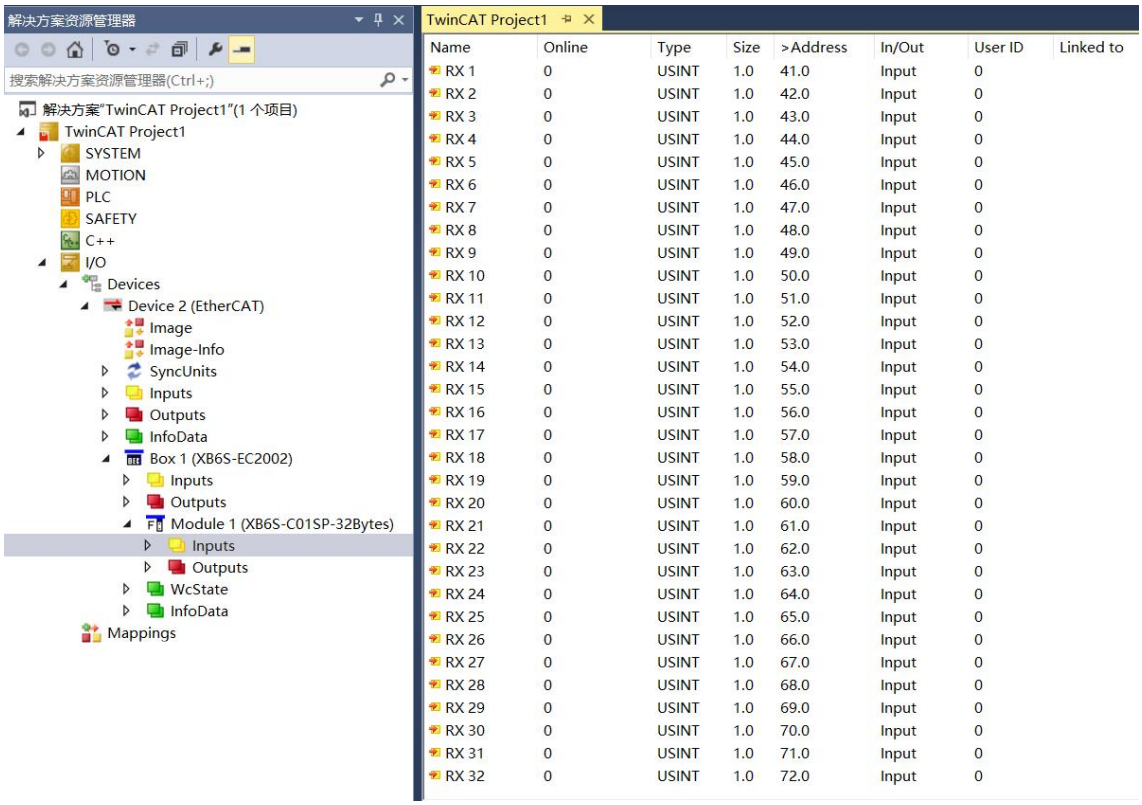
c. For example, to modify the communication mode parameter, you can double-click "Communication Mode" and modify the parameter value, as shown in the figure below.



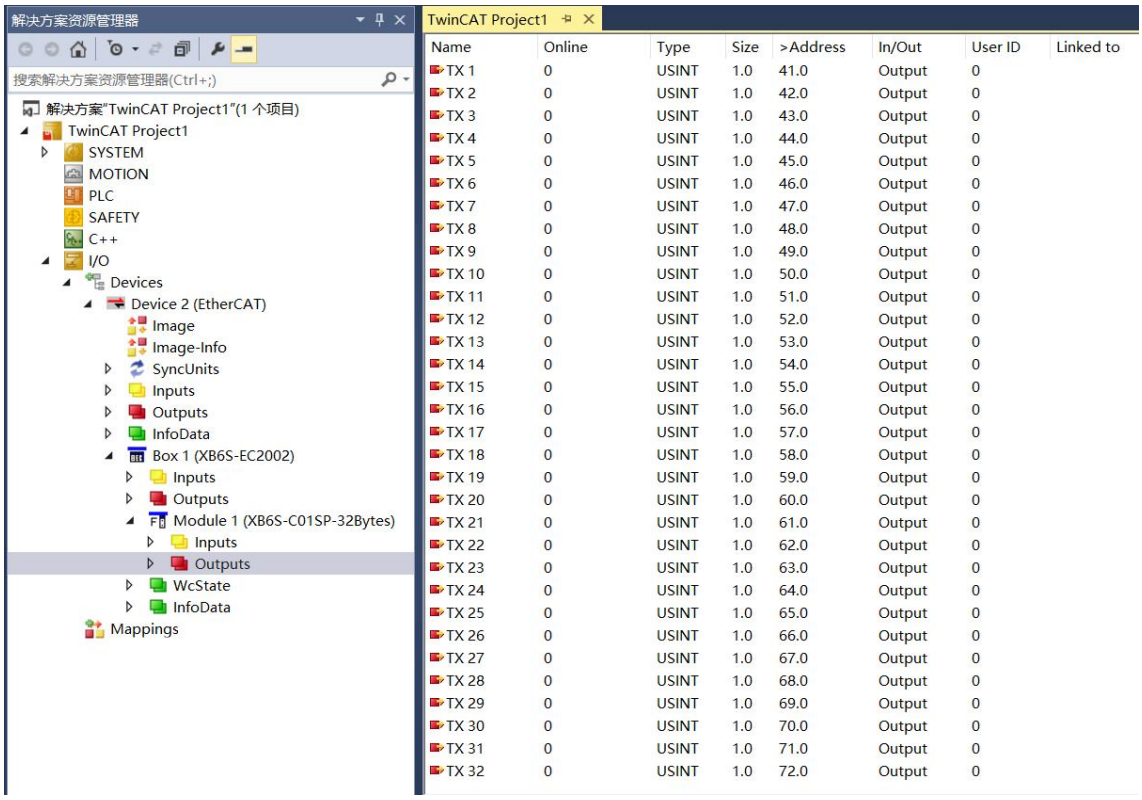
d. After modifying the parameters, you can see the modified parameter items and values below Startup, as shown in the image below. After setting the parameters, a Reload operation and a power-on restart of the module are required to enable the main station to automatically distribute the parameter settings.



e. The left-hand navigation tree "Module 1 -> Inputs" displays the upstream data of the communication module, used to monitor the module's status, as shown in the figure below.



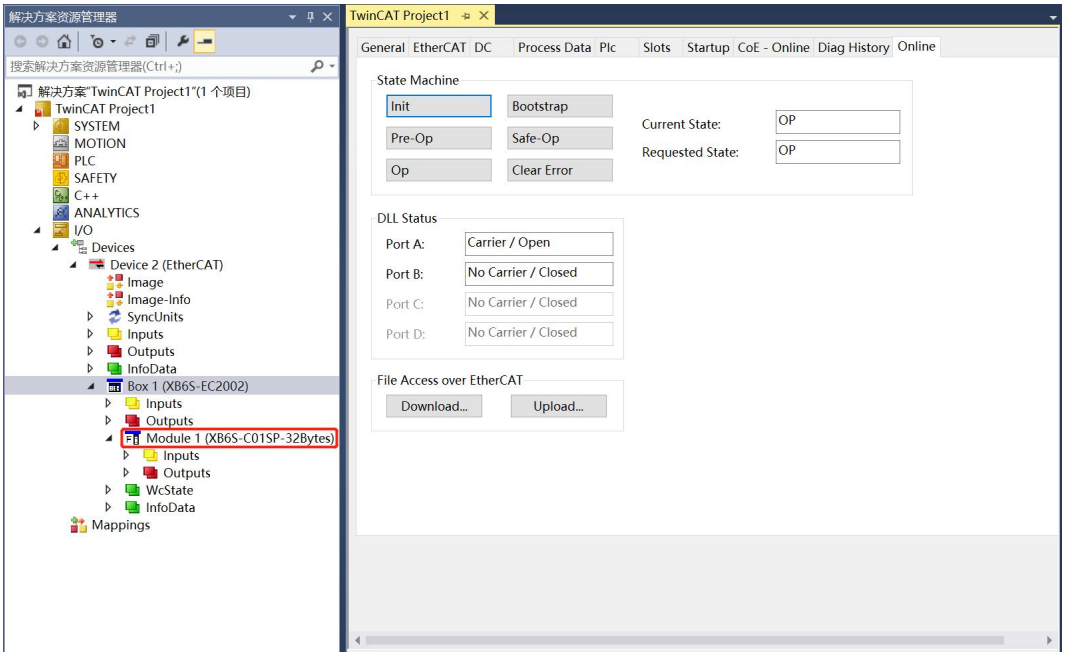
f. The left-hand navigation tree "Module 1 -> Outputs" displays the downlink data of the communication module, used to monitor the output status of the module, as shown in the figure below.



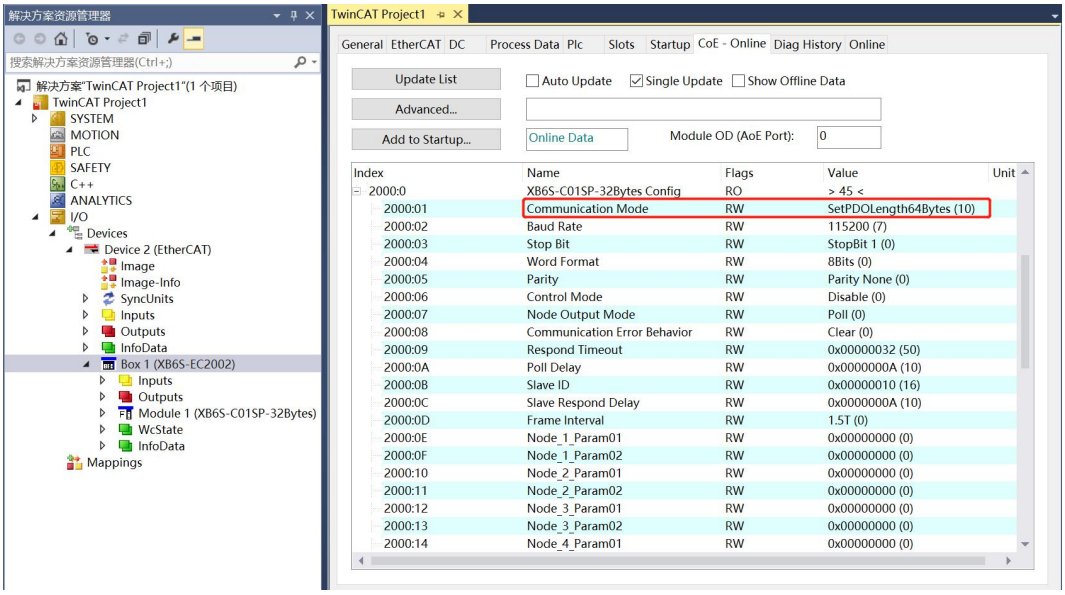
Name	Online	Type	Size	>Address	In/Out	User ID	Linked to
TX 1	0	USINT	1.0	41.0	Output	0	
TX 2	0	USINT	1.0	42.0	Output	0	
TX 3	0	USINT	1.0	43.0	Output	0	
TX 4	0	USINT	1.0	44.0	Output	0	
TX 5	0	USINT	1.0	45.0	Output	0	
TX 6	0	USINT	1.0	46.0	Output	0	
TX 7	0	USINT	1.0	47.0	Output	0	
TX 8	0	USINT	1.0	48.0	Output	0	
TX 9	0	USINT	1.0	49.0	Output	0	
TX 10	0	USINT	1.0	50.0	Output	0	
TX 11	0	USINT	1.0	51.0	Output	0	
TX 12	0	USINT	1.0	52.0	Output	0	
TX 13	0	USINT	1.0	53.0	Output	0	
TX 14	0	USINT	1.0	54.0	Output	0	
TX 15	0	USINT	1.0	55.0	Output	0	
TX 16	0	USINT	1.0	56.0	Output	0	
TX 17	0	USINT	1.0	57.0	Output	0	
TX 18	0	USINT	1.0	58.0	Output	0	
TX 19	0	USINT	1.0	59.0	Output	0	
TX 20	0	USINT	1.0	60.0	Output	0	
TX 21	0	USINT	1.0	61.0	Output	0	
TX 22	0	USINT	1.0	62.0	Output	0	
TX 23	0	USINT	1.0	63.0	Output	0	
TX 24	0	USINT	1.0	64.0	Output	0	
TX 25	0	USINT	1.0	65.0	Output	0	
TX 26	0	USINT	1.0	66.0	Output	0	
TX 27	0	USINT	1.0	67.0	Output	0	
TX 28	0	USINT	1.0	68.0	Output	0	
TX 29	0	USINT	1.0	69.0	Output	0	
TX 30	0	USINT	1.0	70.0	Output	0	
TX 31	0	USINT	1.0	71.0	Output	0	
TX 32	0	USINT	1.0	72.0	Output	0	

6、Example of switching PDO data length function

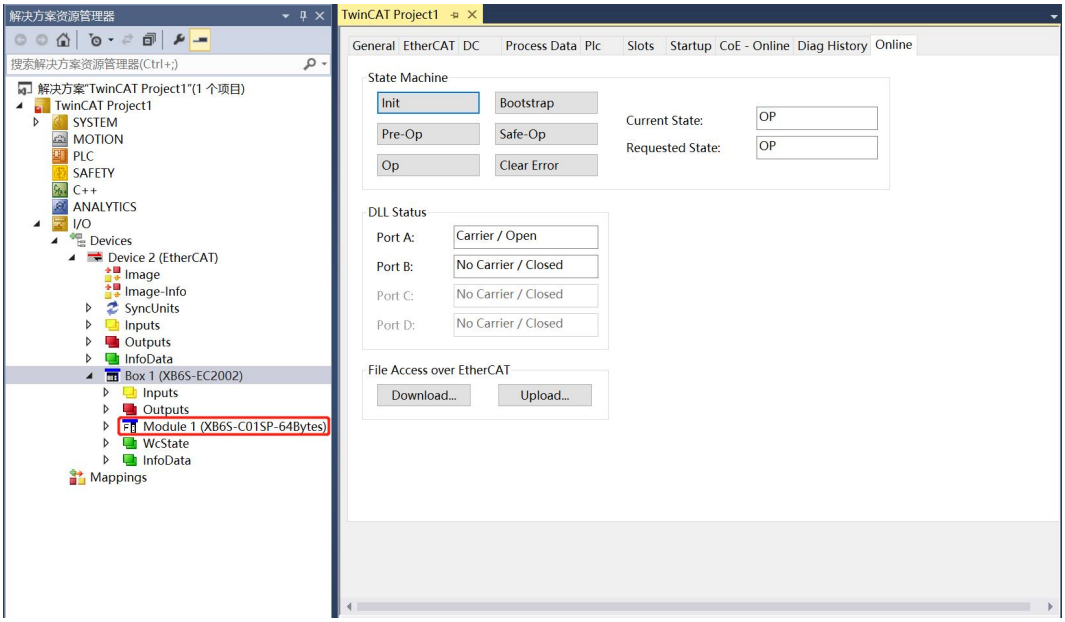
a. Right-click "I/O -> Devices -> Scan" to scan the device. The left navigation tree will show the scanned device as XB6S-C01SP-32Bytes, as shown in the figure below.



b. Click "Box1 -> CoE-Online" in the left navigation tree to enter the configuration parameter editing page. Selecting communication mode 10 sets the PDO data length to 64 bytes, as shown in the figure below.



c. At this time, the module communication mode is in the No_Select state. The module needs to be powered on and off again before scanning the device. The device to be scanned is XB6S-C01SP-64Bytes, as shown in the figure below.



7、RTU Master Mode Functionality Example

Example 1: Verify the value of two holding registers by writing them to the module RTU master in disabled mode using tools or devices such as Modbus Slave debugging software.

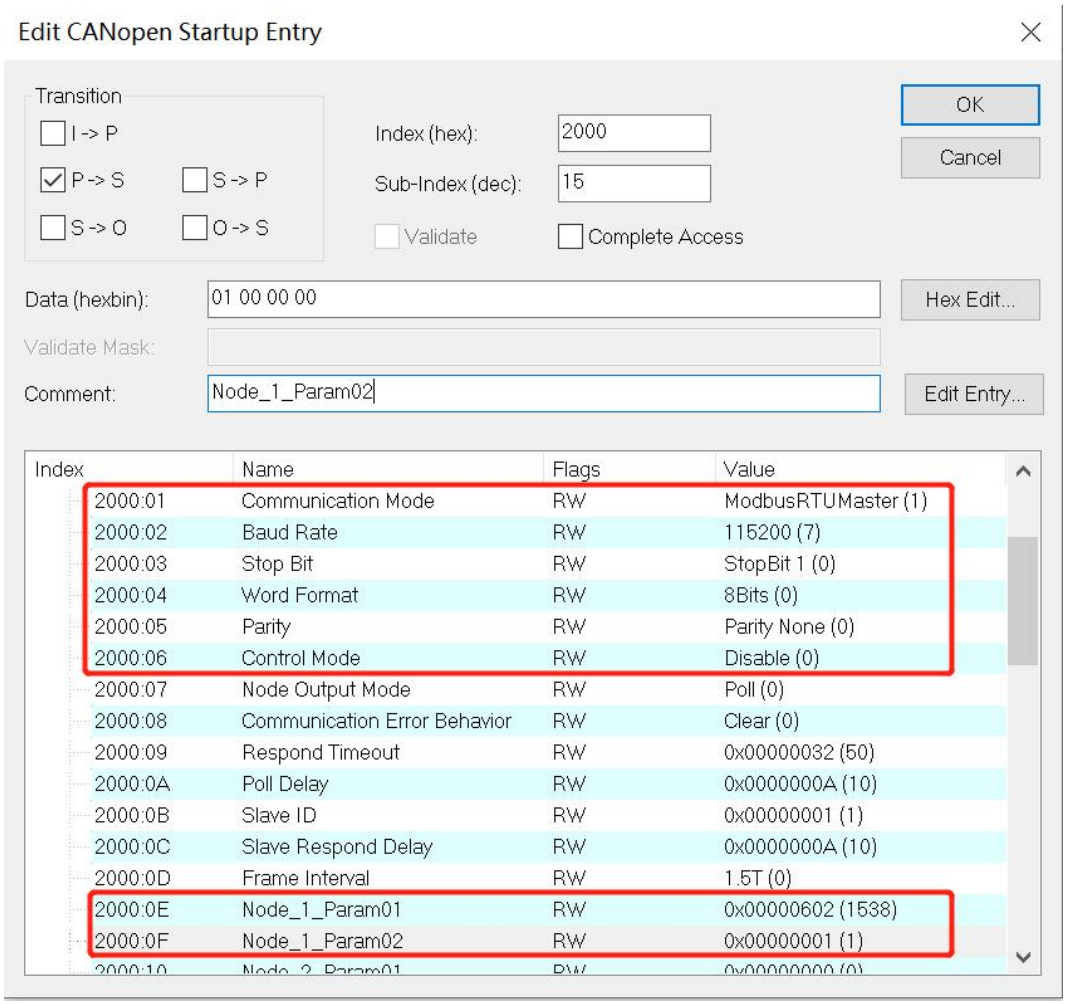
a. Configure the configuration parameters, and select communication mode 1, which is RTU master mode, as shown in the figure below.

Communication Mode: Select ModbusRTUMaster;

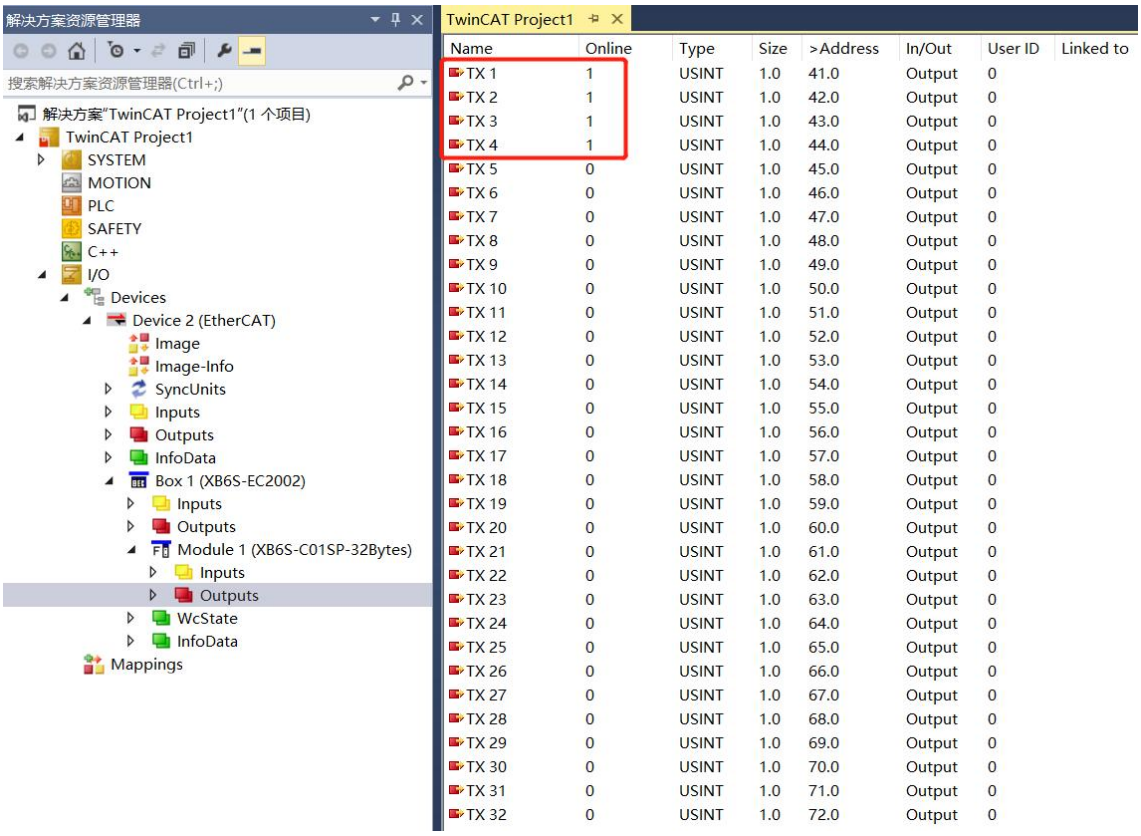
Control Mode: Select Disable;

Node_1_Param_01: Configure 0x00000602. See details for configuration parameters.6.2.1 Modbus Master Station Functions;

Node_1_Param_02: Configure 0x00000001. See details for configuration parameters.6.2.1 Modbus Master Station Functions.

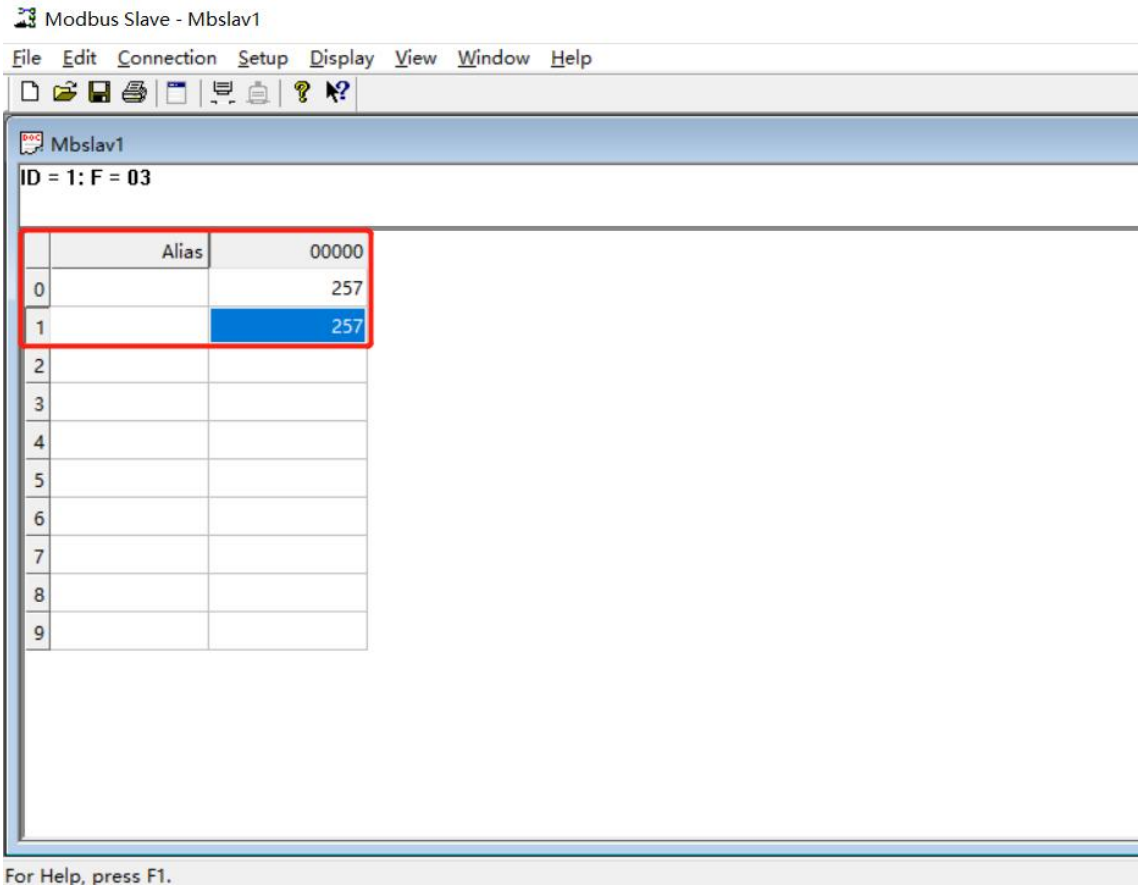


b. In the downlink data, the values of two holding registers are written, as shown in the figure below.



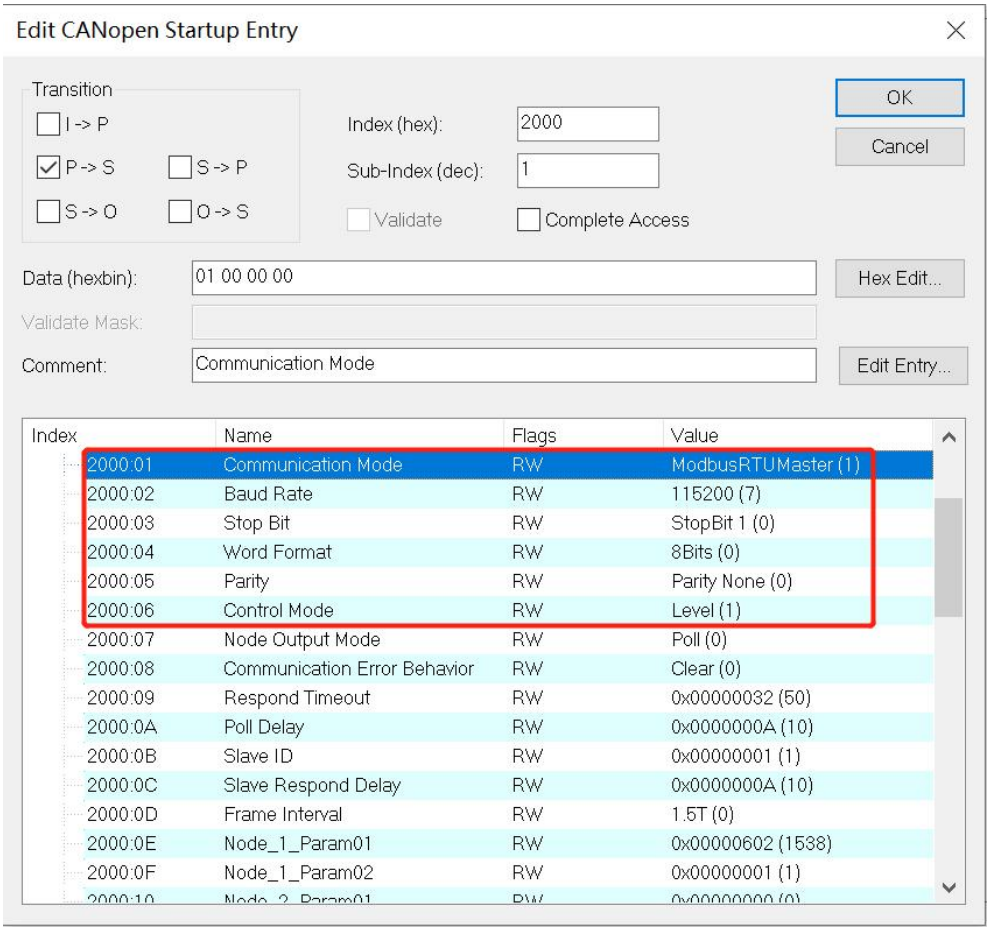
Name	Online	Type	Size	>Address	In/Out	User ID	Linked to
TX 1	1	USINT	1.0	41.0	Output	0	
TX 2	1	USINT	1.0	42.0	Output	0	
TX 3	1	USINT	1.0	43.0	Output	0	
TX 4	1	USINT	1.0	44.0	Output	0	
TX 5	0	USINT	1.0	45.0	Output	0	
TX 6	0	USINT	1.0	46.0	Output	0	
TX 7	0	USINT	1.0	47.0	Output	0	
TX 8	0	USINT	1.0	48.0	Output	0	
TX 9	0	USINT	1.0	49.0	Output	0	
TX 10	0	USINT	1.0	50.0	Output	0	
TX 11	0	USINT	1.0	51.0	Output	0	
TX 12	0	USINT	1.0	52.0	Output	0	
TX 13	0	USINT	1.0	53.0	Output	0	
TX 14	0	USINT	1.0	54.0	Output	0	
TX 15	0	USINT	1.0	55.0	Output	0	
TX 16	0	USINT	1.0	56.0	Output	0	
TX 17	0	USINT	1.0	57.0	Output	0	
TX 18	0	USINT	1.0	58.0	Output	0	
TX 19	0	USINT	1.0	59.0	Output	0	
TX 20	0	USINT	1.0	60.0	Output	0	
TX 21	0	USINT	1.0	61.0	Output	0	
TX 22	0	USINT	1.0	62.0	Output	0	
TX 23	0	USINT	1.0	63.0	Output	0	
TX 24	0	USINT	1.0	64.0	Output	0	
TX 25	0	USINT	1.0	65.0	Output	0	
TX 26	0	USINT	1.0	66.0	Output	0	
TX 27	0	USINT	1.0	67.0	Output	0	
TX 28	0	USINT	1.0	68.0	Output	0	
TX 29	0	USINT	1.0	69.0	Output	0	
TX 30	0	USINT	1.0	70.0	Output	0	
TX 31	0	USINT	1.0	71.0	Output	0	
TX 32	0	USINT	1.0	72.0	Output	0	

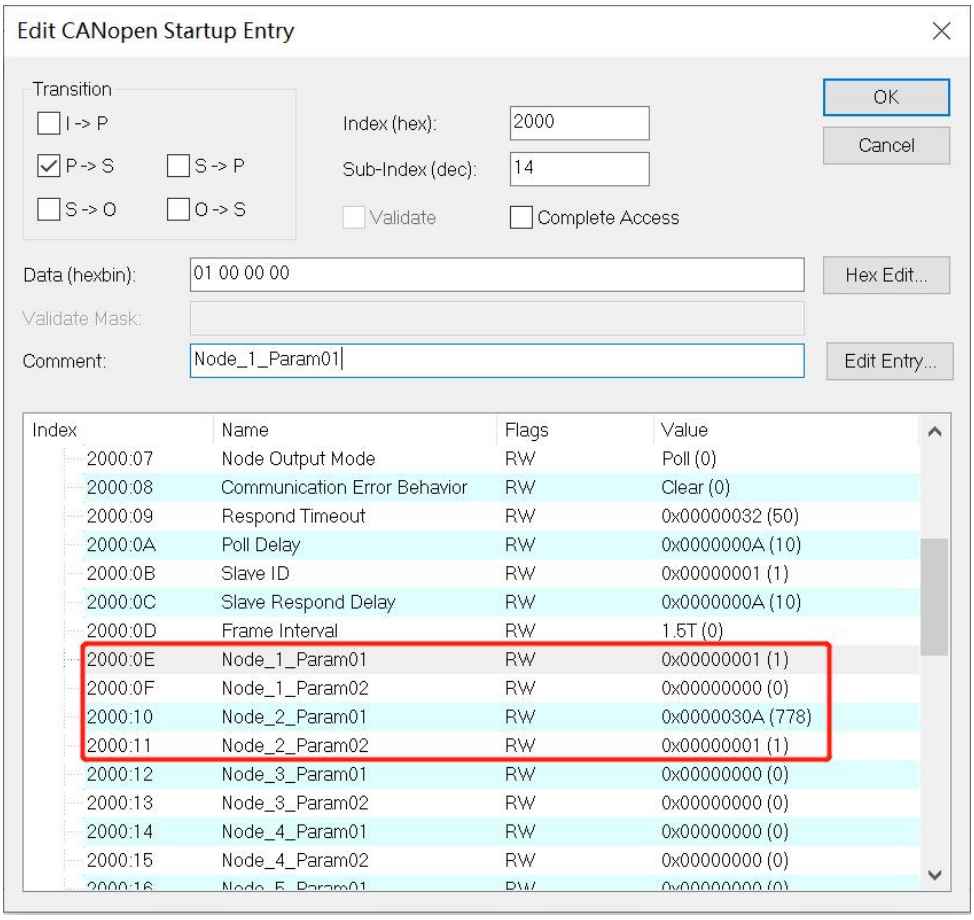
c. The values of the two received registers can be viewed using debugging software, as shown in the figure below.



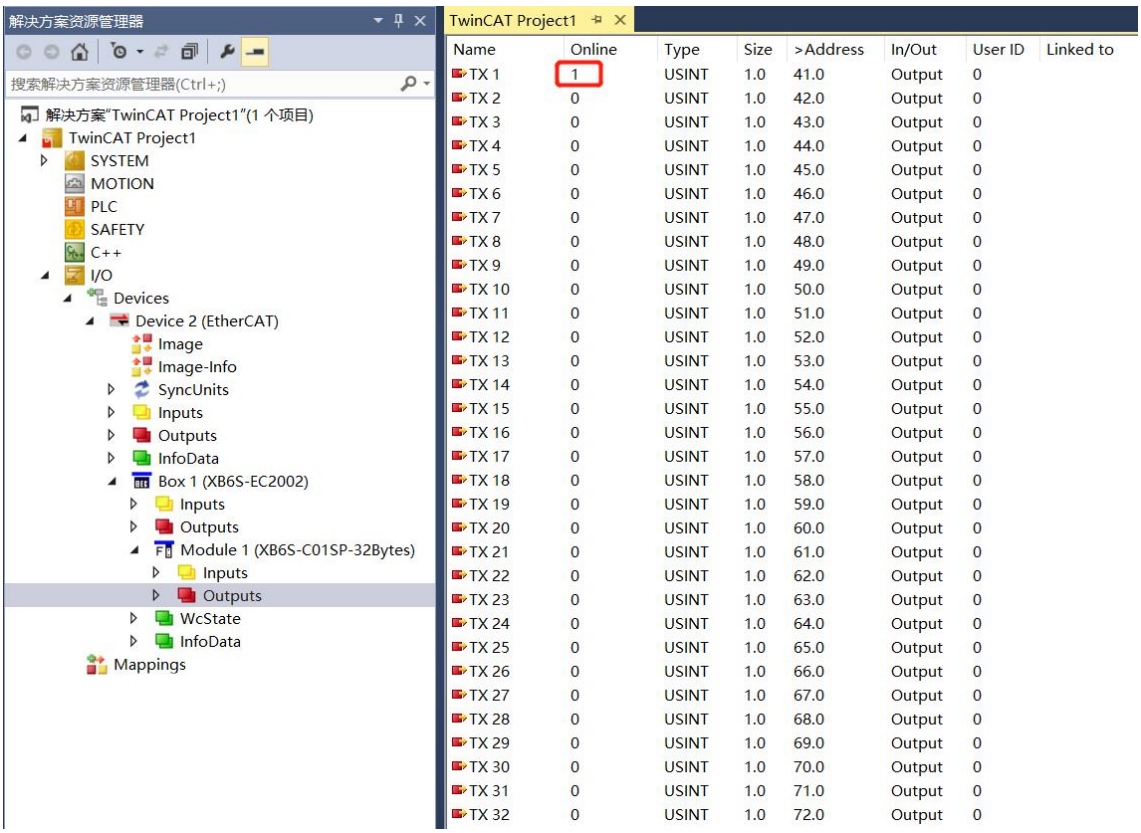
Example 2: Verify that the module RTU master station reads 10 holding registers in Level mode using tools or devices such as Modbus Slave debugging software.

a. Configure the configuration parameters, and select communication mode 1, which is RTU master mode, as shown in the figure below.
Communication Mode: Select ModbusRTUMaster;
Control Mode: Select Level;
Node_1_Param_01: Configure 0x00000001. See details for configuration parameters.6.2.8 Control and Status Node Code;
Node_2_Param_01: Configure 0x0000030A. See details for configuration parameters.6.2.1 Modbus Master Station Functions;
Node_2_Param_02: Configure 0x00000001. See details for configuration parameters.6.2.1 Modbus Master Station Functions.

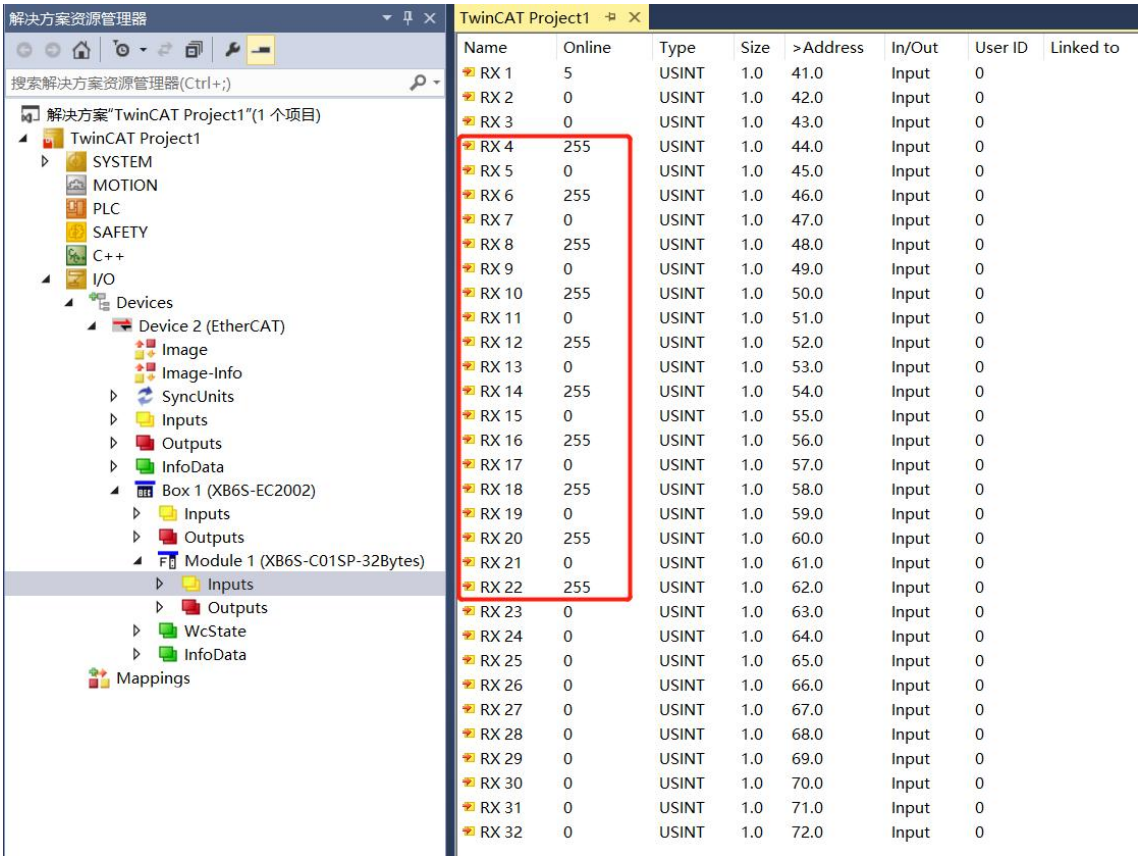




b. Set the control word to 1 in the downlink data and open the debugging software to send data, as shown in the figure below.



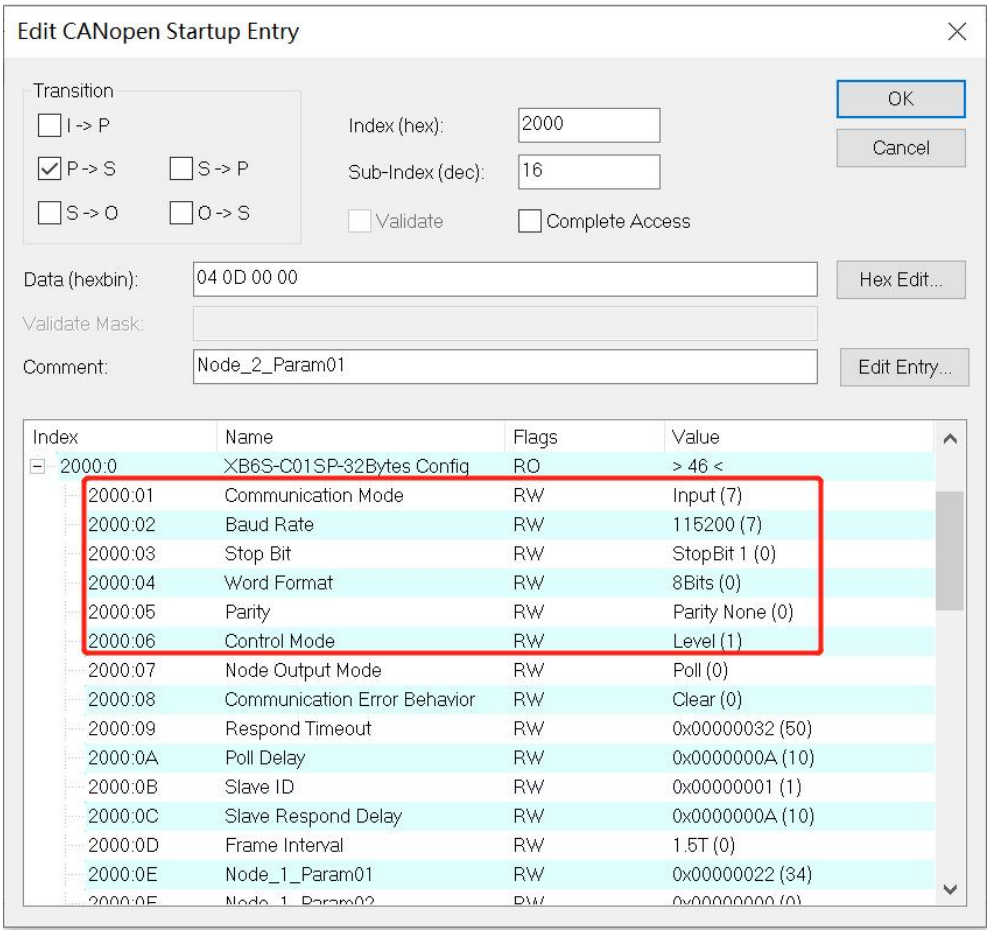
c. The received data can be seen in the upstream data, as shown in the figure below.

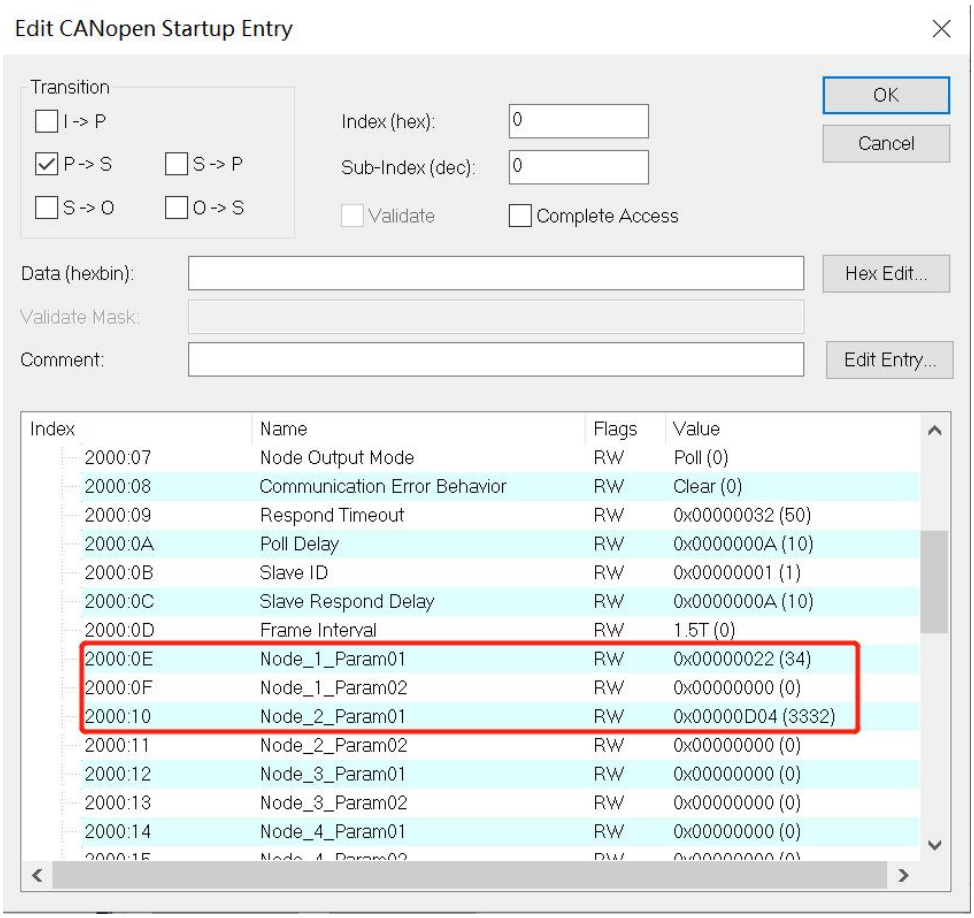


8、Freeport_Input Function Example

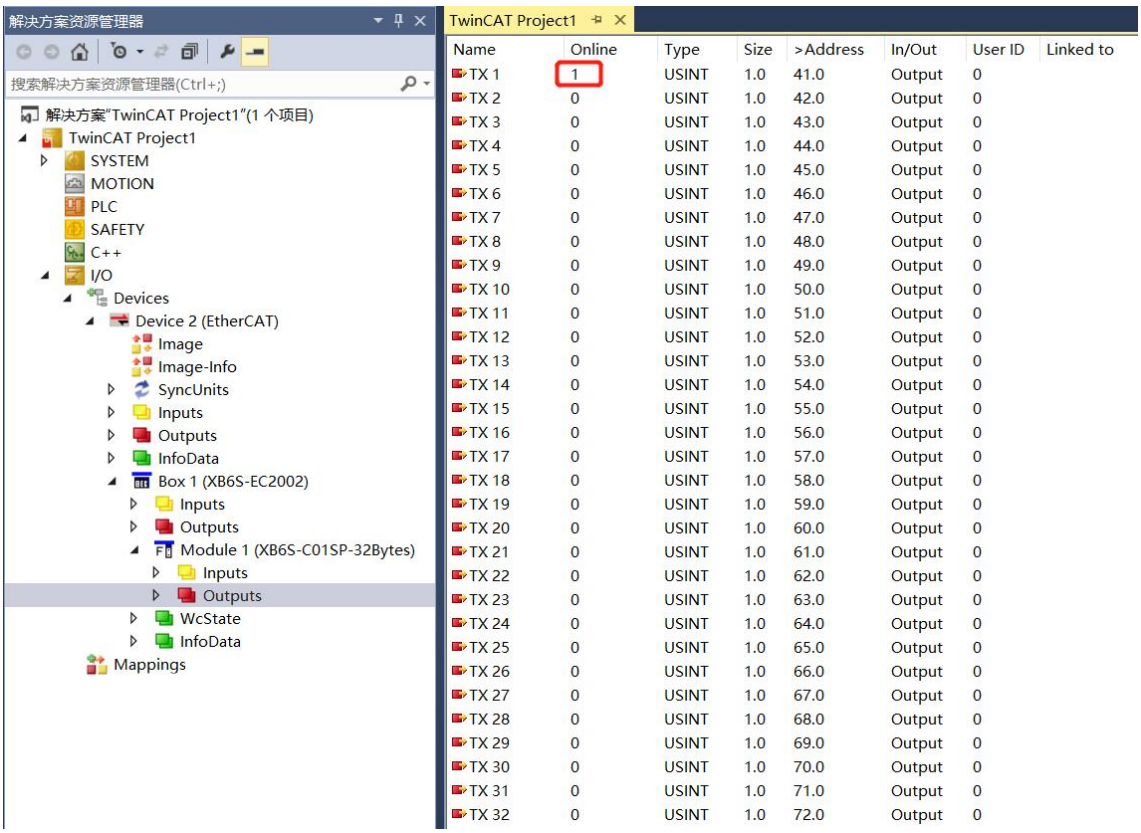
Example: Use Freeport_Input in Level mode to receive 8 bytes of data using tools or devices such as serial port debugging assistants.

a. Configure the configuration parameters, and select communication mode 7, i.e., Input mode, as shown in the figure below.
Communication Mode: Select Input;
Control Mode: Select Level;
Node_1_Param_01: Configure 0x00000022. See details for configuration parameters.6.2.8 Control and Status Node Code;
Node_2_Param_01: Configure 0x00000D04. See details for configuration parameters.6.2.6 Freeport Function.

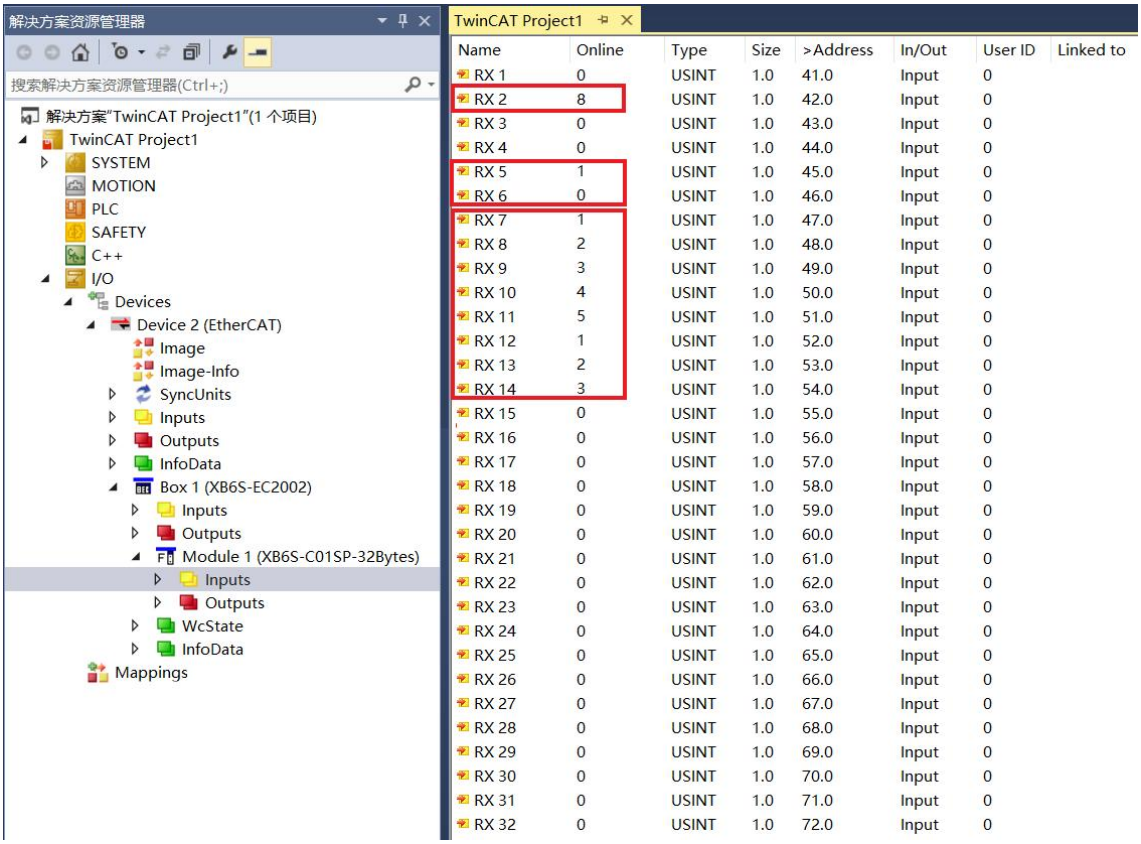




b. Set the control word to 1 in the downlink data and open the serial port debugging assistant to send data, as shown in the figure below.



c. The uplink data shows that the received data length is 8 bytes and the received data count is 1. The received data consists of 8 bytes (RX7~RX14), as shown in the figure below.



6.4.2 Applications in the Sysmac Studio software environment

1、Preparation

- **Hardware environment**
  - **Module model XB6S-C01SP**
  - **EtherCAT coupler, end cap**
    This instruction uses the XB6S-EC2002 coupler as an example.
  - **One computer, pre-installed with Sysmac Studio software.**
  - **This instruction manual uses one Omron PLC, specifically model NX1P2-9024DT, as an example.**
  - **EtherCAT dedicated shielded cable**
  - **One switching power supply**
  - **Device configuration file**
    Configuration file retrieval address:https://www.solidotech.com/cn/resources/configuration-files
- **Hardware configuration and wiring**

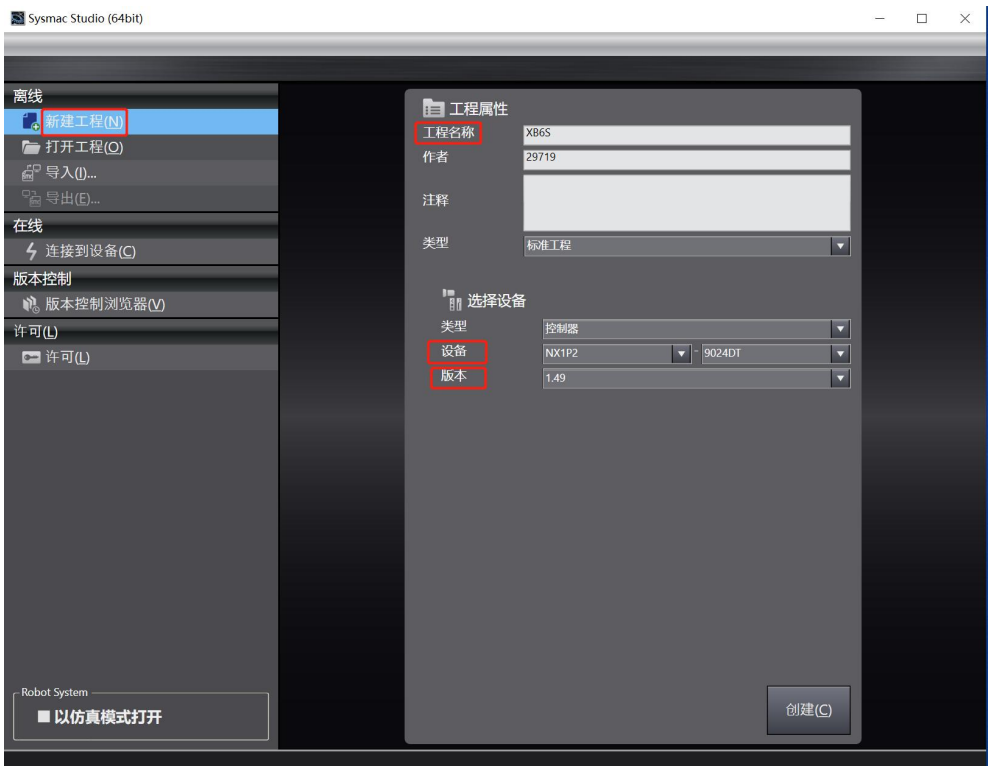
Please follow the instructions.4. Installation and Removal"and"5-wire connection"Required Operation"

- **Computer IP Requirements**

Configure the computer's IP address and the PLC's IP address to ensure they are on the same network segment.

2、New construction projects

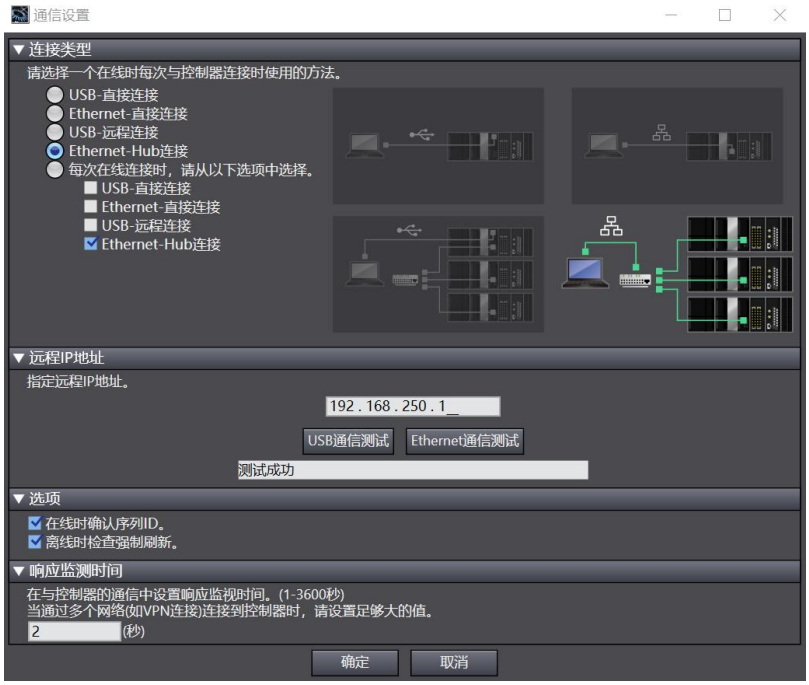
a. Open Sysmac Studio and click "New Project".



- Project Name: Custom.
- Select Device: Select the corresponding PLC model for "Device" and select the corresponding version number for "Version".

b. After entering the project properties, click "Create".

c. Click "Controller -> Communication Settings" in the menu bar, select the method to use each time you connect to the controller when online, and enter the "Remote IP Address", as shown in the figure below.

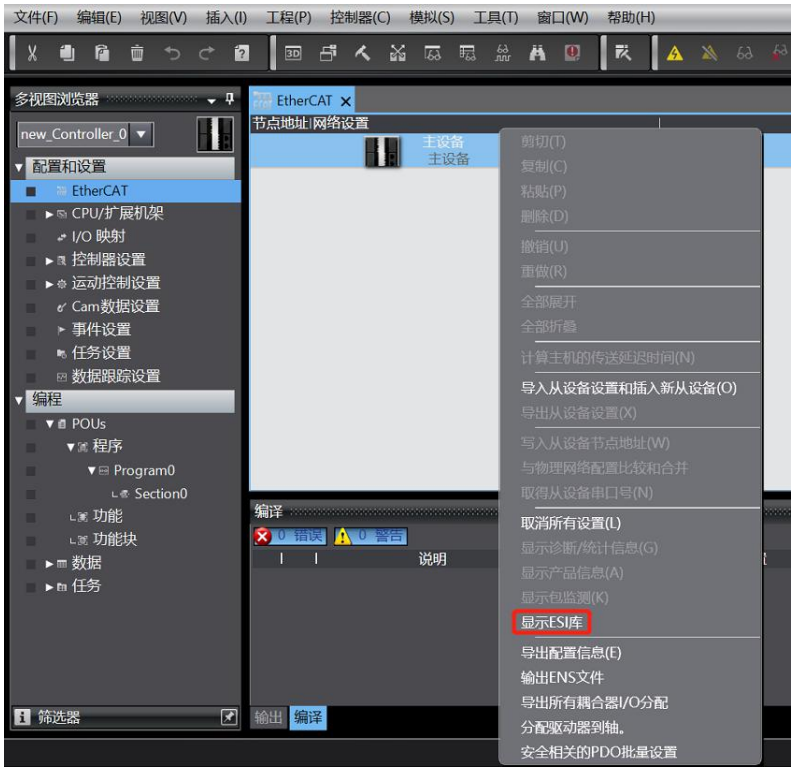


d. Click "Ethernet Communication Test", and the system displays that the test was successful.

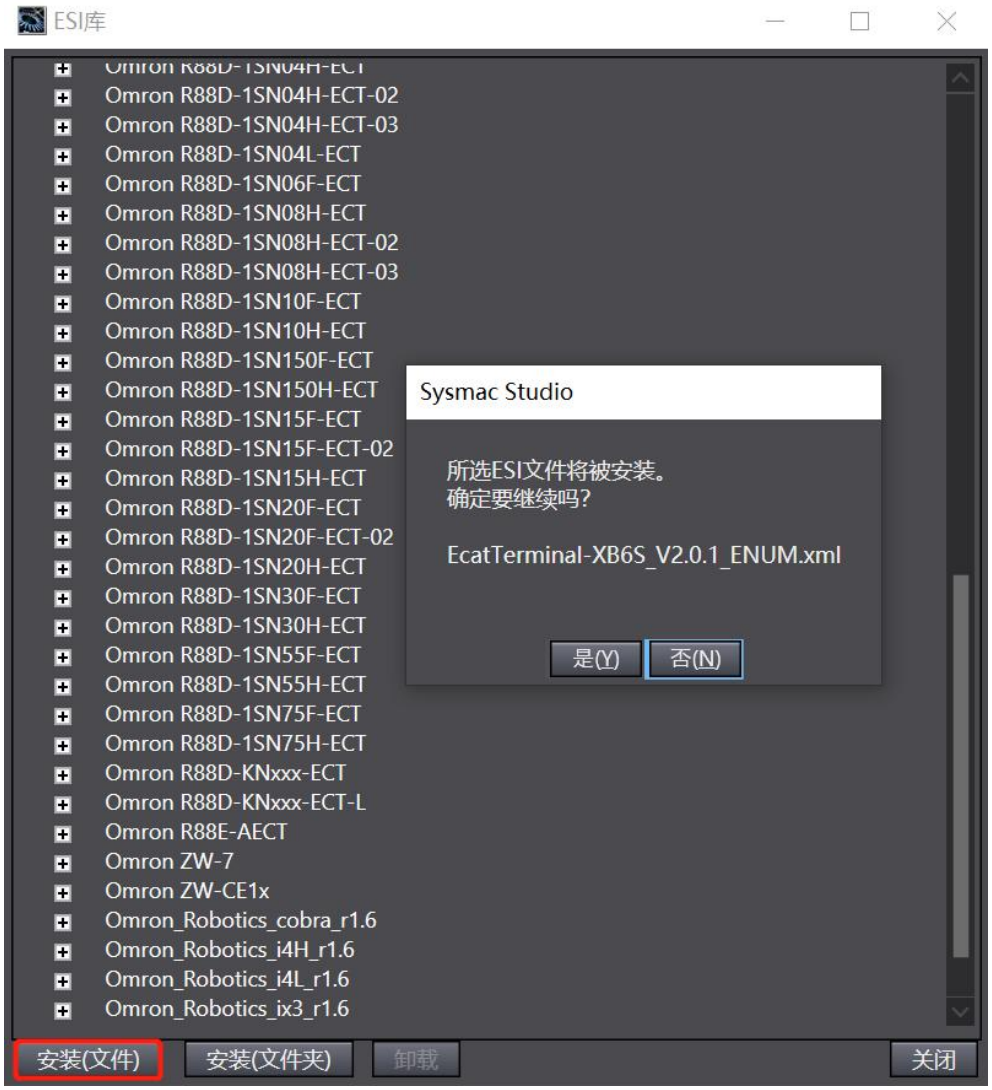
3、 Install XML file

a. Expand "Configuration and Settings" in the left navigation tree and double-click "EtherCAT".

b. Right-click "Master Device" and select "Show ESI Libraries", as shown in the figure below.



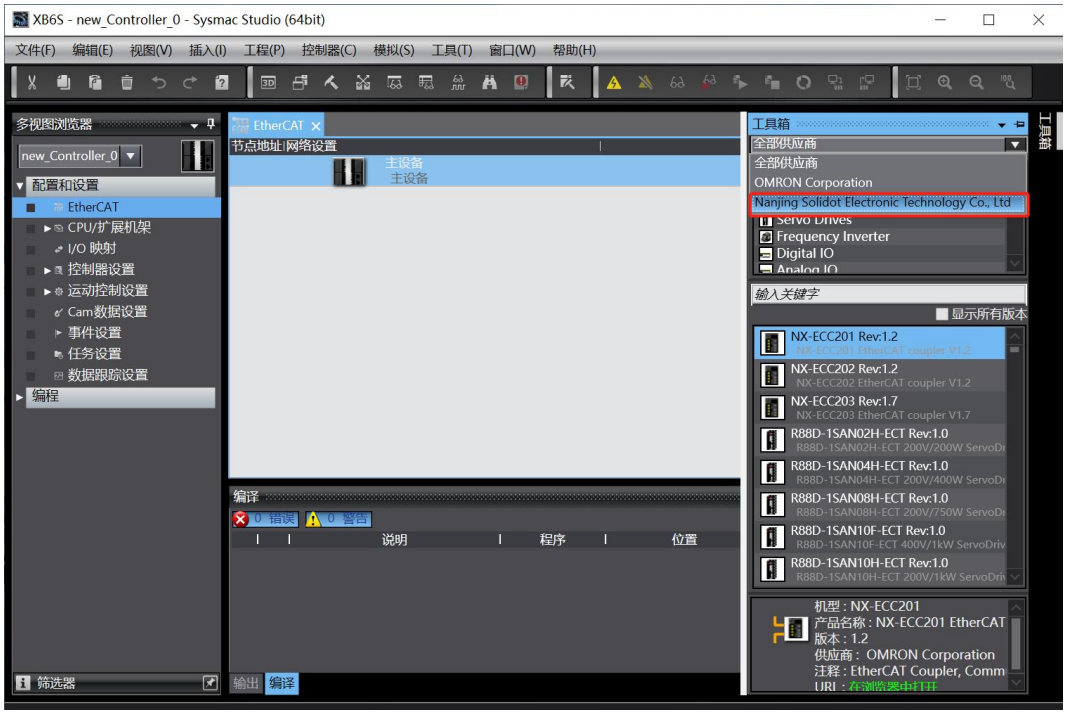
c. In the pop-up "ESI Library" window, click "Install (File)", select the XML file path of the module, and click "Yes" to complete the installation, as shown in the figure below.



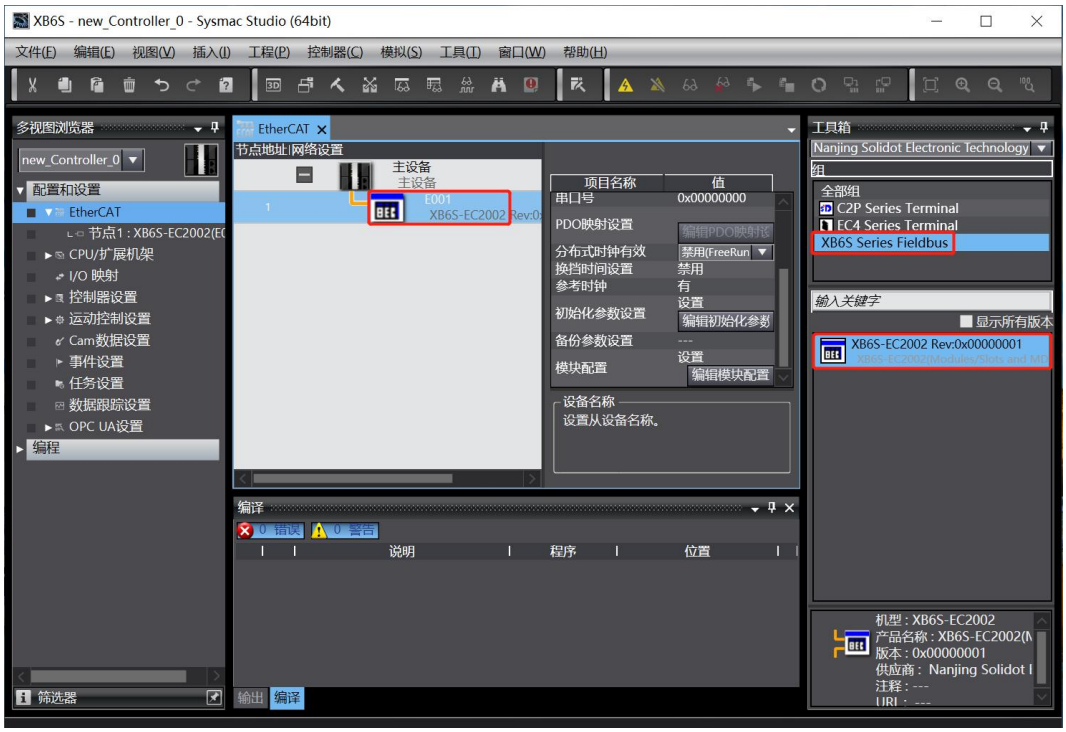
4、Add device

There are two ways to add a device: online scanning and offline addition. This guide will use offline addition as an example.

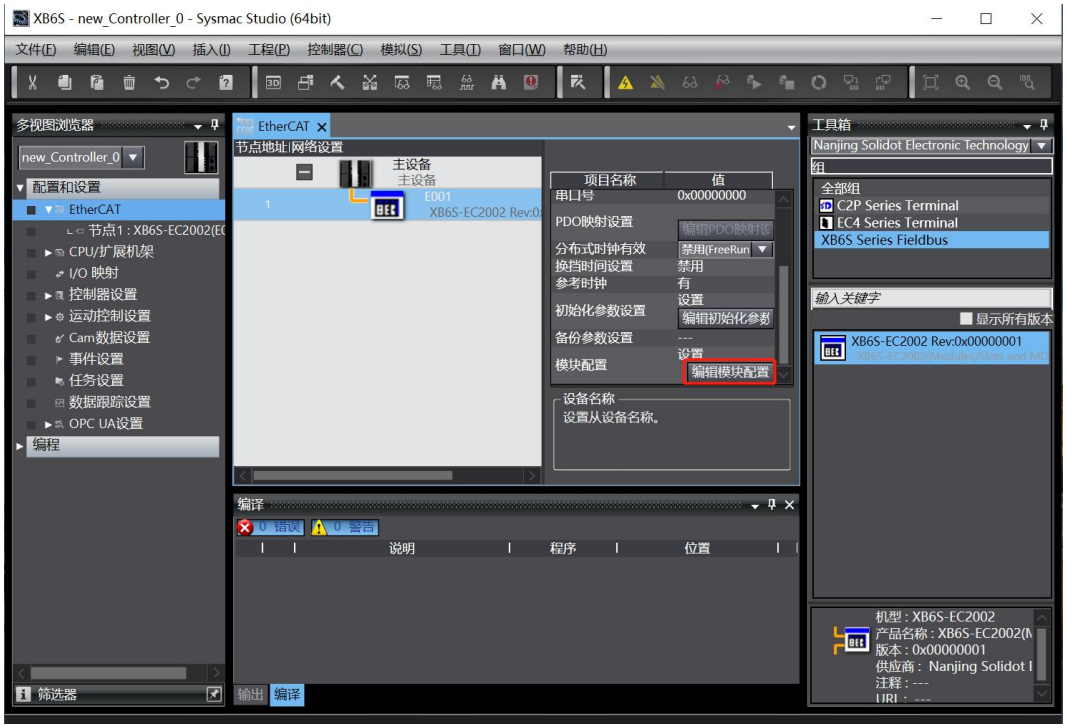
a. In the "Toolbox" section on the right, click to expand all suppliers and select "Nanjing Solidot Electronic Technology Co., Ltd.", as shown in the image below.



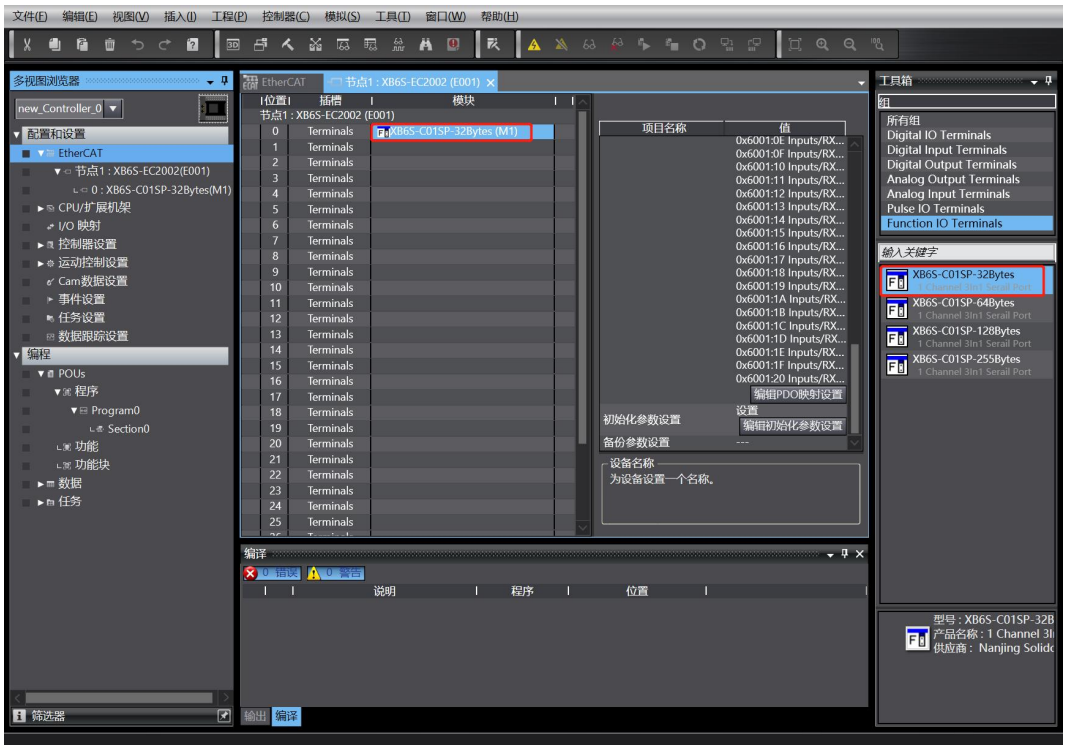
b. Click to select XB6S Series Fieldbus, double-click the XB6S-EC2002 coupler module, and add a slave device, as shown in the figure below.



c. On the EtherCAT main page, select the newly added XB6S-EC2002 coupler module and select "Edit Module Configuration", as shown in the figure below.

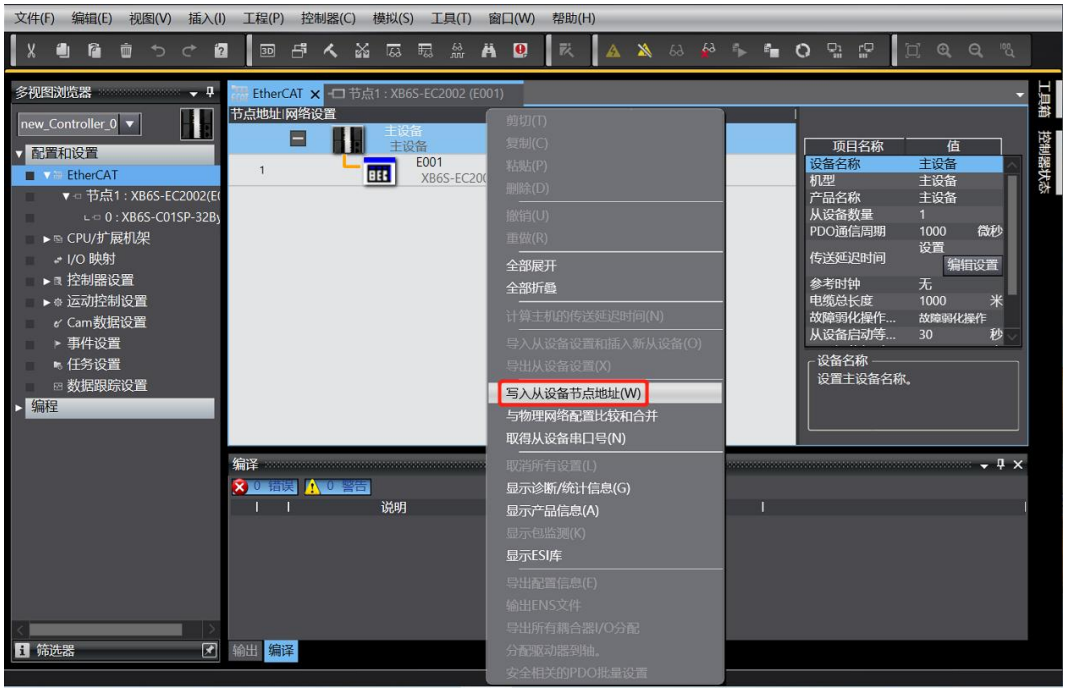


d. Position the cursor in "Modules," then click on a module in the toolbox list on the right. Add I/O modules one by one, following the order of their configuration. Note: The order and model number must match the physical topology!

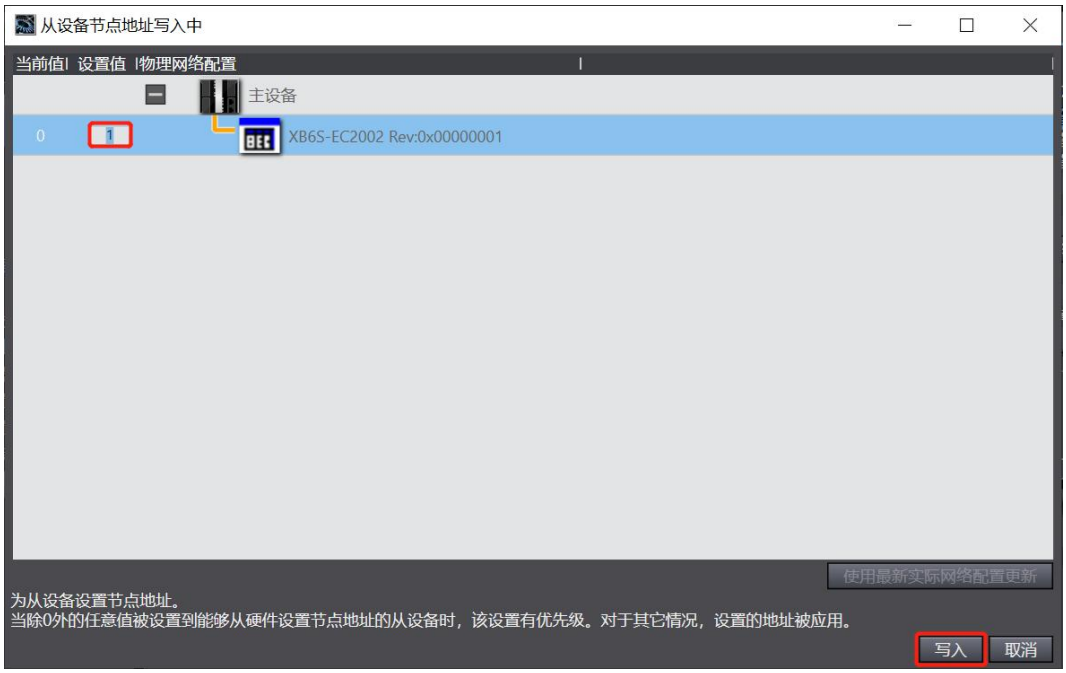


5、Set node address

a. Click "Controller -> Online" in the menu bar to switch the controller to online status. Right-click the master device and select "Write Slave Node Address", as shown in the figure below.



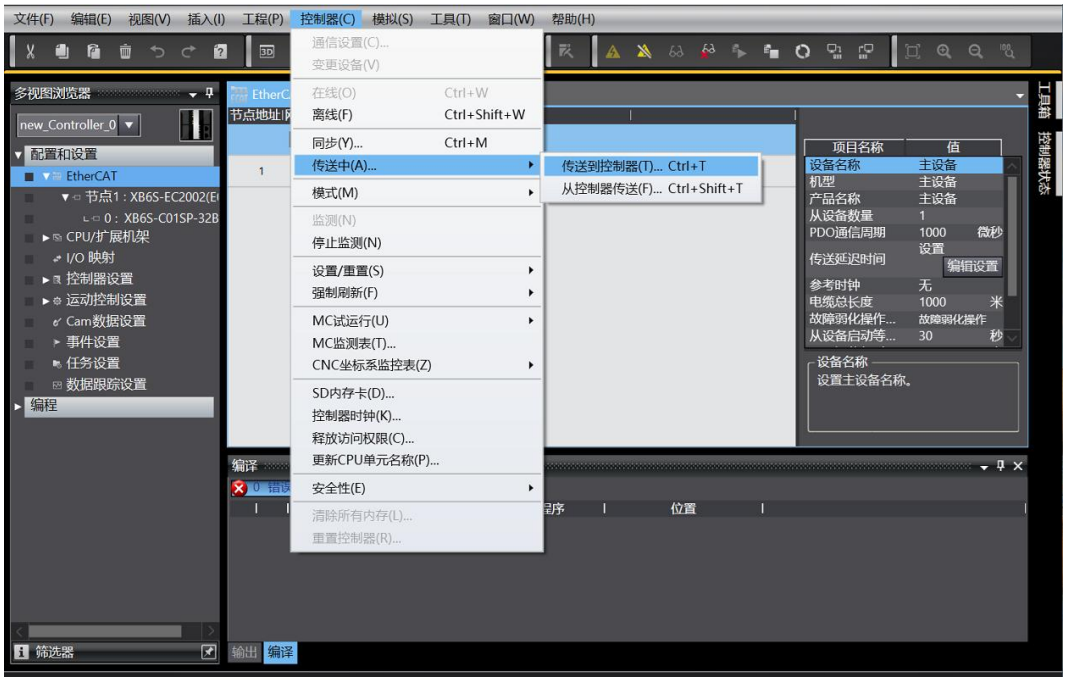
b. In the window for setting the node address, click the value under Setting Value, enter the node address, and click "Write" to change the slave device node address, as shown in the figure below.



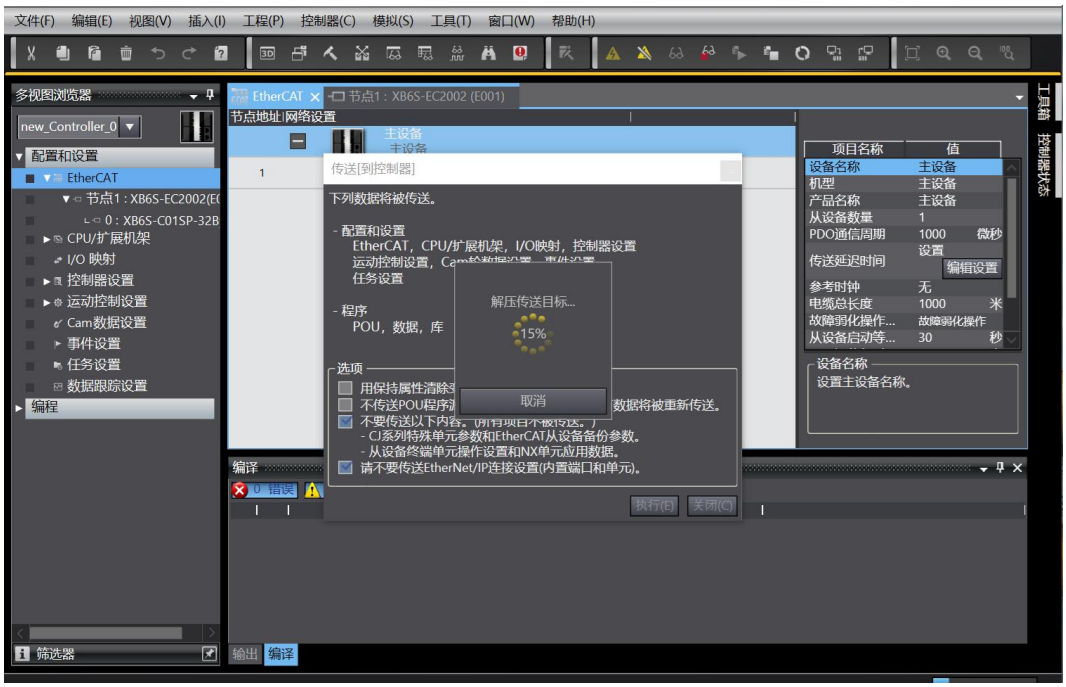
c. After writing, a power-on prompt will appear as shown in the image below. Click "Write" and then restart the slave device power as prompted.

6、 Download the configuration to the PLC

a. Click the "Controller -> Transmitting (A) -> Transmitting to Controller (T)" button in the menu bar, as shown in the figure
below.

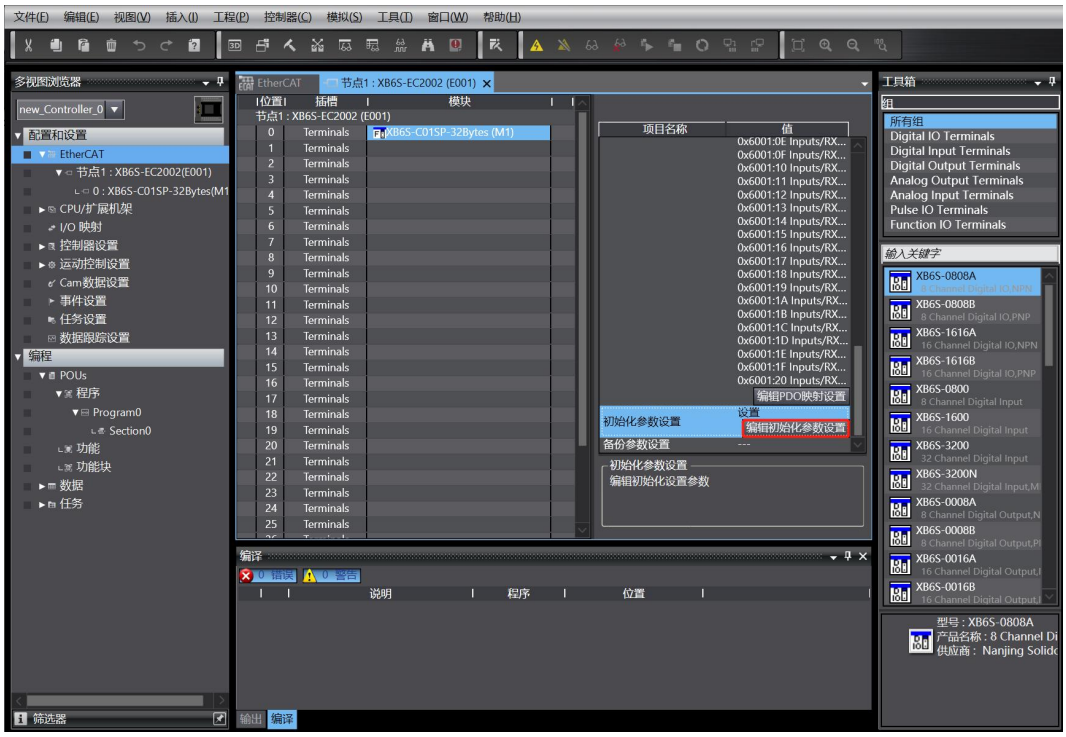


b. Download the configuration to the PLC. A confirmation window will pop up. Click "Execute". In the subsequent pop-up windows, click "Yes/OK" in sequence, as shown in the figure below. After the download is complete, you need to power it on again.



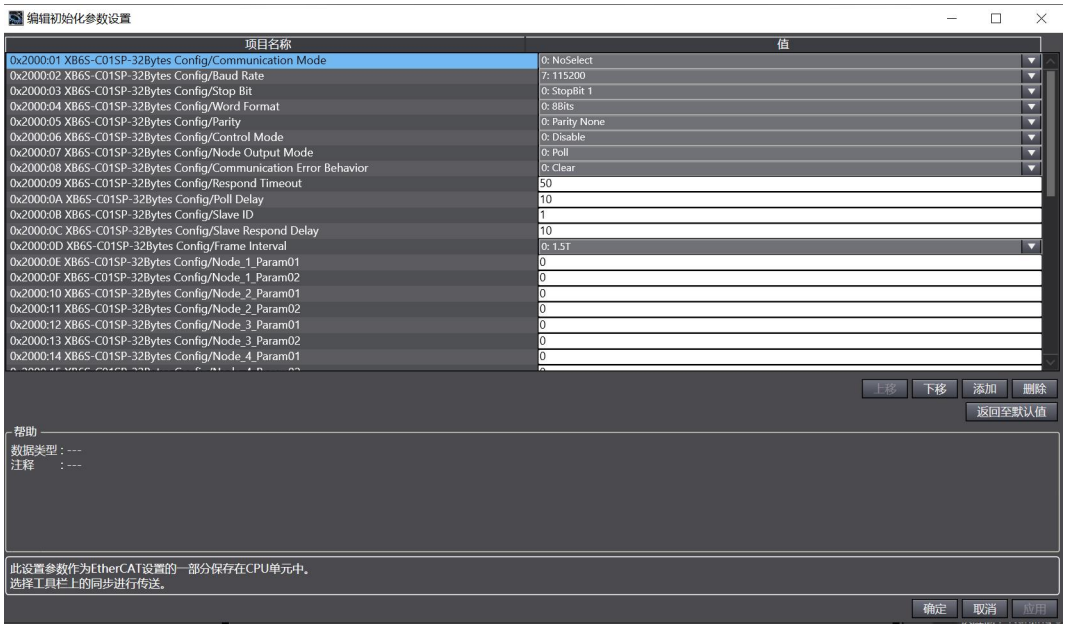
7、 Parameter settings

a. Switch the configuration to offline mode. On the module configuration page of node 1, select the XB6S-C01SP-32Bytes module and click "Edit Initialization Parameter Settings", as shown in the figure below.

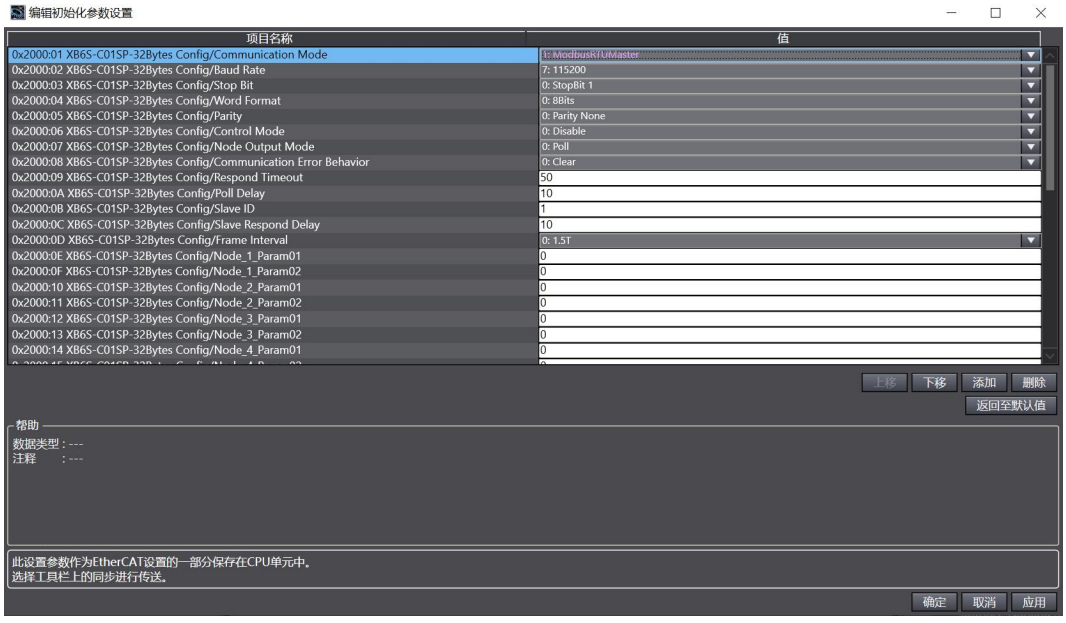


Note: IfThe PLC firmware version is too low, so the EC_CoESDOWrite and EC_CoESDORead instructions are needed to write and read the SDO address.

b. existOn the XB6S-C01SP parameter settings page, you can see 45 configuration parameters. Clicking on any parameter allows you to set the relevant configuration, as shown in the figure below.

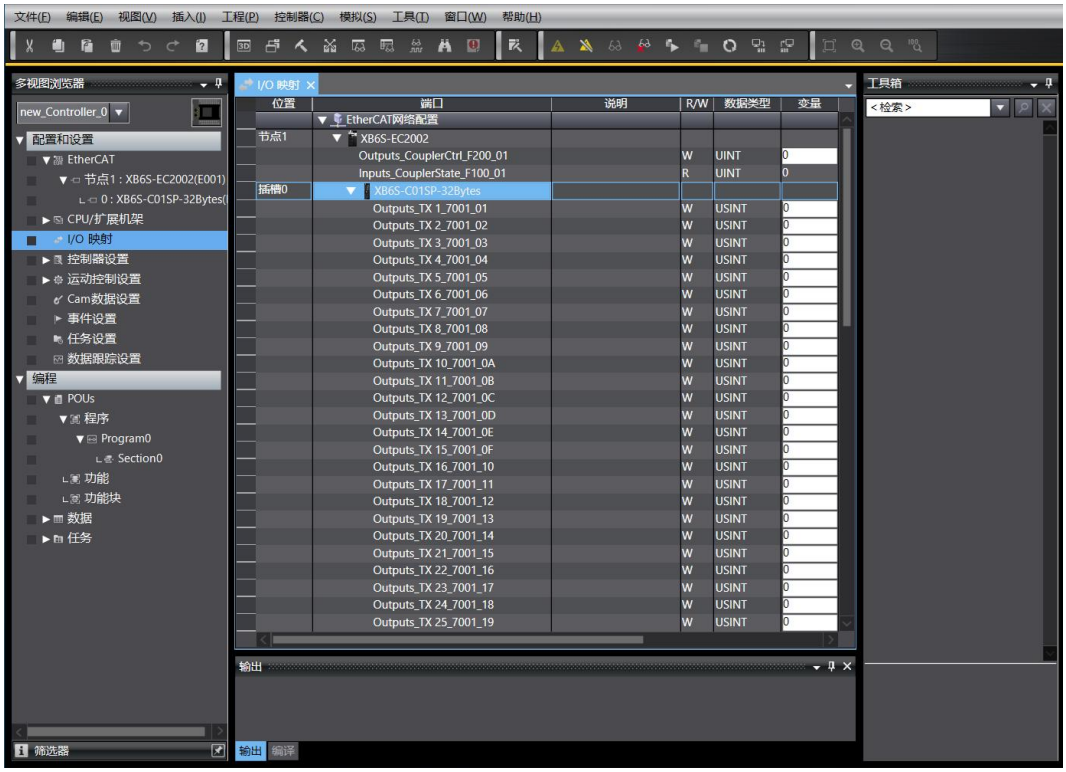


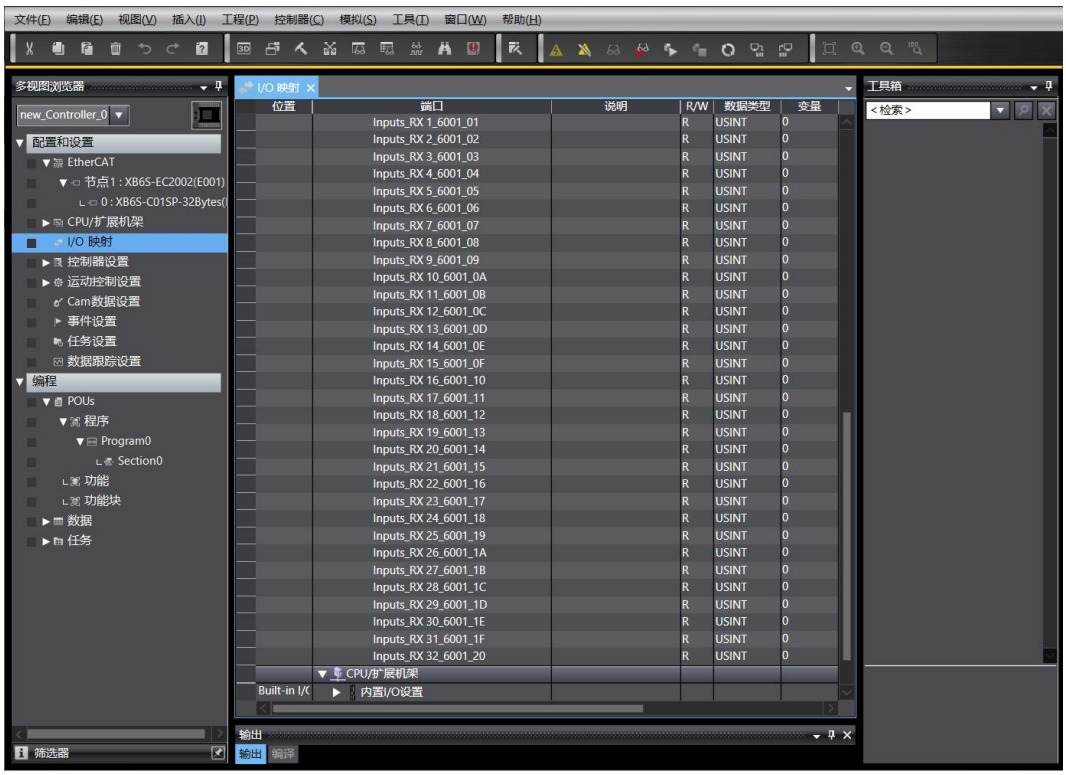
c. For example, to modify the communication mode parameters, click "Communication Mode" and modify the parameter values, as shown in the image below. After all parameters are configured, the program needs to be downloaded to the PLC again, and both the PLC and the module need to be powered on again.



8、I/O function

a. Double-clicking "I/O Mapping" in the left navigation tree will display the mapping table of modules in the topology, allowing you to monitor the input and output values of the communication modules, as shown in the figure below.





9、 RTU Master Mode Functionality Example

Example 1: Verify the value of two holding registers by writing them to the module RTU master in disabled mode using tools or devices such as Modbus Slave debugging software.

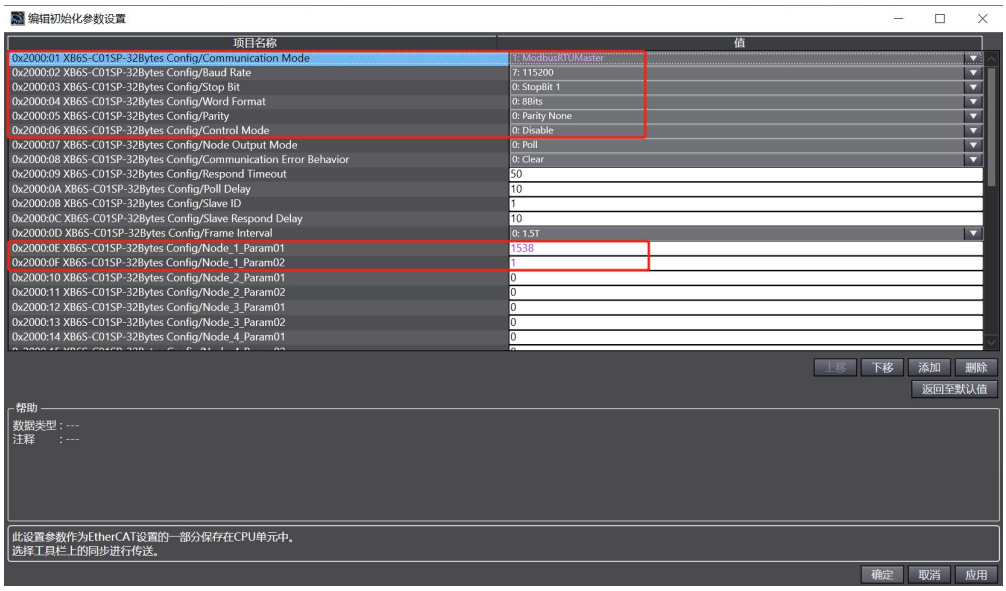
a. Configure the configuration parameters, and select communication mode 1, which is RTU master mode, as shown in the figure below.

Communication Mode: Select ModbusRTUMaster;

Control Mode: Select Disable;

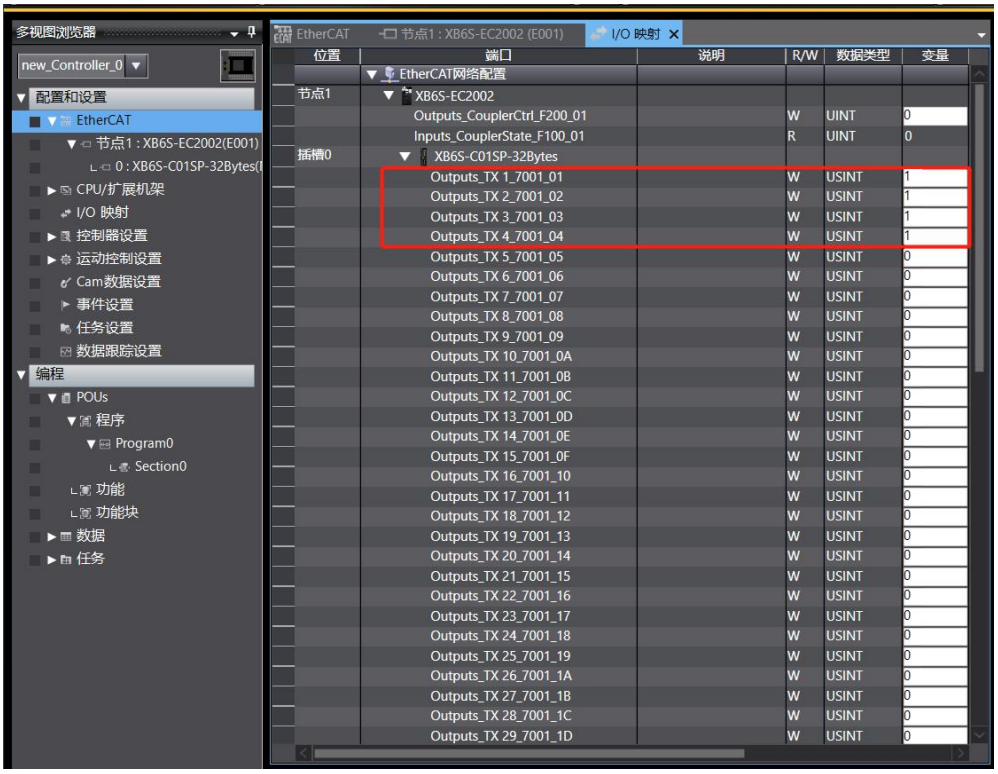
Node_1_Param_01: Configuration 1538 (0x00000602), see configuration parameters for details.6.2.1 Modbus Master Station Functions;

Node_1_Param_02: Configuration 1 (0x00000001), see configuration parameters for details.6.2.1 Modbus Master Station Functions.

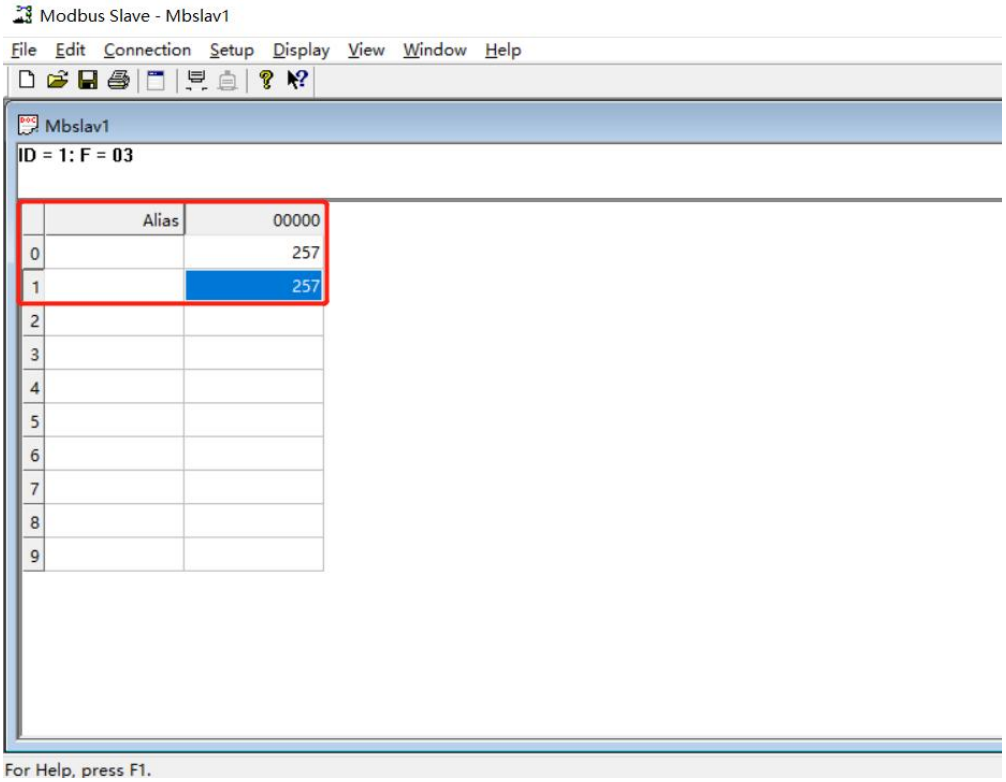


After all parameters are configured, the program needs to be downloaded to the PLC again, and the PLC and module need to be powered on again.

b. In the downlink data, the values of two holding registers are written, as shown in the figure below.

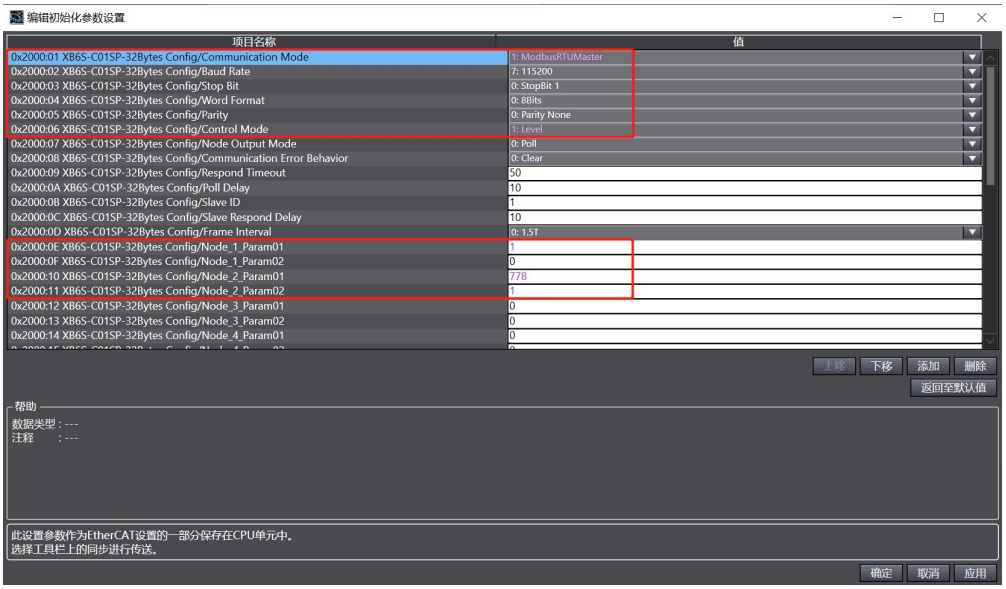


c. The values of the two received registers can be viewed using debugging software, as shown in the figure below.



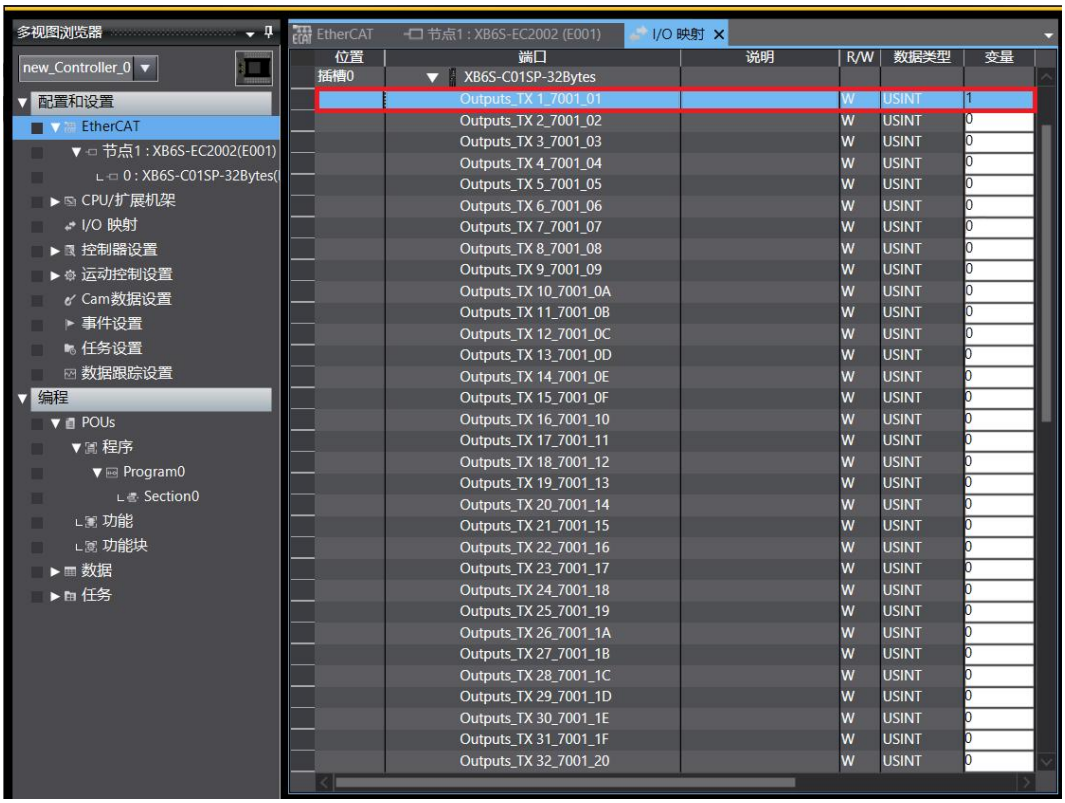
Example 2: Verify that the module RTU master station reads 10 holding registers in Level mode using tools or devices such as Modbus Slave debugging software.

a. Configure the configuration parameters, and select communication mode 1, which is RTU master mode, as shown in the figure below.
Communication Mode: Select ModbusRTUMaster;
Control Mode: Select Level;
Node_1_Param_01: Configuration 1 (0x00000001), see configuration parameters for details.6.2.8 Control and Status Node Code;
Node_2_Param_01: Configuration 778 (0x0000030A), see configuration parameters for details.6.2.1 Modbus Master Station Functions;
Node_2_Param_02: Configuration 1 (0x00000001), see configuration parameters for details.6.2.1 Modbus Master Station Functions.

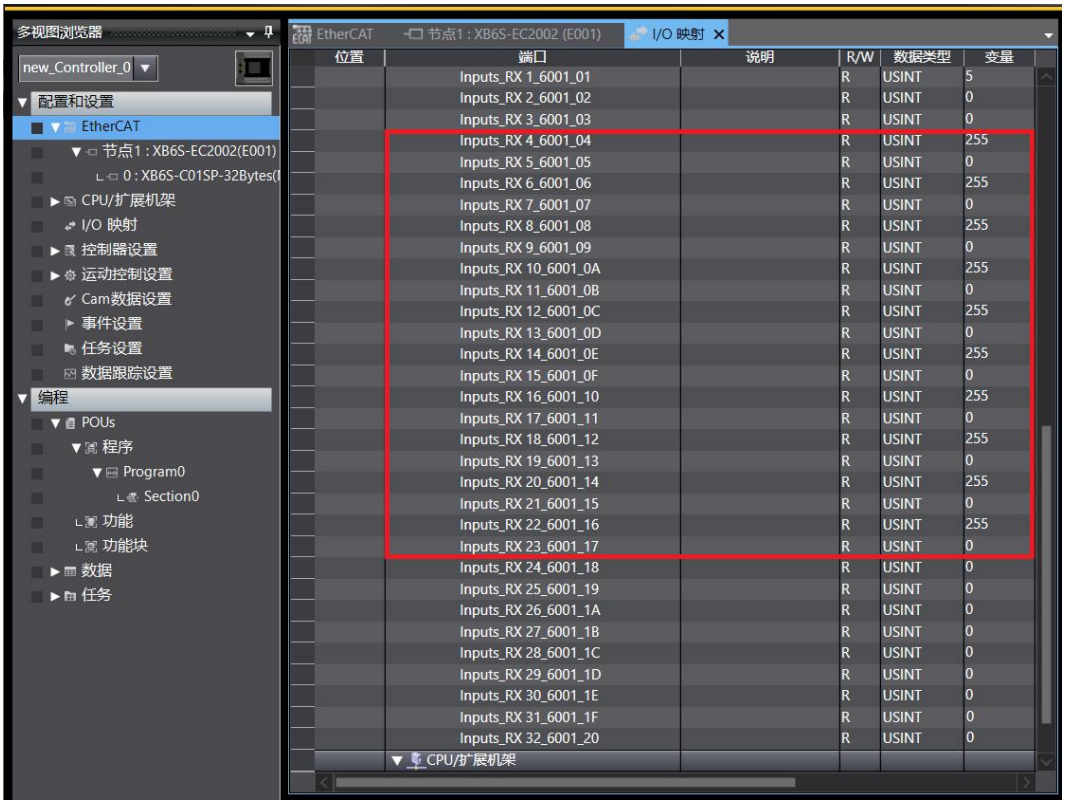


After all parameters are configured, the program needs to be downloaded to the PLC again, and the PLC and module need to be powered on again.

b. Set the control word to 1 in the downlink data and open the debugging software to send data, as shown in the figure below.



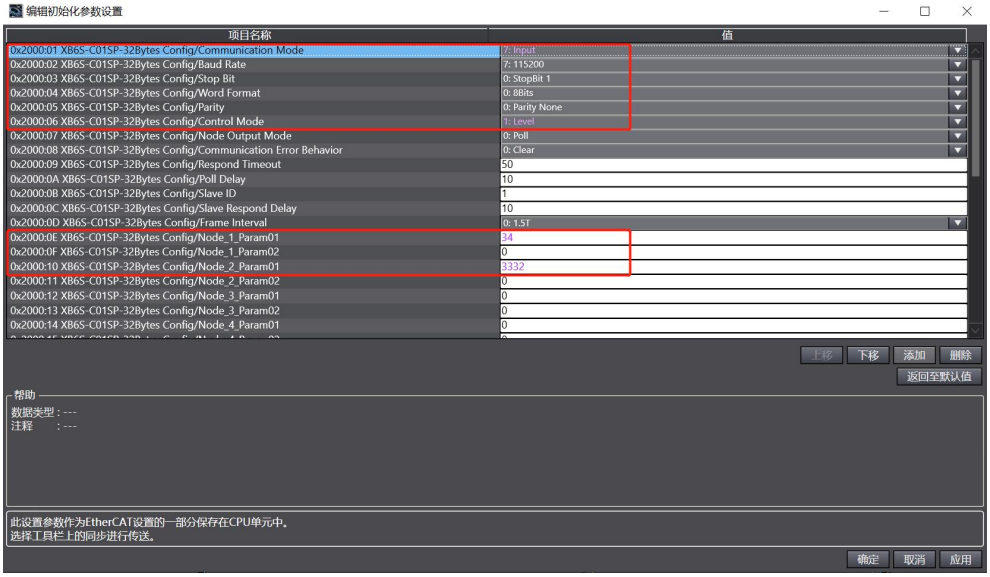
c. The received data can be seen in the upstream data, as shown in the figure below.



10、 Freeport_Input Function Example

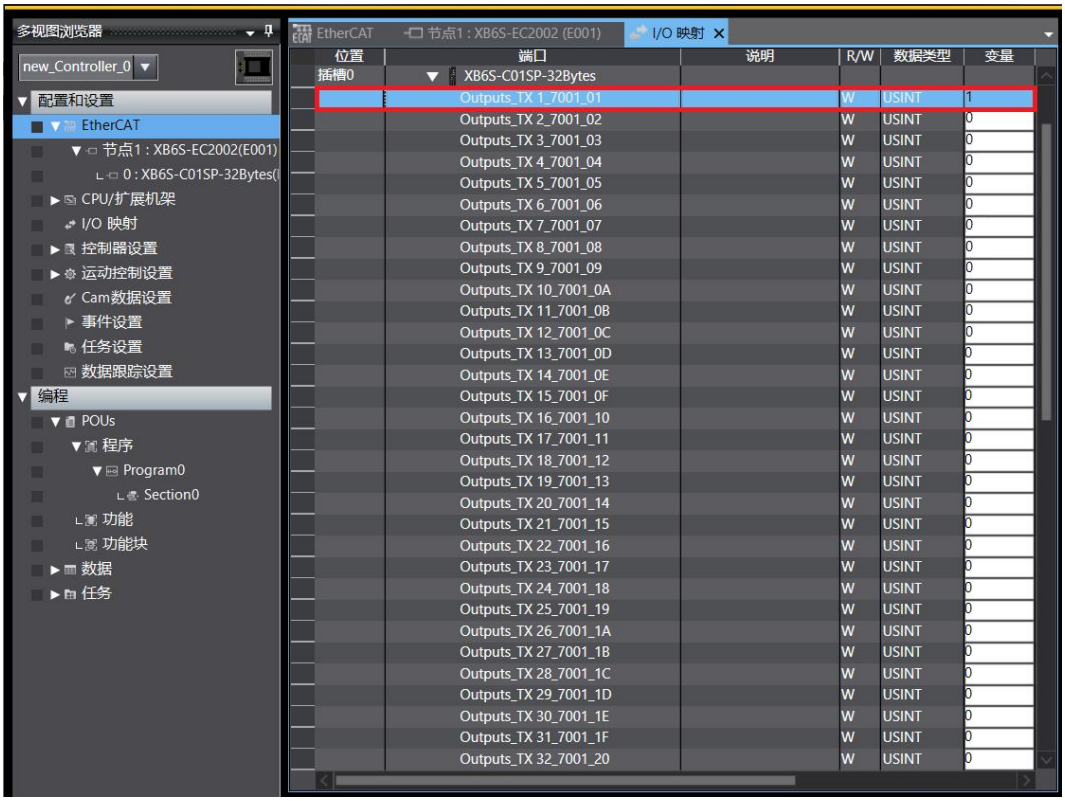
Example: Use Freeport_Input in Level mode to receive 8 bytes of data using tools or devices such as serial port debugging assistants.

a. Configure the configuration parameters, and select communication mode 7, i.e., Input mode, as shown in the figure below.
Communication Mode: Select Input;
Control Mode: Select Level;
Node_1_Param_01: Configuration 34 (0x00000022), see configuration parameters for details.6.2.8 Control and Status Node Code;
Node_2_Param_01: Configuration 3332 (0x00000D04), see configuration parameters for details.6.2.6 Freeport Function.

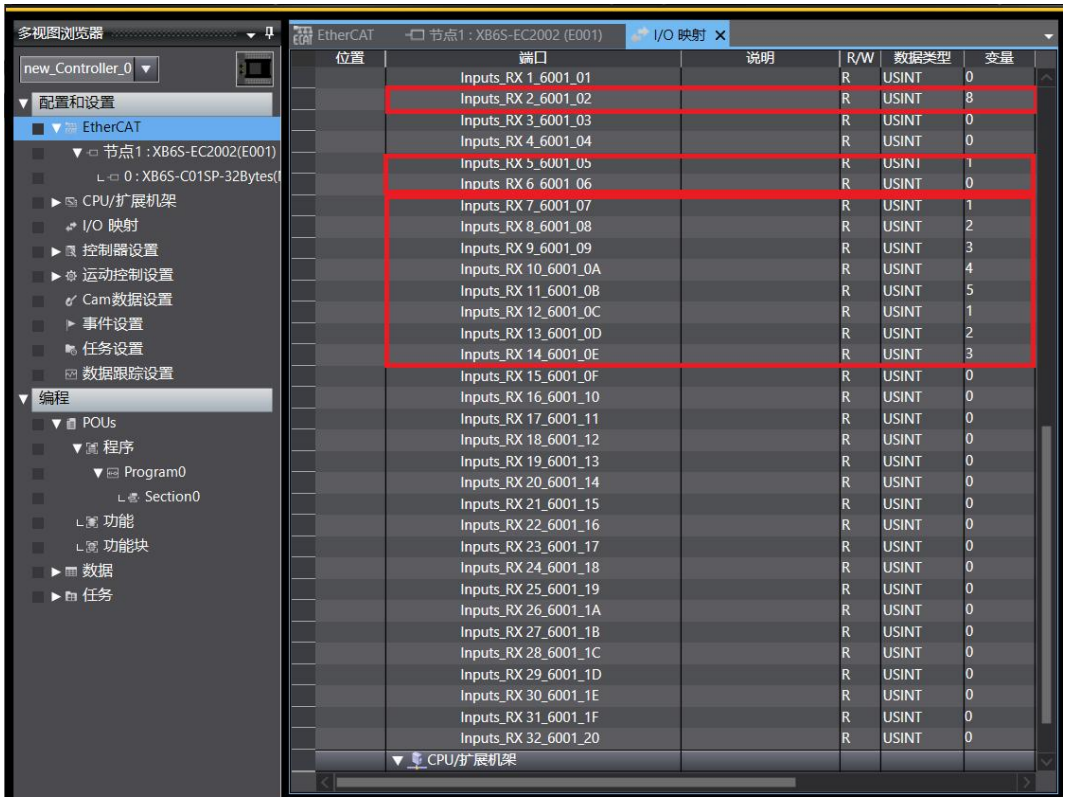


After all parameters are configured, the program needs to be downloaded to the PLC again, and the PLC and module need to be powered on again.

b. Set the control word to 1 in the downlink data and open the serial port debugging assistant to send data, as shown in the figure below.



c. The uplink data shows that the received data length is 8 bytes and the received data count is 1. The received data consists of 8 bytes (RX7~RX14), as shown in the figure below.



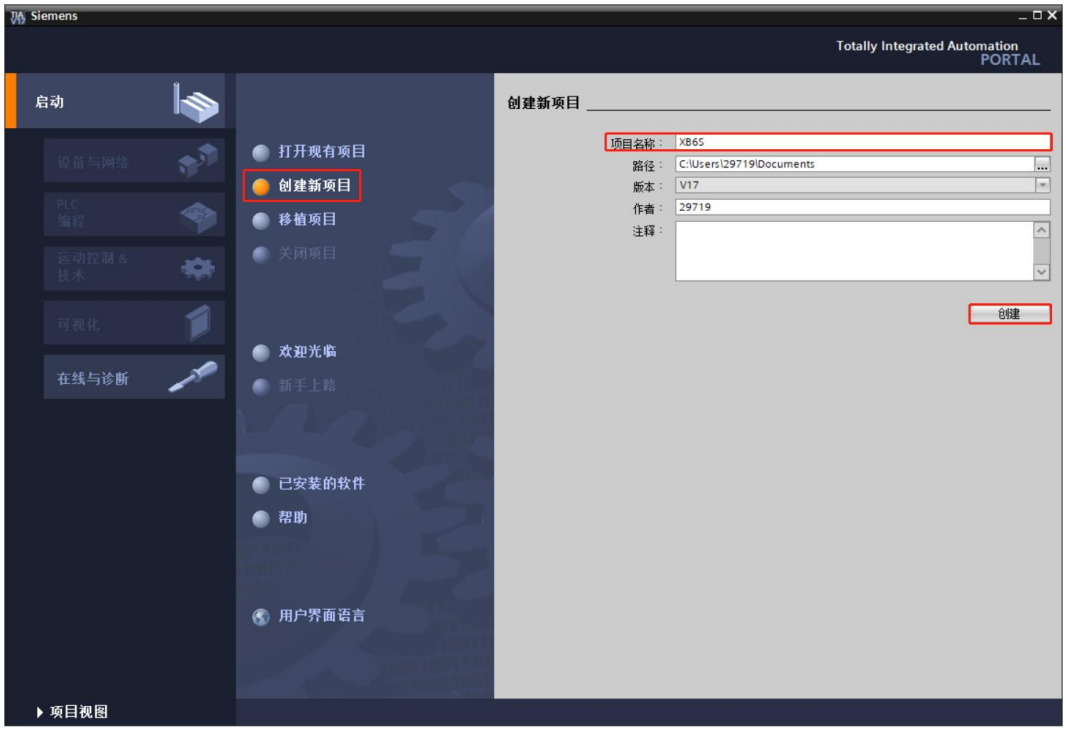
6.4.3 Application in the TIA Portal V17 software environment

1、Preparation

- **Hardware environment**
  - **Module model XB6S-C01SP**
  - **PROFINET bus coupler module, end cap**
    This instruction uses the XB6S-PN2002 coupler module as an example.
  - **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-wire connection"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.



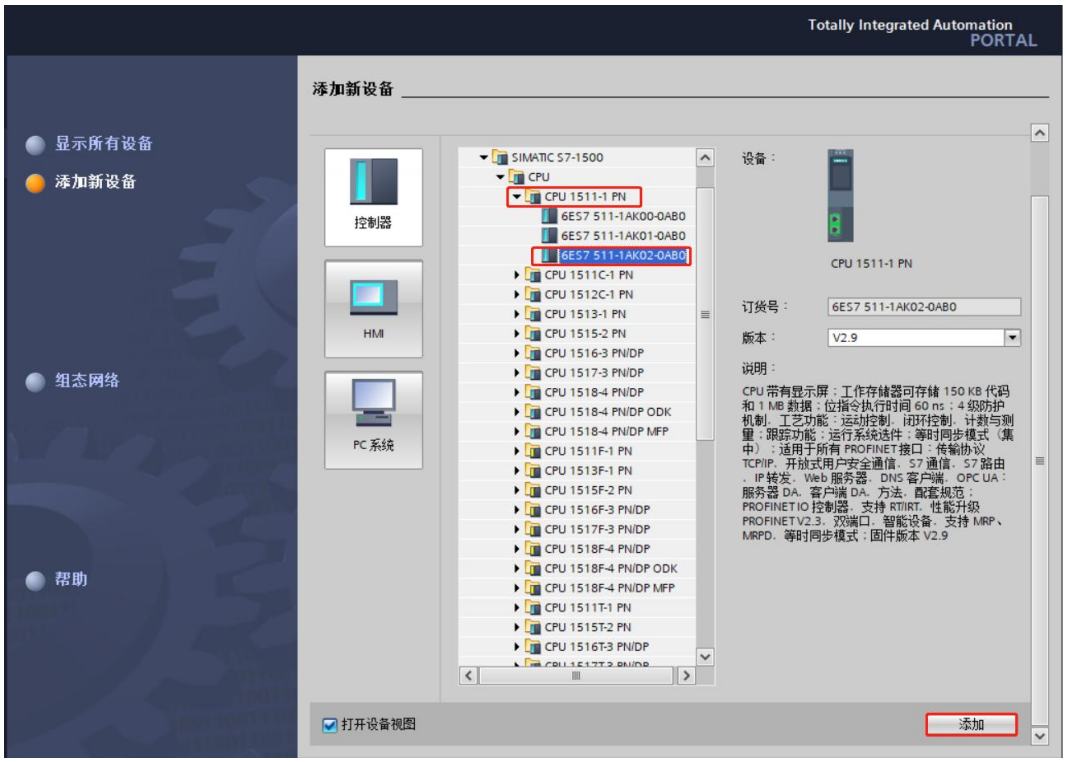
- Project name: Custom, you can keep the default.
- Path: Keep the project path; you can keep the default.

- 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

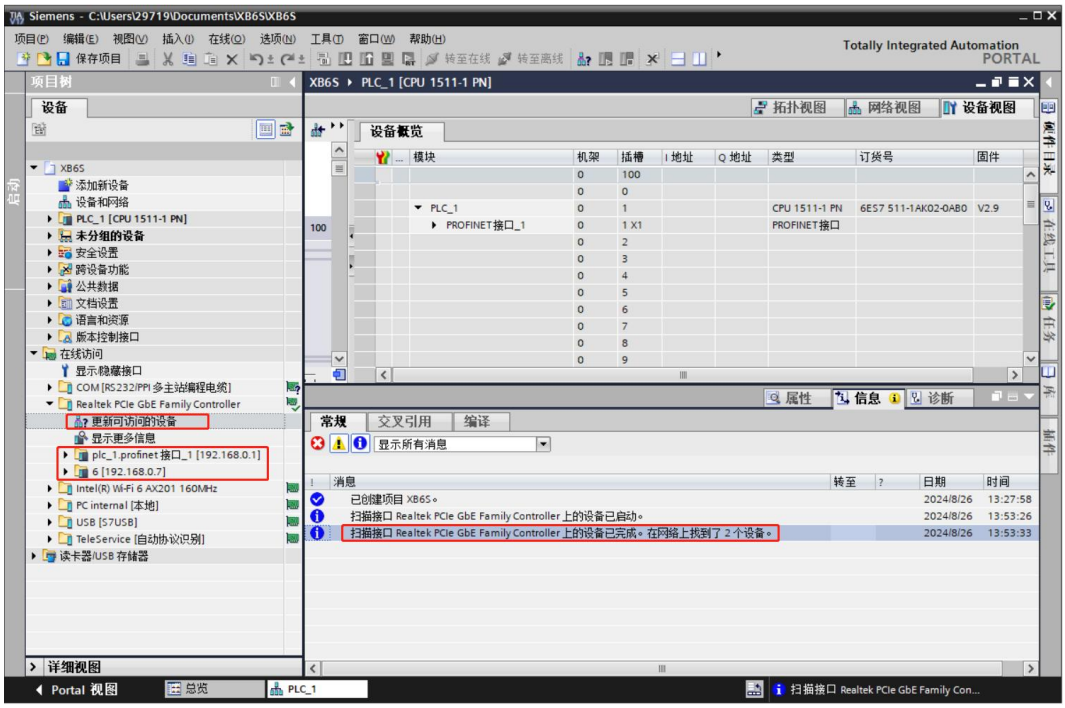
a. Click "Configure Devices", as shown in the figure below.

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.



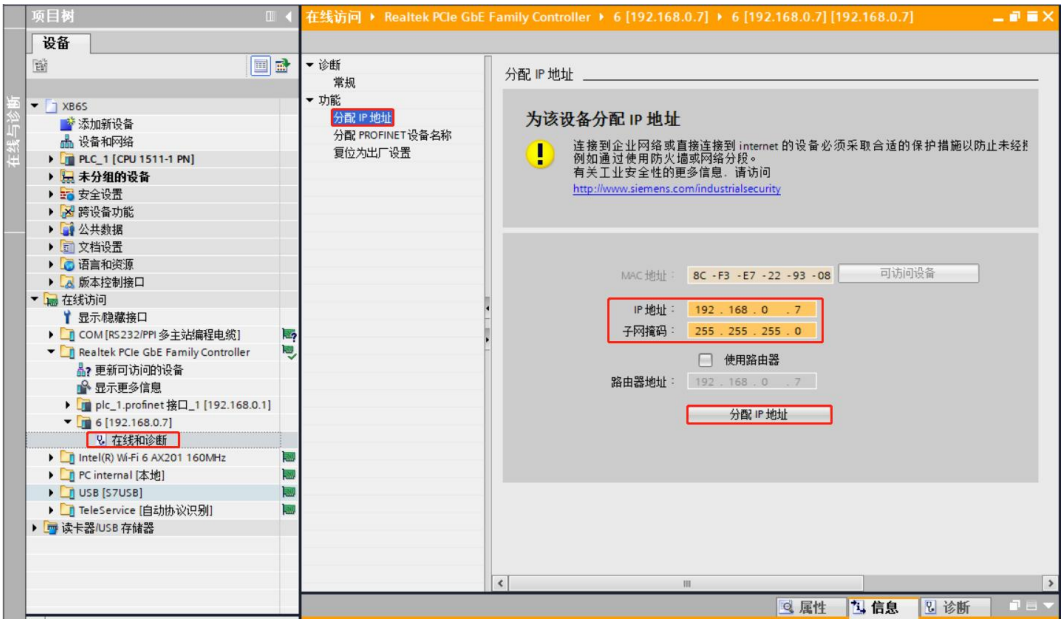
4、Scan connection device

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.

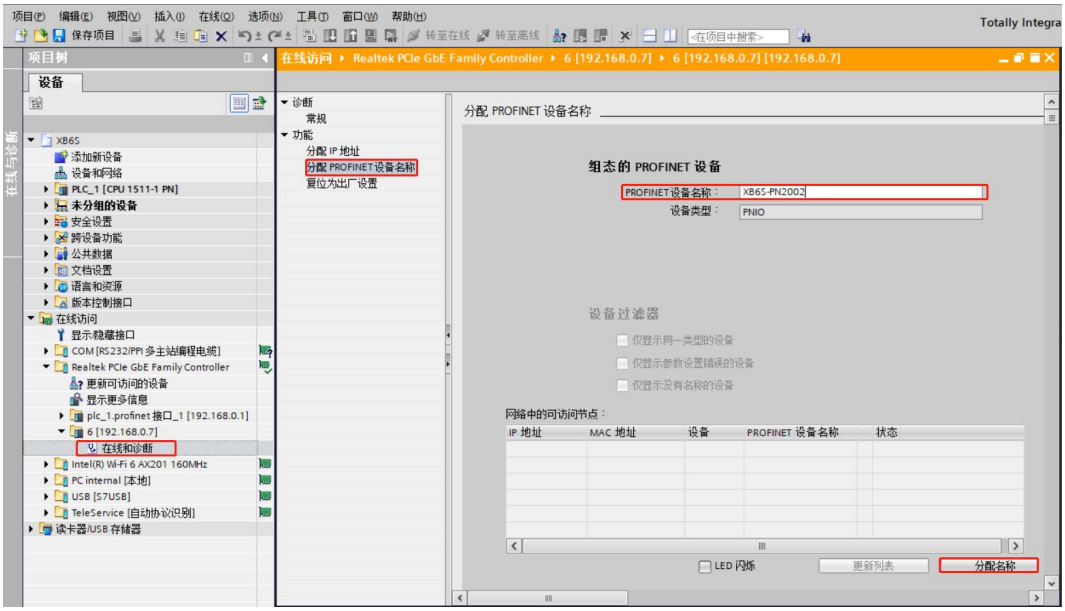


The computer's IP address must be on the same network segment as the PLC. If they are not on the same network segment, change the computer's IP address and repeat the above steps.

b. Double-click "Online and Diagnostics" under the slave device in the left navigation tree. Under the "Function" menu, you can assign the IP address and device name to the current slave device. Click "Assign IP Address", first fill in the "Subnet Mask", then fill in the "IP Address", and click "Assign IP Address" at the bottom, as shown in the figure below.

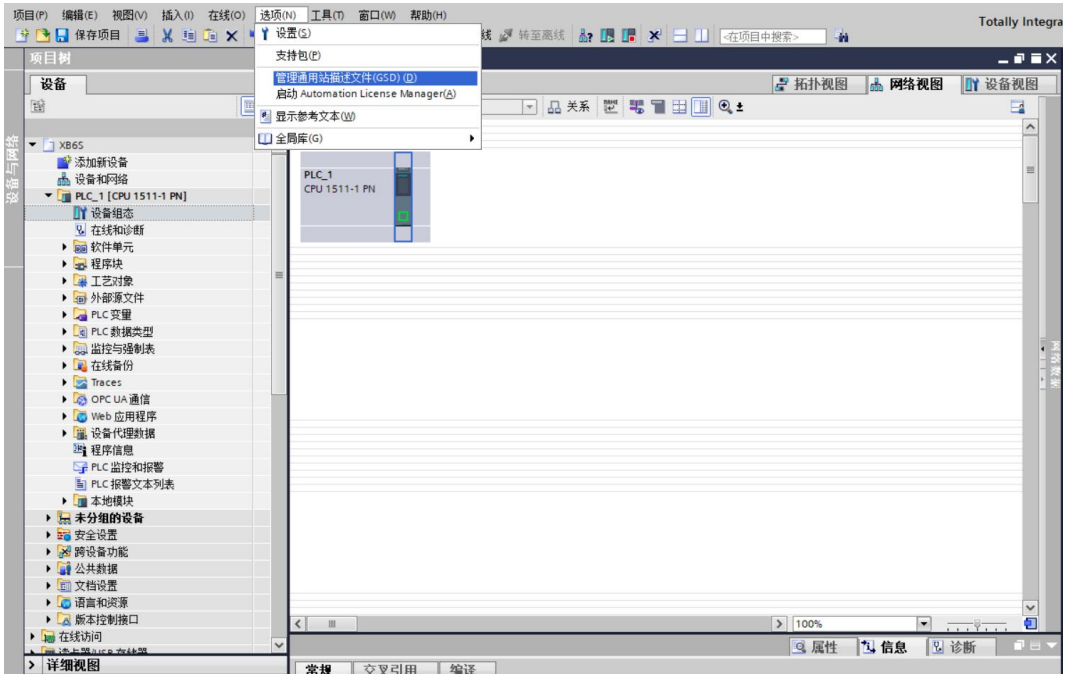


c. Click "Assign PROFINET Device Name", enter the "PROFINET Device Name", and click "Assign Name", as shown in the figure below.

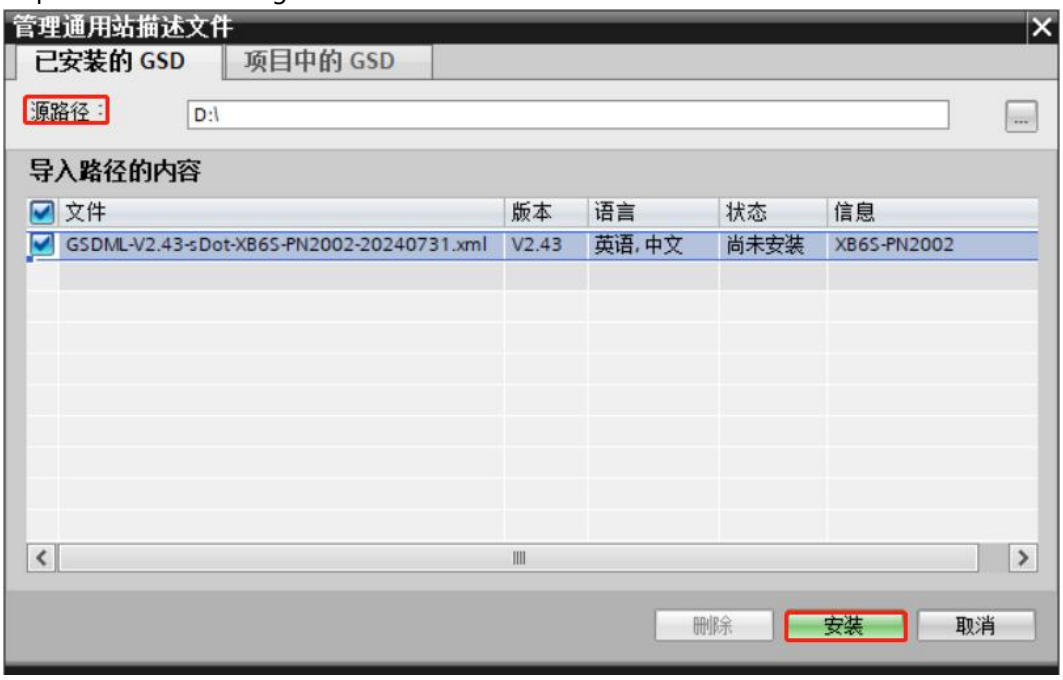


5、Add GSD configuration file

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

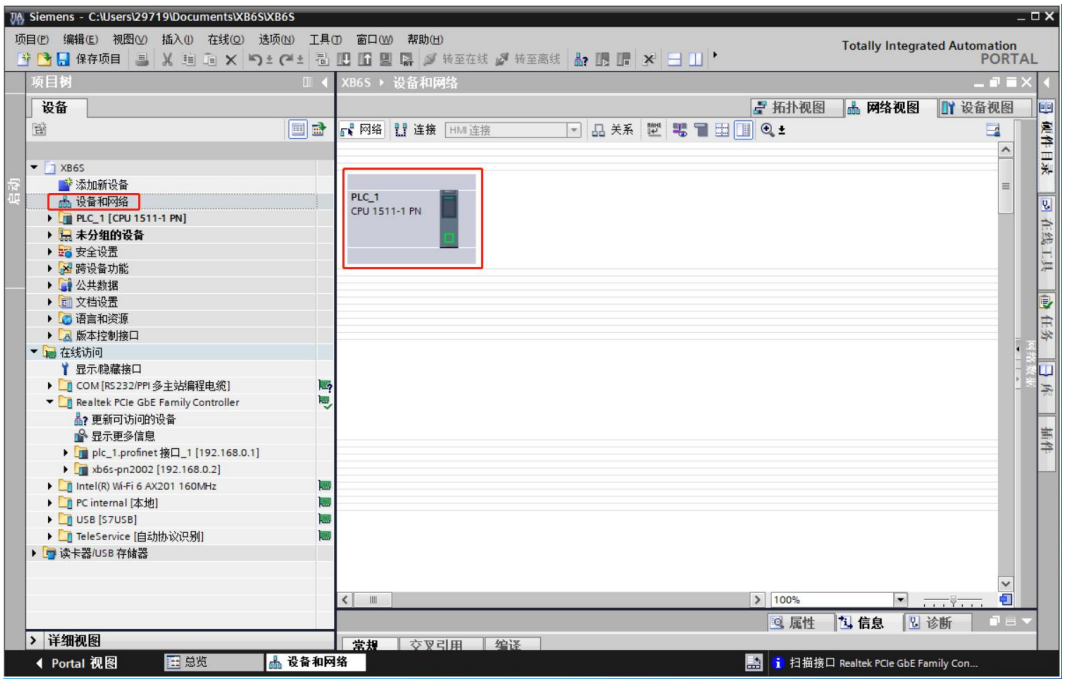


b. Click "Source Path" to select the folder, and check if the status of the GSD file to be added is "Not Installed". If not, click the "Install" button; if already installed, click "Cancel" to skip the installation steps.As shown in the figure below.

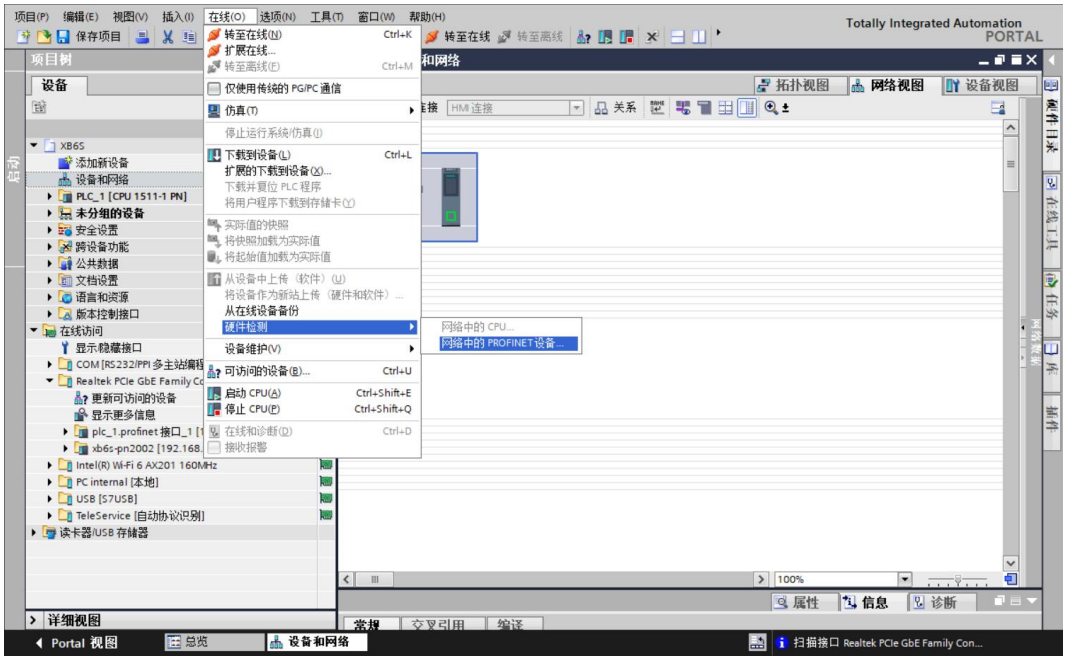


6、Hardware detection and device addition

a. Double-click "Device and Network" in the left navigation tree, and select PLC in the network view, as shown in the figure below.

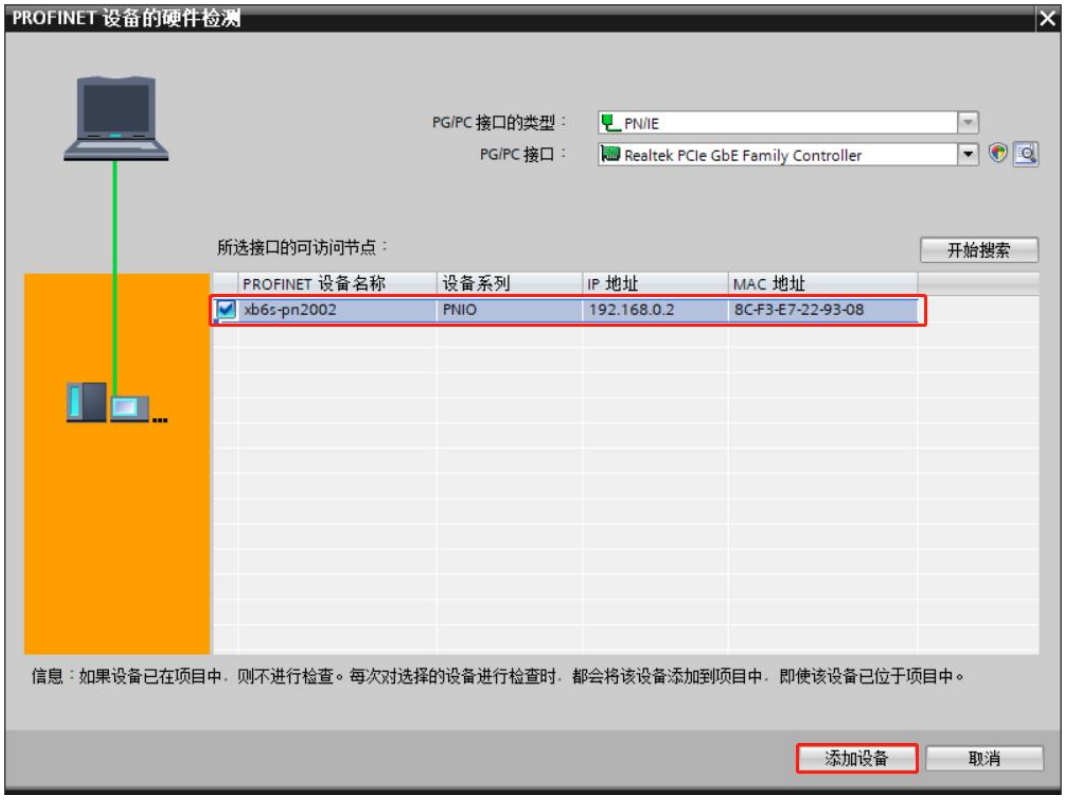


b. In the menu bar, select "Online -> Hardware Detection -> PROFINET Devices in Network", as shown in the figure below.

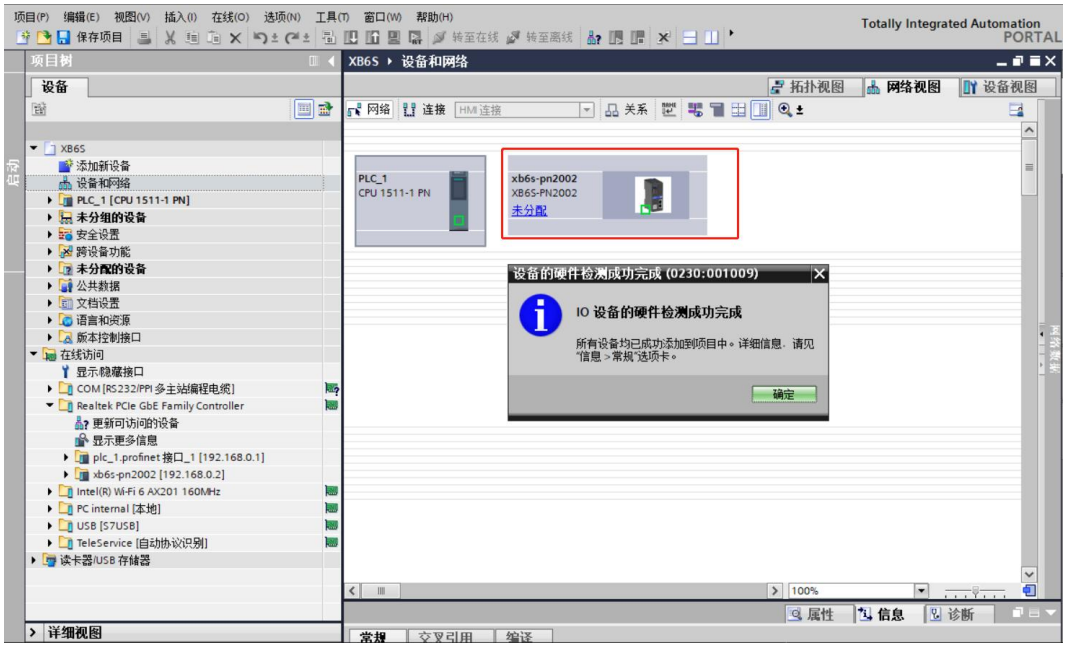


c. A hardware detection window will pop up. Select the correct PG/PC interface and click "Start Search", as shown in the figure below.

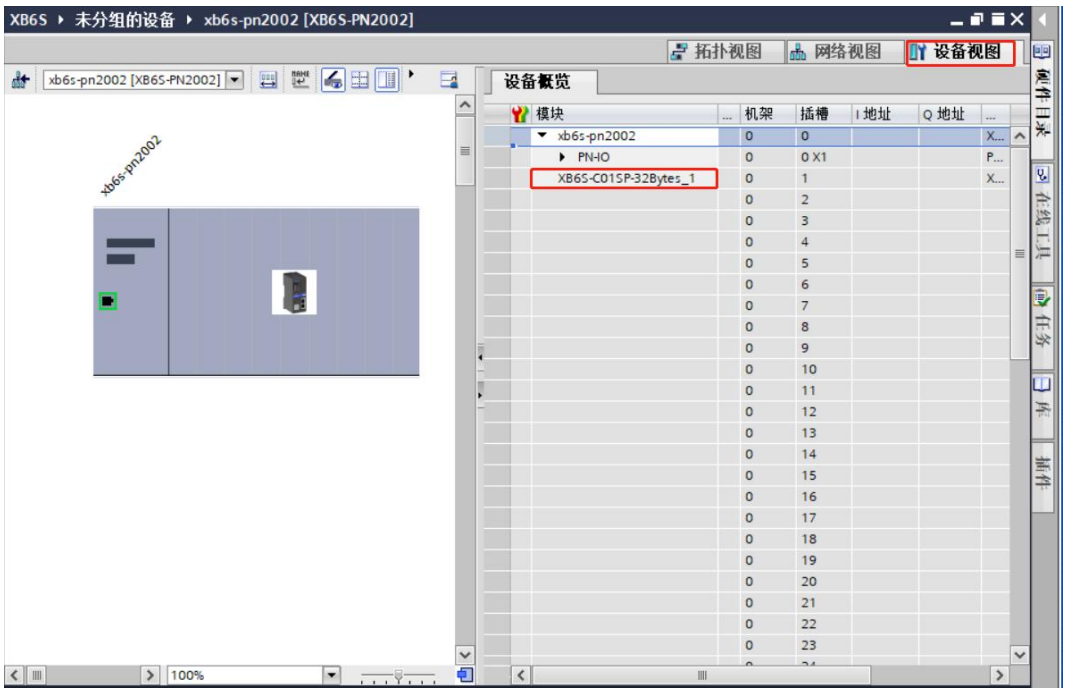
d. To detect coupler devices in the network, select the coupler and click "Add Device," as shown in the image below.



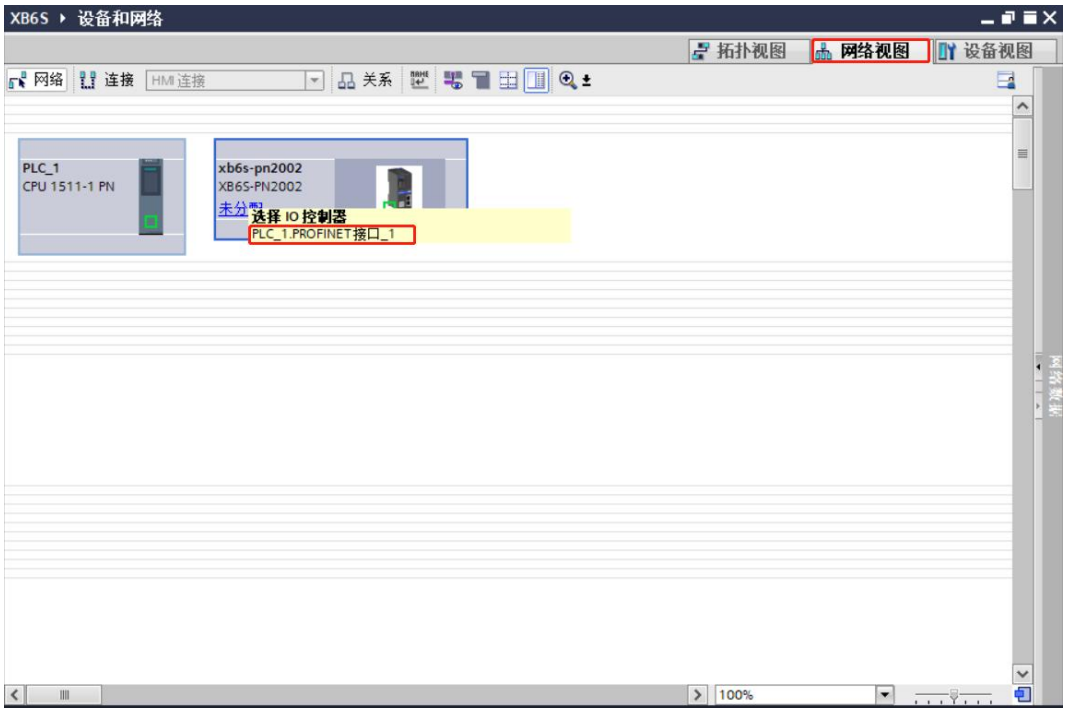
e. After the coupler is successfully added, you can see the coupler icon in the network view, as shown in the figure below.



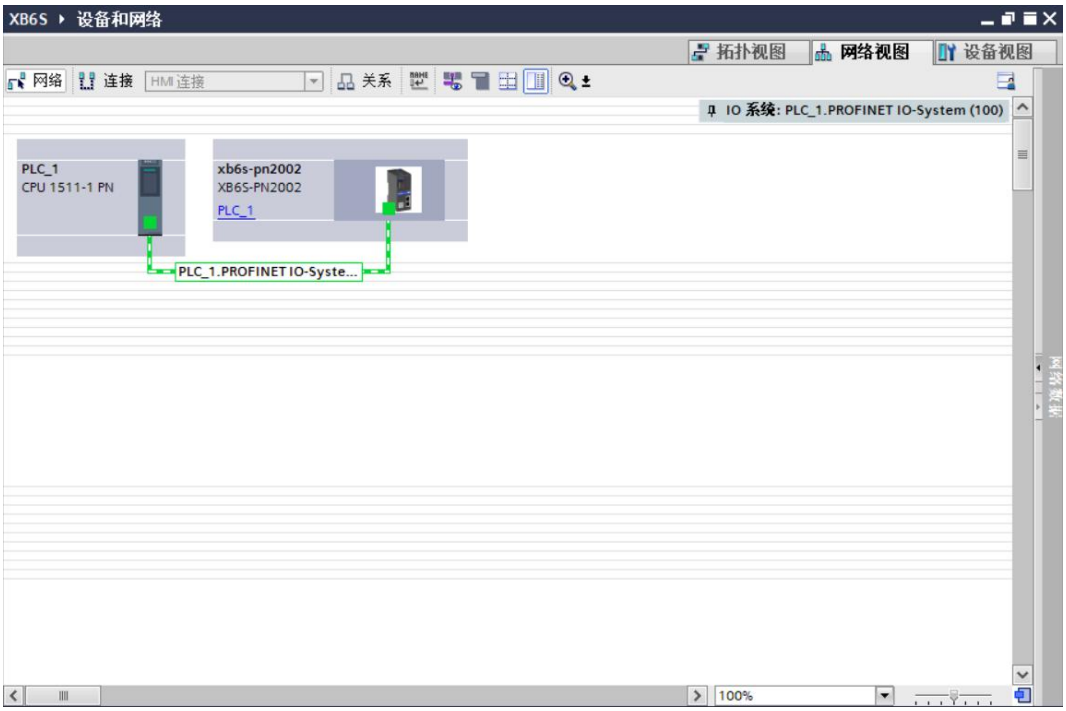
f. Select the coupler icon, switch to the device view, and you can see that all IO devices in the topology have been detected and added, as shown in the figure below.



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

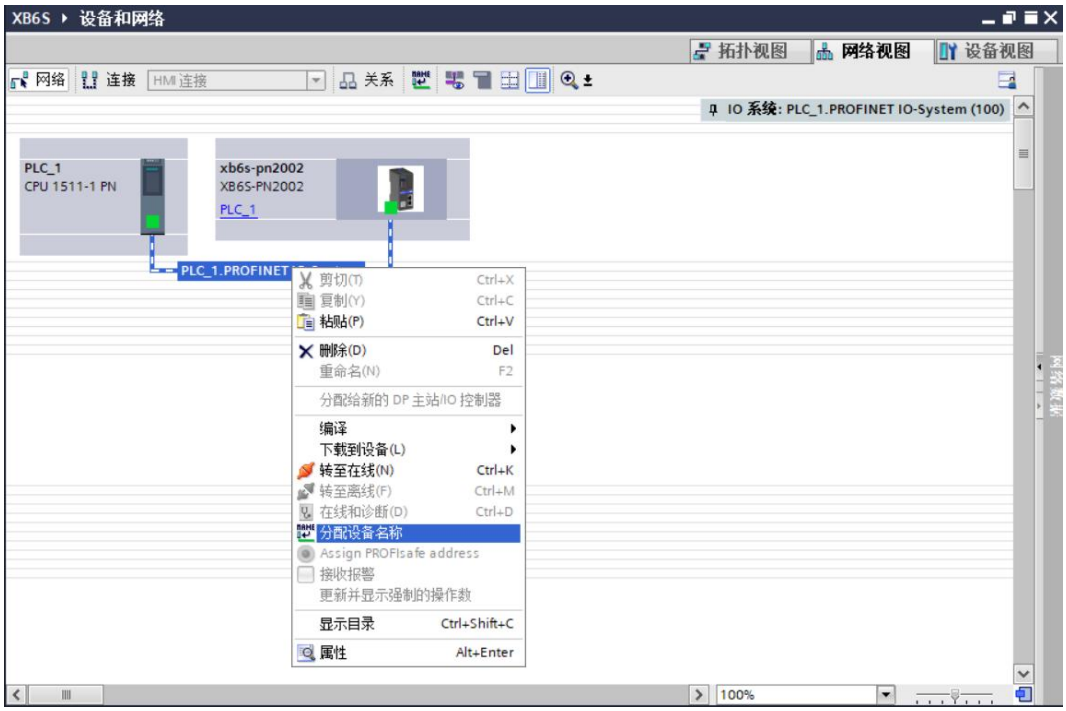


h. Once the connection is complete, it will look like the image below.

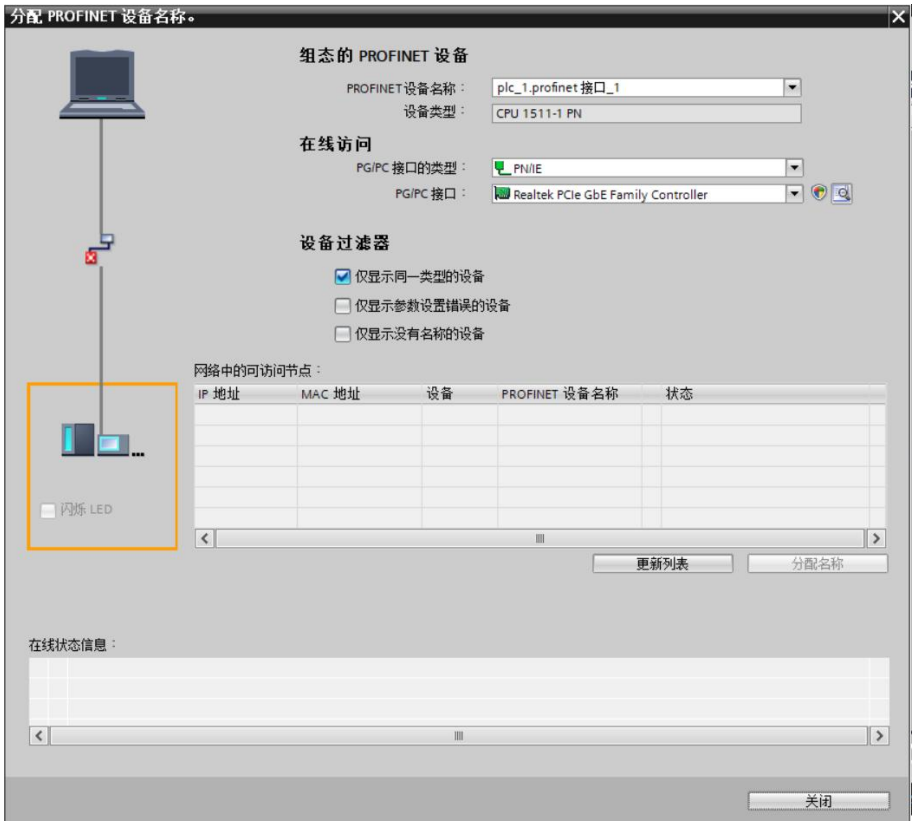


7、Assign device name

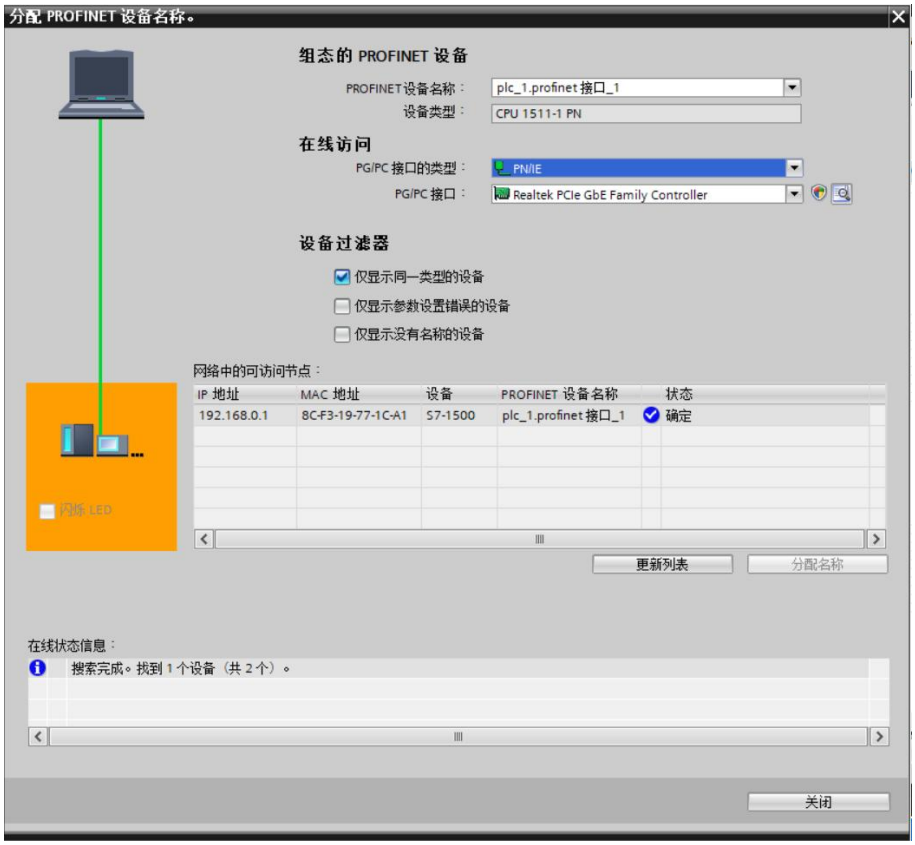
a. In the network view, right-click the connection cable between the PLC and the coupler, and select "Assign Device Name", as shown in the figure below.



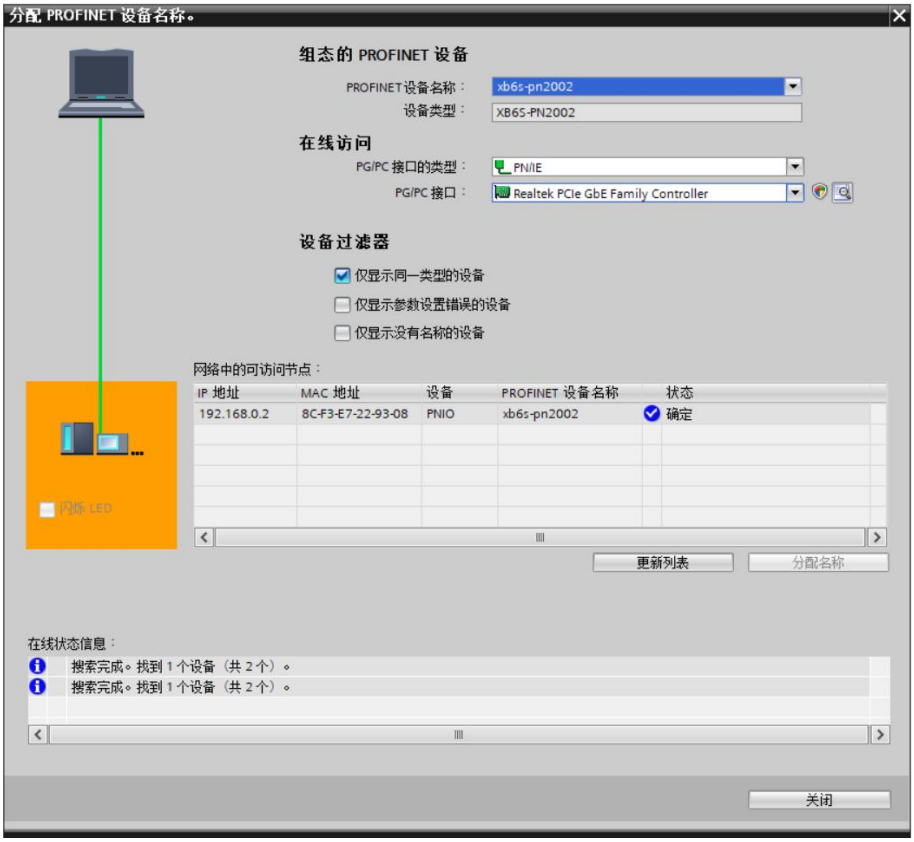
b. A "Assign PROFINET Device Name" window will pop up, as shown in the figure below.



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 "Coupler" as the device name, click "Update List," and then assign a name using the same method after updating, as shown in the figure below.

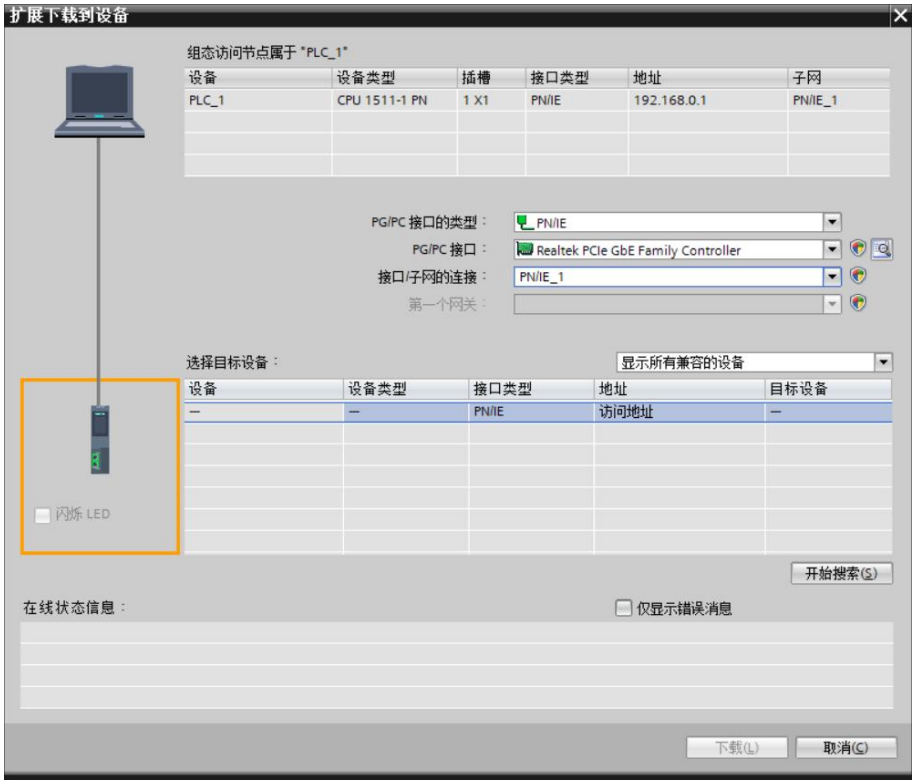


e. Check if the MAC address on the module's silkscreen matches the MAC address of the assigned device name. Click "Close".

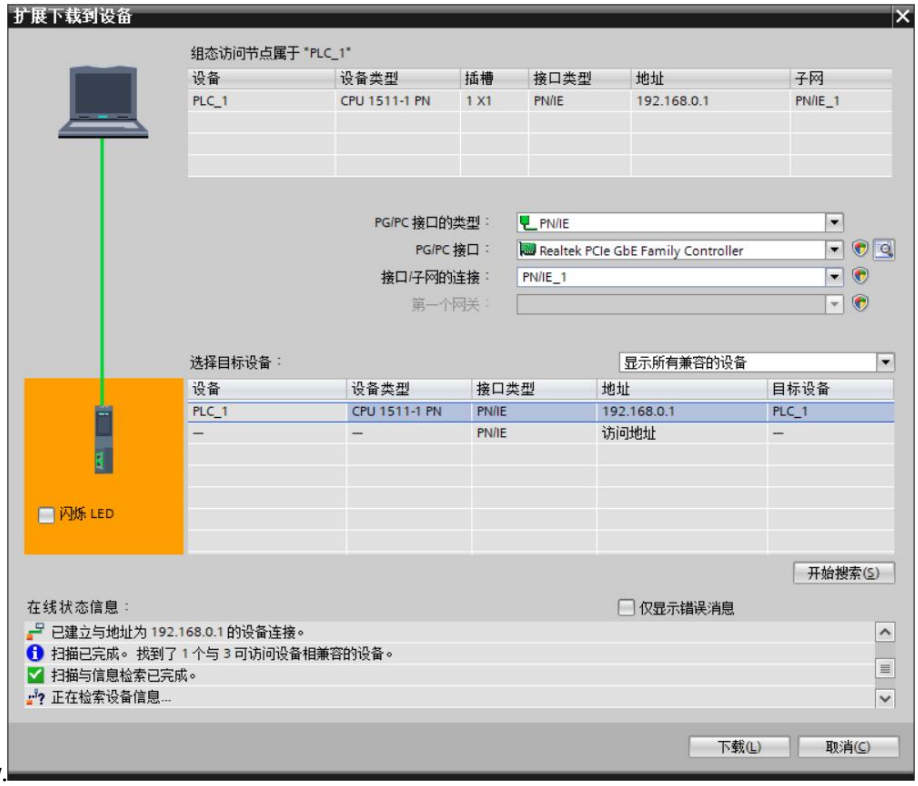
8、Download configuration structure

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.

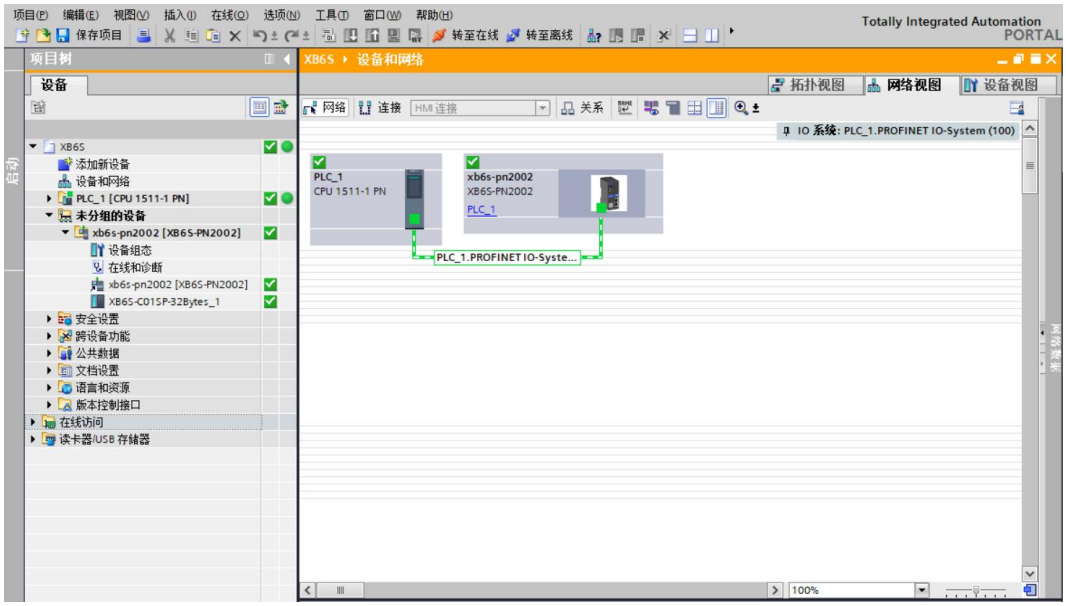
e. Click "Load".

f. Click "Finish".

g. Power on the device again.

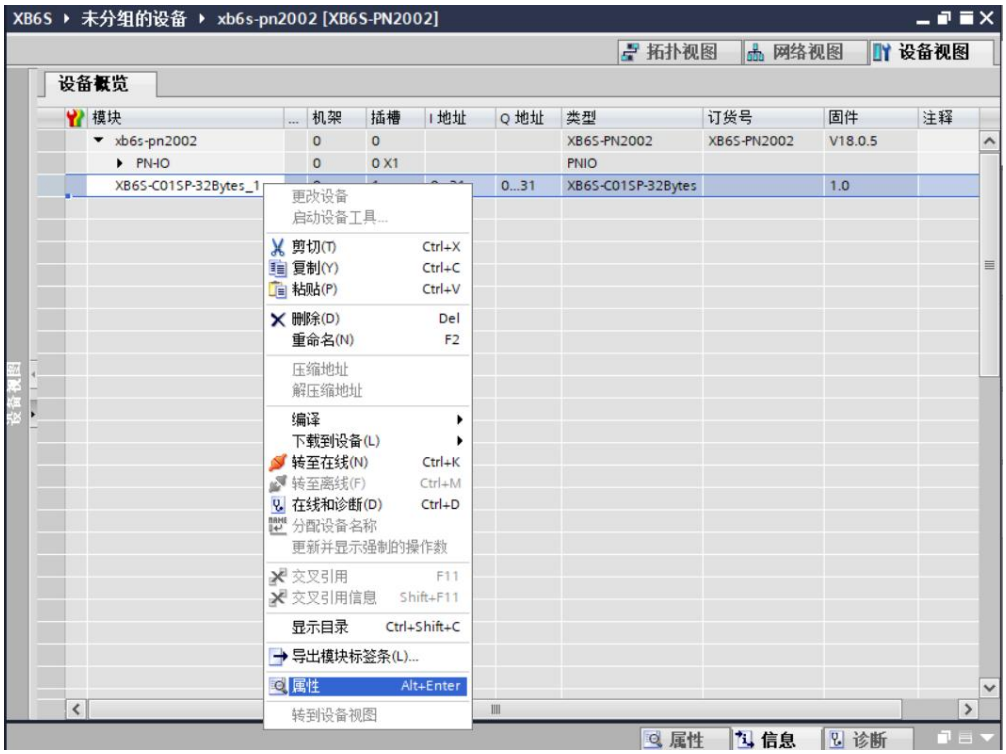
9、Communication connection

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.

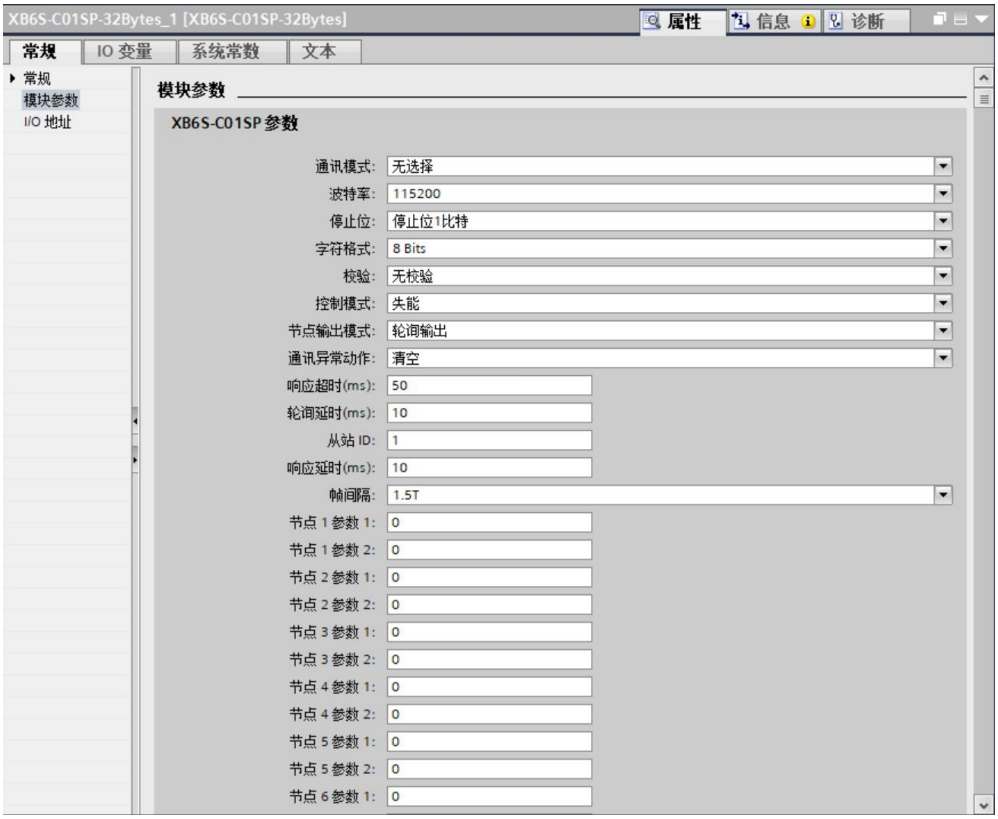


10、 Parameter settings

a. In offline mode, open "Network View", select the coupler module, switch to device view, right-click the XB6S-C01SP-32Bytes module, and click the "Properties" button to view and set various parameters of the module, as shown in the figure below.

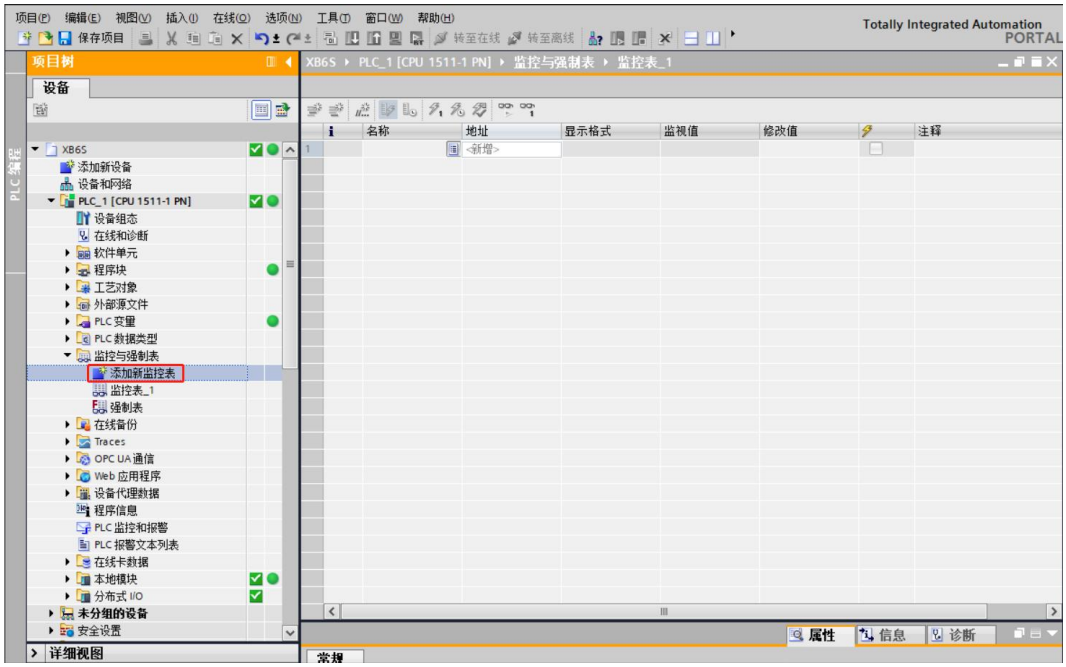


b. On the properties page, click "Module Parameters," as shown in the image below. The parameters can be configured according to actual usage needs. After configuration, re-download the program to the PLC, and then power on both the PLC and the module.



11、 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" to view the channel I address (channel address of input signal) and Q address (channel address of output signal) of each module in the device overview.

For example, the "I address" of the XB6S-C01SP-32Bytes module is 0 to 31, and the "Q address" is 0 to 31, as shown in the figure below.

c. In the address cells of the monitoring table, enter the input/output channel addresses, such as "IB0" to "IB31", "QB0" to "QB31", and press "Enter". After completing all the entries, click [link to entry].  The button allows you to monitor the data.

12、 RTU Master Mode Functionality Example

Example 1: Verify the value of two holding registers by writing them to the module RTU master in disabled mode using tools or devices such as Modbus Slave debugging software.

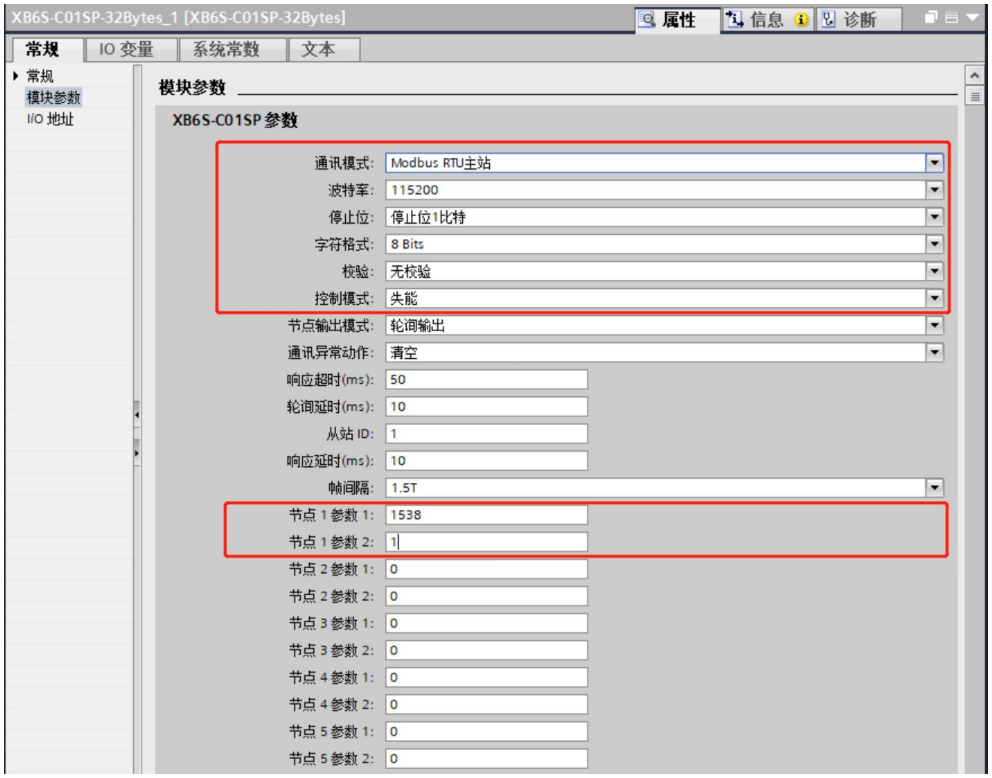
a. Configure the configuration parameters and select Modbus RTU master mode for communication, as shown in the figure below.

Communication mode: Select Modbus RTU master station;

Control mode: Selected disability;

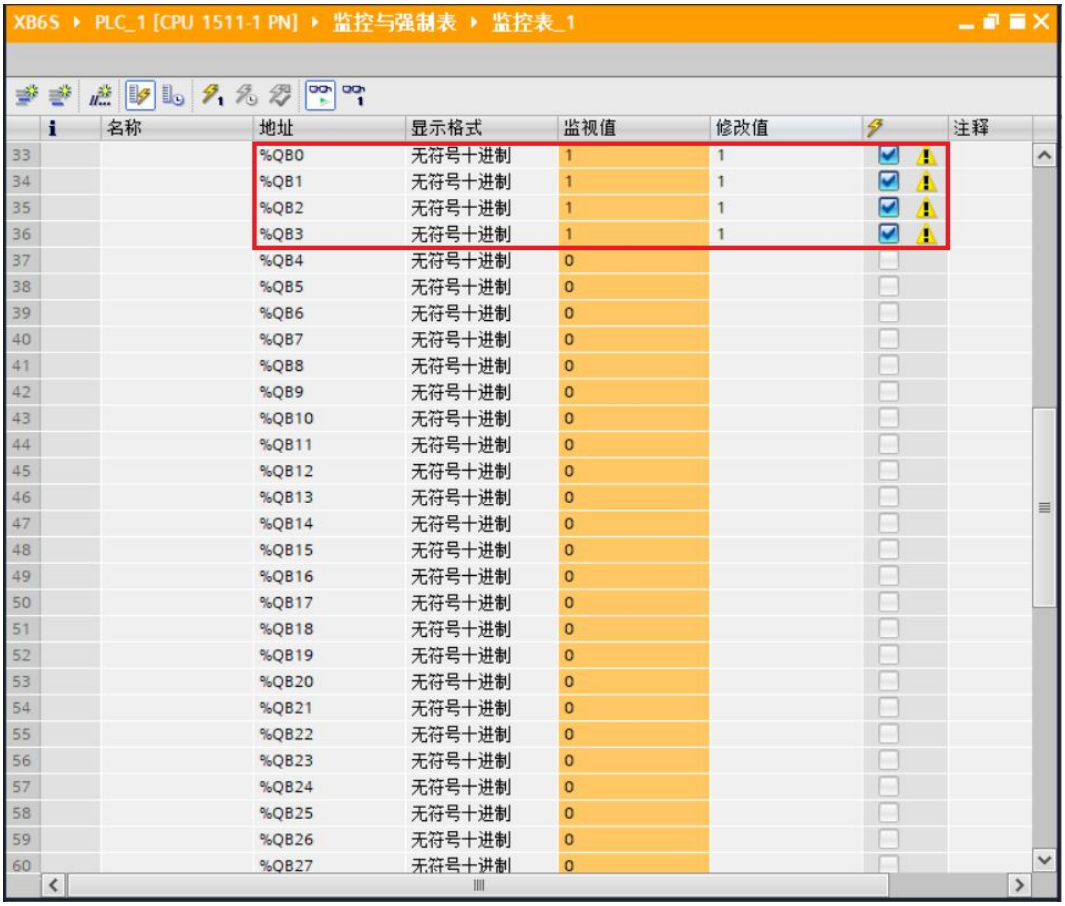
Node 1 parameter 1: Configuration 1538 (0x00000602), see configuration parameters for details.6.2.1 Modbus Master Station Functions;

Node 1 Parameter 2: Configuration 1 (0x00000001), see details for configuration parameters.6.2.1 Modbus Master Station Functions.



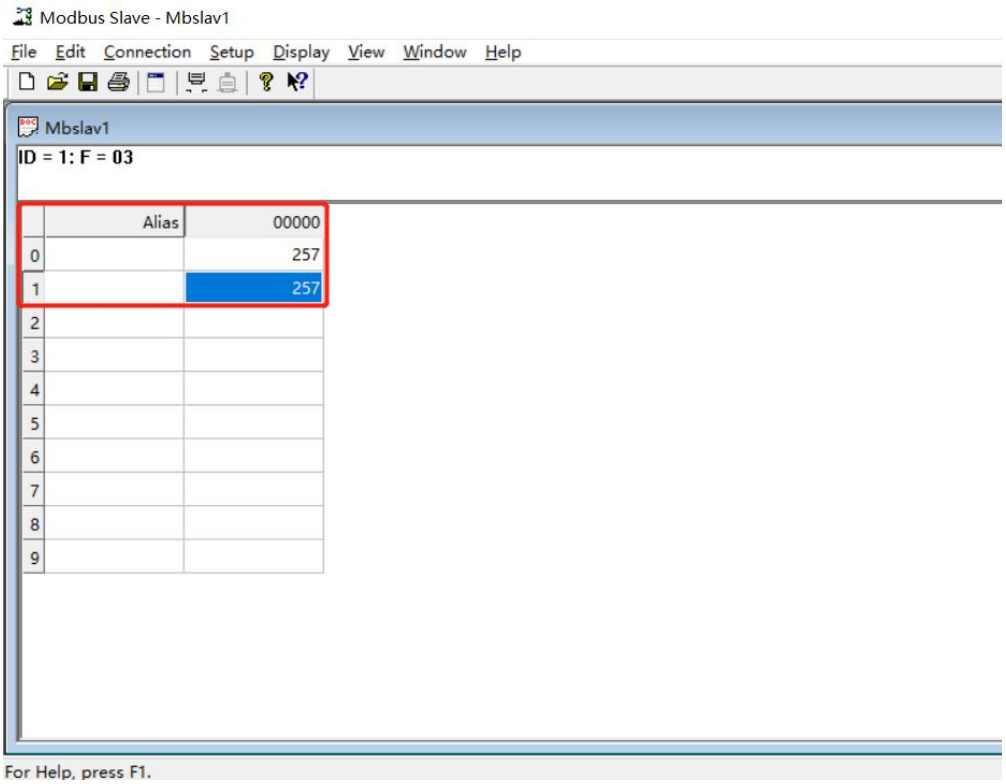
After all parameters are configured, the program needs to be downloaded to the PLC again, and the PLC and module need to be powered on again.

b. In the downlink data, the values of two holding registers are written, as shown in the figure below.



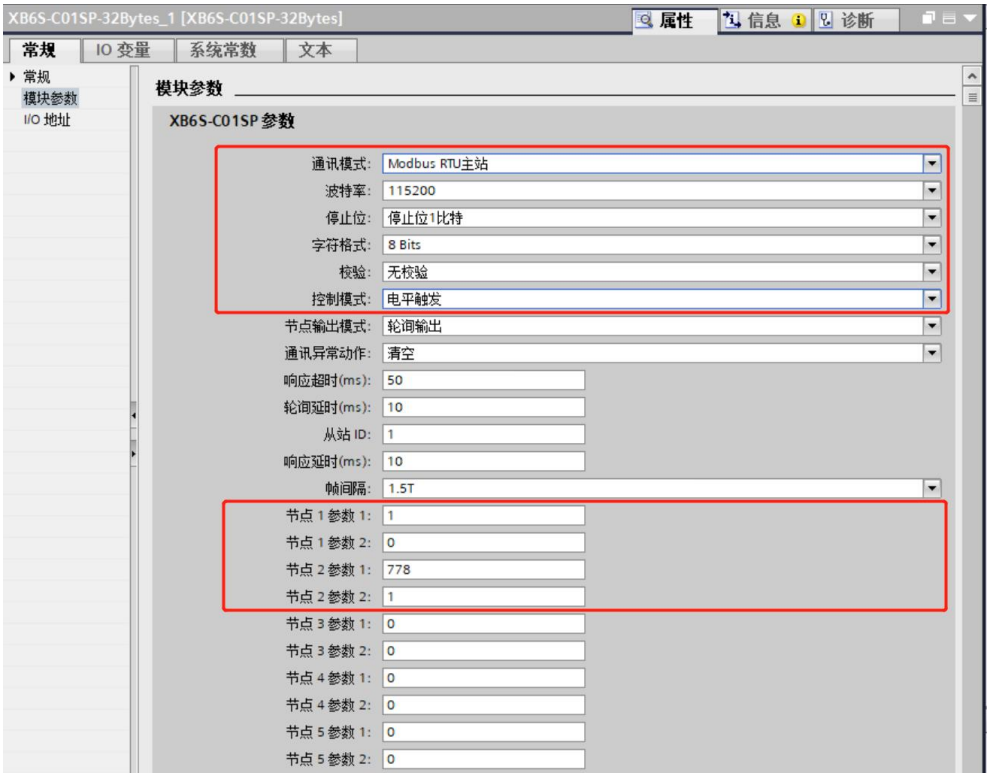
	名称	地址	显示格式	监视值	修改值	注释
33		%QB0	无符号十进制	1	1	
34		%QB1	无符号十进制	1	1	
35		%QB2	无符号十进制	1	1	
36		%QB3	无符号十进制	1	1	
37		%QB4	无符号十进制	0		
38		%QB5	无符号十进制	0		
39		%QB6	无符号十进制	0		
40		%QB7	无符号十进制	0		
41		%QB8	无符号十进制	0		
42		%QB9	无符号十进制	0		
43		%QB10	无符号十进制	0		
44		%QB11	无符号十进制	0		
45		%QB12	无符号十进制	0		
46		%QB13	无符号十进制	0		
47		%QB14	无符号十进制	0		
48		%QB15	无符号十进制	0		
49		%QB16	无符号十进制	0		
50		%QB17	无符号十进制	0		
51		%QB18	无符号十进制	0		
52		%QB19	无符号十进制	0		
53		%QB20	无符号十进制	0		
54		%QB21	无符号十进制	0		
55		%QB22	无符号十进制	0		
56		%QB23	无符号十进制	0		
57		%QB24	无符号十进制	0		
58		%QB25	无符号十进制	0		
59		%QB26	无符号十进制	0		
60		%QB27	无符号十进制	0		

c. The values of the two received registers can be viewed using debugging software, as shown in the figure below.



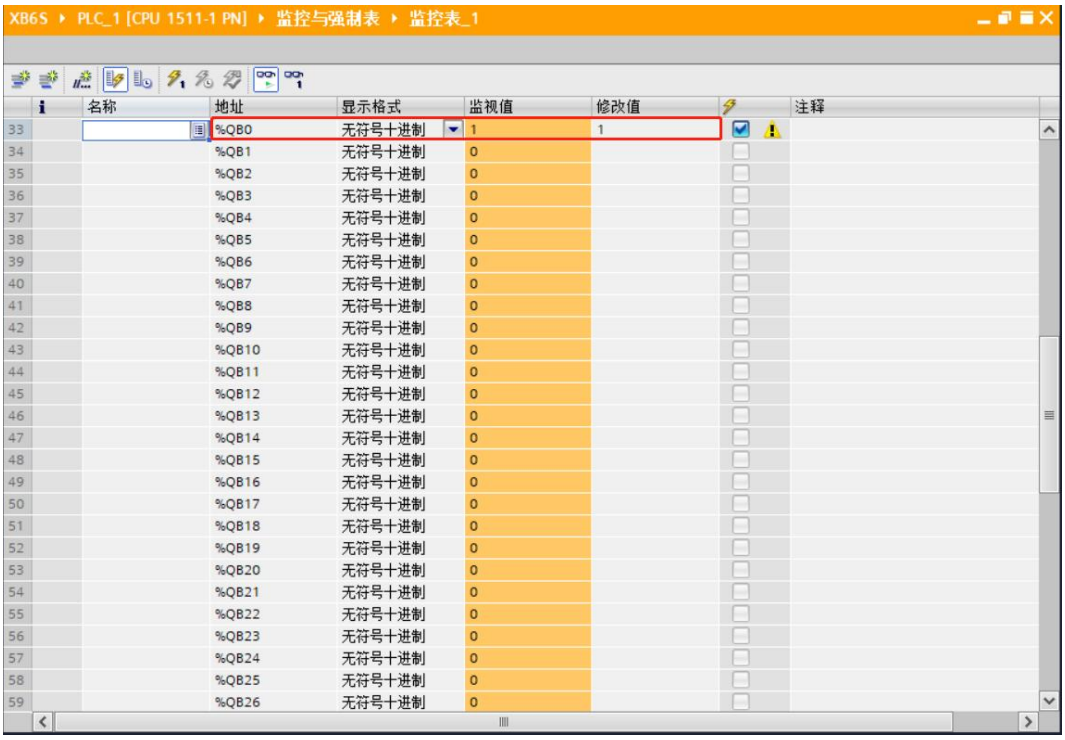
Example 2: Verify that the module RTU master station reads 10 holding registers in Level mode using tools or devices such as Modbus Slave debugging software.

a. Configure the configuration parameters and select Modbus RTU master mode for communication, as shown in the figure below.
Communication mode: Select Modbus RTU master station;
Control mode: Select level trigger;
Node 1 Parameter 1: Configuration 1 (0x00000001), see details for configuration parameters.6.2.8 Control and Status Node Code;
Node 2 parameter 1: Configuration 778 (0x0000030A), see configuration parameters for details.6.2.1 Modbus Master Station Functions;
Node 2 parameter 2: Configuration 1 (0x00000001), see details for configuration parameters.6.2.1 Modbus Master Station Functions.



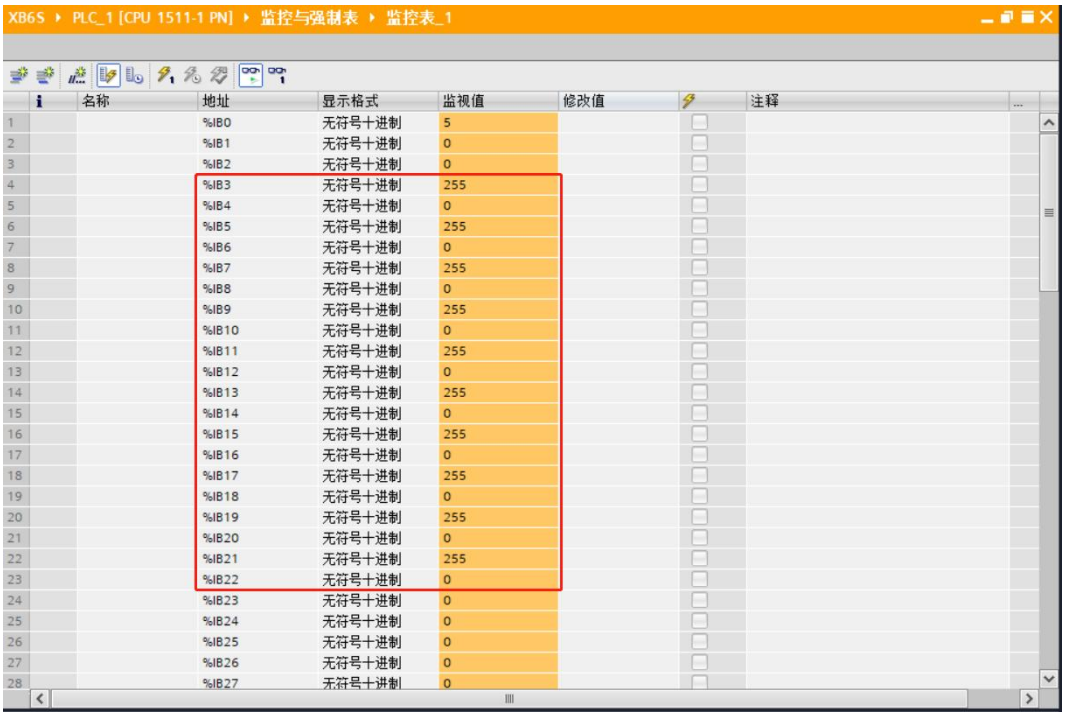
After all parameters are configured, the program needs to be downloaded to the PLC again, and the PLC and module need to be powered on again.

b. Set the control word to 1 in the downlink data and open the debugging software to send data, as shown in the figure below.



	名称	地址	显示格式	监视值	修改值		注释
33		%QB0	无符号十进制	1	1	☑	
34		%QB1	无符号十进制	0			
35		%QB2	无符号十进制	0			
36		%QB3	无符号十进制	0			
37		%QB4	无符号十进制	0			
38		%QB5	无符号十进制	0			
39		%QB6	无符号十进制	0			
40		%QB7	无符号十进制	0			
41		%QB8	无符号十进制	0			
42		%QB9	无符号十进制	0			
43		%QB10	无符号十进制	0			
44		%QB11	无符号十进制	0			
45		%QB12	无符号十进制	0			
46		%QB13	无符号十进制	0			
47		%QB14	无符号十进制	0			
48		%QB15	无符号十进制	0			
49		%QB16	无符号十进制	0			
50		%QB17	无符号十进制	0			
51		%QB18	无符号十进制	0			
52		%QB19	无符号十进制	0			
53		%QB20	无符号十进制	0			
54		%QB21	无符号十进制	0			
55		%QB22	无符号十进制	0			
56		%QB23	无符号十进制	0			
57		%QB24	无符号十进制	0			
58		%QB25	无符号十进制	0			
59		%QB26	无符号十进制	0			

c. The received data can be seen in the upstream data, as shown in the figure below.

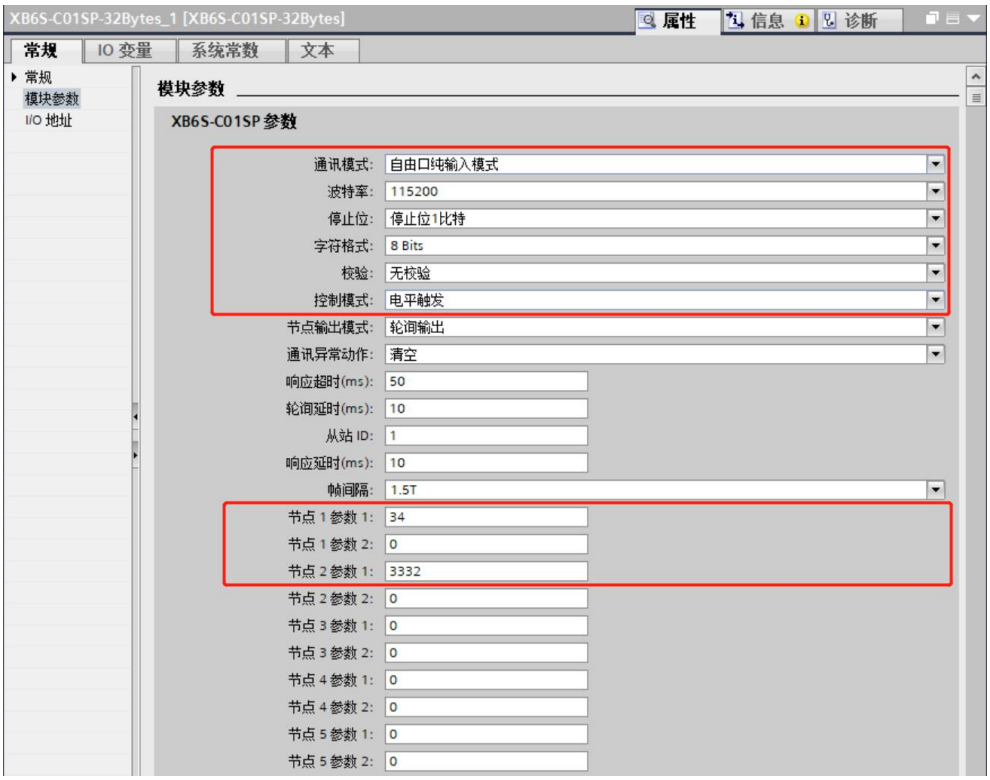


	名称	地址	显示格式	监视值	修改值		注释
1		%IB0	无符号十进制	5			
2		%IB1	无符号十进制	0			
3		%IB2	无符号十进制	0			
4		%IB3	无符号十进制	255			
5		%IB4	无符号十进制	0			
6		%IB5	无符号十进制	255			
7		%IB6	无符号十进制	0			
8		%IB7	无符号十进制	255			
9		%IB8	无符号十进制	0			
10		%IB9	无符号十进制	255			
11		%IB10	无符号十进制	0			
12		%IB11	无符号十进制	255			
13		%IB12	无符号十进制	0			
14		%IB13	无符号十进制	255			
15		%IB14	无符号十进制	0			
16		%IB15	无符号十进制	255			
17		%IB16	无符号十进制	0			
18		%IB17	无符号十进制	255			
19		%IB18	无符号十进制	0			
20		%IB19	无符号十进制	255			
21		%IB20	无符号十进制	0			
22		%IB21	无符号十进制	255			
23		%IB22	无符号十进制	0			
24		%IB23	无符号十进制	0			
25		%IB24	无符号十进制	0			
26		%IB25	无符号十进制	0			
27		%IB26	无符号十进制	0			
28		%IB27	无符号十进制	0			

13、 Freeport_Input Function Example

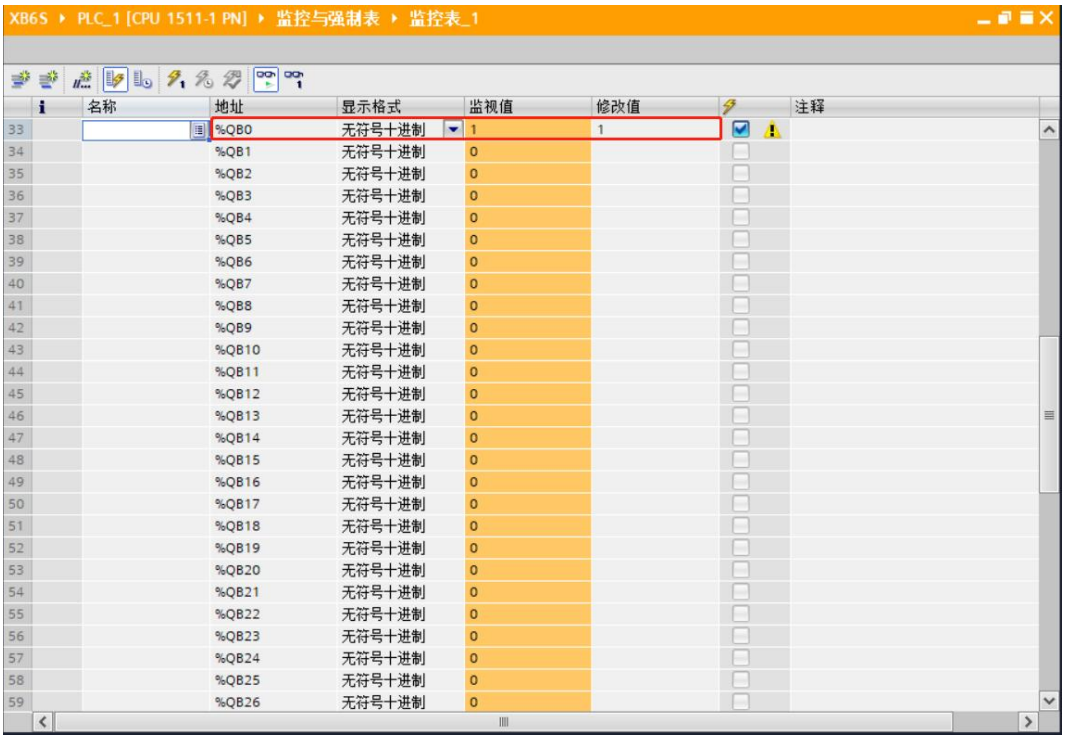
Example: Use Freeport_Input in Level mode to receive 8 bytes of data using tools or devices such as serial port debugging assistants.

a. Configure the configuration parameters and select the free port pure input mode for communication mode, as shown in the figure below.
Communication mode: Select free port pure input mode;
Control mode: Select level trigger;
Node 1 parameter 1: Configuration 34 (0x00000022), see configuration parameters for details.6.2.8 Control and Status Node Code;
Node 2 parameter 1: Configuration 3332 (0x00000D04), see configuration parameters for details.6.2.6 Freeport Function.



After all parameters are configured, the program needs to be downloaded to the PLC again, and the PLC and module need to be powered on again.

b. Set the control word to 1 in the downlink data and open the serial port debugging assistant to send data, as shown in the figure below.



c. The uplink data shows that the received data length is 8 bytes and the received data count is 1. The received data consists of 8 bytes (IB6~IB13), as shown in the figure below.