XB6-C01SP
Serial Communication Module
User Manual

南京实点电子科技有限公司

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Nanjing Solidot Electronic Technology Co., Ltd.

Address: Angying Building , No. 91 Shengli Road, Jiangning Zone, Nanjing, Jiangsu

Postal code: 210038

Telephone: 4007788929

Website: https://www.solidotech.com/en

Table of Contents

1 Product Overview

1.1 Product Introduction

XB6-C01SP is a 1-channel serial communication module in Solidot XB6 series slice I/O. It adopts X-bus backplane bus and is compatiable with XB6 series couplers. Through different function modules, it can realize three serial communication functions of Modbus master and slave, Freeport and pass-through. The modules take up little space, are simple to handle data interaction, and can meet the serial communication needs of different application scenarios.

1.2 Product Features

- Supports multiple communication modes
  Six modes can be set: MRM/MRS/MAM/MAS/FP/PT (see 2.2 serial port parameters)
- Supports three types of communication interfaces
  Three interfaces are available: RS485/RS422/RS232
- Supports two communication protocols.
  Modbus RTU/ASCII
- Small footprint
  Compact structure and small footprint.
- Easy diagnosis
  An innovative channel indicator design is adopted. As the indicators are placed close to the channels, channel status is displayed intuitively and clearly, facilitating detection and maintenance
- Easy configuration
  The modules are easy to configure, and support all mainstream PROFINET master stations
- Easy installation
  Installation on standard DIN 35 mm rails.
  Spring terminal blocks are used for convenient and fast wiring.

2 Product Parameters

2.1 General parameters

Interface parameters	
Model Number	XB6-C01SP
Backplane bus protocol	X-bus
Process data volume: downstream	40 Bytes
Process data volume: upstream	40 Bytes
Technical parameters	
Number of channels	1 channel
Communication interface	RS232、RS485、RS422
Communication protocol	Modbus RTU、Modbus ASCII
Baud rate	1200bps~115200bps
Power	70mA@5VDC
Weight	90g
Dimension	106×73×25.7mm
Wiring method	Push-in technology
Installation method	35mm rail mount
Working temperature	-10~+60℃
Storage temperature	-20℃~+75℃
Relative humidity	95%, non-condensing
Protection degree	IP20

2.2 Serial port parameters

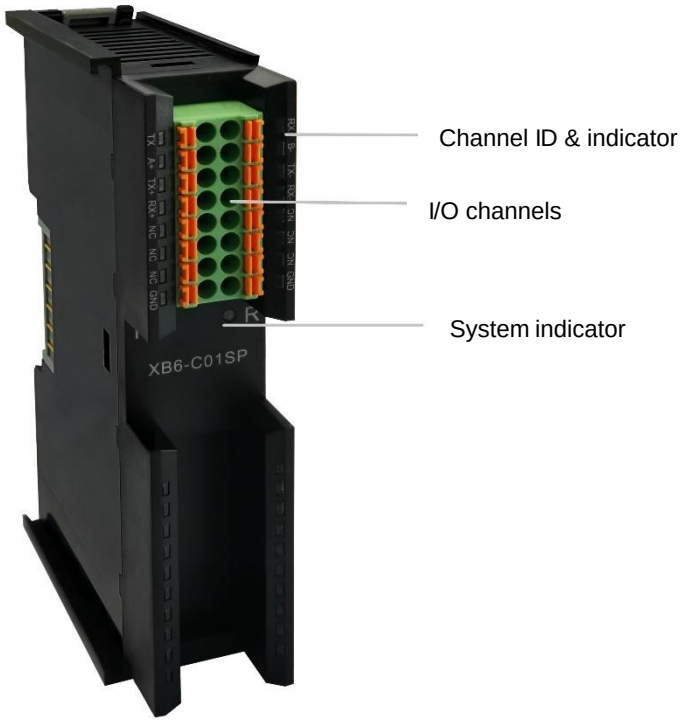
Value	Value Range	Description	
Communicate Mode	0	MRM	Modbus RTU Master
	1	MRS	Modbus RTU Slave[1]
	2	MAM	Modbus ASCII Master
	3	MAS	Modbus ASCII Slave
	4	FP	FreePort
	5	PT	PassThrough
Serial Baud	0	1200 bps	
	1	2400 bps	
	2	4800 bps	
	3	9600 bps	
	4	19200 bps	
	5	38400 bps	
	6	57600 bps	
	7	115200 bps	
Serial Stop	0	1 Bit	
	1	2 Bits	
Serial Parity	0	Non	
	1	Odd	
	2	Eve	
Serial WordFormat	0	8 Bits	
	1	7 Bits	
Modbus Slave ID	1~247	Valid in slave mode	
Modbus Slave Respond Delay	0~65535	Unit ms	

Note[1]: Modbus RTU Slave is not supported

3 Panel

3.1 Product Structure

Name and function description of each part of the product



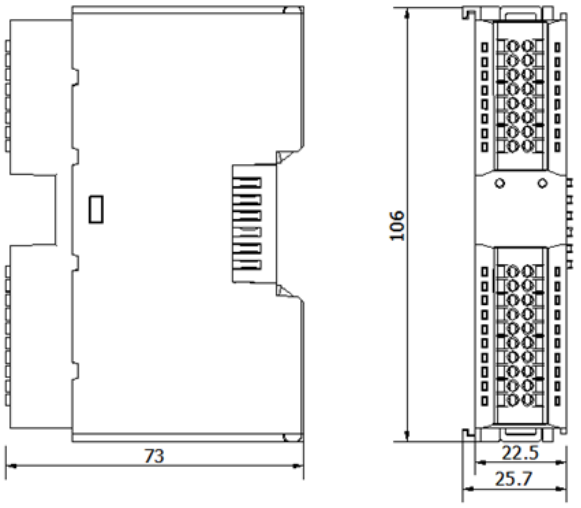
3.2 Indicator function

Name	ID	Color	Status	Status description
Power indicator	P	Green	ON	Normal status of power supply
			OFF	Unpowered or abnormal power supply
Communication indicator	R	Green	ON	Normal status of system operation
			Flashing 1Hz	The I/O module is connected, X-bus system is ready to interact
			OFF	Device not powered on, X-bus not interacting with data or abnormal
Input indicator	RX	Green	Flashing	Channel with data reception
			OFF	Channel without data reception
Output indicator	TX	Green	Flashing	Channel with data reception
			OFF	Channel without data reception

4 Installation and Disassembly

4.1 Dimension

Dimensions (Unit: mm)

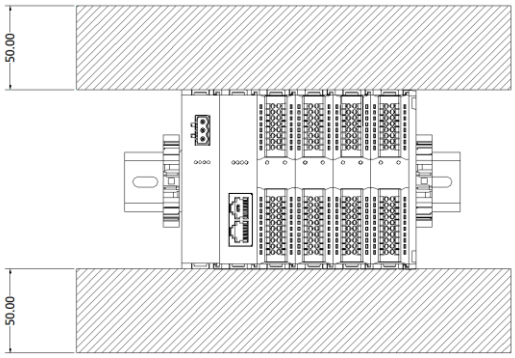


4.2 Installation instructions

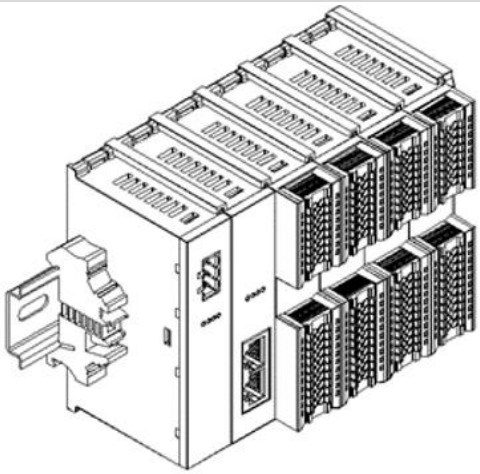
Installation and disassembly precautions

- Ensure that the cabinet is well ventilated (e.g., equipped with a fan).
- Do not install this equipment near or above any equipment that may cause overheating.
- Make sure to install modules vertically and maintain adequate clearance between the modules and nearby devices.
- Installation/disassembly operation may only be carried out after the power supply is cut off.

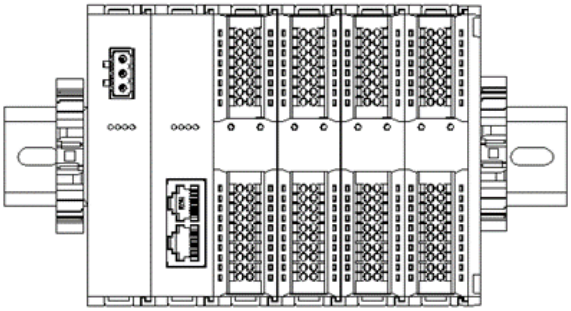
Minimum clearance for module installation (≥50 mm)



Make sure the modules are installed vertically



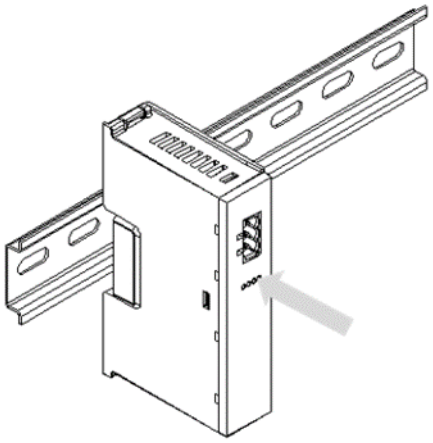
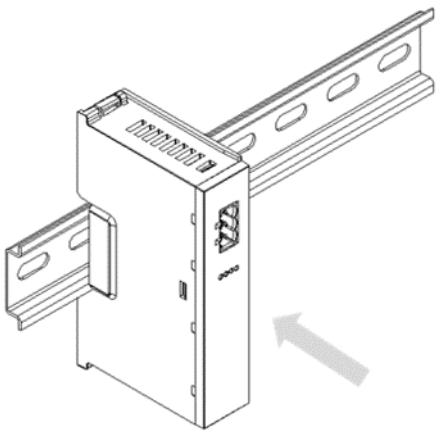
Make sure to install guide rail fasteners



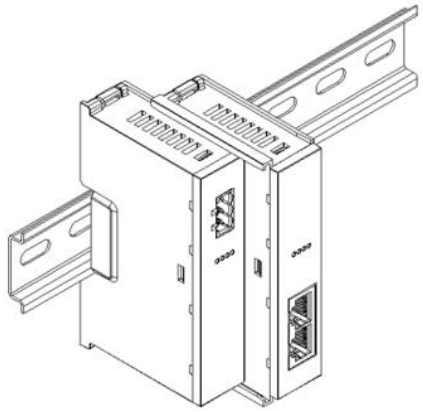
4.3 Installation and disassembly steps

Module installation and disassembly	
Module installation steps	Install the power module on the fixed guide rail first.
	Install the coupler and the required I/O modules on the right side of the power module.
	After installing all required I/O modules, install the end cover to complete module assembly.
	Install guide rail fasteners at both ends of the power module and end cover to fix the module.
Module disassembly steps	Loosen the rail fasteners at both ends of the module.
	Pry loose the module snap fitting with a slotted screwdriver.
	Pull out the removed module.

4.4 Installation schematic diagram

Power module installation	**Steps**
 ①	Align the power module guide rail slot vertically with the guide rail, as shown in the figure①
 ②	Press the power module with force until a "click" sound is heard. The module is now installed in place, as shown in the figure②.

Coupler module installation

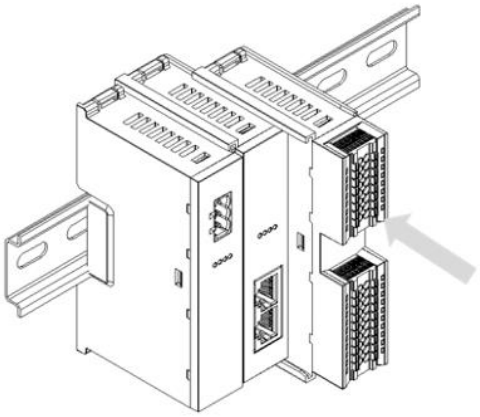


③

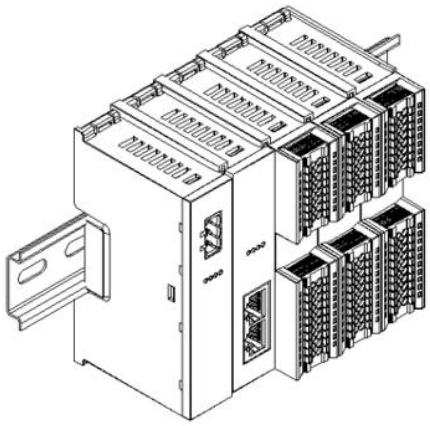
Steps

Align the left slot of the coupler module with the right side of the power module, and push it in as shown in the figure ③. Press the module with force into the guide rail until a "click" sound is heard. The module is now installed in placed.

I/O module installation



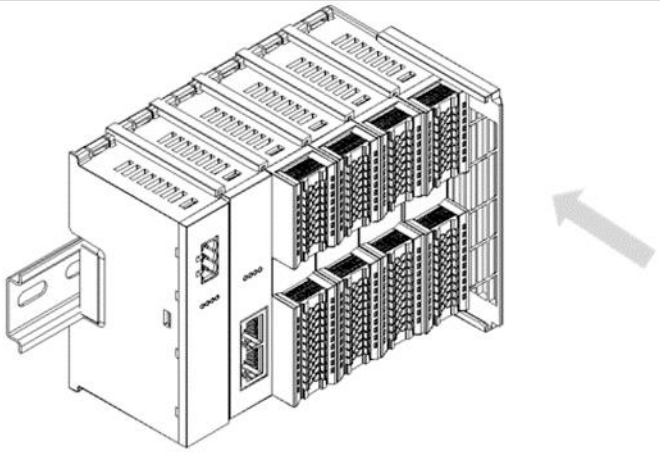
④

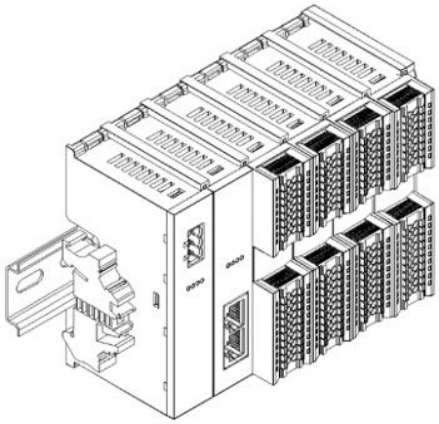
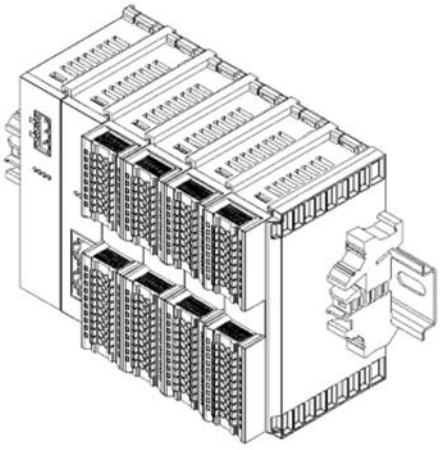


⑤

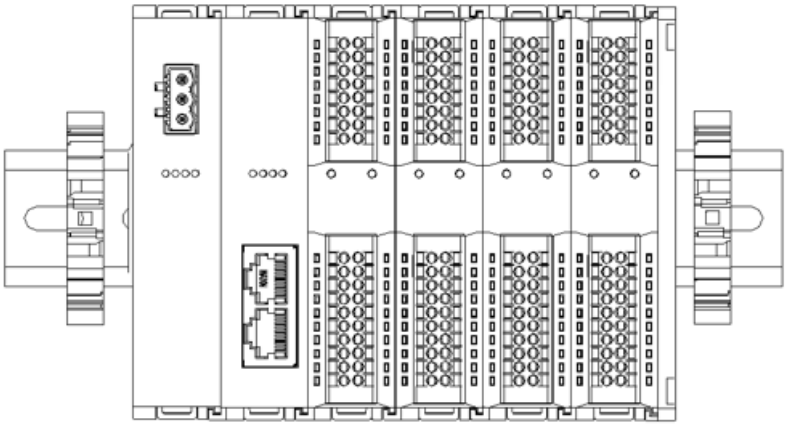
Steps

Install the required IO modules one by one using the same the steps as coupler module installation, as shown in the figure④⑤

Cover plate installation	Steps
 ⑥	Install the end cover on the right side of the last module, as shown in the figure⑥, using the same installation method as the coupler module.

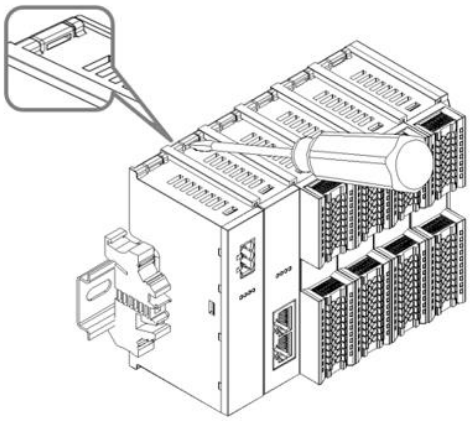
Installation of guide rail fasteners	Steps
 ⑦	Install a guide rail fastener next to the left side of the coupler, and lock it tightly, as shown in the figure⑦
 ⑧	Install a guide rail fastener on the right side of the end cover. In this process, first push the guide rail fastener towards the coupler to ensure that the module is installed firmly, and then lock the fastener with a screwdriver, as shown in the figure⑧

Disassembly	Steps

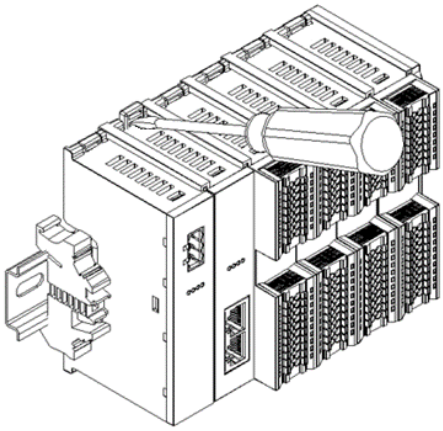


⑨

Using a screwdriver, loosen the guide rail fastener at one end of the module, and move it to one side to create a gap between the module and the fastener, as shown in the figure⑨



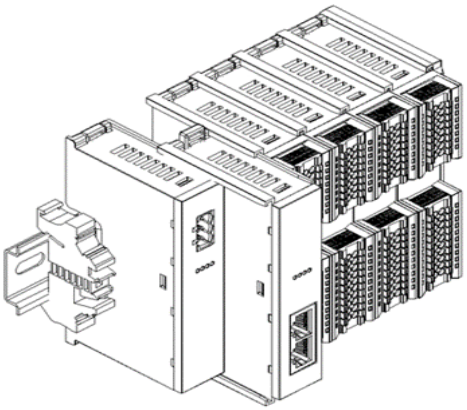
⑩



⑪

Insert the slotted screwdriver into the snap fitting of the module to be removed, and exert force along lateral direction of the module (until a click sound is heard), as shown in the figure⑩⑪

Note: Each module has two snap fittings, one on the top and the other at the bottom. Both should be operated in this way.

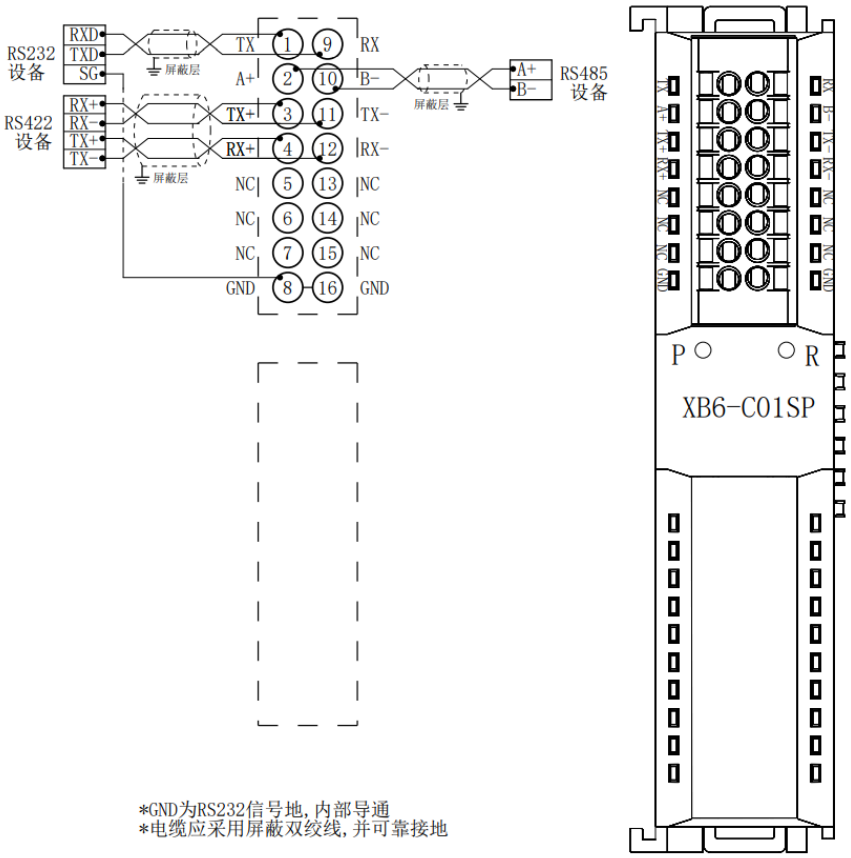


⑫

Remove the module in the reverse order of installation, as shown in the figure⑫

5 Wiring

5.1 Wiring Diagram



- For personal and equipment safety, it is recommended that the power supply be disconnected during wiring operations

5.2 Wiring Terminal Definition

Terminal number	Terminal ID	Description	Terminal number	Terminal ID	Description
1	TX	RS232 Sender	9	RX	RS232 Receiver
2	A+	RS485 Send+	10	B-	RS485Send-
3	TX+	RS422Send+	11	TX-	RS422Send-
4	RX+	RS422Receive+	12	RX-	RS422Receive-
5	NC	Empty terminals	13	NC	Empty terminals
6	NC	Empty terminals	14	NC	Empty terminals
7	NC	Empty terminals	15	NC	Empty terminals
8	GND	Signal Ground	16	GND	Signal Ground

6 Operation

6.1 Description of process data

6.1.1 ModbusRTU/ASCII Master Write Commands

Request (downstream data)			
Register address	**Function description**	**Comment**	**Example**
Register 0	Control word	00H command release 01Hcommand enable	0x01
Register 1	Station number	Interactive slave station number 1~247	0x02
Register 2	Function code	01H，02H，03H，04H	0x03
Register 3	Register address HI	0000H~FFFFH	0x00
Register 4	Register address LO		0xC8
Register 5	Register quantity HI	Discrete：1~288 Register：1~36	0x00
Register 6	Register quantity LO		0x03
Register 7~39	Reserve	NULL	-
Response (upstream data)			
Register Address	**Function Description**	**Comment**	**Example**
Register 0	Control word	See fault code	0x01
Register 1	Station number	Interactive slave station number 1~247	0x02
Register 2	Function code	01H，02H，03H，04H	0x03
Register 3	Number of bytes in the data field	Subject to actual response	0x06
Register 4	Data1HI	0x00~0xFF	0xFF
Register 5	Data1LO	0x00~0xFF	0xFF
Register 6	Data2HI	0x00~0xFF	0xAA
Register 7	Data2LO	0x00~0xFF	0xAA

Register 8	Data3HI	0x00~0xFF	0x55
Register 9	Data3LO	0x00~0xFF	0x55
Register 10	Data4HI	NULL	-
Register 11	Data4LO	NULL	-
Register 12	Data5HI	NULL	-
Register 13	Data5LO	NULL	-
Register 14	Data6HI	NULL	-
Register 15	Data6LO	NULL	-
Register 16	Data7HI	NULL	-
Register 17	Data7LO	NULL	-
Register 18	Data8HI	NULL	-
Register 19	Data8LO	NULL	-
Register 20	Data9HI	NULL	-
Register 21	Data9LO	NULL	-
Register 22	Data10HI	NULL	-
Register 23	Data10LO	NULL	-
Register 24	Data11HI	NULL	-
Register 25	Data11LO	NULL	-
Register 26	Data12HI	NULL	-
Register 27	Data12LO	NULL	-
Register 28	Data13HI	NULL	-
Register 29	Data13LO	NULL	-
Register 30	Data14HI	NULL	-
Register 31	Data14LO	NULL	-
Register 32	Data15HI	NULL	-
Register 33	Data15LO	NULL	-
Register 34	Data16HI	NULL	-
Register 35	Data16LO	NULL	-
Register 36	Data17HI	NULL	-
Register 37	Data17LO	NULL	-
Register 38	Data18HI	NULL	-
Register 39	Data18LO	NULL	-

6.1.2 ModbusRTU/ASCII Master Write Commands

Request (downstream data)			
Register Address	**Function Description**	**Comment**	**Example**
Register 0	Control word	00H command release 01Hcommand enable	0x01
Register 1	Station number	Interactive slave station number 1~247	0x02
Register 2	Function code	0FH，10H	0x10
Register 3	Register address HI	0000H~FFFFH	0x00
Register 4	Register address LO		0xC8
Register 5	Register quantity HI	Discrete：1~280 Register ：1~34	0x00
Register 6	Register quantity LO		0x03
Register 7	Number of bytes	Discrete：1~35，Register ： 1~34	0x06
Register 8	Data1HI	0x00~0xFF	0xFF
Register 9	Data1LO	0x00~0xFF	0xFF
Register 10	Data2HI	0x00~0xFF	0xAA
Register 11	Data2LO	0x00~0xFF	0xAA
Register 12	Data3HI	0x00~0xFF	0x55
Register 13	Data3LO	0x00~0xFF	0x55
Register 14~39	Reserve	NULL	-
Response (upstream data)			
Register Address	**Function Description**	**Comment**	**Example**
Register 0	Control word	See fault code	0x00
Register 1	Station number	Interactive slave station number 1~247	0x02
Register 2	Function code	0FH，10H	0x10
Register 3	Register address HI	0000H~FFFFH	0x00
Register 4	Register address LO		0xC8
Register 5	Register quantity HI	Discrete：1~280 Register ：1~34	0x00
Register 6	Register quantity LO		0x03
Register 7~39	Reserve	NULL	-

6.1.3 Modbus fault code

Fault code	**Notes**
0x00	No error
0x01	Illegal function code
0x02	Illegal data address
0x03	Illegal data
0x04	Slave device failure
0x10	Wrong station number
0x11	Wrong function code response
0x12	Error request length
0x13	Wrong response length
0x14	CRC checksum error
0x15	Wrong data frame
0xFF	Unknown error

6.1.4 Pass-through function uplink data (Hex)

Byte number	Definition	Range of values
01	Status Word	0：Packet not yet sent
		1：Packet is ready
		2：Packet count error
		3：Data length abnormal
		F：Data transmission completed
02	Transmission method	0：Invalid setting
		1：Input-only mode
		2：Output-only mode
		3：Request mode
		4：Response mode
03	Downstream data length	0~FF
04	Upstream data length	0~FF
05	Downlink packet count	0~8 packet counting，F packet completion
06	Uplink Packet Count	0~8 packet counting
07	Data 01	0~FF
08	Data 02	0~FF
…	…	…
28	Data 19	0~FF

6.1.5 Pass-through function downlink data (Hex)

Byte number	Definition	Range of values
01	Status Word	0：Disable
		1：Enable
02	Transmission method	0：Invalid setting
		1：Input-only mode
		2：Output-only mode
		3：Request mode
		4：Response mode
03	Downstream data length	0~FF
04	Upstream data length	0~FF
05	Downlink packet count	0~8 packet counting，F packet completion
06	Uplink Packet Count	0~8 packet counting
07	Data 01	0~FF
08	Data 02	0~FF
…	…	…
28	Data 19	0~FF

6.1.6 Description of the transmission mode of the pass-through function (Hex)

Input-only mode							
Command Function	**Byte number/definition**						
	01	**02**	**03**	**04**	**05**	**06**	**07~28**
	Downlink: control word Uplink: Status word	**Transmission method**	**Downlink data length**	**Uplink data length**	**Downlink data packet count**	**Uplink data packet count**	**Data**
Downlink data writing	00	01	Invalid	28 Bytes	Invalid	Invalid	…
Downlink Performance	01	01	Invalid	28 Bytes	Invalid	Invalid	…
Waiting for data reception, when the peripheral device is enabled to send data							
Packet 1 data received upstream	00	01	Invalid	28 Bytes	Invalid	01	Data01~ Data19
Downstream 2nd packet data receive command	01	01	Invalid	28 Bytes	Invalid	02	…
Packet 2 data received upstream	00	01	Invalid	28 Bytes	Invalid	02	Data1A~ Data28
Downlink deactivation	00	00	00	00	00	00	…
Output-only mode							
Command Function	**Byte number/definition**						
	01	**02**	**03**	**04**	**05**	**06**	**07~28**
	Downlink: control word Uplink: Status word	**Transmission method**	**Downlink data length**	**Uplink data length**	**Downlink data packet count**	**Uplink data packet count**	**Data**
Downlink data writing to packet 1	00	02	28 Bytes	Invalid	01	Invalid	Data01~ Data19

Downlink write packet 2 with enable	01	02	28 Bytes	Invalid	02	Invalid	Data1A~ Data28
Writing completed	01	02	28 Bytes	Invalid	0F	Invalid	…
Wait for data transmission to complete							
Upstream transmission complete	0F	02	Invalid	28 Bytes	Invalid	02	…
Downlink deactivation	00	00	00	00	00	00	…

Note: The data length is 28 Bytes for example, the following table is the same.

Request Mode							
Command Function	**Byte number/definition**						
	01	**02**	**03**	**04**	**05**	**06**	**07~28**
	Downlink: control word Uplink: Status word	**Transmission method**	**Downlink data length**	**Uplink data length**	**Downlink data packet count**	**Uplink data packet count**	**Data**
Downlink data writing to packet 1	00	03	28 Bytes	28 Bytes	01	Invalid	Data01~ Data19
Downlink write packet 2 with enable	01	03	28 Bytes	28 Bytes	02	Invalid	Data1A~ Data28
Writing completed	01	03	28 Bytes	Invalid	0F	Invalid	…
Waiting for data reception, when the peripheral device is enabled to send data							
Packet 1 data received upstream	00	03	Invalid	28 Bytes	Invalid	01	Data01~ Data19
Downstream 2nd packet data receive command	01	03	Invalid	28 Bytes	Invalid	02	…
Packet 2 data received upstream	00	03	Invalid	28 Bytes	Invalid	02	Data1A~ Data28
Downlink deactivation	00	00	00	00	00	00	…

Response mode							
Command Function	**Byte number/definition**						
	01	**02**	**03**	**04**	**05**	**06**	**07~28**
	Downlink: control word Uplink: Status word	**Transmission method**	**Downlink data length**	**Uplink data length**	**Downlink data packet count**	**Uplink data packet count**	**Data**
Downlink data writing to packet 1	00	04	28 Bytes	28 Bytes	01	Invalid	Data01~ Data19
Downlink write packet 2 with enable	01	04	28 Bytes	28 Bytes	02	Invalid	Data1A~ Data28
Waiting for data reception, when the peripheral device is enabled to send data							
Packet 1 data received upstream	00	04	28 Bytes	28 Bytes	02	01	Data01~ Data19
Downstream 2nd packet data receive command	01	04	28 Bytes	28 Bytes	02	02	Data1A~ Data28
Packet 2 data received upstream	00	04	28 Bytes	28 Bytes	02	02	Data1A~ Data28
The next exercise can respond	01	04	28 Bytes	28 Bytes	0F	02	Data1A~ Data28
Downlink deactivation	00	00	00	00	00	00	…

6.2 Module configuration description

6.2.1 Application in TIA Portal V17 software environment

1、Preparation

- **Hardware environment**
  - **Model number: XB6-C01SP**
  - **Power module，PROFINET coupler，cover plate**

    In this case XB6-P2000H power module and XB6-PN0002 coupler were taken as examples
  - **one computer with installed TIA Portal V17 software**
  - **PROFINET dedicated shielded cable**
  - **Devices or modules supporting MODBUS protocol**

    This description is based on the example of Anchorite energy meters
  - **One Siemens PLC**
  - **A switching power supply**
  - **Module installation guide rail and fasteners**
  - **Device configuration files**

    Website of configuration files：https://www.solidotech.com/documents/configfile
  - **Hardware configuration and wiring**

    Please follow the instructions for 4 Installation and Disassembly and 5 Wiring.

2、 Project Creation

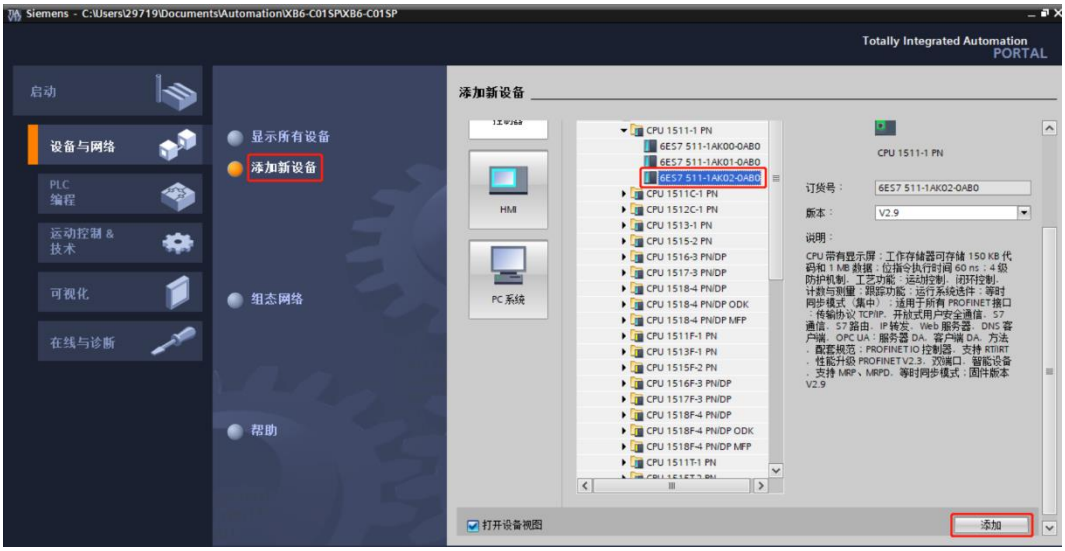
Open the TIA Portal V17 software and click on "Create new project".

- Project Name: Customizable, default can be kept.
- Path: Keep the project path, default can be kept.
- Version: Default can be kept.
- Author: Default can be kept.
- Comment: Customizable, optional to fill in.

3、 Adding a PLC

a. Click “Configure a device”。

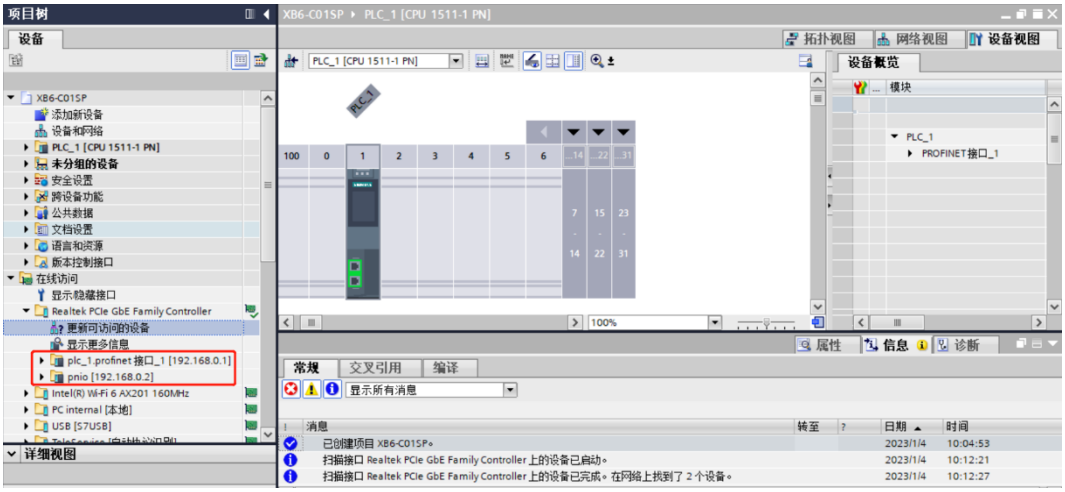
b. Click “Add new device”， select the PLC model you are currently using, and click "Add", as showed below. After the addition is completed, you can view that the PLC has been added to the device navigation tree.



4、Scan devices

a. Click on the "Online Access -> Update Accessible Devices" in the left navigation tree, as shown in the following figure.

b. After the update is completed, the connected slave devices will be displayed as shown in the following figure.



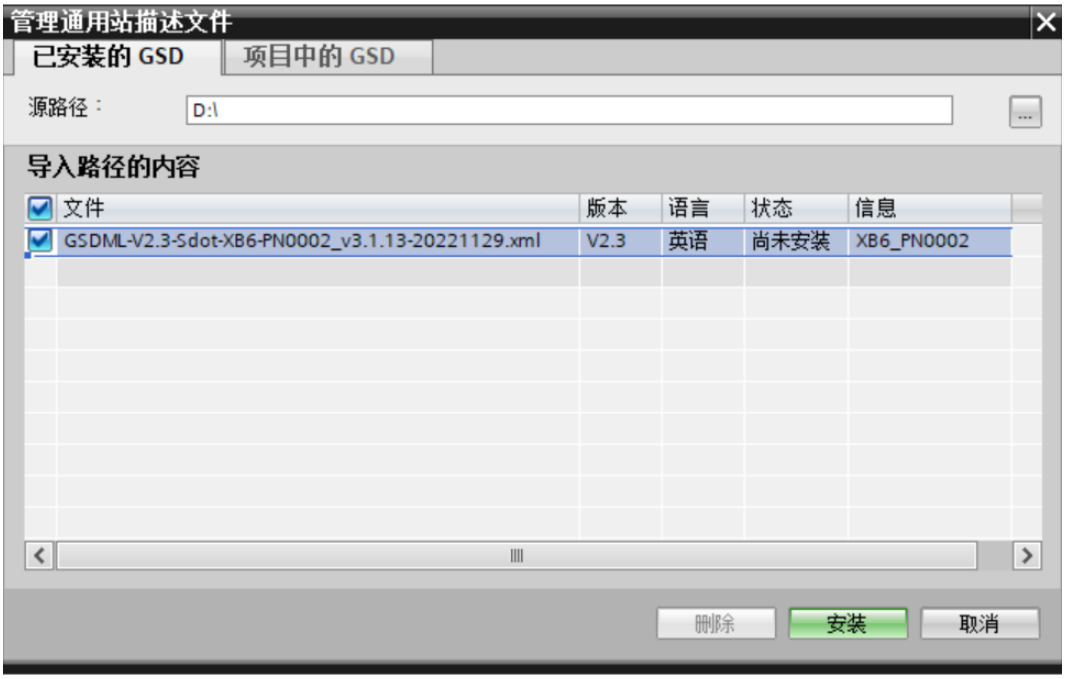
The IP address of the computer must be in the same network segment as the PLC. If they are not in the same network segment, modify the computer's IP address and repeat the above steps.

5、 Add GSD configuration file

a. In the menu bar, click "Options" and select "Manage general station description files (GSD)"

b. Click "Source path" to select the file.

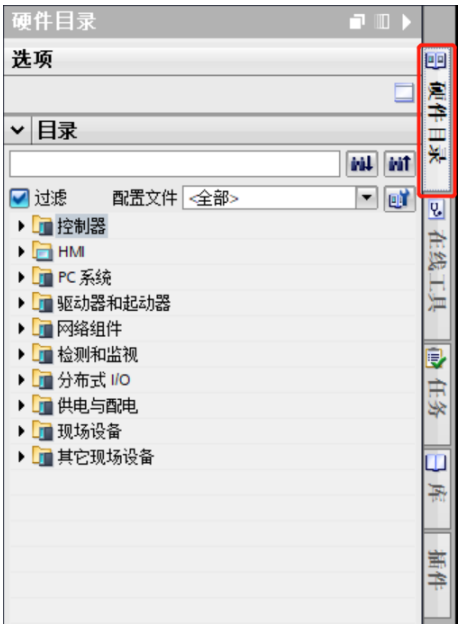
c. Check whether the status of the GSD file to be added is "Not Installed". If it is not installed, click on the "Install" button. If it has already been installed, click on "Cancel" to skip the installation steps.



6、 Adding slave devices, modifying device names and IP addresses.

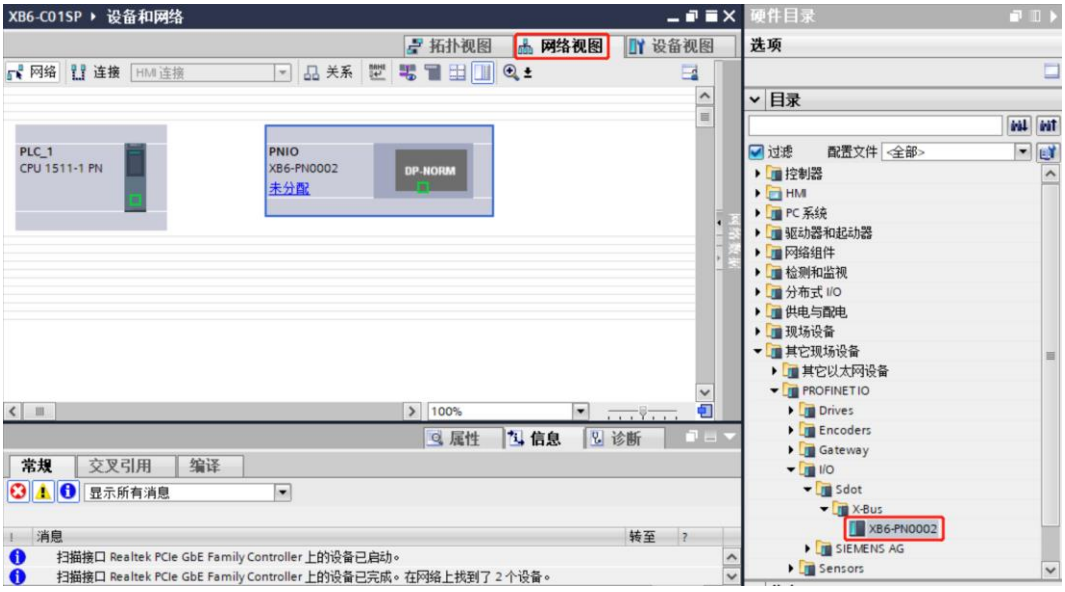
a. Double-click on the "Devices and Networks" in the left navigation tree.

b. Click on the vertical button "Hardware Catalog" on the right side, and the catalog will be displayed as shown in the figure below.



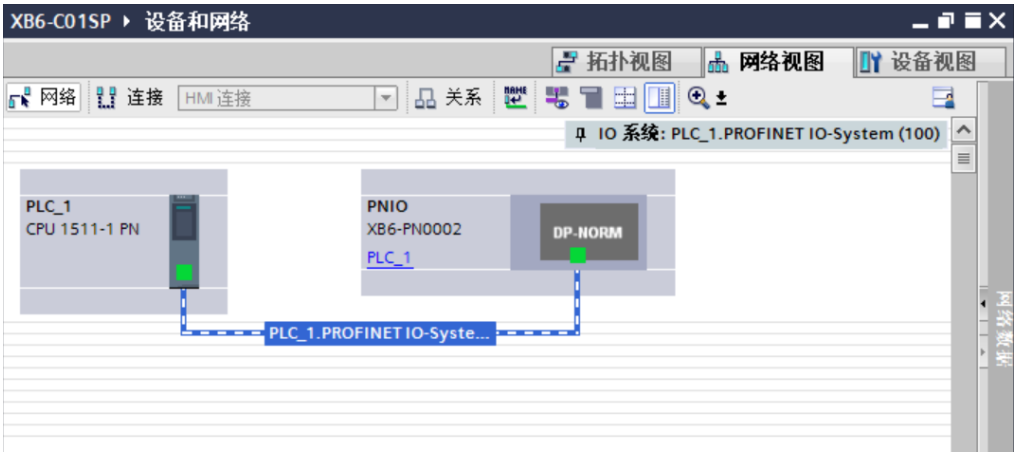
c. Select "Other field devices -> PROFINET IO -> I/O -> Sdot -> X-Bus -> XB6-PN0002".

d. Drag or double-click on "XB6-PN0002" to the "Network View", as shown in the figure below.

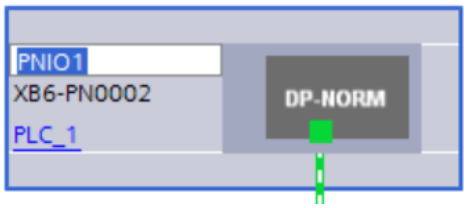


e. . Click on "Unassigned (blue font)" on the slave device and select "PLC_1.PROFINET Interface_1", as shown in the figure below.

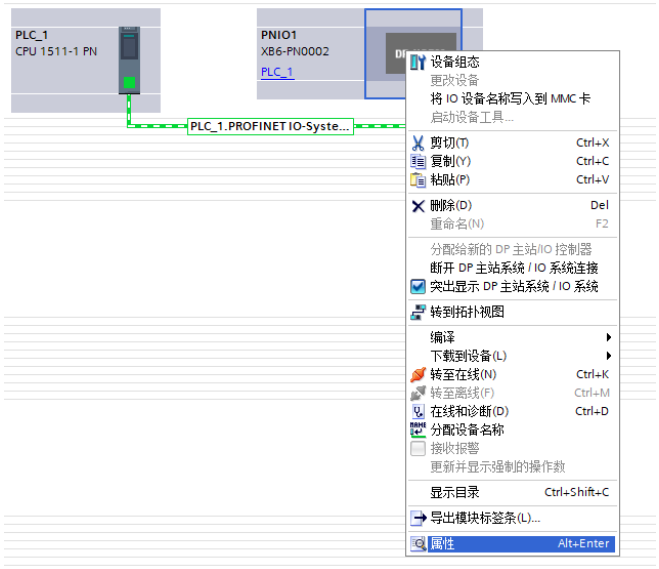
f. After completing the connection, it will appear as shown in the figure below.

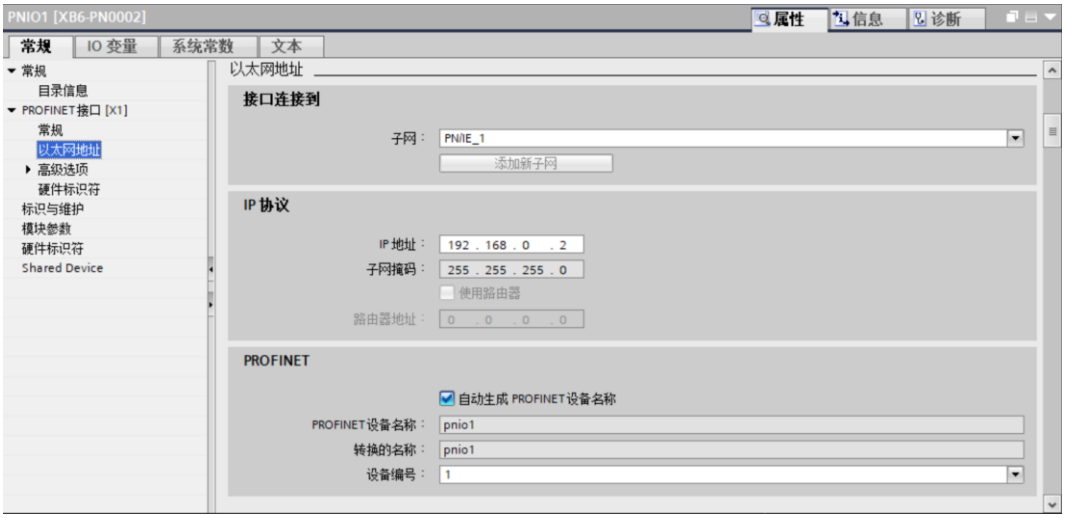


g. Click on the device name to rename it, as shown in the figure below.

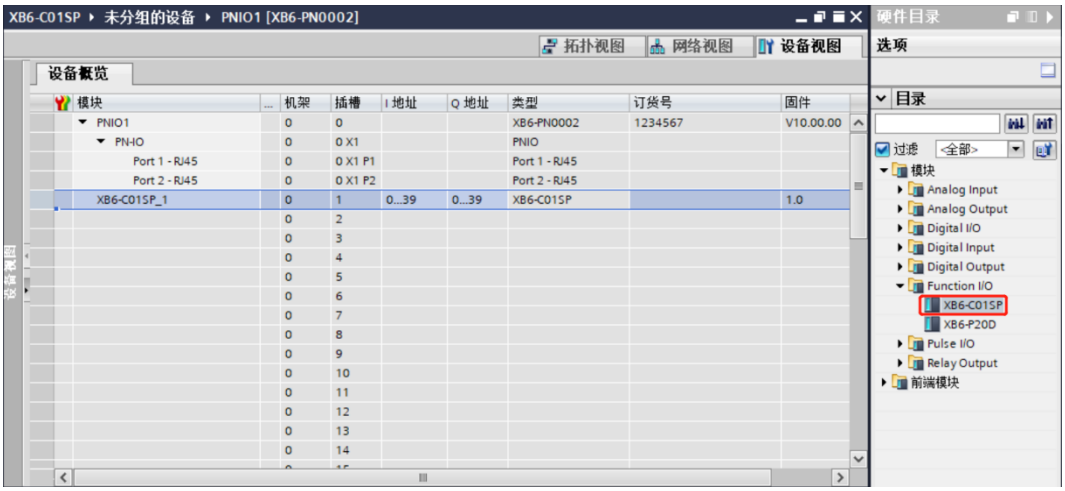


h. Right-click on the coupling view icon and click "Properties" to see the property menu. Modify the IP address in "Properties" as shown below.



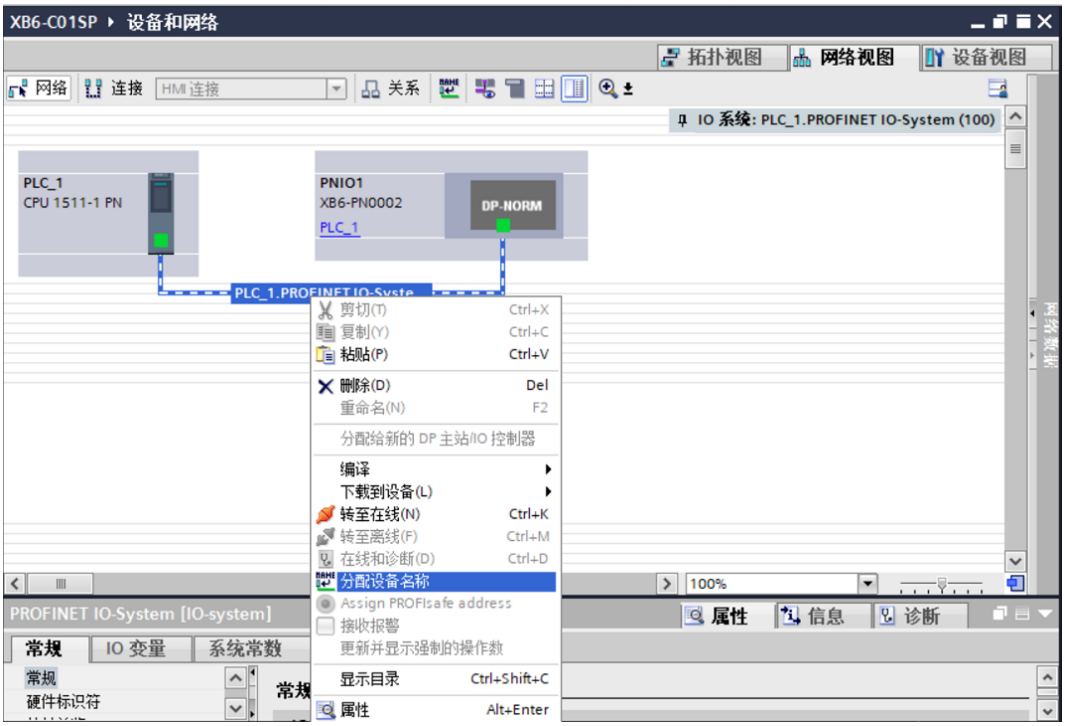


i. Click on "Device View" to enter an overview of the coupling device. Under the "Module" directory on the right, add I/O modules according to actual topology (the order must be consistent with actual topology, otherwise communication will not succeed) as shown below.

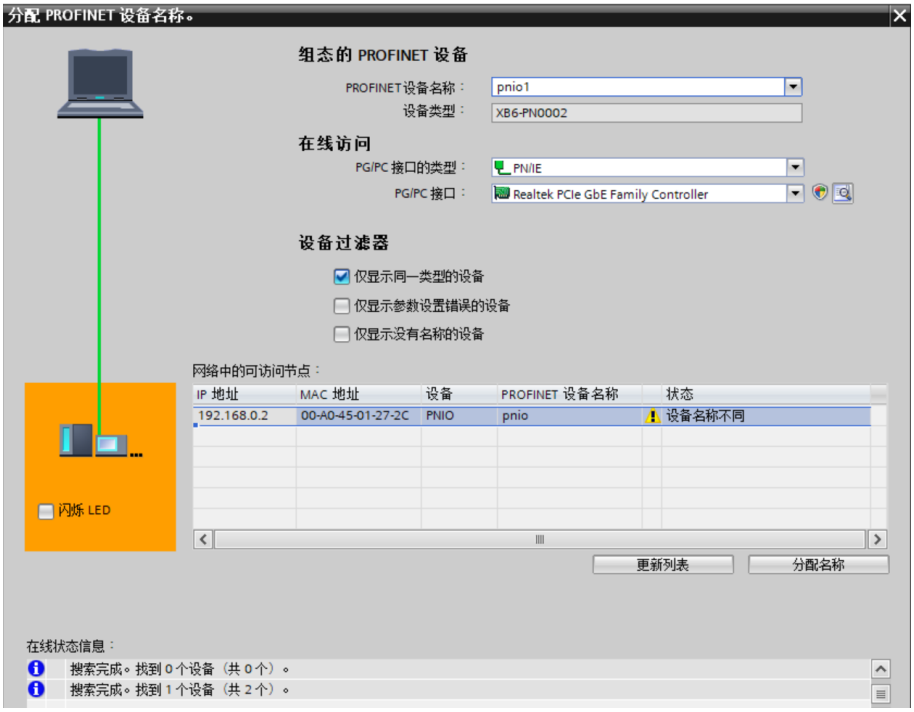


Up to 32 modules can be added, and I/O addresses are assigned by the system but can also be changed manually.

j. Switch to "Network View", right-click on the connection line between PLC and PNIO1, select "Assign Device Name".



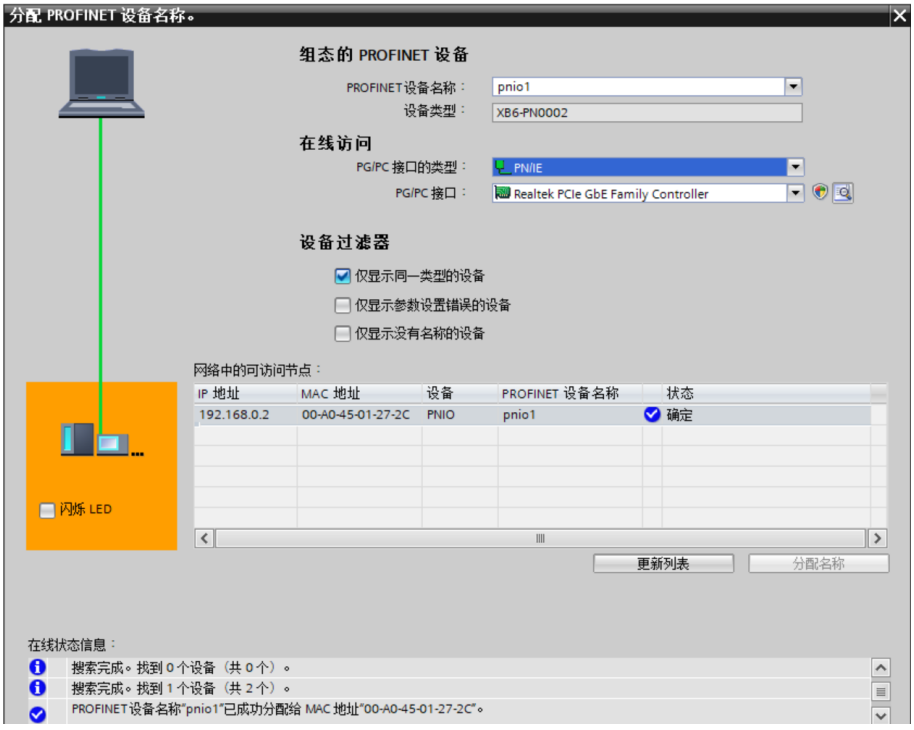
k. The window for assigning PROFINET device names pops up as shown below.



Check whether MAC address printed on coupling is same as that of assigned device name.

- PROFINET Device Name: The name set in “Assign IP Address and Device Name” for slave station.
- Type of PG/PC interface: PN/IE.
- PG/PC Interface: Actual network adapter used.。

l. Select each slave station device one by one, click “Update List”, then click “Assign Names”. Check if status of nodes in “Accessible Nodes in Network” is “Confirmed” as shown below.



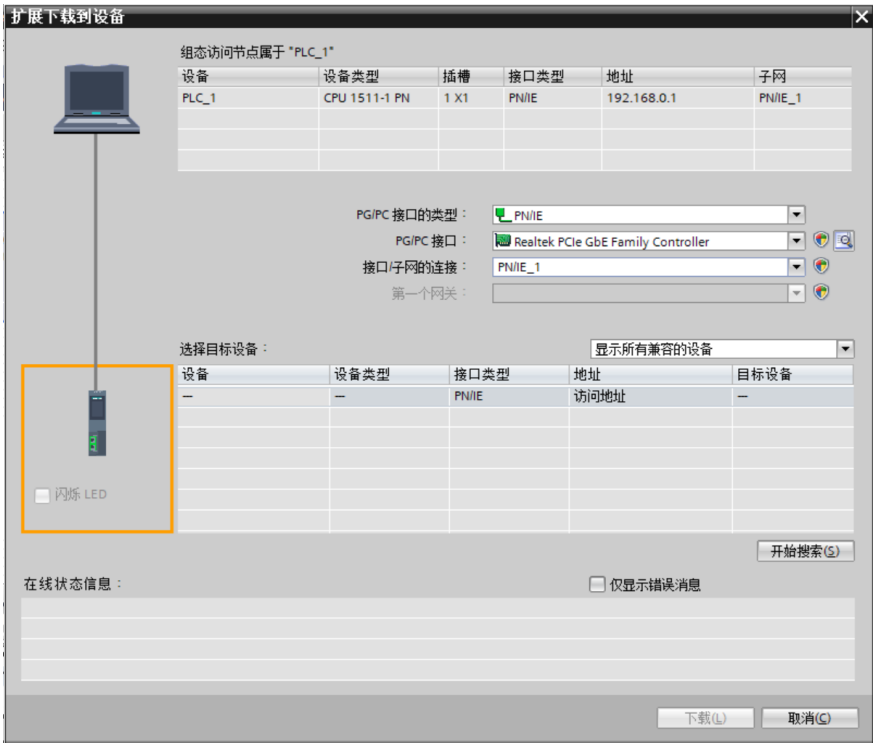
m. Click “Close”.

7、Download Configuration Structure

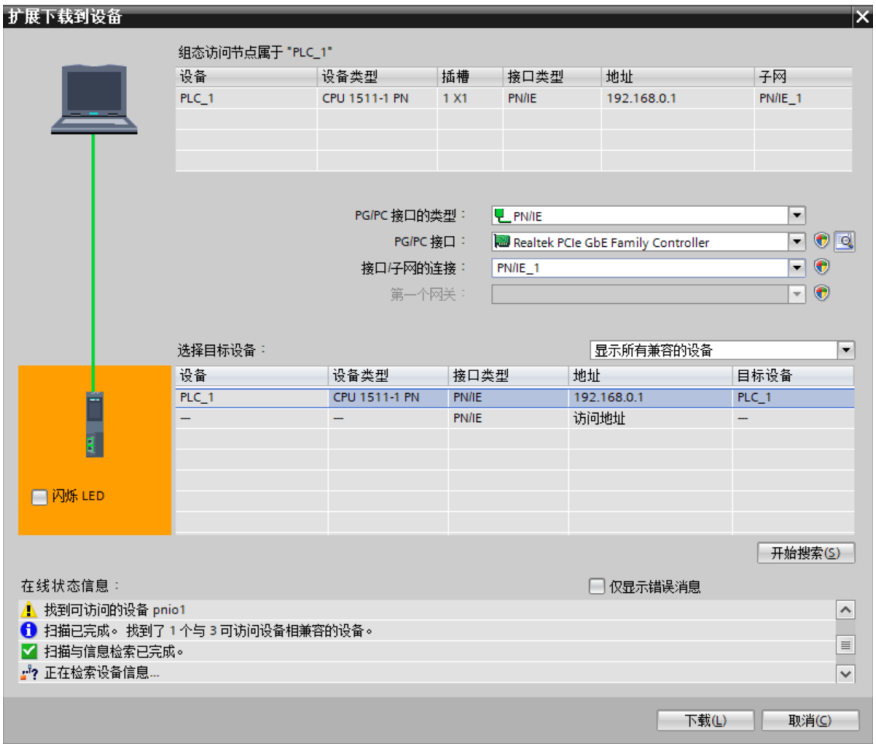
a. In the "Network View", select the PLC.

b. Click on the button in the menu bar to download the current configuration to the PLC.。

c. Configure as shown in the figure below in the pop-up "Extended Download to Device" interface.



d. Click on "Start Search" button, as shown below.



e. Click on "Download".

f. Select "Continue without synchronizing", as shown below.

g. Choose "All Stop".

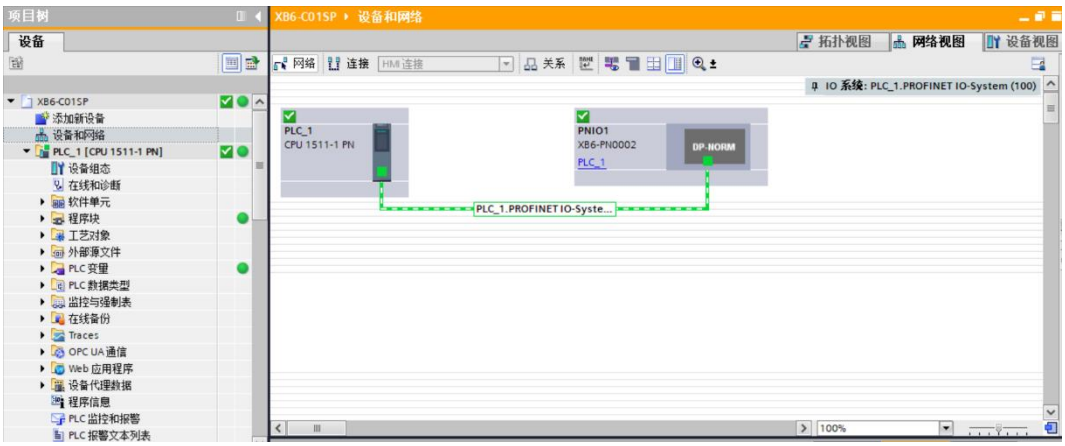
h. Click on "Load".

i. Click on "Finish"

j. Re-power up the device.

8、Communication Connection

a. Click the button, then click "Go Online" button to connect successfully as shown in the figure below.。



9、Check Device Indicator Lights

XB6-P2000H: P light is green ON.

XB6-PN0002: P light is green ON, L light is ON, B light is not lit, R light is ON.

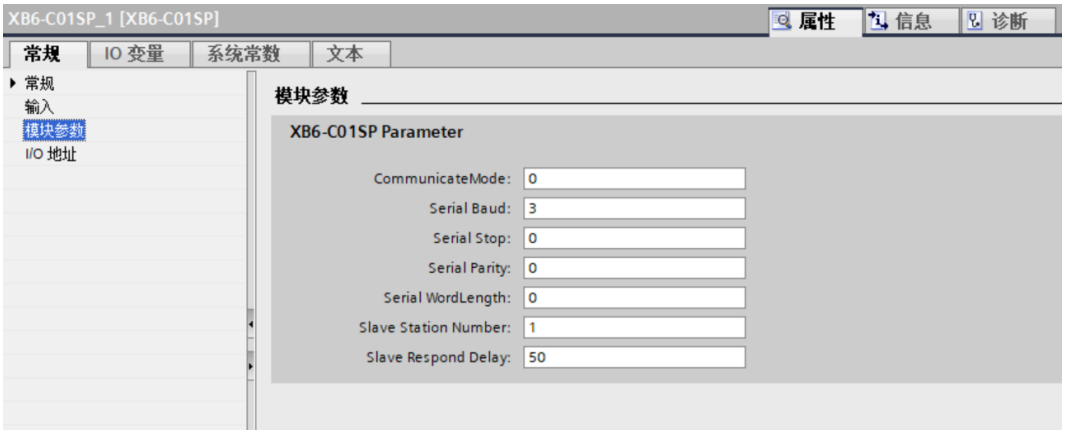
Module XB6-C01SP: P light and R light are both ON.。

10、 Parameter Setting

a. Open "Device View".

b. Select XB6-C01SP module, right-click on "Properties", and click on "Module Parameters" as shown in the figure below.

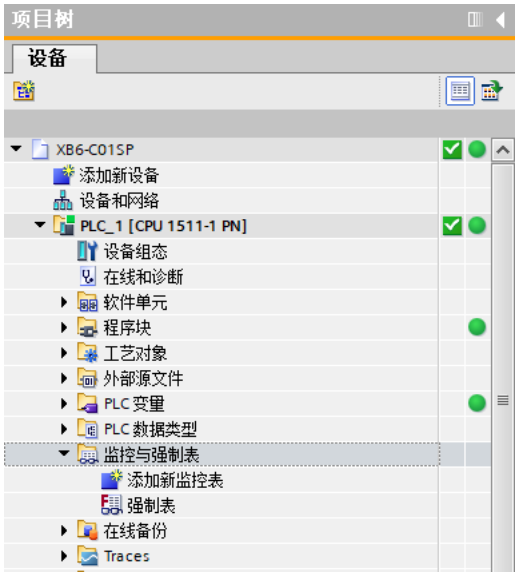
c. The parameters can be configured according to actual needs of use. After configuration completion, download the program again into PLC and both PLC and module need to be powered up again.上电。



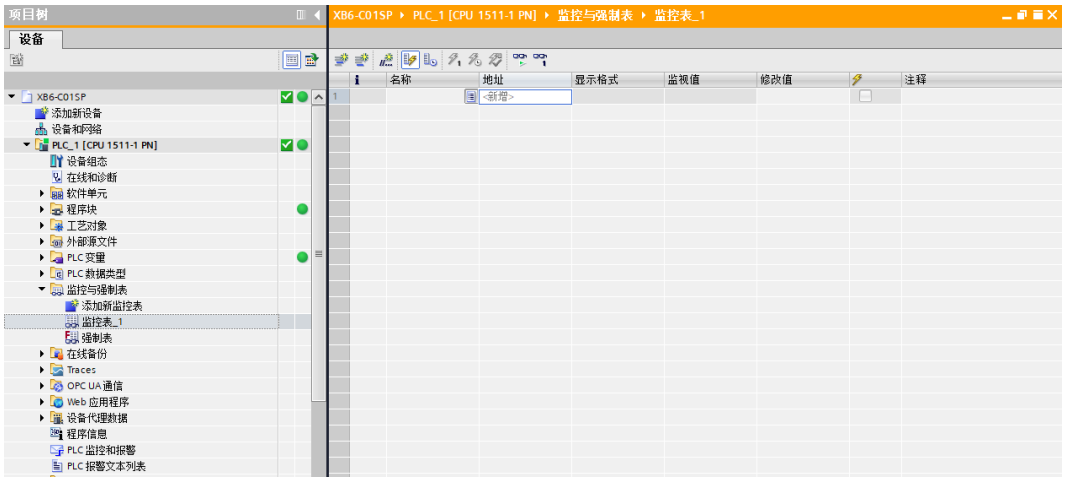
11、 Function Verification

Example 1: Verify Module Communication Function through Monitoring Table

a. Expand the project navigation on the left side and select "Monitoring & Forcing Tables" as shown in the figure below.



b. Double-click "Add New Monitoring Table". The system adds a new monitoring table as shown in the figure below



c. Click  button

d. Open “Device View” to check channel Q address (output signal channel address) or I address (input signal channel address) of module XB6-C01SP in device overview.

For example, if you see that “Q Address” for module XB6-C01SP ranges from 0-39 while “I Address” ranges from 0-39 as well，as shown in Figure below.

e. Fill input/output channel addresses based on communication equipment requirements into cells of monitoring table's addresses such as writing QB0....QB6、IB0....IB10 for Ankerui energy meter’s monitoring table，then press Enter key

f. Enter values into cell of “Modify Value”, click Write button to write the modified value of “QB0” from 0 to 1. You can see data in IB address monitoring value and channel indicator light flashes once.

XB6-C01SP ▸ PLC_1 [CPU 1511-1 PN] ▸ 监控与强制表 ▸ 监控表_1

	名称	地址	显示格式	监视值	修改值	注释
1		%QB0	十六进制	16#01	16#01	控制字
2		%QB1	十六进制	16#01	16#01	站号
3		%QB2	十六进制	16#03	16#03	功能码
4		%QB3	十六进制	16#00	16#00	寄存器起始地址高位
5		%QB4	十六进制	16#00	16#00	寄存器起始地址低位
6		%QB5	十六进制	16#00	16#00	寄存器数量高位
7		%QB6	十六进制	16#03	16#03	寄存器数量低位
8		%IB0	十六进制	16#00		
9		%IB1	十六进制	16#01		
10		%IB2	十六进制	16#03		
11		%IB3	十六进制	16#06		
12		%IB4	十六进制	16#00		
13		%IB5	十六进制	16#01		
14		%IB6	十六进制	16#01		
15		%IB7	十六进制	16#02		
16		%IB8	十六进制	16#E2		
17		%IB9	十六进制	16#01		
18		%IB10	十六进制	16#00		

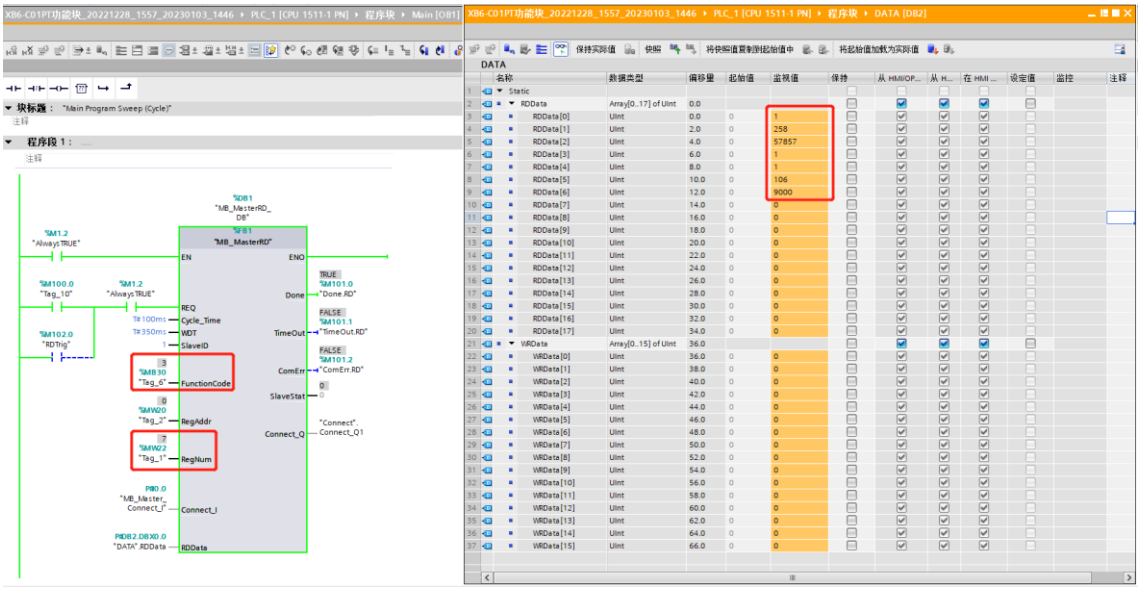
Note: QB0 control word is 1 means serial port enable, while it is 0 means serial port release.

Example 2: Introduce XB6-C01SP Module Data Transmission Function with Our Self-developed Function Block

The communication function under the function block of module will be briefly introduced here. For detailed introduction of function block, please refer to "XB6-C01SP Siemens Step7 self-built function block user manual".

a. Expand navigation tree on the left side, view program blocks in "Program Blocks -> Main[OB1]", and monitor data in "Program Blocks -> DATA[DB2]"

b. After opening Main[OB1] program, Program Segment 1 is for reading function block. Click Enable Monitoring button to enable program block functionality. After that, the path of functional blocks becomes a passage and some values of energy meter can be read from DATA [DB2] data monitoring table as shown below.



6.2.2 Application in Sysmac Studio software environment

1、Preparation

- **Hardware environment**
  - **Model number: XB6-C01SP**
  - **Power module，EtherCAT coupler，cover plate**

    In this case we take XB6-P2000H power module and XB6-EC0002 coupler as examples
  - **A computer installed with Sysmac Studio software**
  - **One Omron PLC**

    In this case NX1P2-9024DT was taken as a example
  - **Devices or modules supporting MODBUS protocol**

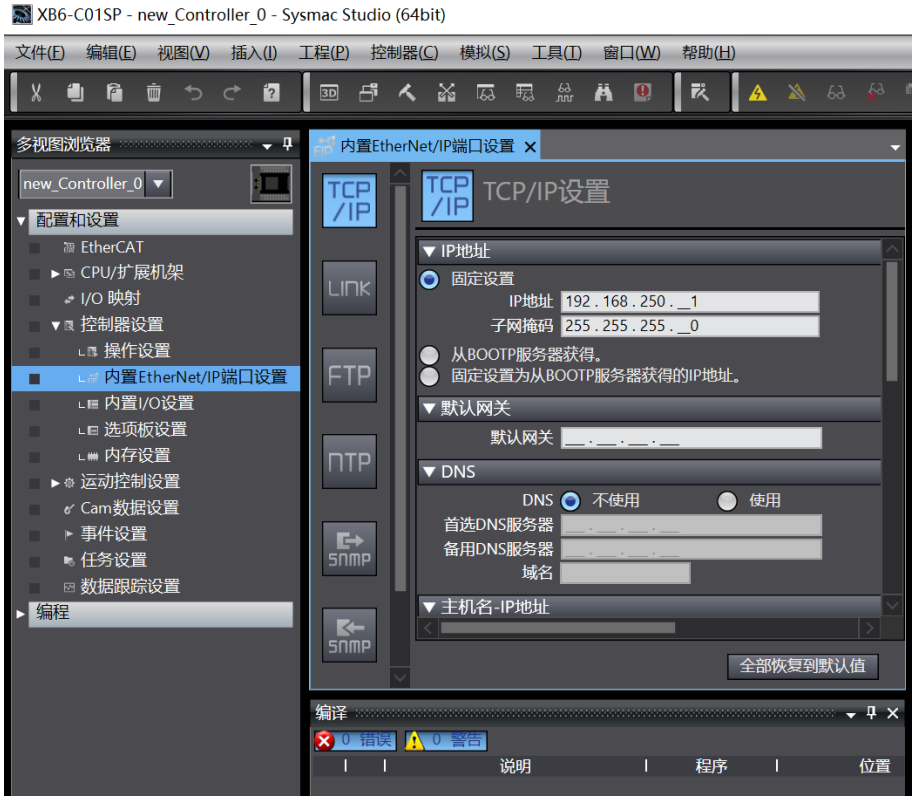
    This instruction takes Ankerui electric energy meter as an example.
  - **EtherCAT speical shielded cable**
  - **A switching power suppl**
  - **Device configuration files**

    Website of configuration files：https://www.solidotech.com/documents/configfile
- **Hardware configuration and wiring**

  Please follow the instructions for 4 Installation and Disassembly and 5 Wiring.

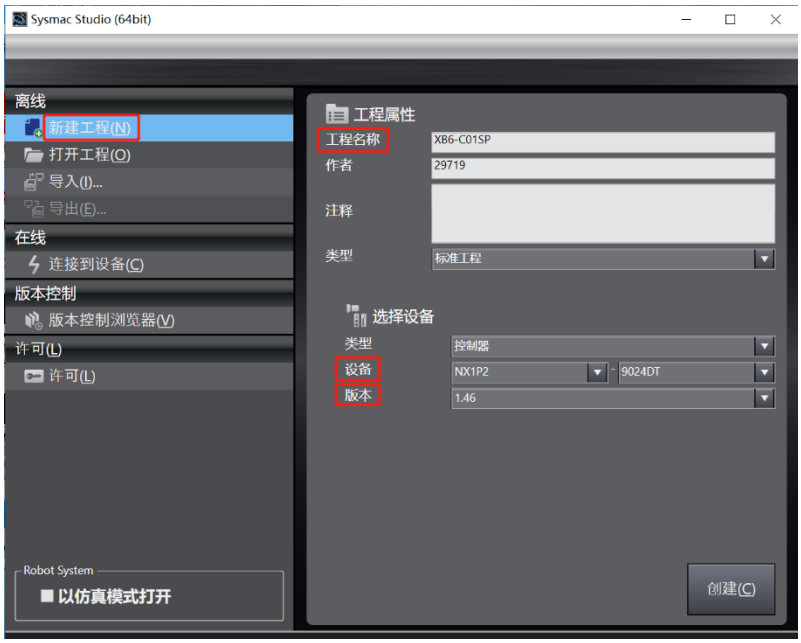
2、 Setting IP

a. Set the IP address of the computer and PLC to ensure that they are on the same network segment. If the PLC's IP is unknown, it can be viewed in "Configuration and Settings -> Controller Settings -> Built-in EtherNet/IP Port Settings" after creating a project, as shown below



3、 Creating a new project

a. Open Sysmac Studio software and click the "New Project" button, as shown below.

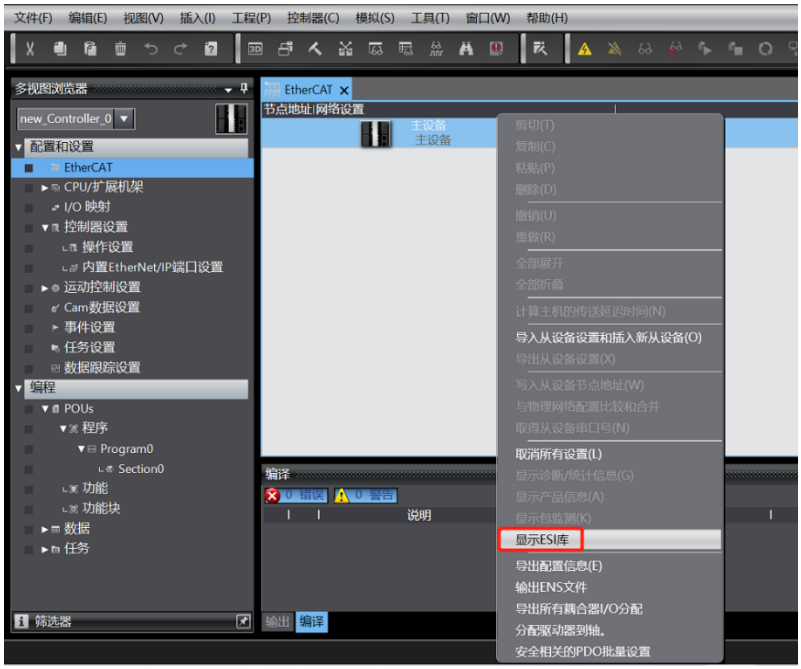


- Project name: Customized.
- Select device: Select the corresponding PLC model for "Device", and recommend selecting V1.40 or above for "Version".

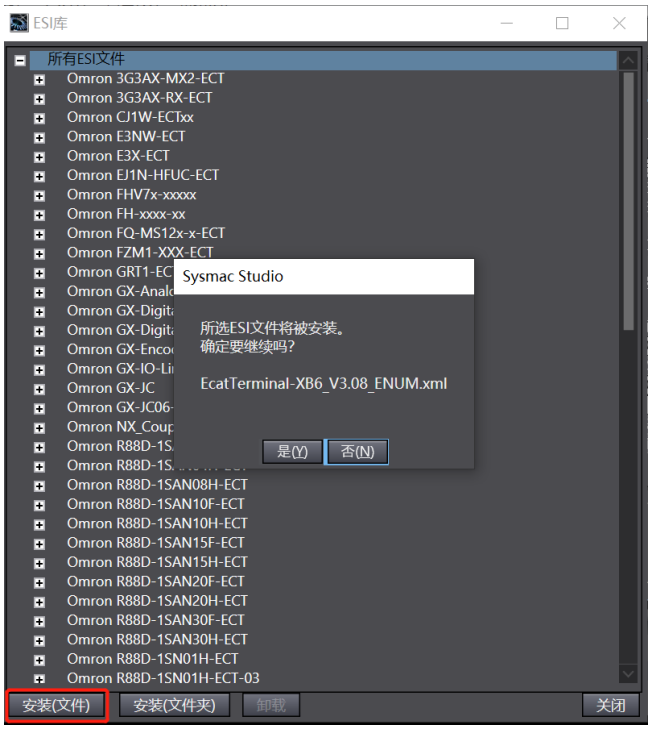
b. After completing the project properties input, click the "Create" button

4、 Installing XML files

a. Expand "Configuration and Settings" in the left navigation tree, double-click on "EtherCAT", right-click on "Master Device", select "Show ESI Library", as shown below.

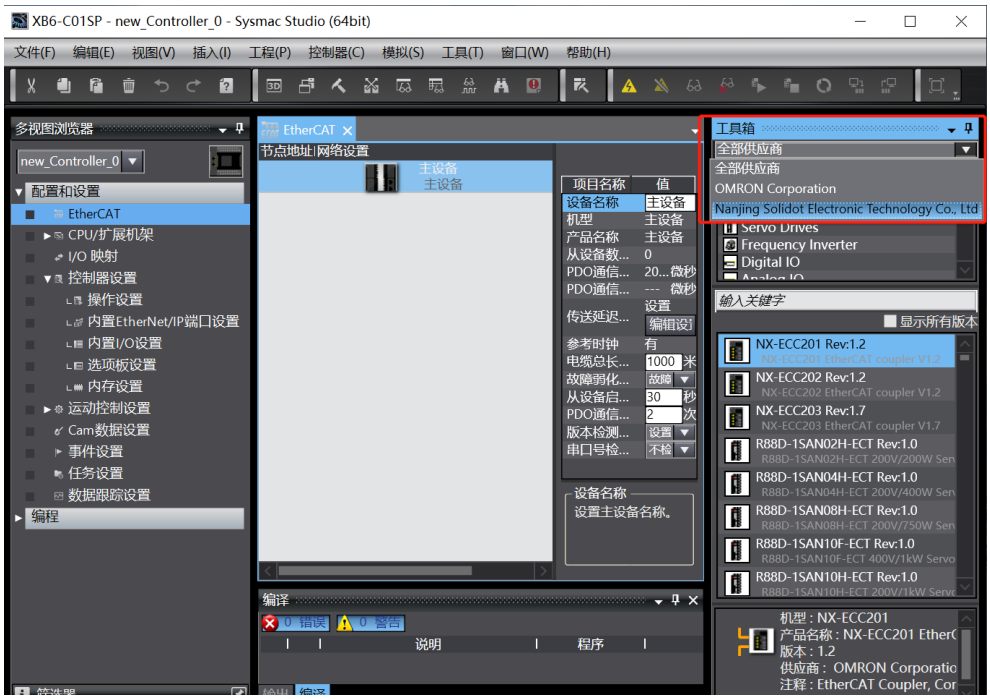


b. Click on “Install (File)” button in “ESI Library” window that pops up，select XML file path，click “Yes” to complete installation，as shown below.

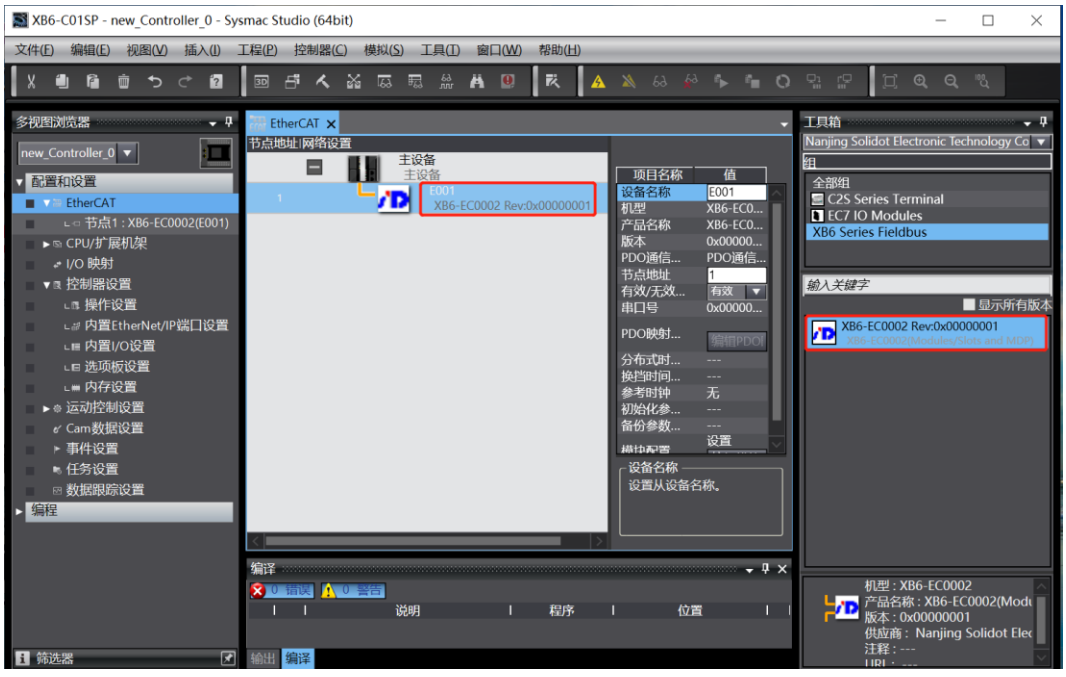


5、 Adding slave devices

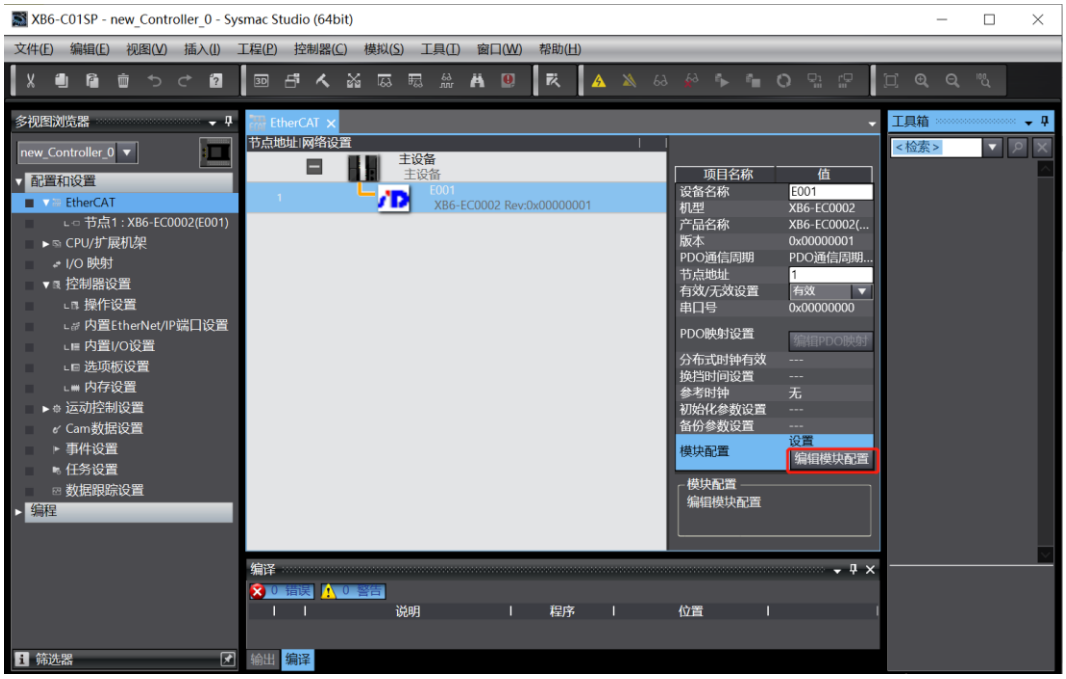
a. Inthe right-hand side toolbox column，click to expand all suppliers，select“Nanjing Solidot Electronic Technology Co., Ltd.”as shown below.



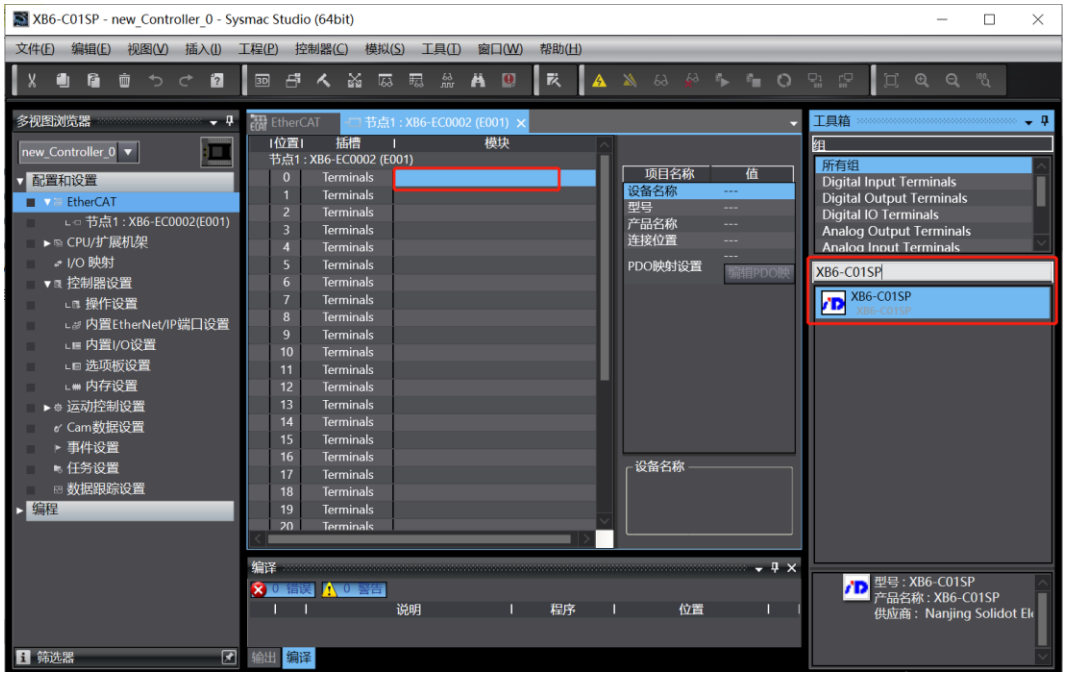
b. Click“XB6 Series Fieldbus”to select product series,and then choose product model at bottom.Double-click“XB6-EC0002”to add slave device as shown below.

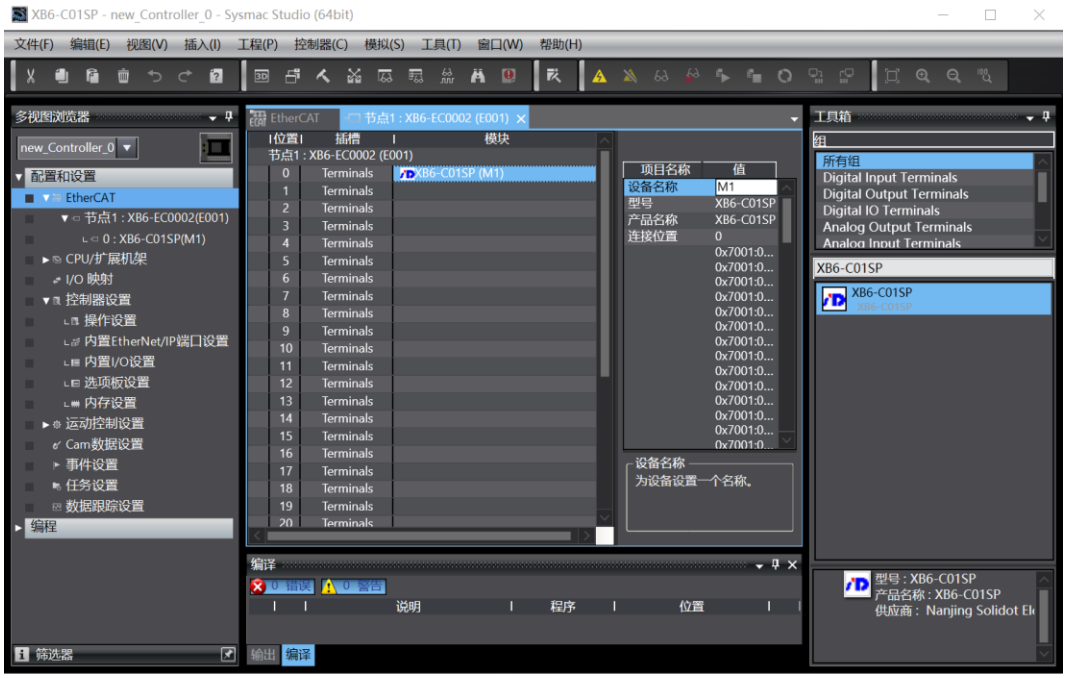


c. On the EtherCAT main page, click on "XB6-EC0002" and then click on "Edit Module Configuration" in the menu on the right-hand side, as shown in the figure below.



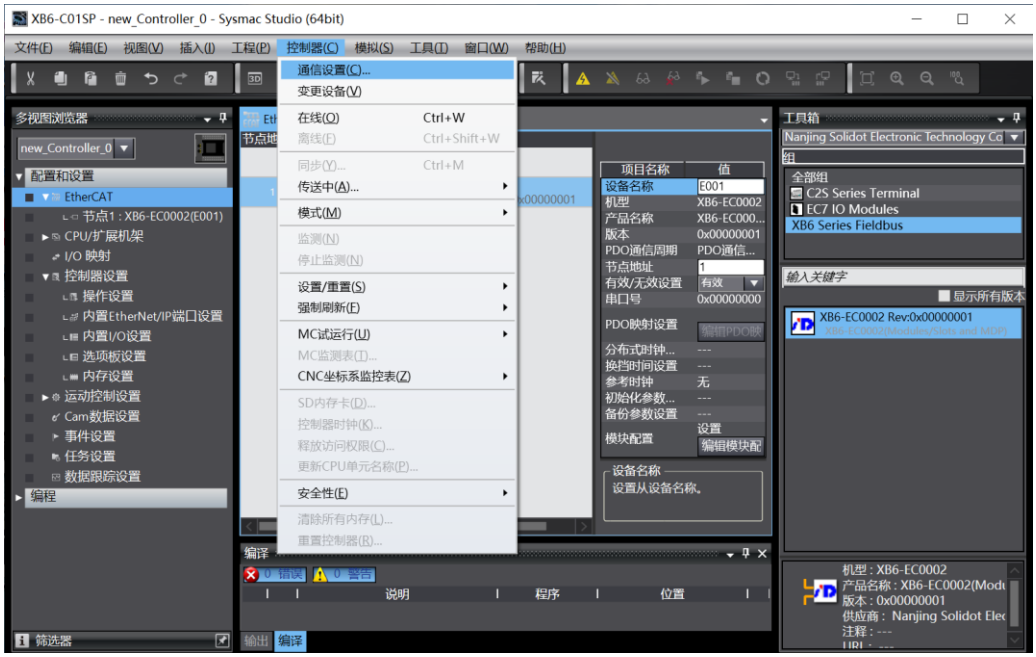
d. On the module configuration main page, click on the position of slot 0 and then search for module model "XB6-C01SP" in the search box at the bottom of the toolbox on the right-hand side. Double-click to add it to the slot, as shown in figure below. Repeat this process for all modules according to their actual installation topology. Note: The order and model must be consistent with physical topology!



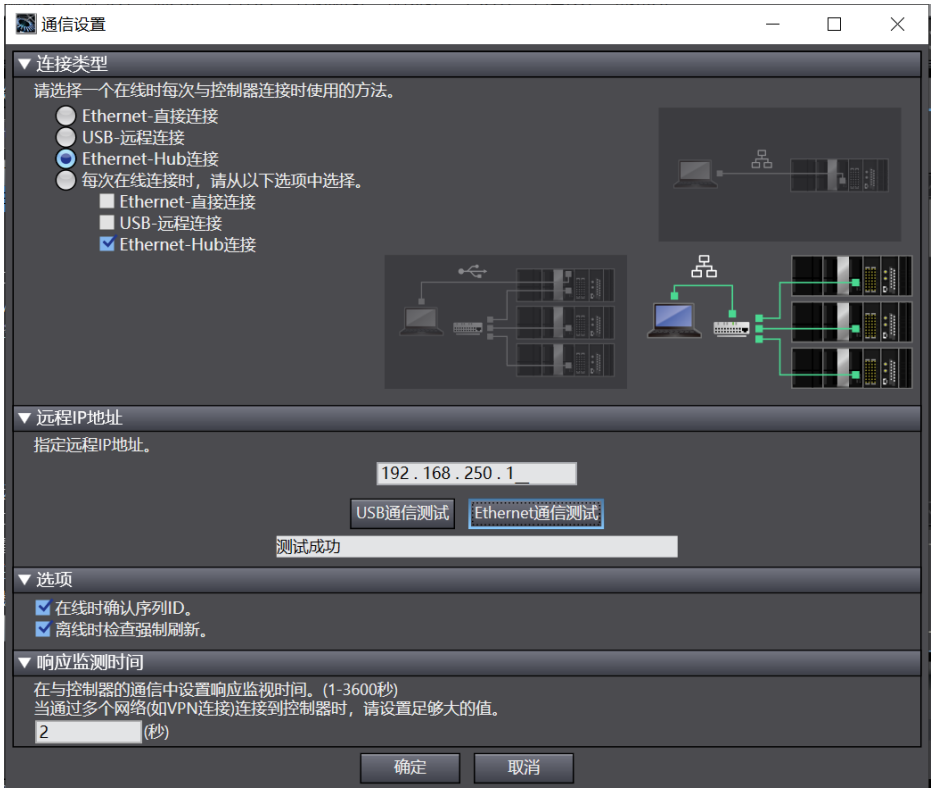


6、 Communication Settings

a. Click on the menu bar "Controller -> Communication Settings" to open the communication settings window as shown in the figure below.

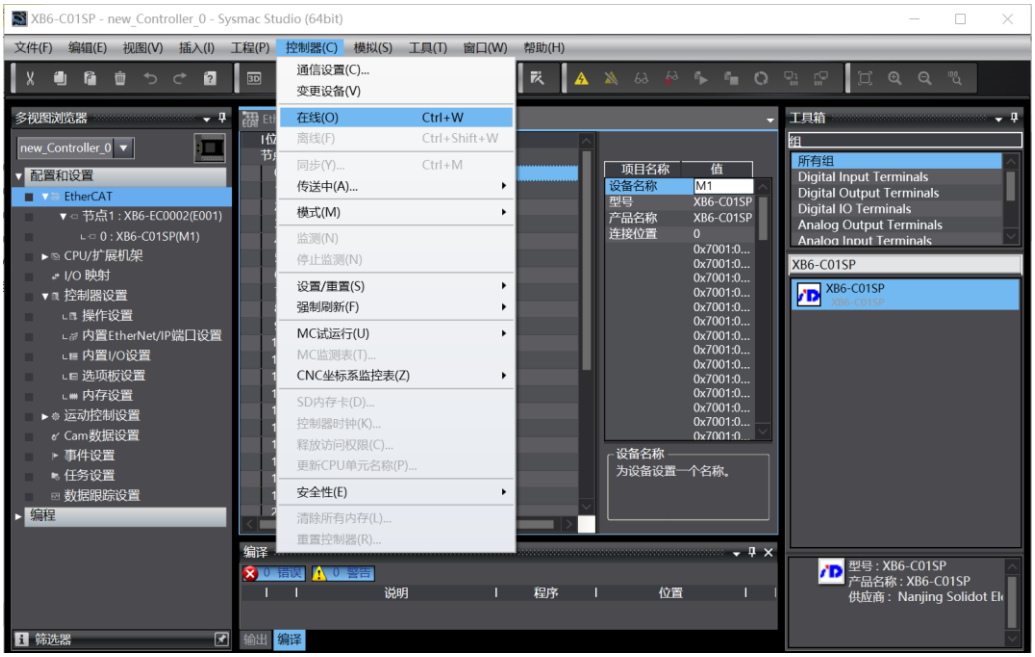


b. In the communication settings window, select "Ethernet-Hub Connection" for connection type and choose "Ethernet-Hub Connection" as the method used every time when connecting to the controller online. Fill in the corresponding PLC's IP address for remote IP address, click on "Ethernet Communication Test", if communication is normal, then "Test Successful" will be displayed in the box below. After confirming that communication is normal, click on "OK", as shown in the figure below.

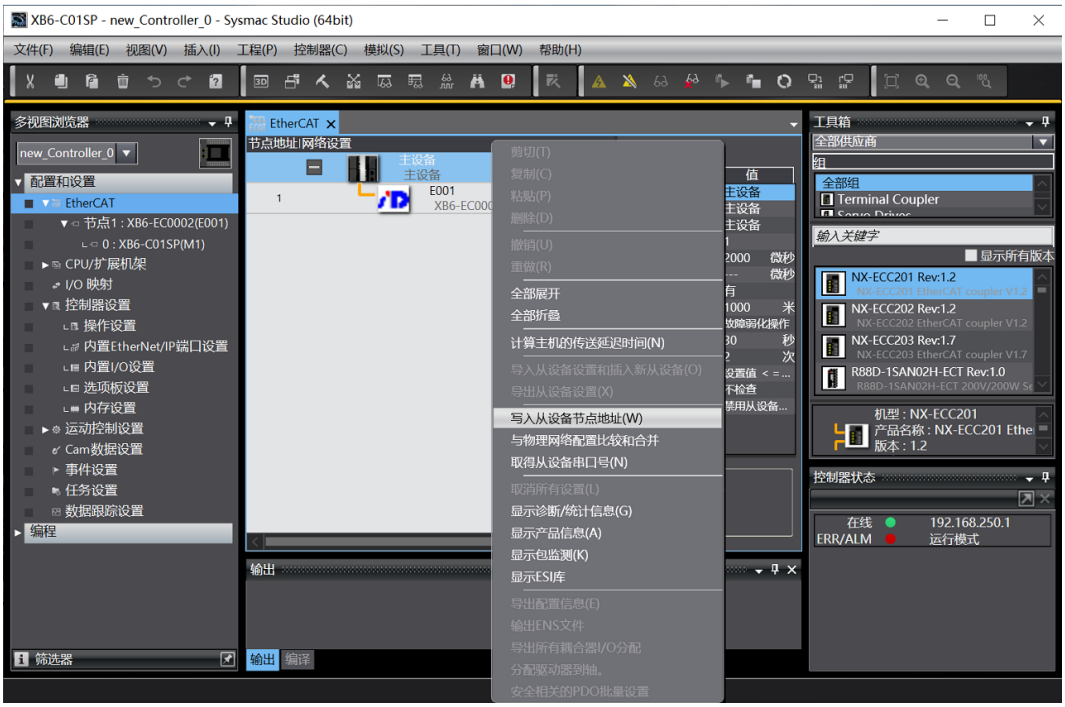


7、 Setting Node Address

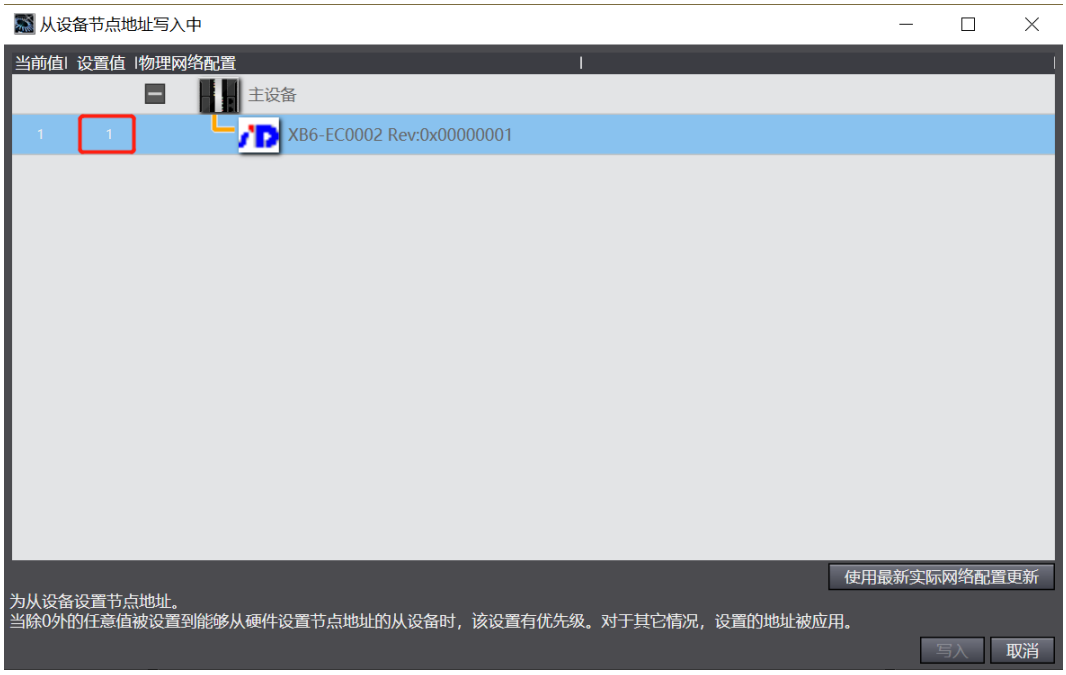
a. Click on menu bar “Controller -> Online” to switch controller to online status as shown in the below figure.



b. Right-click on main device and select “Write Slave Device Node Address”, as shown in the below figure.



c. In node address setting window, click value under set value and enter node address; click “Write” button to change slave device node address, as shown in the below figure.

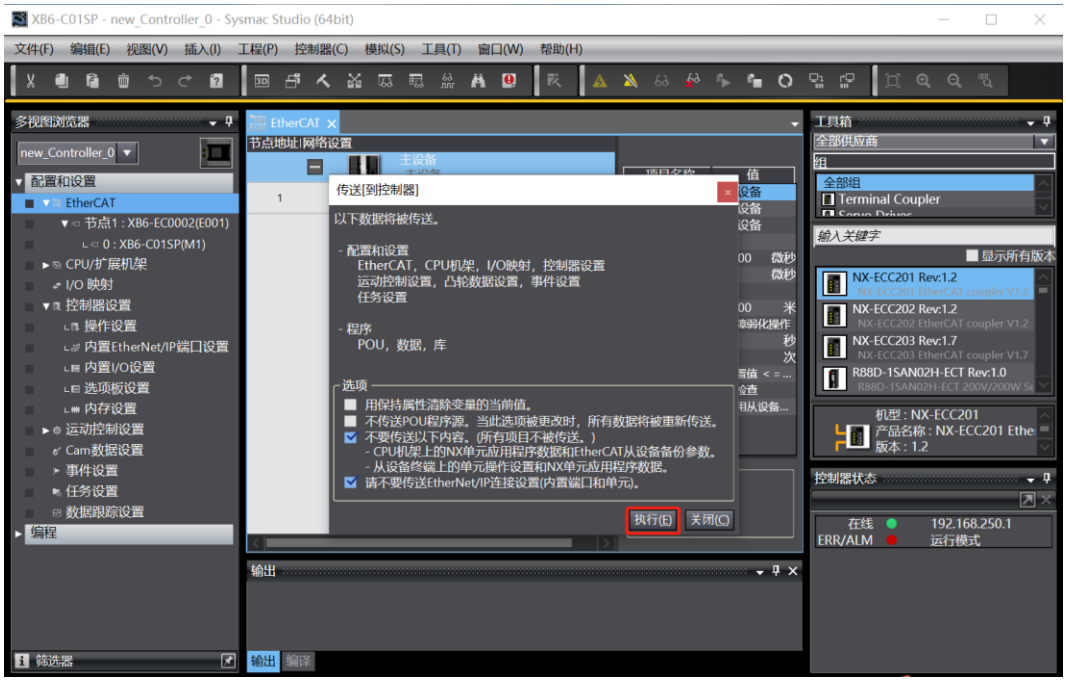


d. After successful writing of node address, follow prompts to power off and restart slave device.

8、 Downloading Configuration into PLC

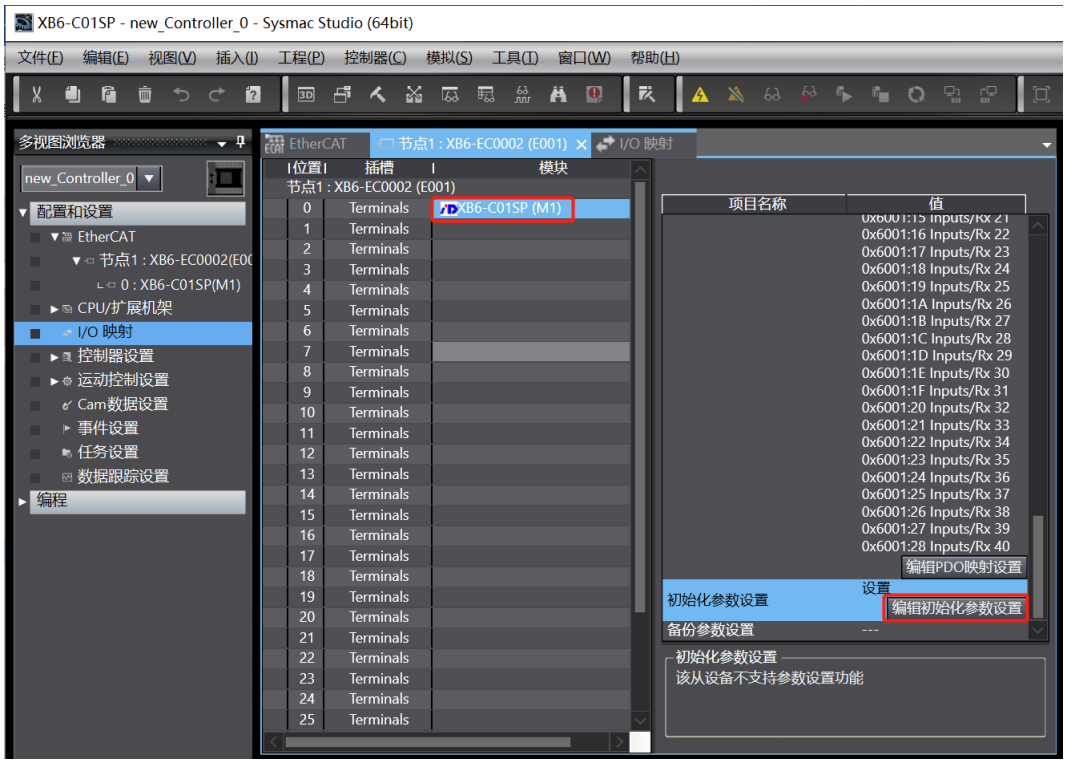
a. Click on menu bar “Controller -> Transfer (A) -> Download (T)” button to transfer configuration into controller as shown in the below figure.

e. A pop-up confirmation window appears; click “Execute” button followed by clicking “Yes/OK” buttons for subsequent pop-ups until download is complete; after which it needs a reboot.。

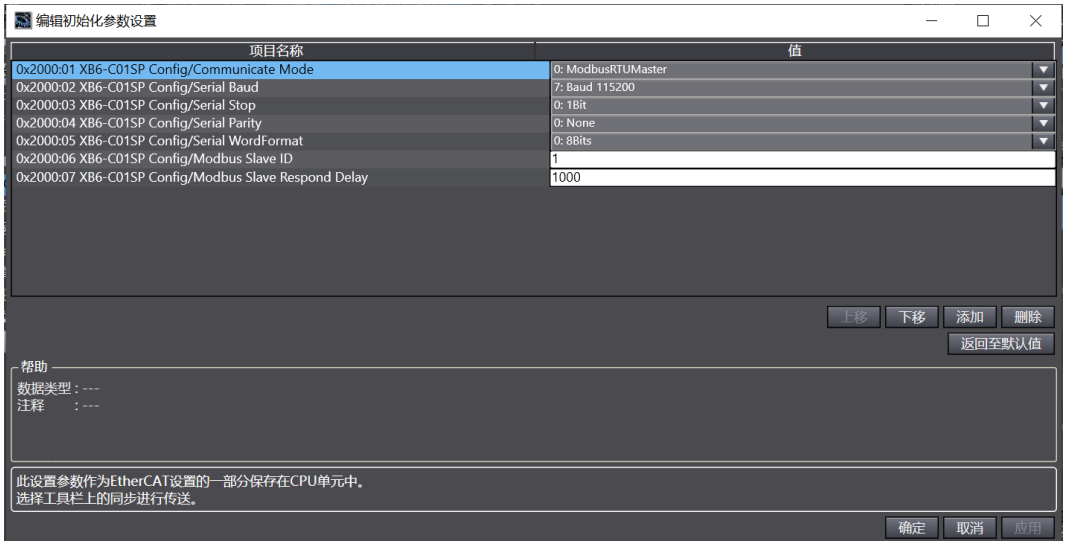


9、 Module Parameter Configuration

a. On edit module configuration main page, click on XB6-C01SP; then right-click“Edit Initialization Parameter Settings”on right side of screen can open parameter page， as showinbelow.Note: Switching offline before configuring parameters is required.

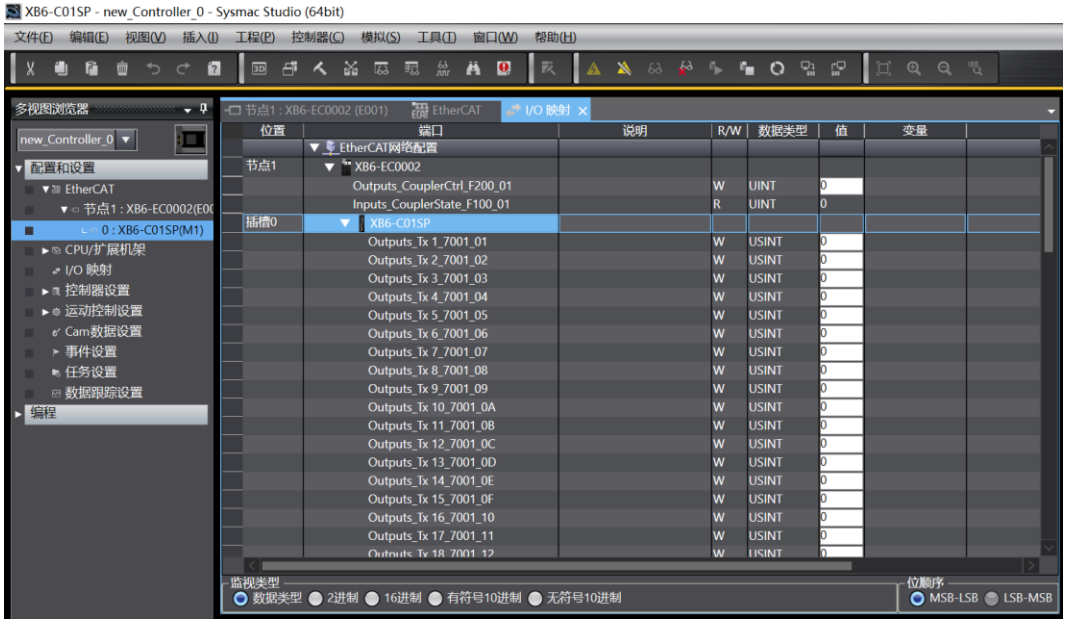


b. On parameter setting page，parameters can be configured accordingto actual needs of communication module. After configuration is completed, download program to PLC again and both PLC and module need to be rebooted as shown in the below figure.



10、 Viewing Module Function

a. Double-click on "I/O Mapping" in the left navigation tree; under node 1 on the main page on the right side, you can see device name: XB6-EC0002; device name for slot 0: XB6-C01SP. Click on the expand icon before device name to view input/output signal monitoring page of module. Output values (Outputs_Tx) can be set according to actual needs while input values (Inputs_Rx) can be viewed as shown in the below figure.



6.2.3 Application in TwinCAT3 software environment

1、 Preparation

- **Hardware environment**
  - **Model number: XB6-C01SP**
  - **Power module，EtherCAT coupler，cover plate**

    In this case we take XB6-P2000H power module and XB6-EC0002 coupler as examples
  - **A computer installed with TwinCAT3 software**
  - **Devices or modules supporting MODBUS protocol**

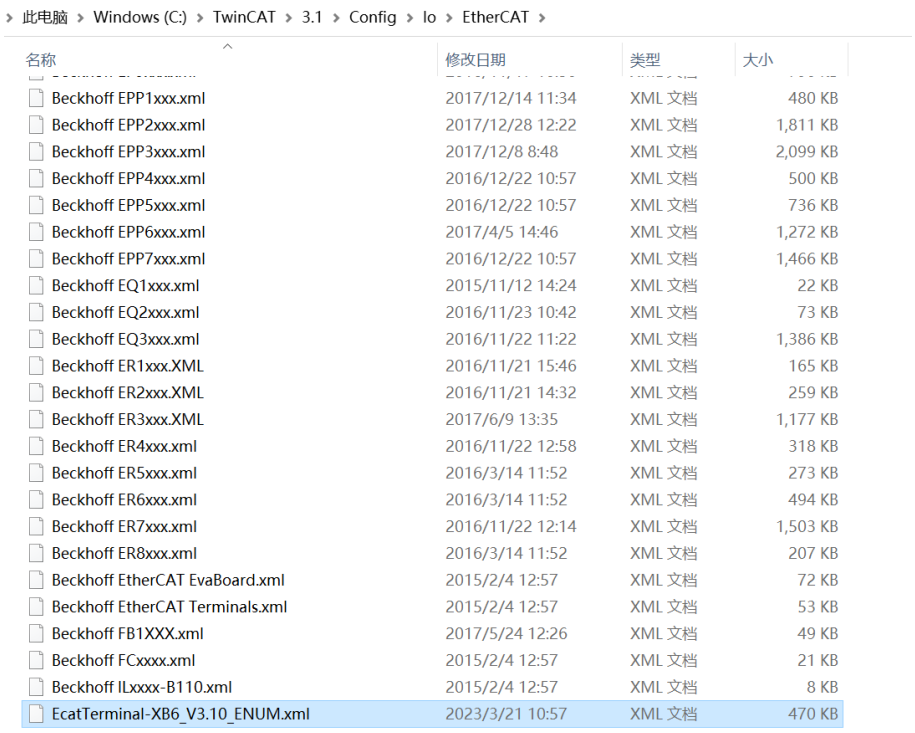
    This instruction takes RS232 barcode scanner as an example.
  - **EtherCAT speical shielded cable**
  - **A switching power suppl**
  - **Module installation guide rail and fasteners**
  - **Device configuration files**

    Website of configuration files：https://www.solidotech.com/documents/configfile
- **Hardware configuration and wiring**

  Please follow the instructions for 4 Installation and Disassembly and 5 Wiring.

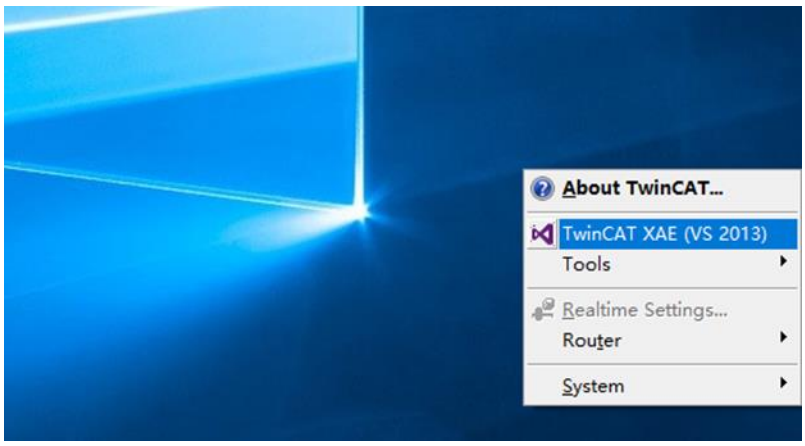
2、 Preset Configuration File

Place the ESI configuration file (EcatTerminal-XB6_V3.10_ENUM.xml) in the TwinCAT installation directory "C:\TwinCAT\3.1\Config\Io\EtherCAT" as shown below.

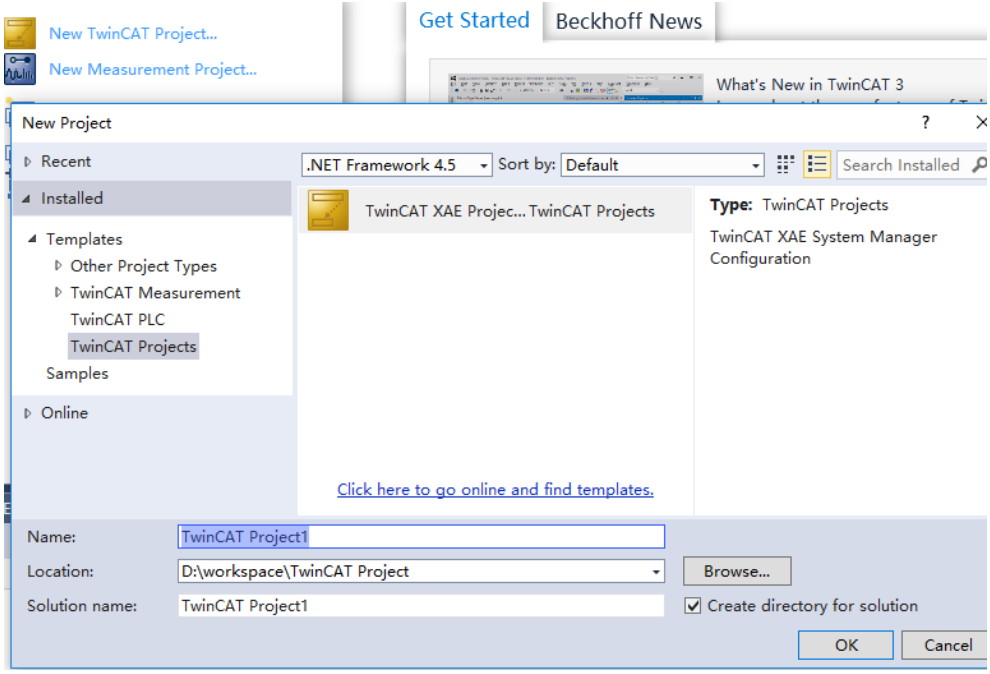


1、Project Creation

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

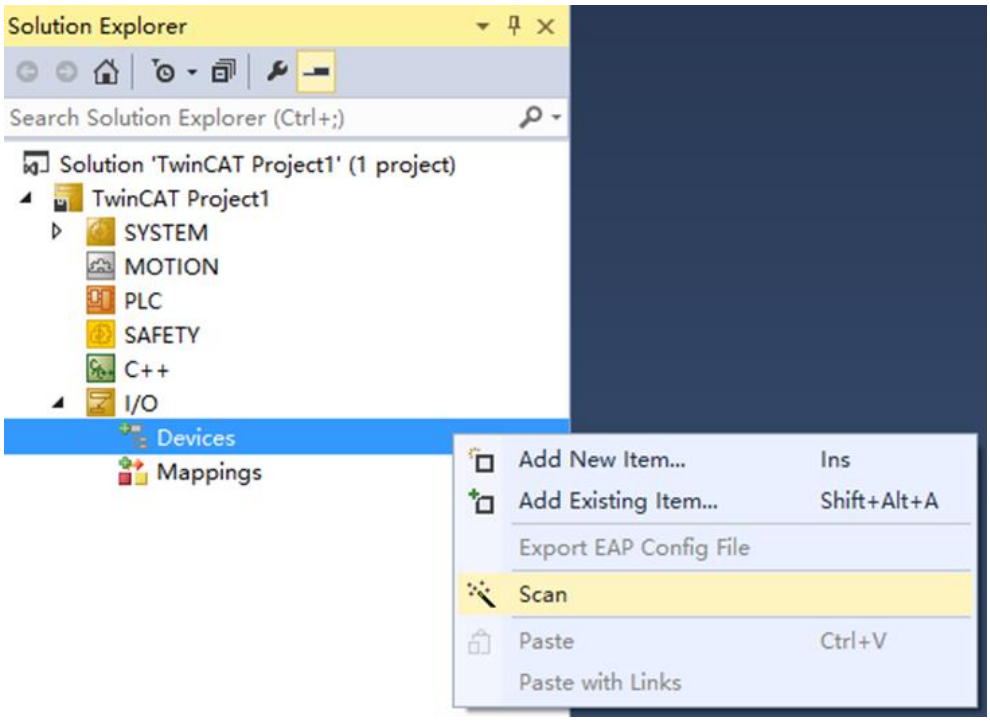


b. Click on "New TwinCAT Project". In the pop-up window, enter a name for your project under "Name", a solution name under "Solution Name", and choose a location for your project under "Location". You can leave these three items at their default settings if you wish, then click on "OK" to create your project successfully, as shown below.

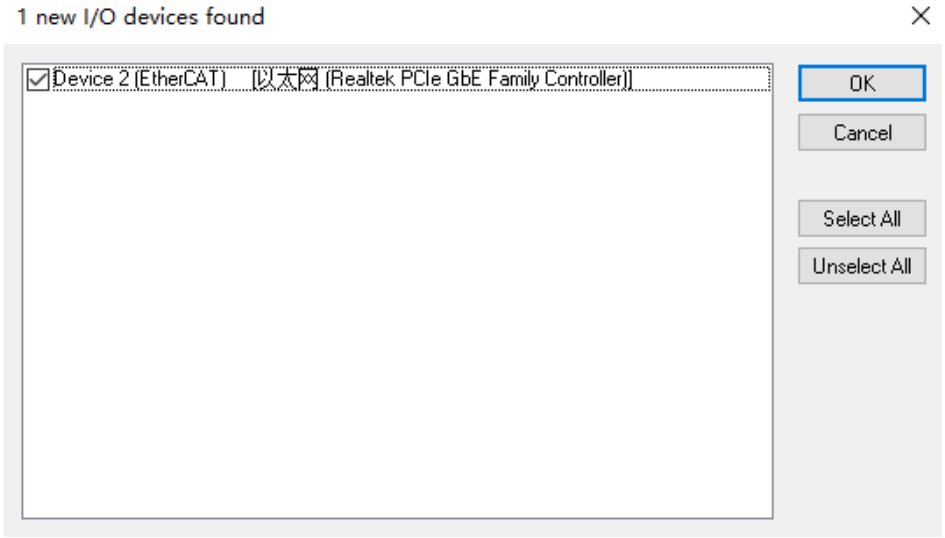


2、Scan Devices

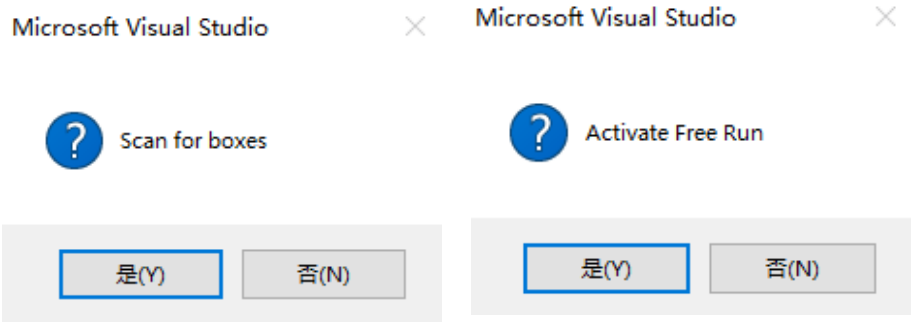
a. After creating your project, right-click on “Scan” option under “I/O -> Devices” to scan slave devices as shown below.



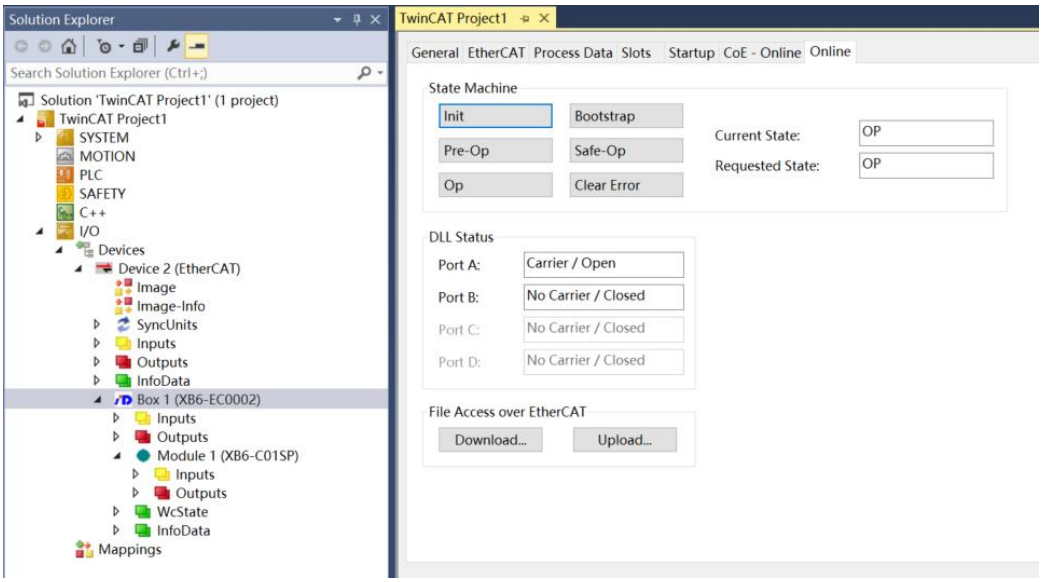
b. Checkmark “Local Connection” network card as shown below



c. In the pop-up window “Scan for boxes”, click on “Yes”. In another pop-up window named “Activate Free Run”, click on “Yes”, as shown below.

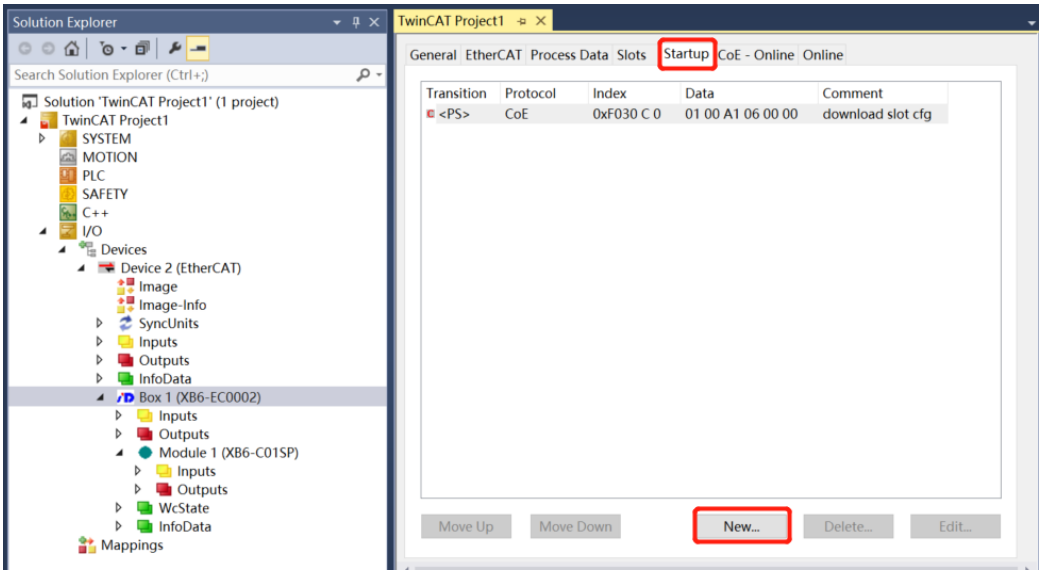


d. After scanning devices, Box1(XB6-EC0002) and Module 1(XB6-C01SP) will appear in left navigation tree with status OP indicating that they are online and running properly; RUN light is ON indicating that slave device is working fine too,as shown below

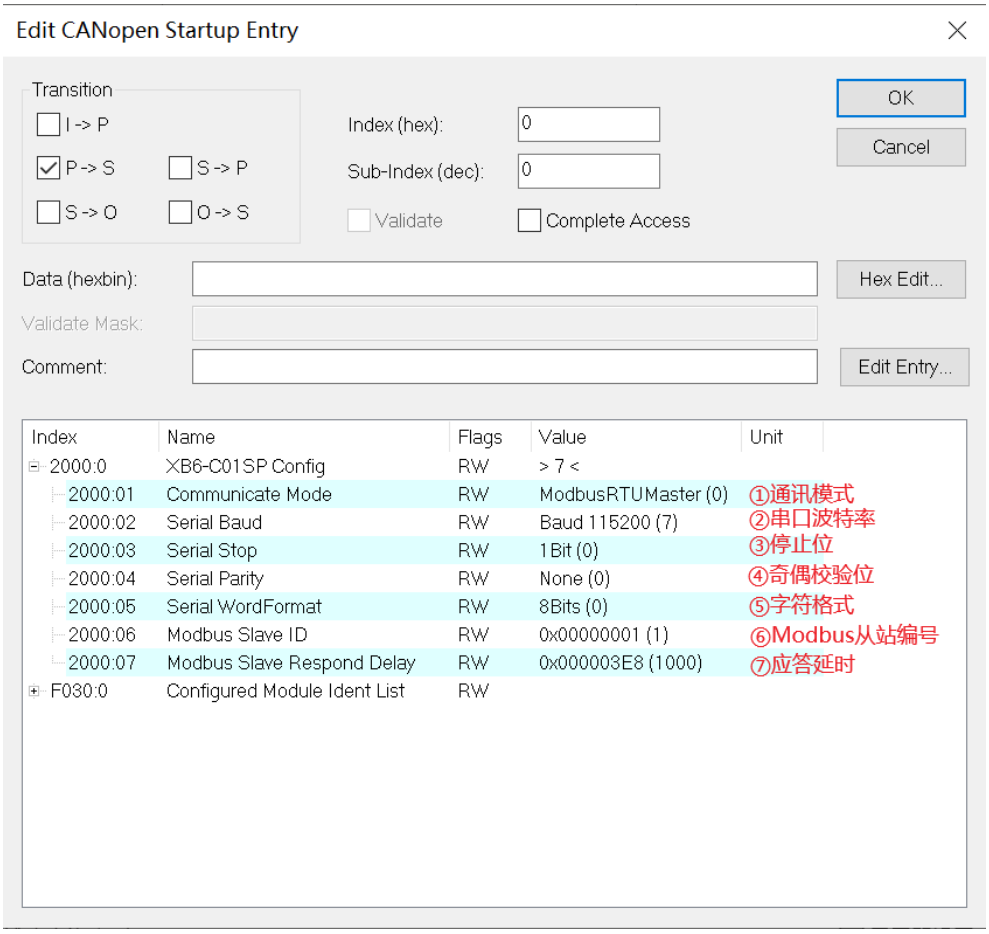


3、 Verify Basic Functions

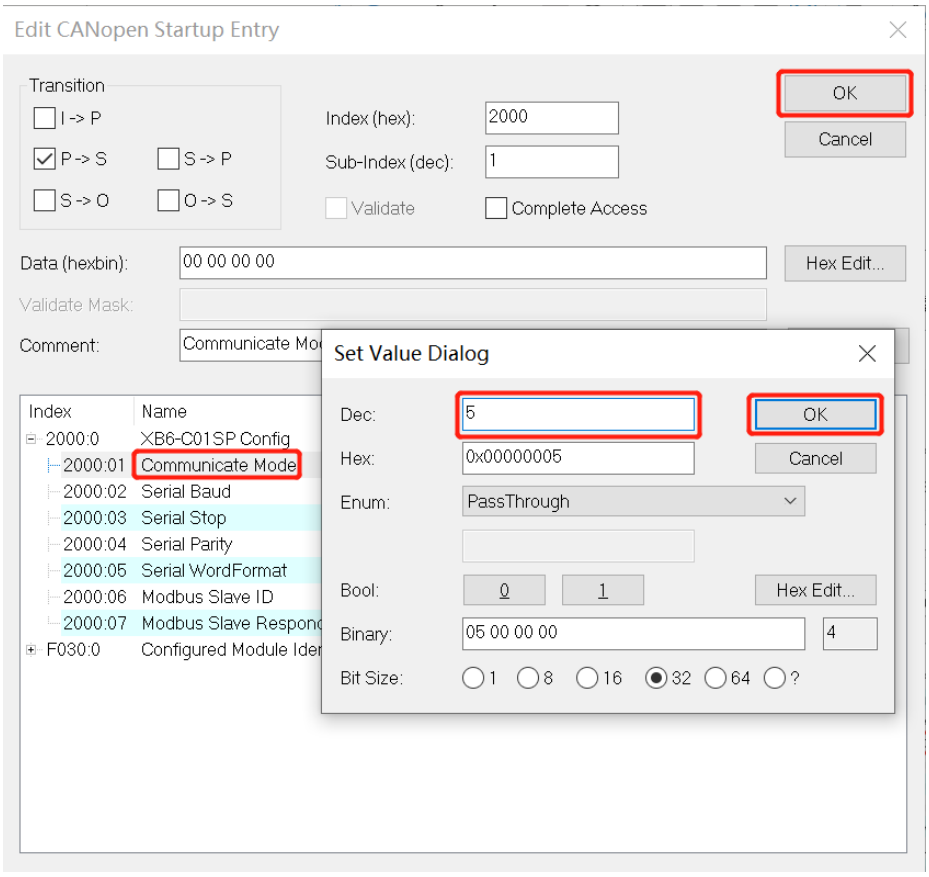
a. Clicking on left navigation tree item“Box1 -> Startup -> New”will take you to parameter editing page where you can edit parameters related to CANopen startup entry ,as showm blow:



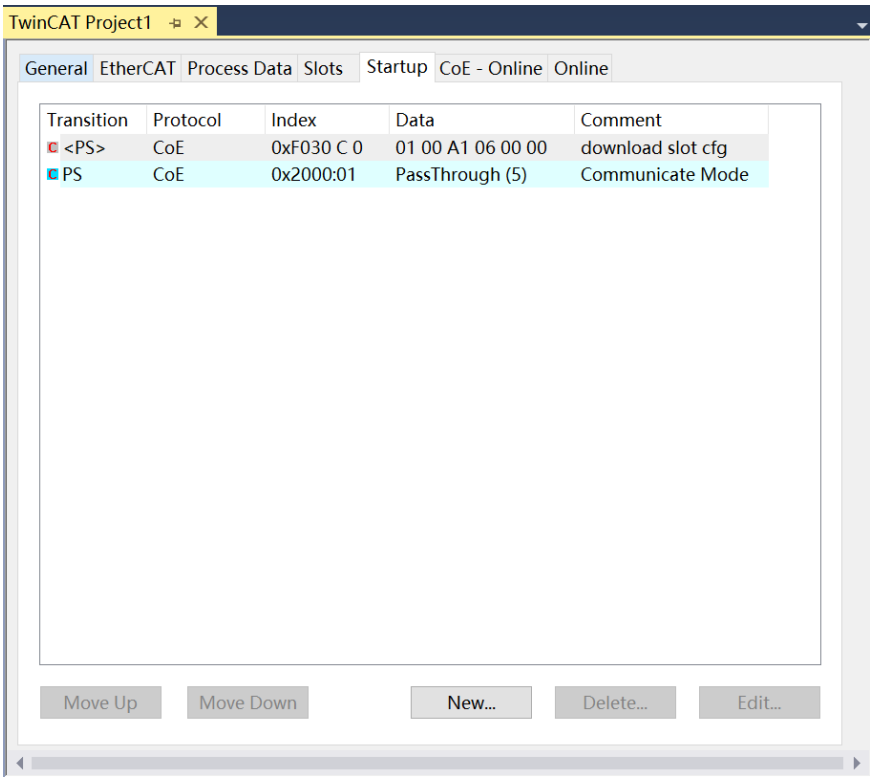
b. On Edit CANopen Startup Entry popup menu ,clicking "+" before Index 2000:0 will expand configuration parameter menu. You can see 7 configuration parameters here and clicking on any of them will allow you to set related configurations, as shown below.



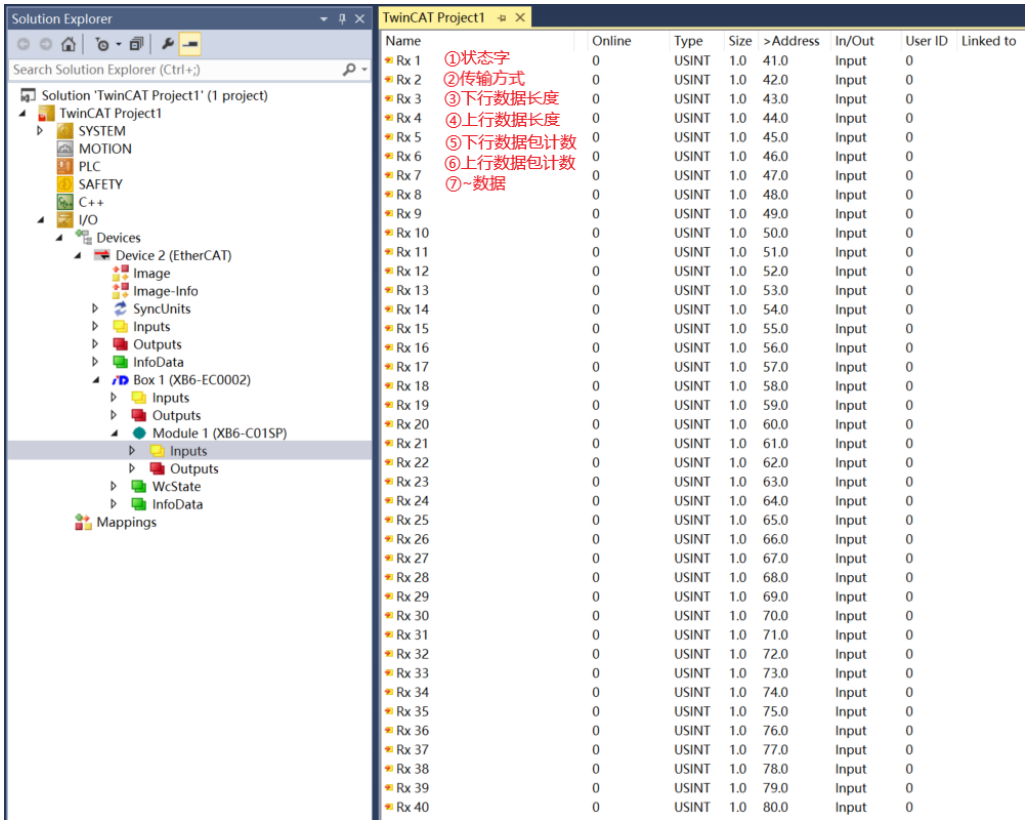
c. For example, if you want to modify communication mode parameter, double-click on "Communicate Mode" and change the parameter value as shown below.



d. After modifying the parameters, you can see modified items and their values under Startup section as shown below

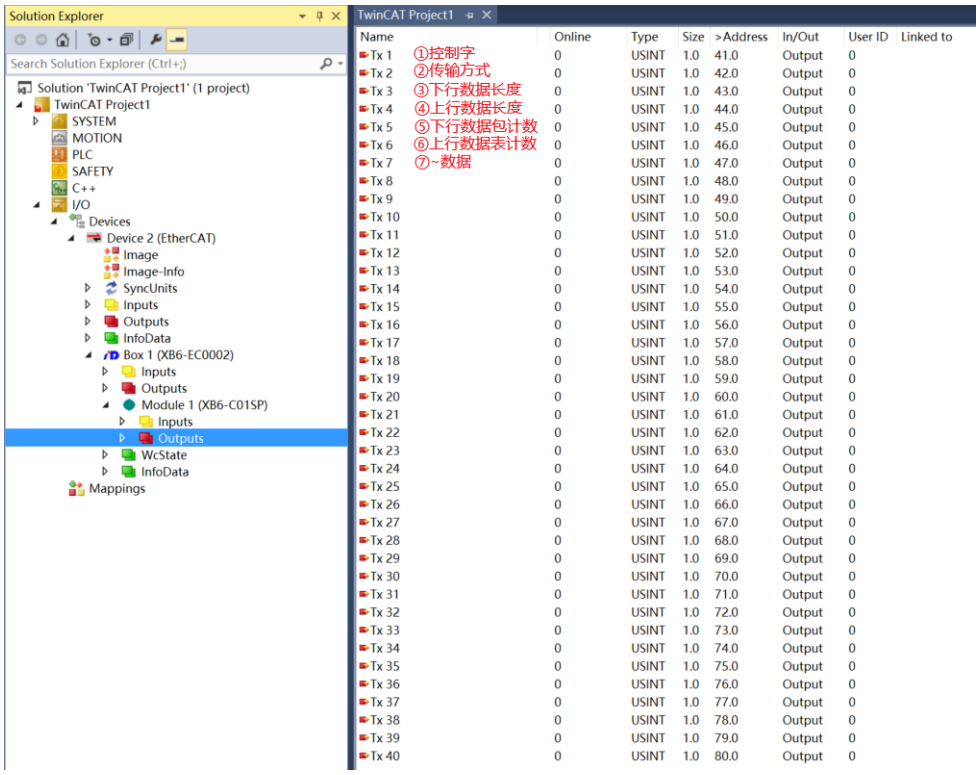


e. Left navigation tree item “Module 1 -> Inputs” displays upstream data of communication module for monitoring its status ,as shown below.



Name	Online	Type	Size	>Address	In/Out	User ID	Linked to
Rx 1	0	USINT	1.0	41.0	Input	0	
Rx 2	0	USINT	1.0	42.0	Input	0	
Rx 3	0	USINT	1.0	43.0	Input	0	
Rx 4	0	USINT	1.0	44.0	Input	0	
Rx 5	0	USINT	1.0	45.0	Input	0	
Rx 6	0	USINT	1.0	46.0	Input	0	
Rx 7	0	USINT	1.0	47.0	Input	0	
Rx 8	0	USINT	1.0	48.0	Input	0	
Rx 9	0	USINT	1.0	49.0	Input	0	
Rx 10	0	USINT	1.0	50.0	Input	0	
Rx 11	0	USINT	1.0	51.0	Input	0	
Rx 12	0	USINT	1.0	52.0	Input	0	
Rx 13	0	USINT	1.0	53.0	Input	0	
Rx 14	0	USINT	1.0	54.0	Input	0	
Rx 15	0	USINT	1.0	55.0	Input	0	
Rx 16	0	USINT	1.0	56.0	Input	0	
Rx 17	0	USINT	1.0	57.0	Input	0	
Rx 18	0	USINT	1.0	58.0	Input	0	
Rx 19	0	USINT	1.0	59.0	Input	0	
Rx 20	0	USINT	1.0	60.0	Input	0	
Rx 21	0	USINT	1.0	61.0	Input	0	
Rx 22	0	USINT	1.0	62.0	Input	0	
Rx 23	0	USINT	1.0	63.0	Input	0	
Rx 24	0	USINT	1.0	64.0	Input	0	
Rx 25	0	USINT	1.0	65.0	Input	0	
Rx 26	0	USINT	1.0	66.0	Input	0	
Rx 27	0	USINT	1.0	67.0	Input	0	
Rx 28	0	USINT	1.0	68.0	Input	0	
Rx 29	0	USINT	1.0	69.0	Input	0	
Rx 30	0	USINT	1.0	70.0	Input	0	
Rx 31	0	USINT	1.0	71.0	Input	0	
Rx 32	0	USINT	1.0	72.0	Input	0	
Rx 33	0	USINT	1.0	73.0	Input	0	
Rx 34	0	USINT	1.0	74.0	Input	0	
Rx 35	0	USINT	1.0	75.0	Input	0	
Rx 36	0	USINT	1.0	76.0	Input	0	
Rx 37	0	USINT	1.0	77.0	Input	0	
Rx 38	0	USINT	1.0	78.0	Input	0	
Rx 39	0	USINT	1.0	79.0	Input	0	
Rx 40	0	USINT	1.0	80.0	Input	0	

f. Left navigation tree item “Module 1 -> Outputs” displays downstream data of pulse output module for monitoring its output status ,as shown below.

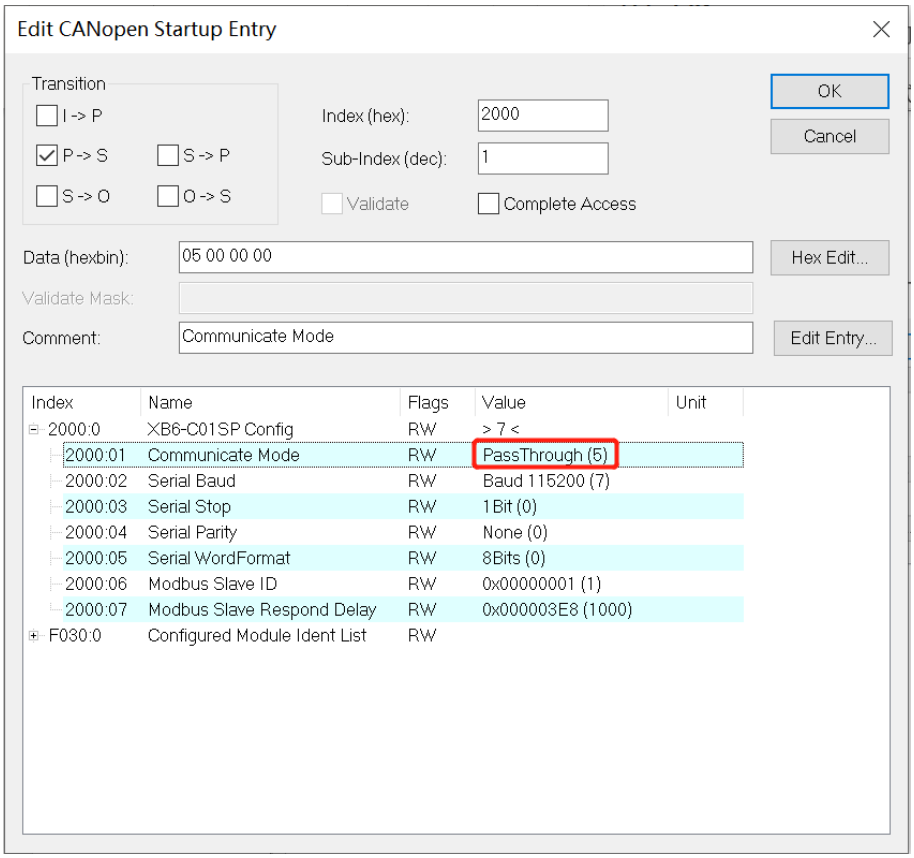


Name	Online	Type	Size	>Address	In/Out	User ID	Linked to
Tx 1	0	USINT	1.0	41.0	Output	0	
Tx 2	0	USINT	1.0	42.0	Output	0	
Tx 3	0	USINT	1.0	43.0	Output	0	
Tx 4	0	USINT	1.0	44.0	Output	0	
Tx 5	0	USINT	1.0	45.0	Output	0	
Tx 6	0	USINT	1.0	46.0	Output	0	
Tx 7	0	USINT	1.0	47.0	Output	0	
Tx 8	0	USINT	1.0	48.0	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	
Tx 33	0	USINT	1.0	73.0	Output	0	
Tx 34	0	USINT	1.0	74.0	Output	0	
Tx 35	0	USINT	1.0	75.0	Output	0	
Tx 36	0	USINT	1.0	76.0	Output	0	
Tx 37	0	USINT	1.0	77.0	Output	0	
Tx 38	0	USINT	1.0	78.0	Output	0	
Tx 39	0	USINT	1.0	79.0	Output	0	
Tx 40	0	USINT	1.0	80.0	Output	0	

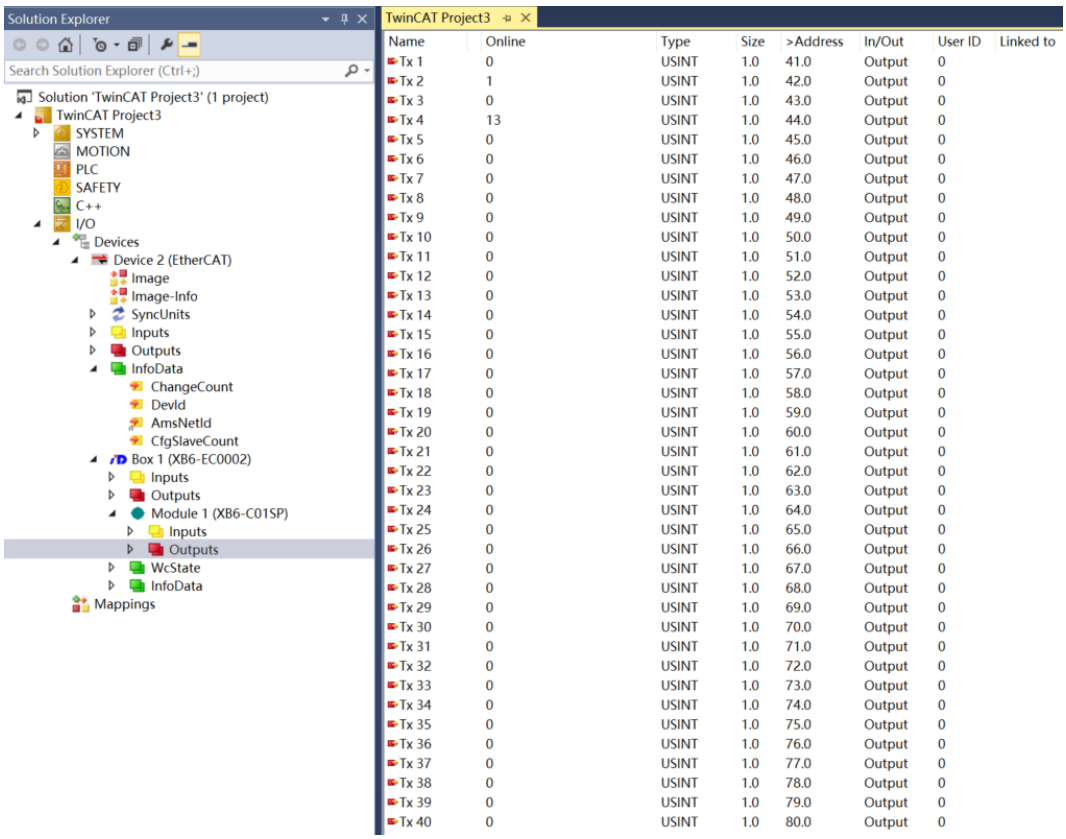
4、Example of Transparent Transmission Function

Example: Verify pure input mode in module transparent transmission function through barcode scanner

a. Configure the parameters by selecting communication mode 5 i.e. transparent mode as shown below:

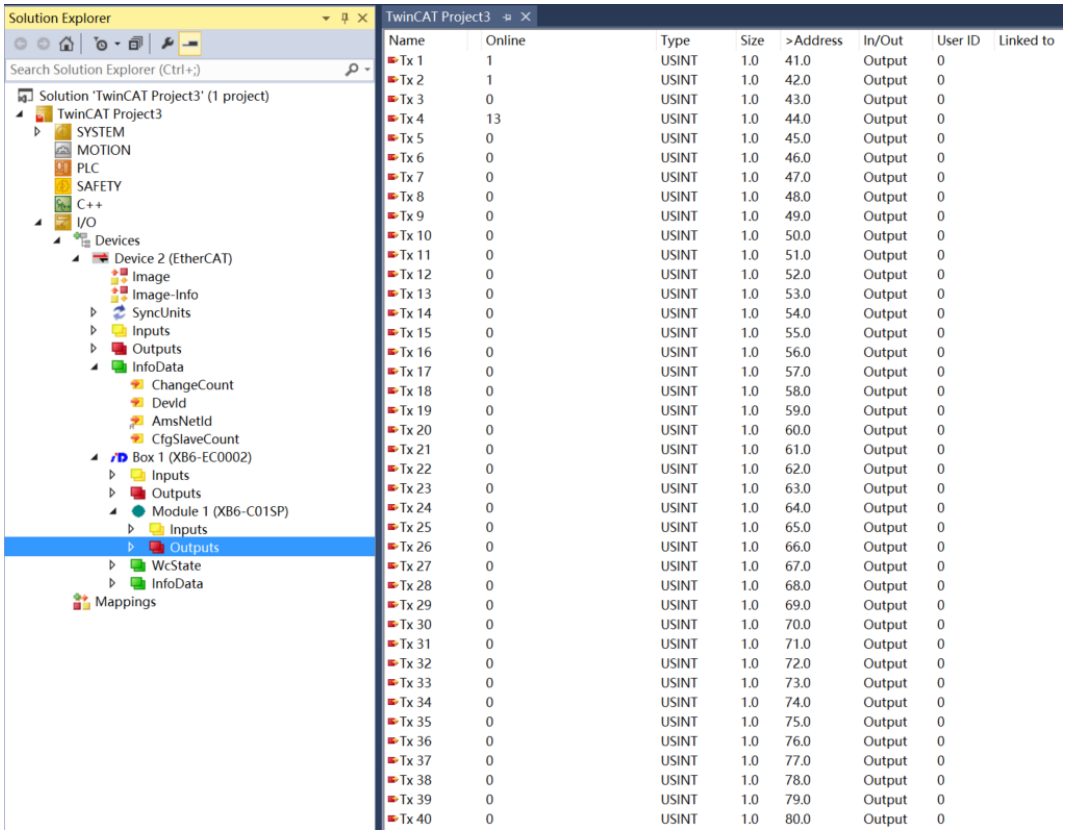


b. Write downlink data where Tx2 is set to 1 indicating that transmission method is pure input mode; Tx4 is set to 13 indicating that upstream data length is 13 (you can write any length for first time but after receiving data,you'll know actual upstream data length),as showm blow



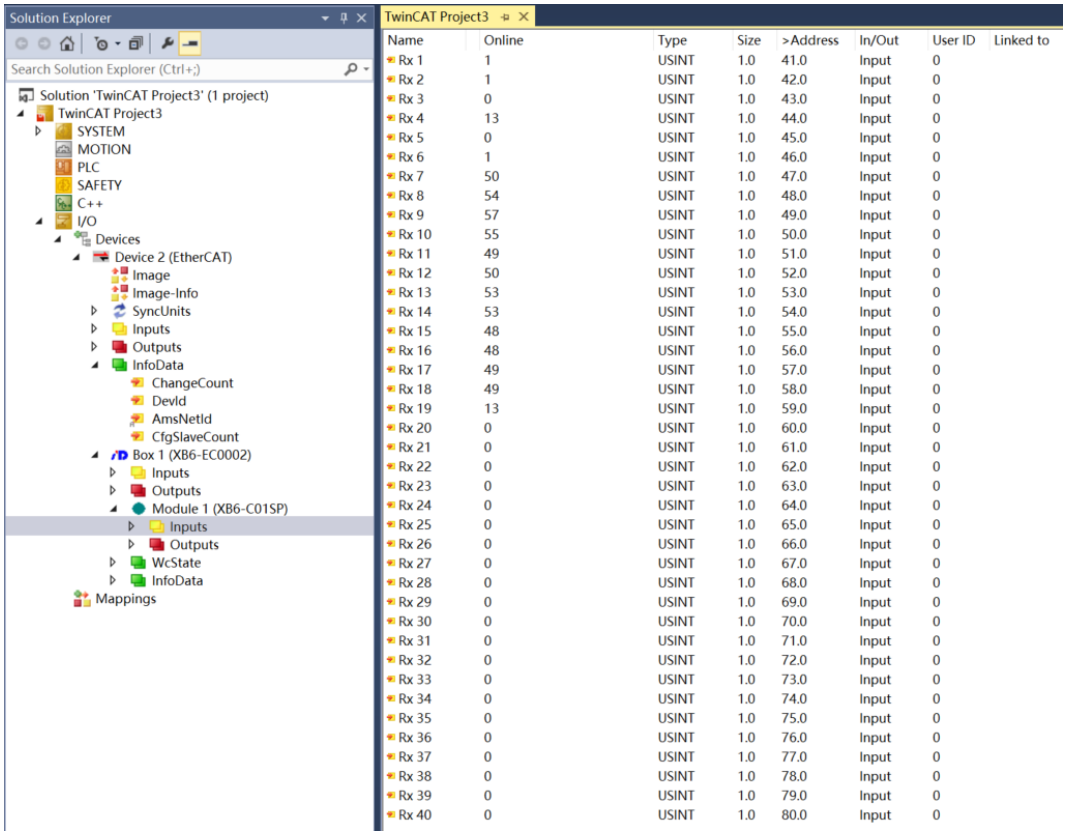
Name	Online	Type	Size	>Address	In/Out	User ID	Linked to
Tx 1	0	USINT	1.0	41.0	Output	0	
Tx 2	1	USINT	1.0	42.0	Output	0	
Tx 3	0	USINT	1.0	43.0	Output	0	
Tx 4	13	USINT	1.0	44.0	Output	0	
Tx 5	0	USINT	1.0	45.0	Output	0	
Tx 6	0	USINT	1.0	46.0	Output	0	
Tx 7	0	USINT	1.0	47.0	Output	0	
Tx 8	0	USINT	1.0	48.0	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	
Tx 33	0	USINT	1.0	73.0	Output	0	
Tx 34	0	USINT	1.0	74.0	Output	0	
Tx 35	0	USINT	1.0	75.0	Output	0	
Tx 36	0	USINT	1.0	76.0	Output	0	
Tx 37	0	USINT	1.0	77.0	Output	0	
Tx 38	0	USINT	1.0	78.0	Output	0	
Tx 39	0	USINT	1.0	79.0	Output	0	
Tx 40	0	USINT	1.0	80.0	Output	0	

c. Enable downlink instruction where Tx1 is set to 1 indicating enablement ,as showm blow



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	0	USINT	1.0	43.0	Output	0	
Tx 4	13	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	
Tx 33	0	USINT	1.0	73.0	Output	0	
Tx 34	0	USINT	1.0	74.0	Output	0	
Tx 35	0	USINT	1.0	75.0	Output	0	
Tx 36	0	USINT	1.0	76.0	Output	0	
Tx 37	0	USINT	1.0	77.0	Output	0	
Tx 38	0	USINT	1.0	78.0	Output	0	
Tx 39	0	USINT	1.0	79.0	Output	0	
Tx 40	0	USINT	1.0	80.0	Output	0	

d. Scan barcode with scanner which completes sending of data . Upstream Data received from barcode scanner shows that packet has been prepared successfully when Rx1=1 ;upstream Data Length =13 when Rx4=13;Rx6=1 indicates first package while Rx7~Rx19 are actual scanned code characters obtained by scanning device ,as showm blow



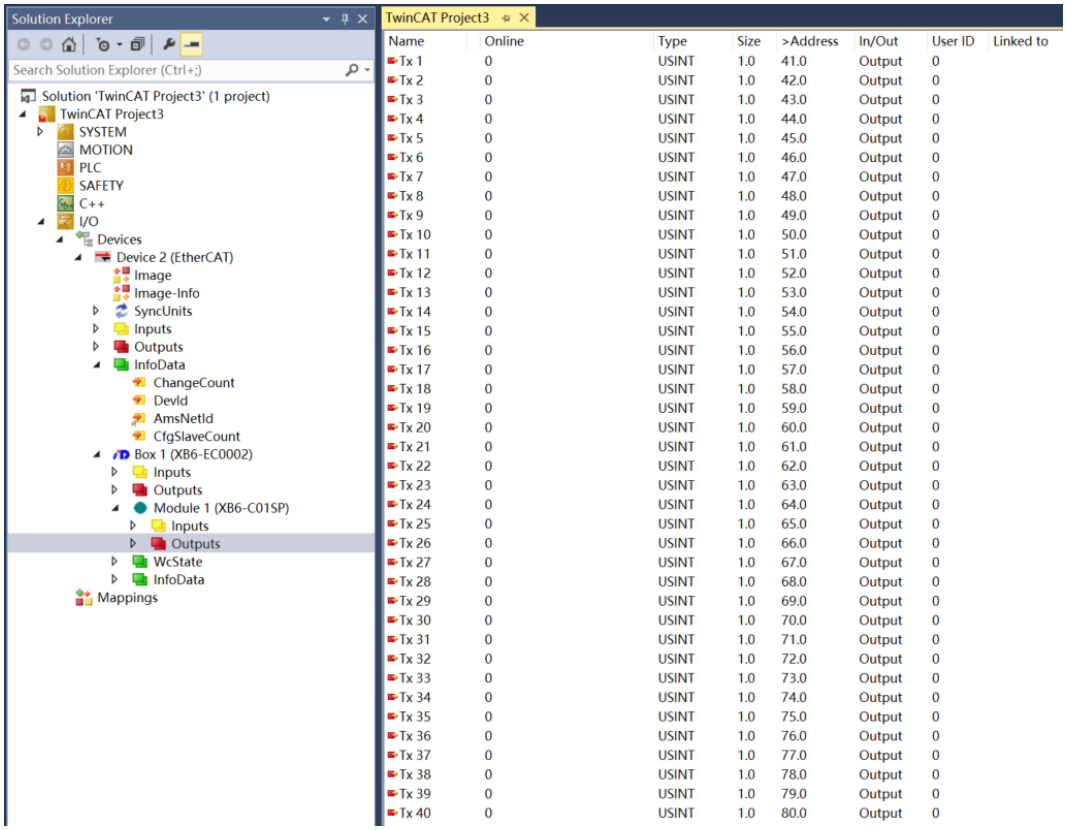
e. Scanned barcodes are displayed in figure given above

f. Convert the received data into a string, as shown in the following table, which is consistent with the barcode and can be successfully read.

Rx7	50	ASCII code converts to“2”
Rx8	54	ASCII code converts to“6”
Rx9	57	ASCII code converts to“9”
Rx10	55	ASCII code converts to“7”
Rx11	49	ASCII code converts to“1”
Rx12	50	ASCII code converts to“2”
Rx13	53	ASCII code converts to“5”
Rx14	53	ASCII code converts to“5”
…	…	…
Rx18	49	ASCII code converts to“1”

Rx19	13	ASCII code converts to empty

g. The downlink disable command, Tx1 is 0 which means disabled, 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	
Tx 33	0	USINT	1.0	73.0	Output	0	
Tx 34	0	USINT	1.0	74.0	Output	0	
Tx 35	0	USINT	1.0	75.0	Output	0	
Tx 36	0	USINT	1.0	76.0	Output	0	
Tx 37	0	USINT	1.0	77.0	Output	0	
Tx 38	0	USINT	1.0	78.0	Output	0	
Tx 39	0	USINT	1.0	79.0	Output	0	
Tx 40	0	USINT	1.0	80.0	Output	0	

7 FAQ

7.1 When updating accessible devices, the device cannot be found

1. Confirm that the Botu software is installed correctly.
2. Make sure that no other software is using the network adapter used by the Botu software.
3. Ensure that the Ethernet cable, network card, and port are working properly.
4. IP address or MAC address conflict.。

7.2 The load button is gray when downloading configuration files

1. Confirm that there are no forced values in the PLC.
2. Confirm that the PLC is in a stopped state.