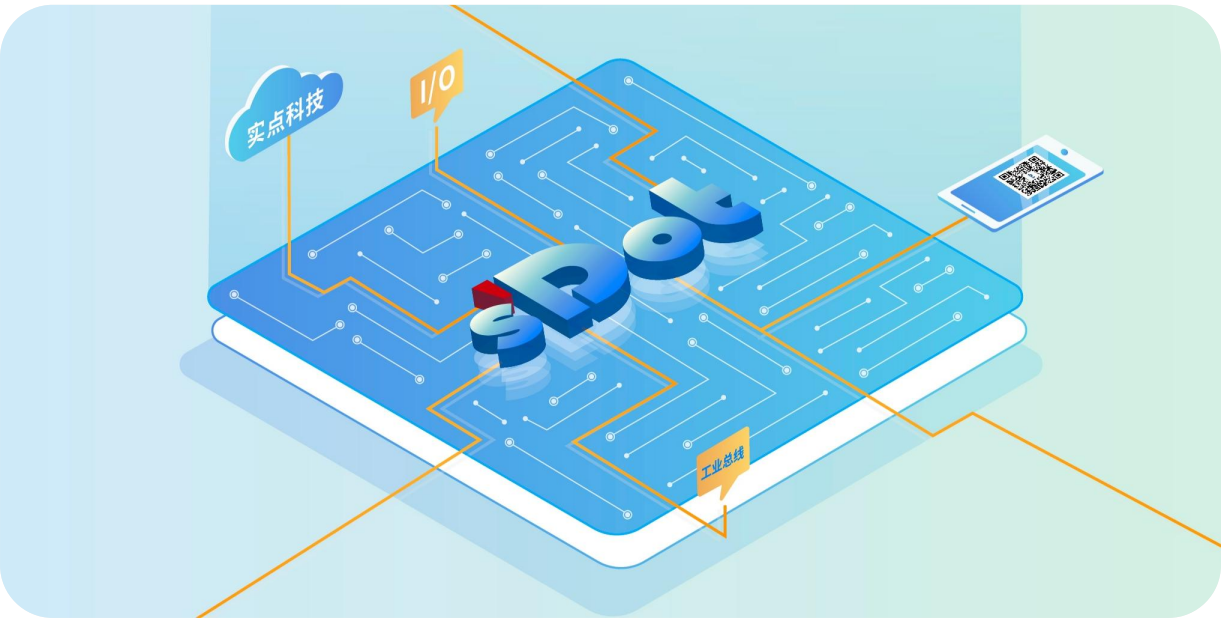

XB6S-PS20D

SSI absolute encoder counting module

User Manual

Nanjing Solidot Electronic Technology Co., Ltd.

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

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1 Product Overview

1.1 Product Introduction

The XB6S-PS20D is a plug-in SSI absolute encoder counting module. It utilizes the X-bus backplane and is compatible with our XB6S series coupler modules. It supports dual-channel SSI encoder input, counting, and probe latching. The module offers a compact footprint, high data reliability, and exceptional real-time performance, making it suitable for a wide range of industrial systems and equipment.

1.2 Product Features

- Dual Channel
  Supports two-channel SSI encoder input.
- Support setting data bit length and position
  Frame length, LSB and MSB are programmable.
- Support two encoding displays
  Gray code and binary code.
- Support bidirectional counting
  The encoder rotates forward and reverse, and the counting direction is flexible.
- Probe latch function
  Supports latching the current count value when the voltage of the probe input pin changes.
- Small size
  Compact structure and small space occupation.
- Easy to diagnose
  The innovative channel indicator light design is close to the channel, making it clear at a glance and easy to detect and maintain.
- Easy configuration
  The configuration is simple and supports all major master stations.
- Easy to install
  DIN 35 mm standard rail installation
  It uses spring-type terminal blocks, making wiring quick and easy.

2 Naming conventions

2.1 Naming conventions

XB 6 S - P S 2 0 D

(1) (2)(3) (4)(5)(6)(7)(8)

Serial number	Meaning	Description
(1)	Bus type	XB: X-bus
(2)	Product Series	6: Insert type
(3)	Product Version	S: Strengthen, upgraded version
(4)	Module Type	P：Pulse
(5)	Module Function	L：Location S: SSI synchronous serial interface protocol T: Train (PTO: Pulse Train Output) pulse train output C: Count pulse count
(6)	Function input channel number	0, 1, 2, 4, 8
(7)	Function output channel number	0, 1, 2, 4, 8
(8)	Electrical characteristics	D：Difference, orthogonal A: NPN, 24VDC B: PNP, 24VDC C: PNP/NPN, 5VDC, TTL (compatible) L: NPN, 5VDC, TTL (Pinyin: Sinking) Y: PNP, 5VDC, TTL (Pinyin: Sourcing)

3 Product Parameters

3.1 General Parameters

Interface parameters	
Product Model	XB6S-PS20D
Bus Protocol	X-bus
Process data volume: Downstream	2 Bytes
Process data volume: Uplink	26Bytes
Channel Type	Encoder input channel: 2 groups of SSI absolute encoder channels
	Probe input channel: 4 channels (1-ch Encoder + 2-ch Probe IN), PNP/NPN
	Ordinary digital input channels: 2 channels (1-ch Encoder + 1-ch DI), PNP/NPN
	Ordinary digital output channels: 8 channels (1-ch Encoder + 4-ch DO), NPN
Refresh rate	1ms
Technical Parameters	
System input power	5VDC (4.5V~5.5V)
Rated current consumption	160mA
Power consumption	0.75W
Encoder input	2 channels
Encoder signal type	Differential signaling, 5V
Data frame length	10~40 bits
Positional value format	Support Gray code or binary
Position value LSB/MSB	Configurable
SSI encoder clock frequency	≤2.0MHz
Reading interval	Configurable
Probe function	Support

(high-speed hardware latch)	
Dimensions	106.4×25.7×72.3mm
Operating temperature	-20℃~+60℃
Storage temperature	-40℃~+80℃
Weight	110g
Wiring method	Screw-free quick plug
Installation	35mm standard rail installation
Relative humidity	95%, non-condensing
Protection level	IP20

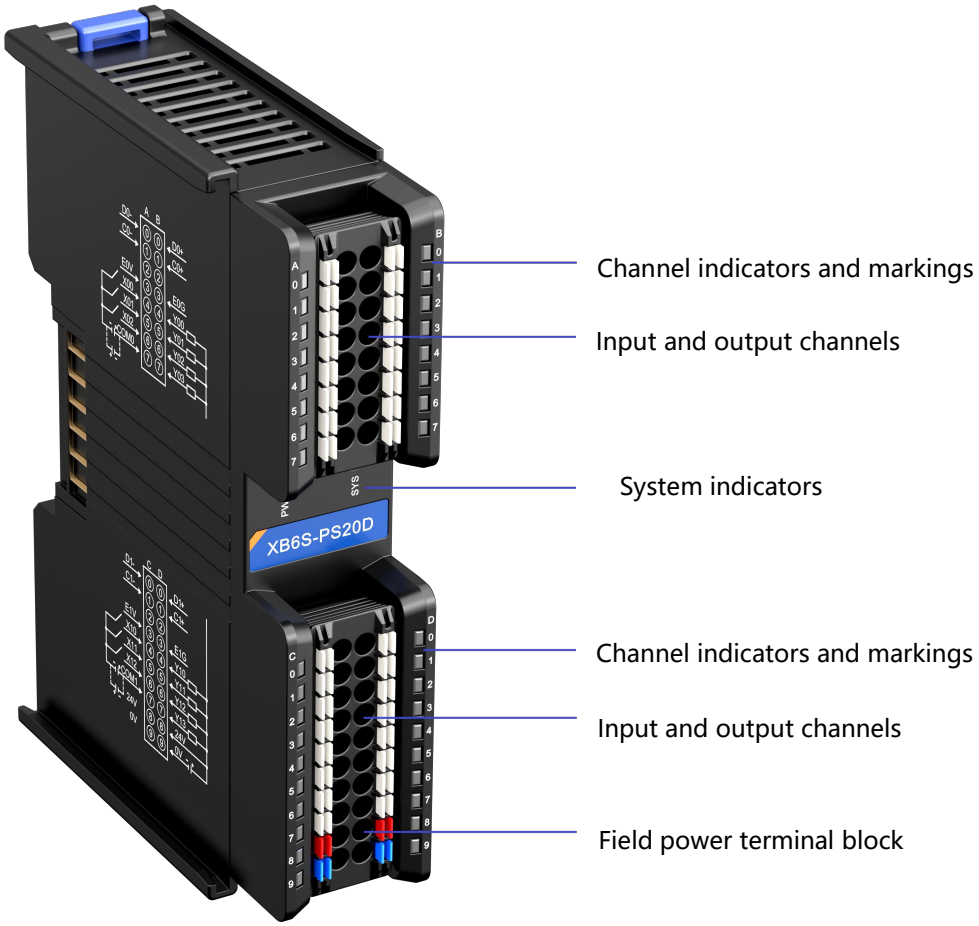
3.2 Digital parameters

Digital input	
Rated voltage	24VDC (20.4V~28.8V)
Signal points	6
Signal Type	NPN/PNP
OFF voltage/OFF current	-3V~+5V/0.9mA or less
ON voltage/ON current	11V~30V/2.1mA or more
Input current	4mA
Isolation method	Optocoupler Isolation
Isolation and withstand voltage	500VAC
Channel indicator light	Green LED light
Digital output	
Rated voltage	24VDC (20.4V~28.8V)
signal points	8
Signal Type	NPN
Load Type	Resistive load, inductive load
Single channel rated current	Max: 500mA
Port protection	Overcurrent protection
Isolation method	Optocoupler Isolation
Isolation and withstand voltage	500VAC
Channel indicator	Green LED

4 Panel

4.1 Panel structure

Name of each part of the product



4.2 Indicator light function

Name	Logo	Color	Status	Status Description
Power indicator	PWR	Green	Steady on	Power supply is normal
			Off	The product is not powered on or the power supply is abnormal
System operation indicator light	SYS	Green	Steady on	The system is running normally
			Flashing 1Hz	No business data interaction, waiting for business data interaction to be established
			Flashing 10Hz	Firmware Upgrade
			Off	System not working
Data line channel indicator	0	Green	Steady on	Modules establish communication
			Off	The module has not established communication
Clock line channel indicator	1	Green	Steady on	Modules establish communication
			Off	The module has not established communication
Input channel indicator	4~6 (left side)	Green	Steady on	Channel has signal input
			Off	The channel has no input or the signal input is abnormal
Output channel indicator	4~7 (right side)	Green	Steady on	Channel has signal output
			Off	The channel has no output or the signal output is abnormal

5 Installation and removal

5.1 Installation Guide

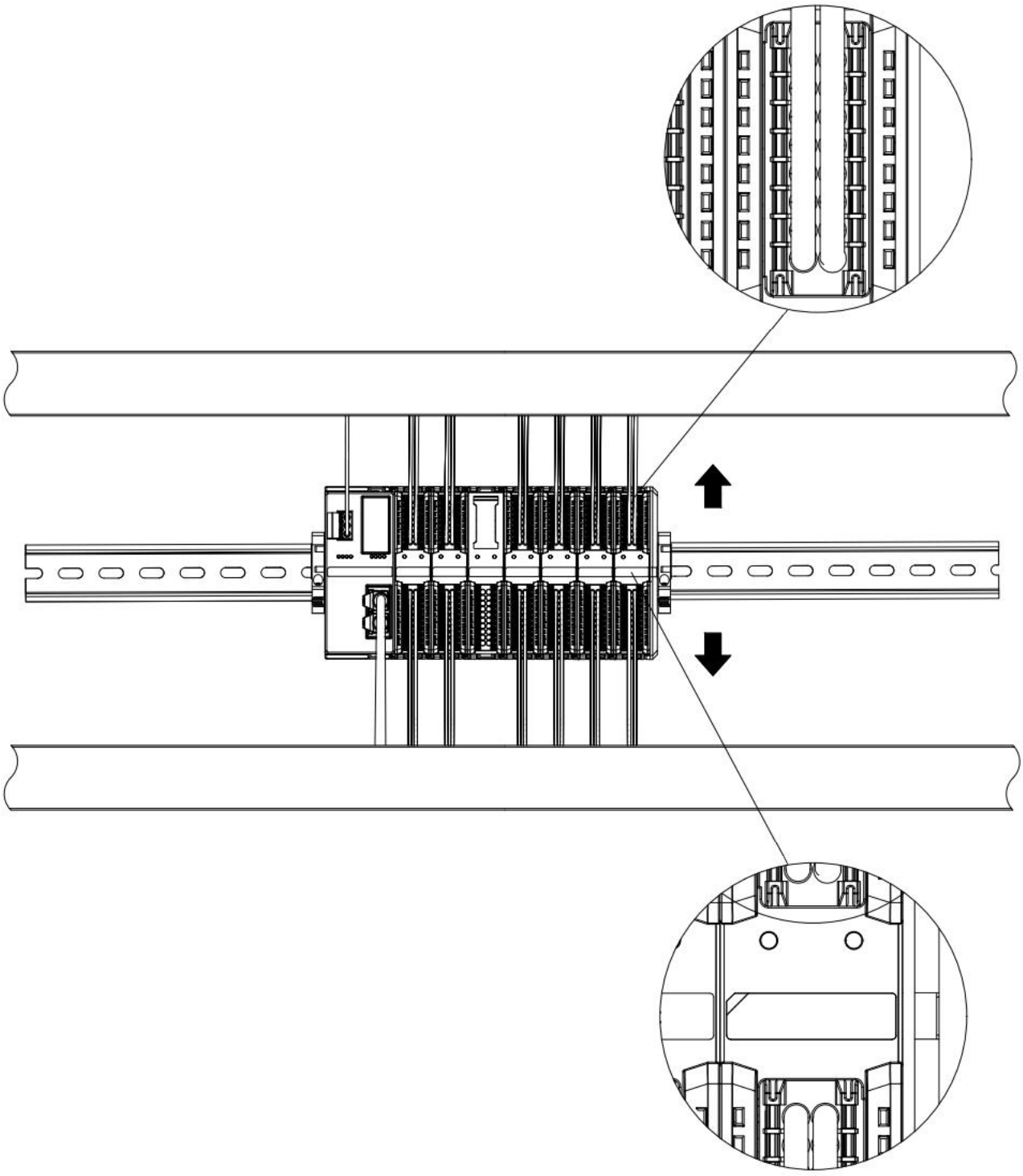
Installation\disassembly precautions

- **The module protection level is IP20. The module needs to be installed in a cabinet and used indoors.**
- **Ensure that the cabinet has good ventilation (such as installing an exhaust fan in the cabinet).**
- **Do not install this device near or over any equipment that may cause overheating.**
- **Be sure to install the module vertically on the fixed rail and ensure that there is sufficient air circulation around it (there should be at least 50 mm of air circulation space above and below the module).**
- **After installing the module, be sure to install the guide rail fixings at both ends to secure the module.**
- **Installation and removal must be performed with the power off.**
- **After the module is installed, it is recommended to connect and route the cables in an up-and-down manner.**

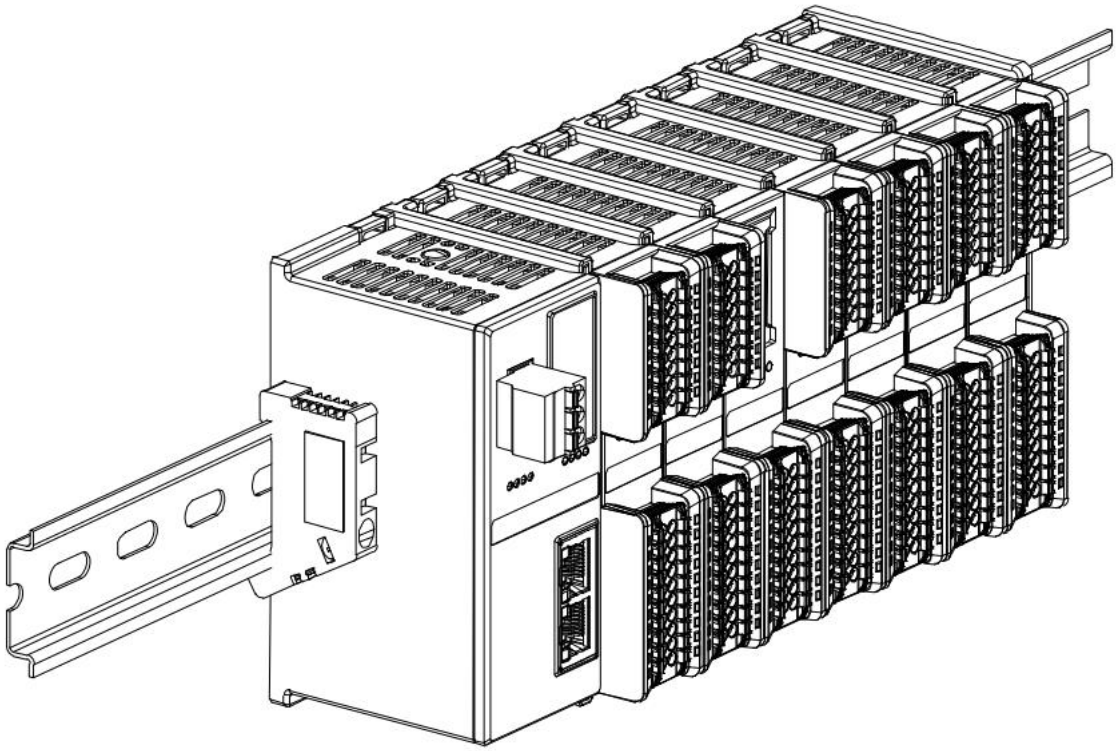
⚠ warning

- If used in a manner not specified in the product user manual, the protection provided by the equipment may be impaired.

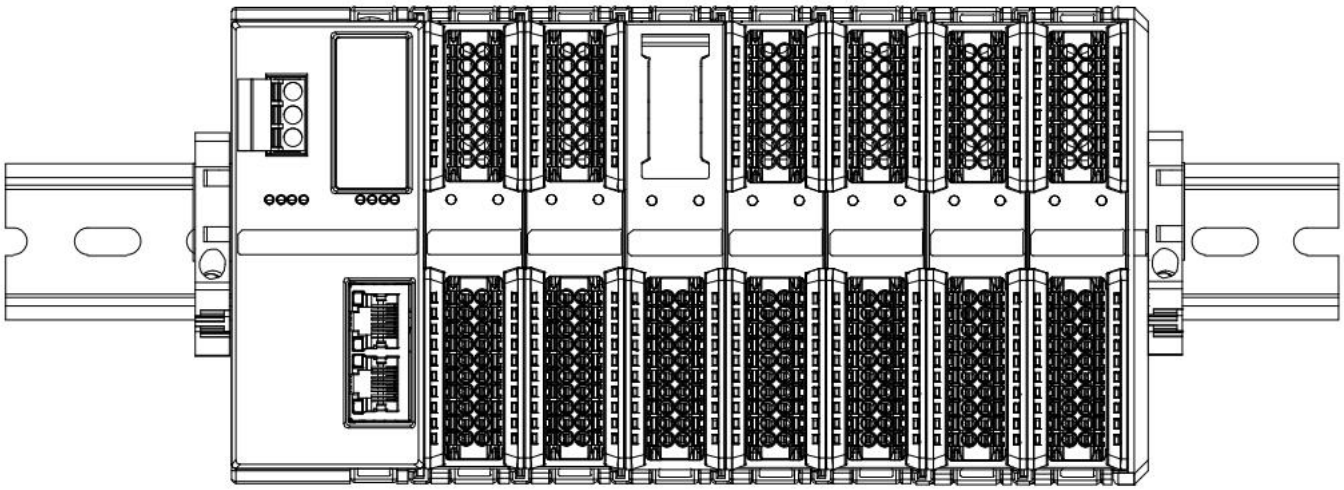
Module installation diagram, minimum clearance between top and bottom (≥ 50mm)



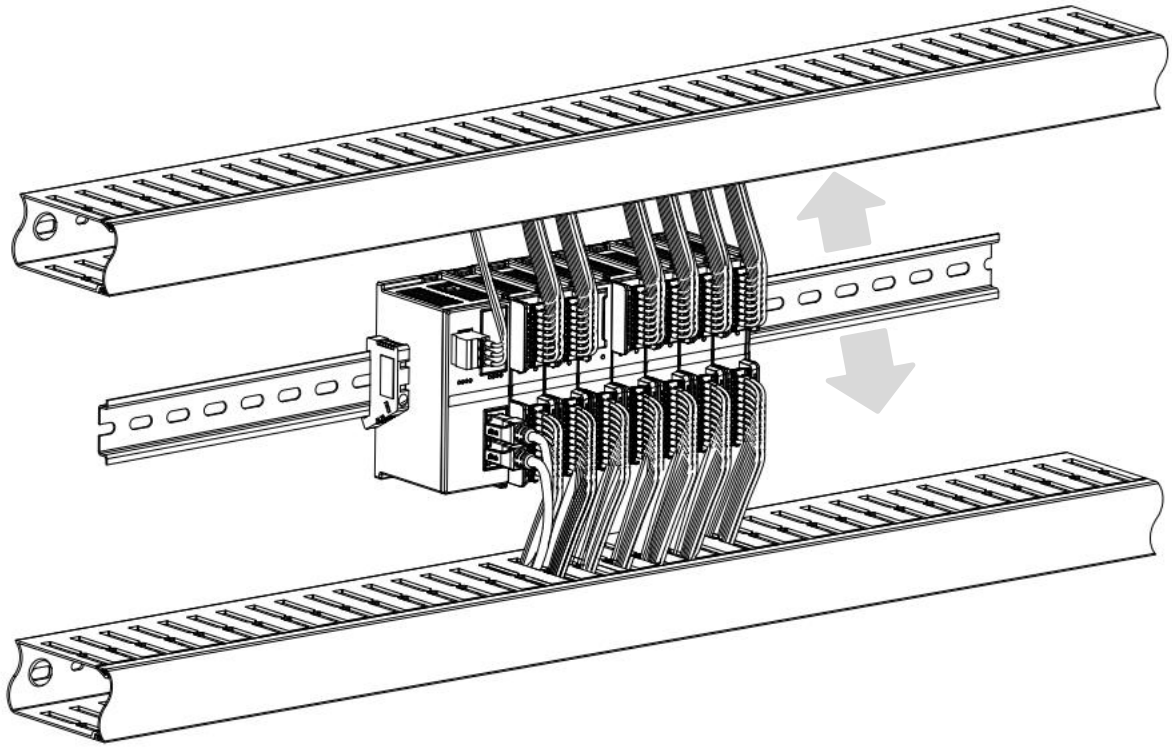
Ensure the module is installed vertically on the fixed rail



Be sure to install the rail fixings



Module upper and lower wiring diagram



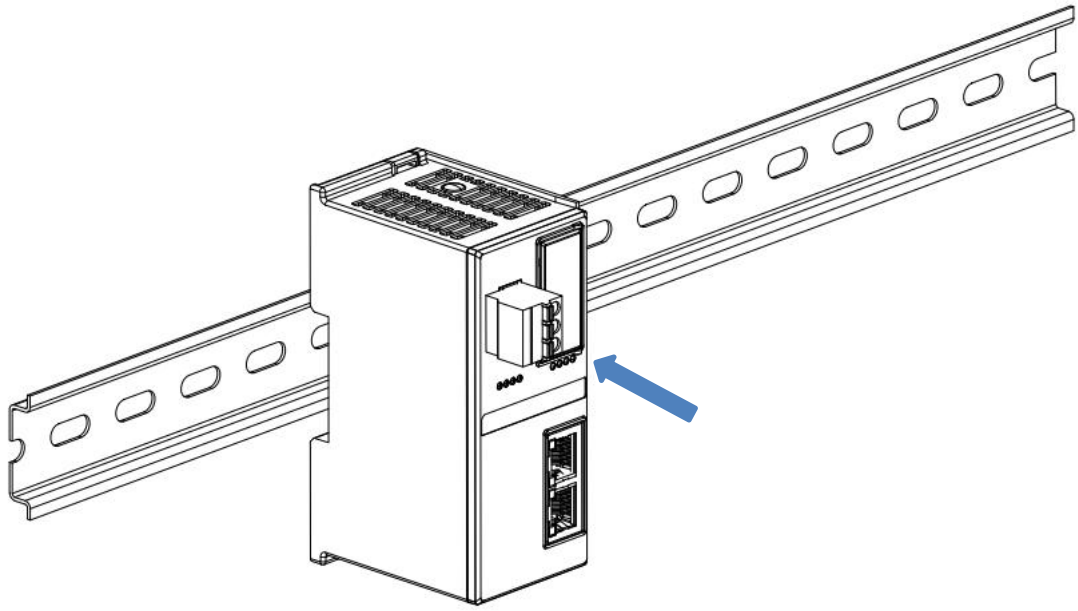
5.2 Installation and removal steps

Module installation and removal	
Module installation steps	1. Install the coupler module on the fixed guide rail first.
	2. Install the required I/O modules or functional modules in sequence on the right side of the coupler module.
	3. After installing all required modules, install the End cap to complete the module assembly.
	4. Install the guide rail fixings at both ends of the coupler module and End cap to secure the module.
Module disassembly steps	1. Loosen the guide rail fixings at both ends of the module.
	2. Use a flat-blade screwdriver to pry open the module buckle.
	3. Pull out the disassembled module.

5.3 Installation and disassembly diagram

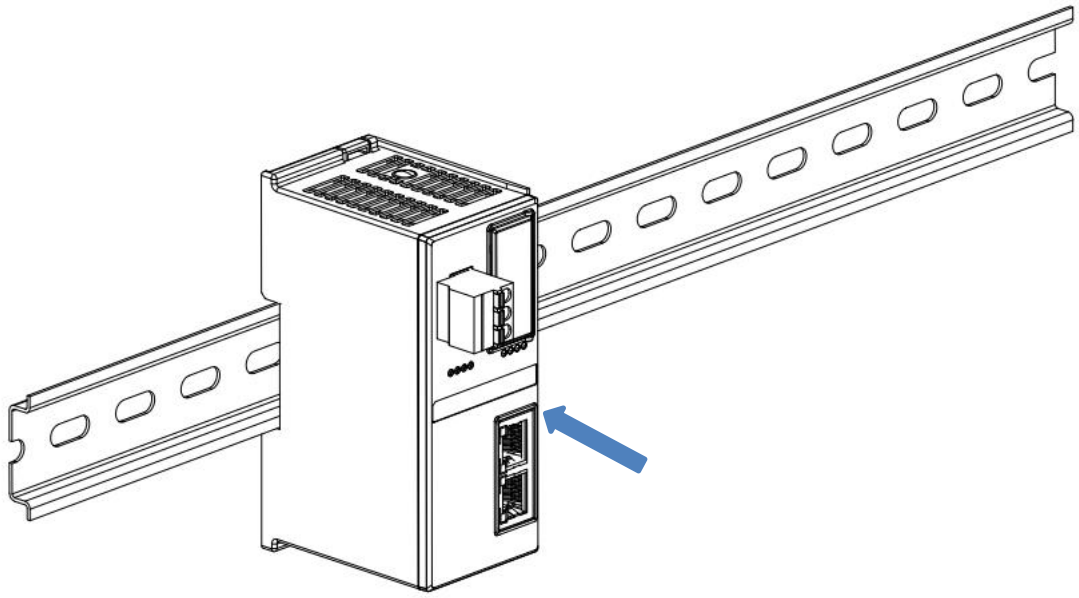
Coupler module installation

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



①

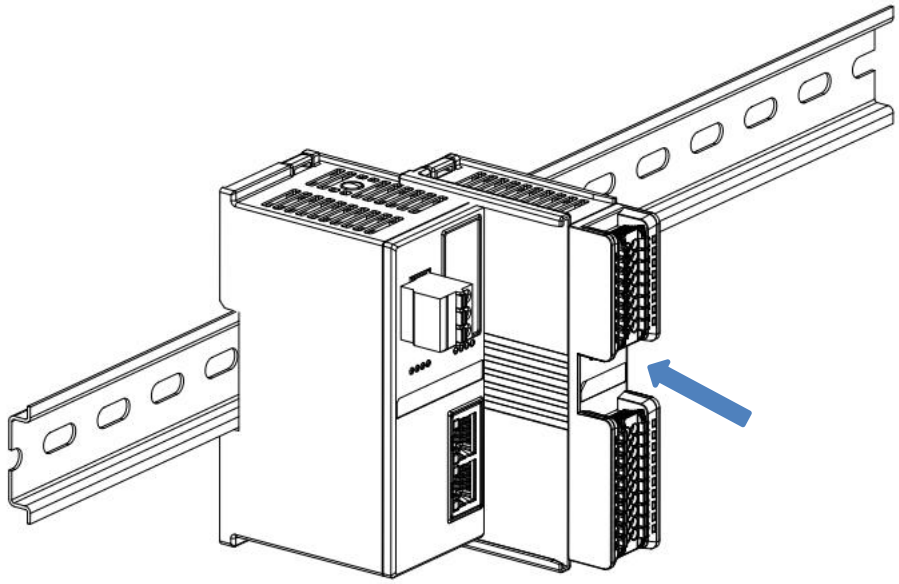
- Press the coupler module toward the guide rail with force until you hear a "click" sound. The module is then installed in place, as shown in Figure ② below.



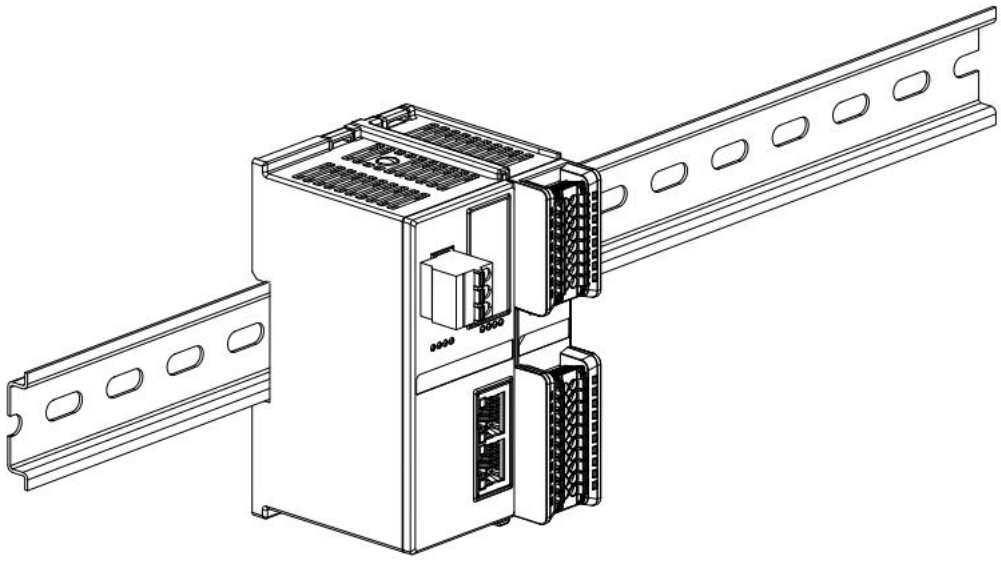
②

I/O module installation

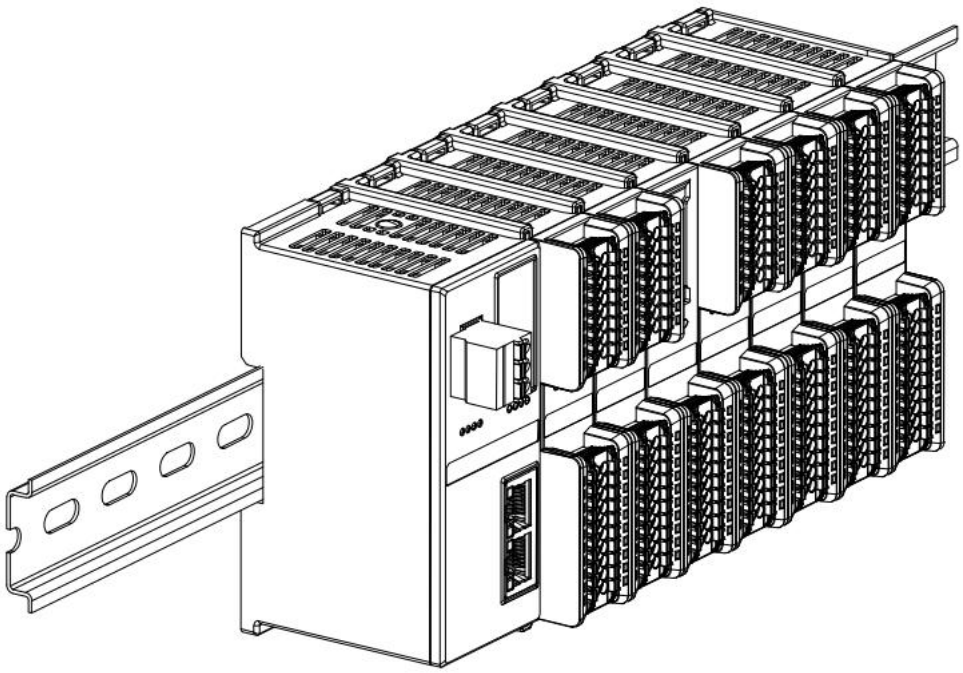
- Follow the steps above to install the coupler module, and install the required I/O modules or functional modules one by one. Push them in as shown in Figures ③, ④, and ⑤ below. When you hear a "click," the module is installed in place.



③



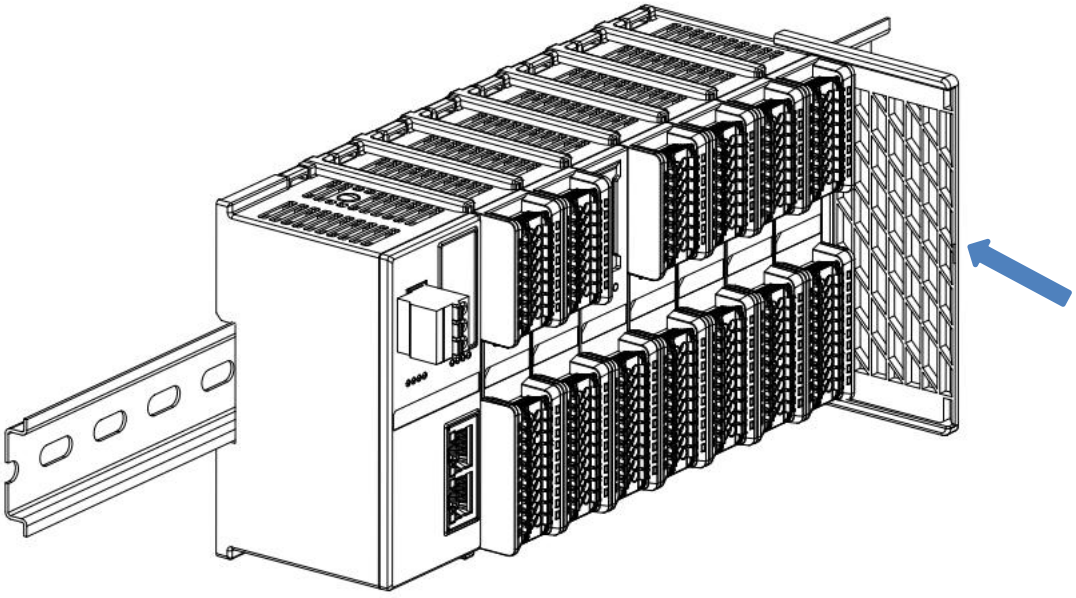
④



⑤

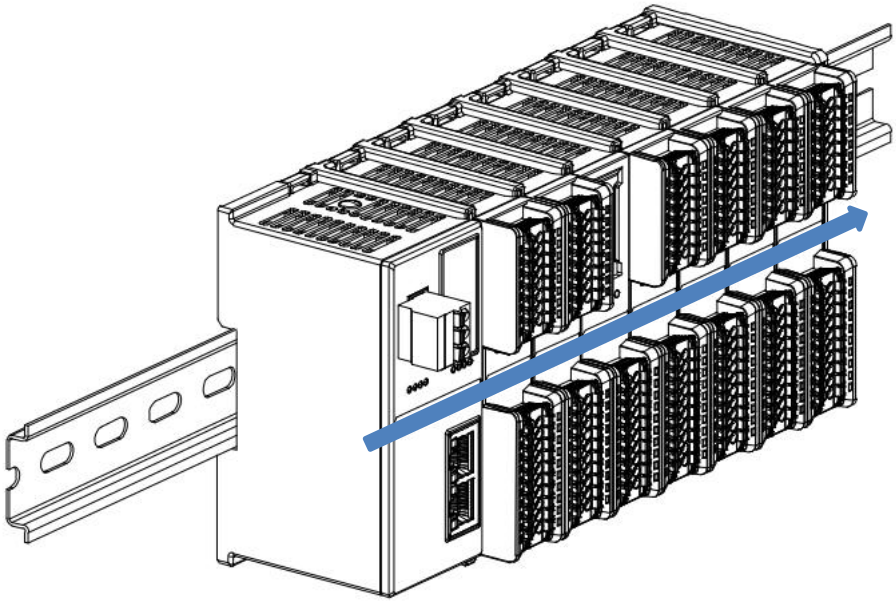
End cap installation

- Install the End cap on the right side of the last module, aligning the groove on the End cap with the guide rail. Refer to the installation method for the I/O module and push the End cap inwards into place, as shown in Figure ⑥ below.



⑥

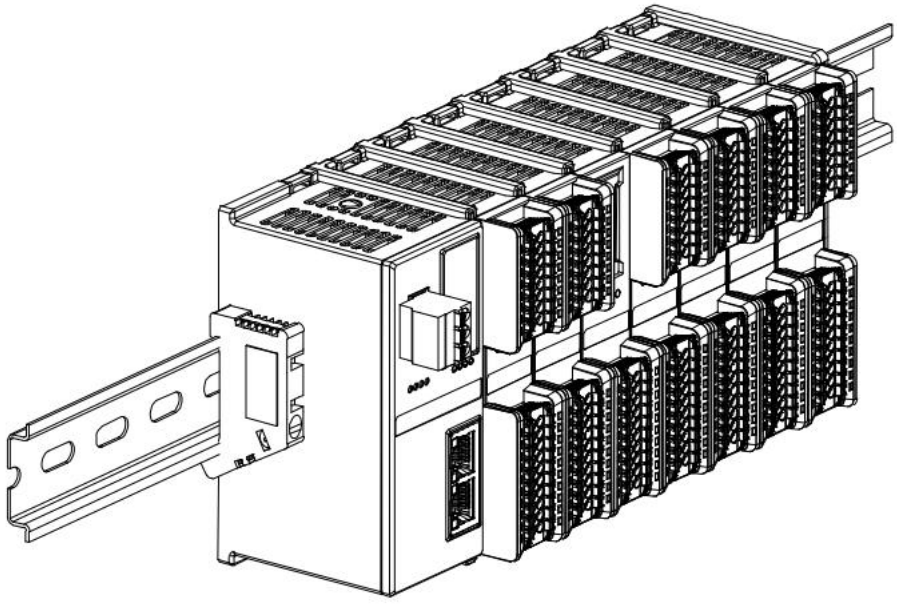
- After the End cap is installed, check whether the front of the entire module is flat and ensure that all modules and end covers are installed in place and the front is flush, as shown in Figure ⑦ below.



⑦

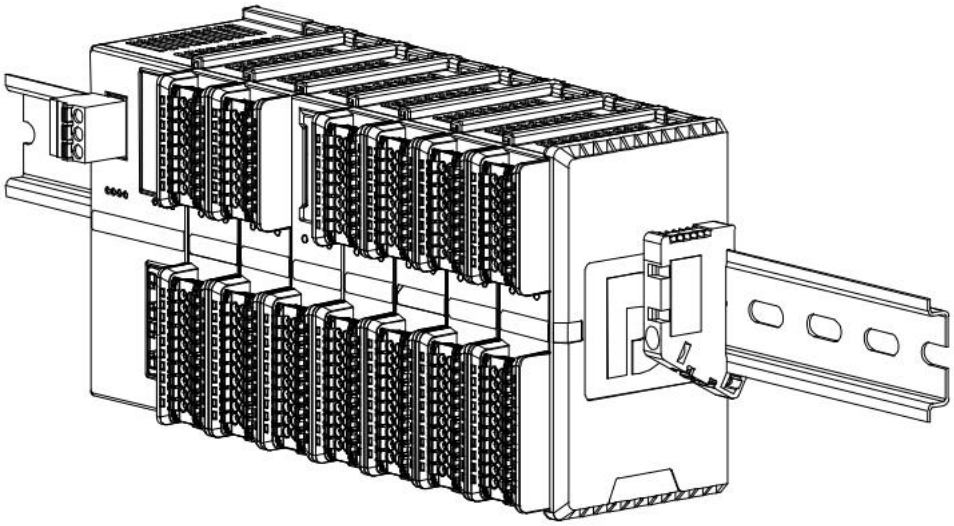
Guide rail fixing installation

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



⑧

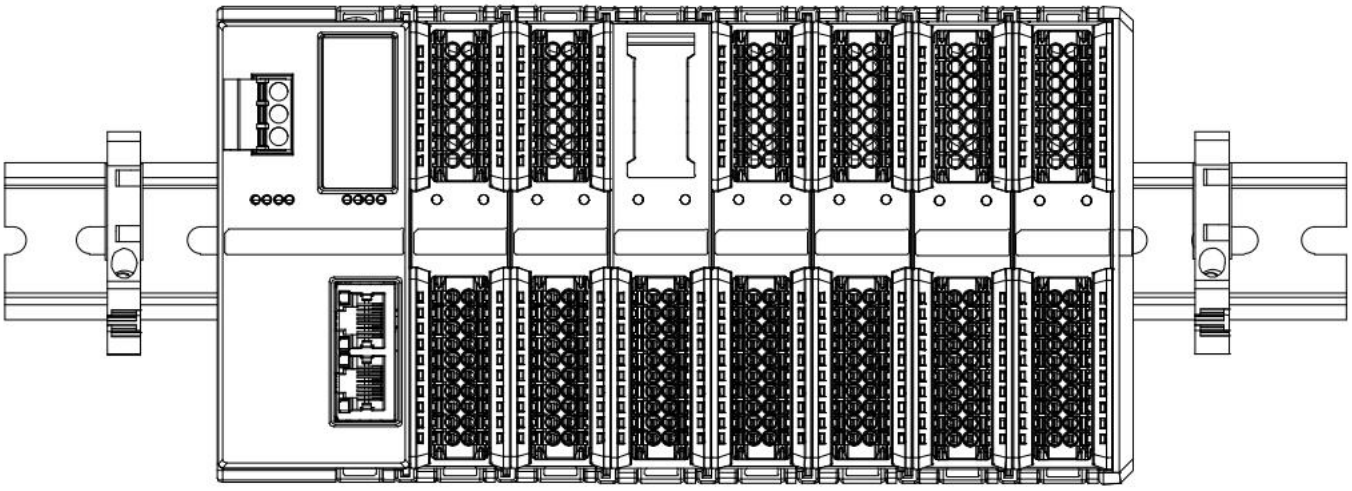
- Install the guide rail fixture on the right side of the End cap. First, push the guide rail fixture toward the coupler to ensure that the module is installed firmly, and then tighten the guide rail fixture with a screwdriver, as shown in Figure ⑨ below.



⑨

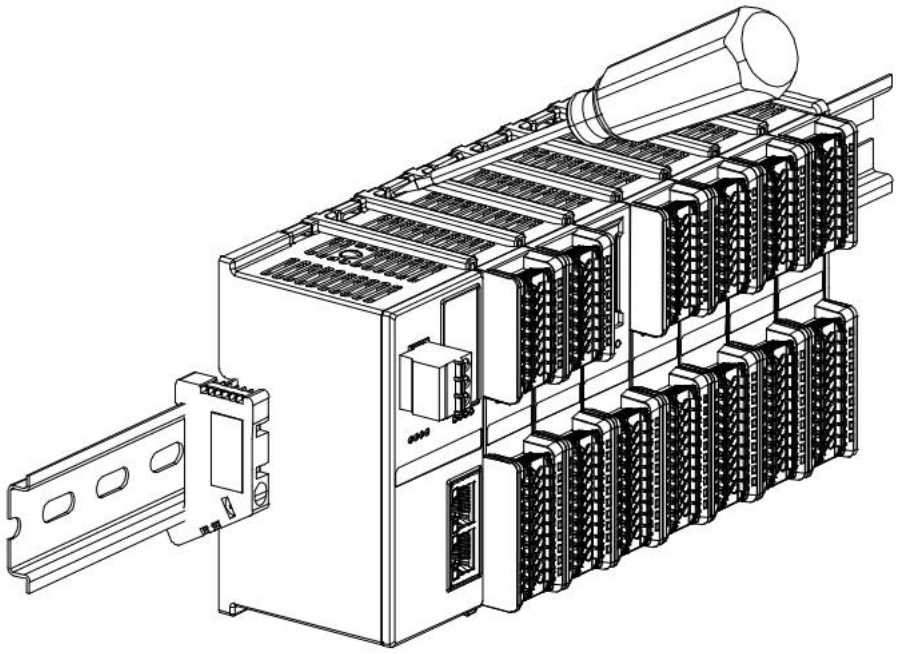
Disassembly

- Use a screwdriver to loosen the guide rail fixture at one end of the module and move it to one side to ensure there is a gap between the module and the guide rail fixture, as shown in Figure ⑩ below.

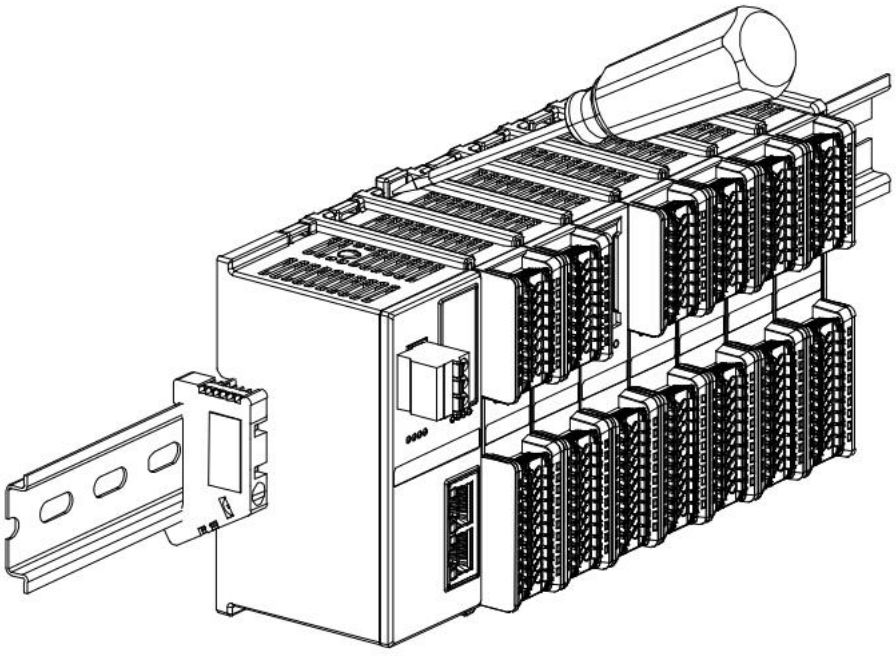


⑩

- Insert a flat-head screwdriver into the buckle of the module to be removed, and apply force sideways toward the module (until you hear a click), as shown in the figure below.⑪ and ⑫. Note: Each module has a buckle on the top and bottom, and both modules are operated in the same way.

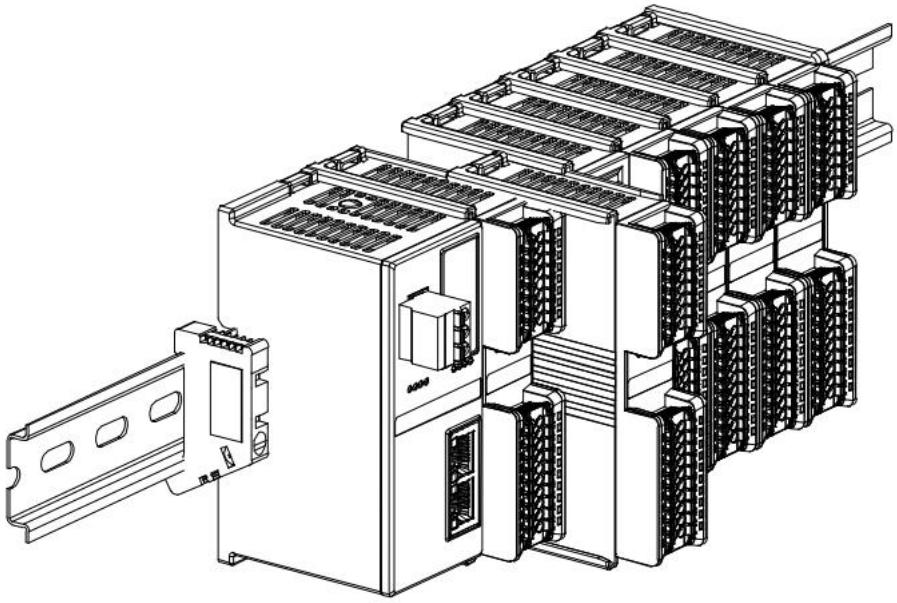


⑪



⑫

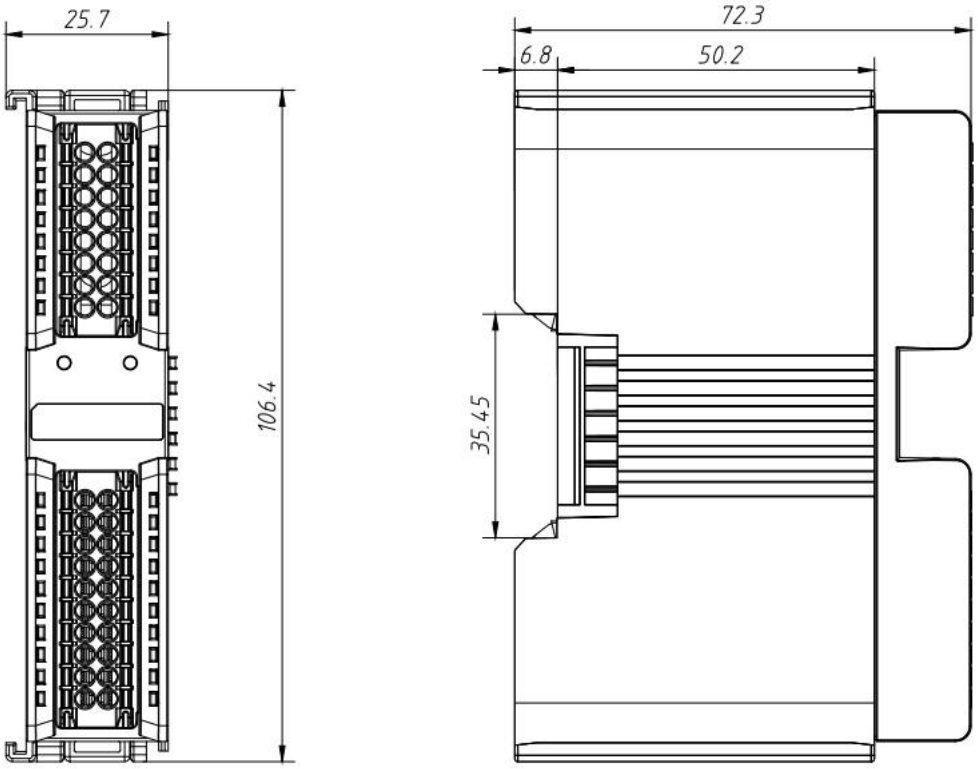
■ Follow the opposite steps of installing the module to disassemble it, as shown below.⑬shown.



⑬

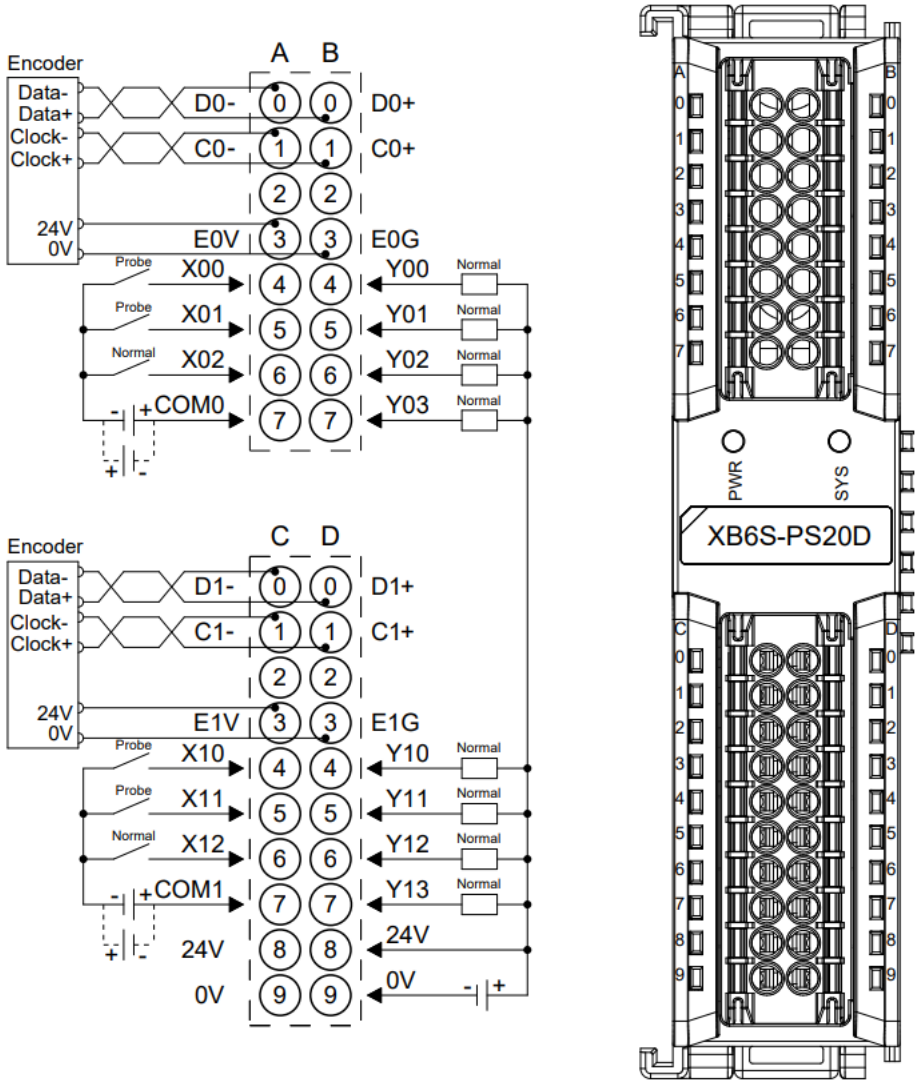
5.4 Dimensions

Overall specifications (unit: mm)



6 Wiring

6.1 Wiring Diagram



- For personal and equipment safety, it is recommended to disconnect the power supply when performing wiring operations.
- 24V internal conduction; 0V internal conduction.
- COM0 and COM1 are the common terminals of the input channels; NPN/PNP compatible.
- The load common power supply must use the same power supply as the module.

6.2 Terminal Block Definition

Encoder0					
A			B		
Terminal marking	Terminal Definition	Description	Terminal marking	Terminal Definition	Description
0	D+	Encoder data signal input+	0	D-	Encoder data signal input-
1	C+	Encoder clock signal output+	1	C-	Encoder clock signal output-
2	NC	Empty terminal	2	NC	Empty terminal
3	E0V	24V encoder power supply	3	E0G	0V encoder power supply
4	X00	DI channel 0 (probe function)	4	Y00	DO channel 0
5	X01	DI channel 1 (probe function)	5	Y01	DO channel 1
6	X02	DI channel 2	6	Y02	DO channel 2
7	COM0	Input channel common terminal	7	Y03	DO channel 3
Encoder1					
C			D		
Terminal marking	Terminal Definition	Description	Terminal marking	Terminal Definition	Description
0	D+	Encoder data signal input+	0	D-	Encoder data signal input-
1	C+	Encoder clock signal output+	1	C-	Encoder clock signal output-
2	NC	Empty terminal	2	NC	Empty terminal
3	E1V	24V encoder power supply	3	E1G	0V encoder power supply
4	X10	DI channel 0 (probe function)	4	Y10	DO channel 0

5	X11	DI channel 1 (probe function)	5	Y11	DO channel 1
6	X12	DI channel 2	6	Y12	DO channel 2
7	COM1	Input channel common terminal	7	Y13	DO channel 3
8	24V	Field side power supply 24V	8	24V	Field side power supply 24V
9	0V	Field side power supply 0V	9	0V	Field side power supply 0V

7 Use

7.1 Process data

7.1.1 Uplink data

Uplink data 26 bytes (13 bytes for each encoder, encoder [n] ranges from 0 to 1)				
Name	**Meaning**	**Value range**	**Data Type**	**Length**
E[n] Input CH0 (Latch)	Encoder probe input signal channel 0	0: No signal input 1: There is signal input	bool	1 bit
E[n] Input CH1 (Latch)	Encoder probe input signal channel 1	0: No signal input 1: There is signal input	bool	1 bit
E[n] Input CH2	Encoder common input signal channel 2	0: No signal input 1: There is signal input	bool	1 bit
E[n] Latched Flag CH0	Encoder probe input channel 0 latch completion flag	0: 1->0 latch once, toggle once 1: 0->1 latch once, toggle once	bool	1 bit
E[n] Latched Flag CH1	Encoder probe input channel 1 latch completion flag	0: 1->0 latch once, toggle once 1: 0->1 latch once, toggle once	bool	1 bit
E[n] Count Value	Encoder count value	0~2^32-1	unsigned32	4 bytes
E[n] Latch Value CH0	Encoder probe input channel 0 latch value	0~2^32-1	unsigned32	4 bytes
E[n] Latch Value CH1	Encoder probe input channel 1 latch value	0~2^32-1	unsigned32	4 bytes

Uplink data description:

- **Encoder probe input signal channel E[n] Input CH0/CH1 (Latch)**
  Each encoder is equipped with two probe input channels, indicating the presence or absence of input signals from the corresponding probe input channels.
  When the latch function of the probe input channel is not enabled, it can be used as a normal digital input channel.

- **Encoder common input signal channel E[n] Input CH2**
  Each encoder is equipped with one common digital input channel, indicating the presence or absence of the corresponding DI channel input signal.

- **Encoder probe input channel latch completion flag E[n] Latched Flag CH0/CH1**
  One encoder is equipped with two probe input channels. After the probe input channel completes a latch, the flag bit will toggle from 0 to 1 or from 1 to 0.
  Example 1: The latch completion flag of encoder 0 probe input channel 1 is 0. After completing one latch, the flag becomes 1. After completing another latch, the flag becomes 0.

- **Encoder count value E[n] Count Value**
  The encoder count value corresponds to the current count value of the corresponding encoder and ranges from 0 to 2^32-1. The actual count range of an encoder is determined by the LSB and MSB positions of the encoder. The encoder count range is 0 to 2MSB-LSB+1-1.

- **Encoder probe input channel latch value E[n] Latch Value CH0/CH1**
  Each encoder is equipped with two probe input channels. By inputting signals that meet the specified conditions into the probe input channels, the current count value of the corresponding encoder can be quickly latched. The value range is 0 to 2^32-1. The actual count range of an encoder is determined by the LSB and MSB positions of the encoder. The encoder count range is 0 to 2MSB-LSB+1-1. The latched value has the same range as the count value: 0 to 2MSB-LSB+1-1.

7.1.2 Downlink data

2 bytes of downlink data (1 byte for each encoder, encoder [n] ranges from 0 to 1)				
Name	**Meaning**	**Value range**	**Data Type**	**Length**
E[n] Output CH0	Encoder output channel 0	0: Output high level 24V 1: Output low level 0V	bool	1 bit
E[n] Output CH1	Encoder output channel 1	0: Output high level 24V 1: Output low level 0V	bool	1 bit
E[n] Output CH2	Encoder output channel 2	0: Output high level 24V 1: Output low level 0V	bool	1 bit
E[n] Output CH3	Encoder output channel 3	0: Output high level 24V 1: Output low level 0V	bool	1 bit
E[n] Latch CH0 Enable	Encoder probe input channel 0 latch enable	0: Disability 1: Enable	bool	1 bit
E[n] Latch CH1 Enable	Encoder probe input channel 1 latch enable	0: Disability 1: Enable	bool	1 bit

Downlink data description:

- **Encoder output channel (normal output) E[n] Output CH0/CH1/CH2/CH3**
  Digital channel output (NPN type output): Set to "0" to output high level 24V, set to "1" to output low level 0V.

- **Encoder probe input channel latch enable E[n] Latch CH0/CH1 Enable**
  If the encoder input latch channel enable flag is set to 1, the latch function is enabled; if it is set to 0, the latch function is disabled.

7.2 Configuration parameter definition

The module configuration has a total of 16 parameters. The two encoders each have 8 configuration parameters and are configured independently. The configuration parameters of encoder 0 are introduced as an example, as shown in the following table.

Function	Parameter name	Value range	Default value
Encoder SSI frame length	E0 Frame Length	10~40	13
The clock frequency when the encoder reads data	E0 Clock Frequency	0: 2MHz	0
		1: 1.5MHz	
		2: 1MHz	
		3:500KHz	
		4: 250KHz	
		5:125KHz	
Encoder interval time	E0 Interval Time	1~50000 (unit: 100us)	1
Encoder encoding method	E0 Encoder Type	0: Binary	1
		1: Gray (Gray code)	
LSB bit number of the encoder position value	E0 LSB Position	0~39	0
MSB bit number of the encoder position value	E0 MSB Position	1~40	12
Encoder 0 probe mode	E0 Latch Mode	0: CH0 Single, CH1 Single Channel 0 single, channel 1 single	0
		1: CH0 Repeat, CH1 Single Channel 0 repeat, channel 1 single	
		2: CH0 Single, CH1 Repeat Channel 0 single, channel 1 repeated	
		3: CH0 Repeat, CH1 Repeat Channel 0 repeat, channel 1 repeat	
Encoder 0 probe trigger edge	E0 Latch Edge	0: CH0 Raising, CH1 Raising Channel 0 rising edge, channel 1 rising edge	0
		1: CH0 Falling, CH1 Raising Channel 0 falling edge, channel 1 rising edge	
		2: CH0 Raising, CH1 Falling Channel 0 rising edge, channel 1 falling edge	

		3: CH0 Falling, CH1 Falling Channel 0 falling edge, channel 1 falling edge	

Parameter Description:

Encoder SSI frame length Frame Length

LSB Position of the position value

MSB Position of the position value

The frame length parameter, combined with the position number LSB and MSB parameters, can set the resolution and total value of the encoder count. The resolution is the value that increases per revolution of the encoder.

Clock Frequency when reading data

The default clock frequency is 0, which is 2MHz.

Interval Time

The default value is 1, i.e. 100us, and the configurable range is 1~50000 (100us).

Encoder encoding method Encoder Type

The default value is 1, which enables Gray code conversion. Setting it to 0 disables Gray code conversion and uses binary code.

Probe function parameters include the probe mode (Latch Mode) and the probe trigger edge (Latch Edge). Each encoder is equipped with two probe input channels. By inputting the corresponding signal into the probe input channel, the corresponding encoder count value can be latched.

Probe Mode: The probe mode parameter can configure each probe function channel of the encoder to single/continuous mode.

If the probe function channel is configured in single mode, after the probe function is enabled, the count value can be latched once when the channel inputs a signal that meets the set conditions; when a signal that meets the set conditions is input again subsequently, the count value will no longer be latched unless the probe function channel is re-enabled.

If the probe function channel is configured in continuous mode, after the probe function is enabled, each time the channel inputs a signal that meets the set conditions, the count value can be latched once, and the count value can be latched multiple times.

Probe trigger edge: The probe trigger edge parameter allows you to configure each encoder probe channel for rising or falling edge triggering. The latch trigger signals for each encoder's two probe function channels can be configured independently, and the latched values can be displayed separately.

The probe input channel is compatible with both PNP and NPN signals through the COM terminal. When the COM terminal is connected to 0V, the input signal is PNP type, and a high-level 24V input signal is valid, while a low-level 0V input signal is invalid. When the COM terminal is connected to 24V, the input signal is NPN type, and a low-level 0V input signal is valid, while a high-level 24V input signal is invalid.

Rising edge triggering means that the probe input channel is triggered from an invalid signal to a valid signal, and falling edge triggering means that the probe input channel is triggered from a valid signal to an invalid signal.

7.3 Module Configuration Description

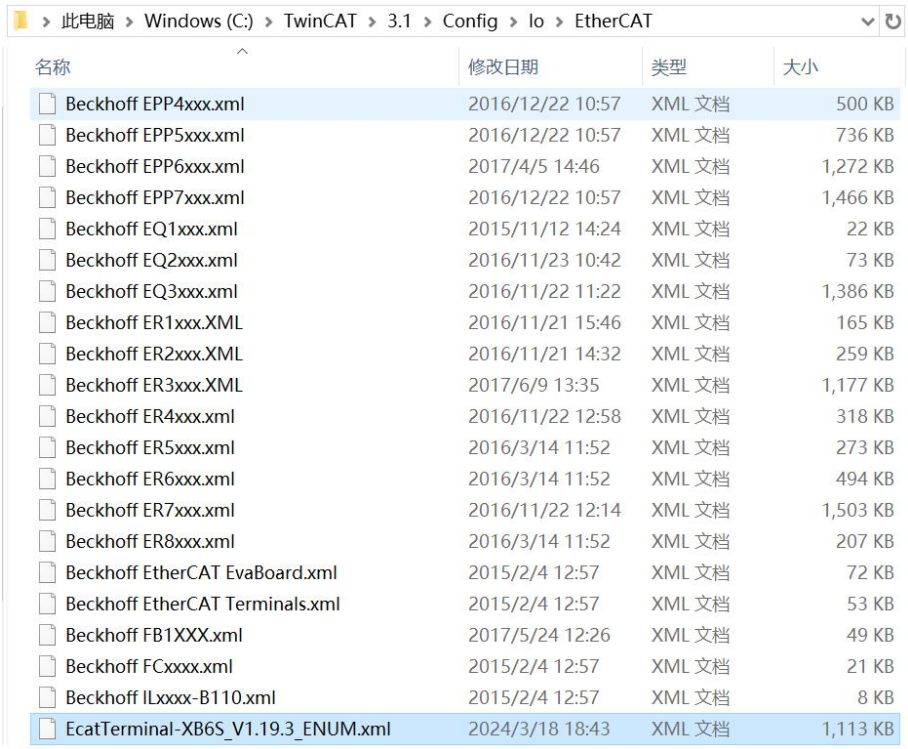
7.3.1 Application in TwinCAT3 software environment

1、Preparation

- **Hardware environment**
  - **Module model XB6S-PS20D**
  - **EtherCAT coupler, end cap**
    This description takes the XB6S-EC2002 coupler as an example
  - **A computer with TwinCAT3 software pre-installed**
  - **EtherCAT dedicated shielded cable**
  - **Handwheel/encoder/orthogonal pulse generator and other equipment**
  - **A switching power supply**
  - **Module mounting rails and rail fixings**
  - **Device Profile**
    Configuration file acquisition address:
    https://www.solidotech.com/cn/resources/configuration-files
- **Hardware configuration and wiring**
  Please follow the "5 Installation and removal""6 Wiring"

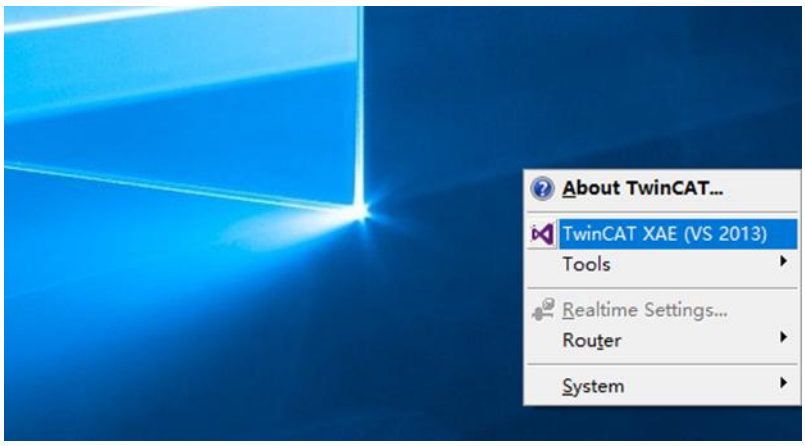
2、Pre-configured profiles

Place the ESI configuration file (EcatTerminal-XB6S_V1.19.3_ENUM.xml) in the TwinCAT installation directory "C:\TwinCAT\3.1\Config\Io\EtherCAT", as shown in the figure below.

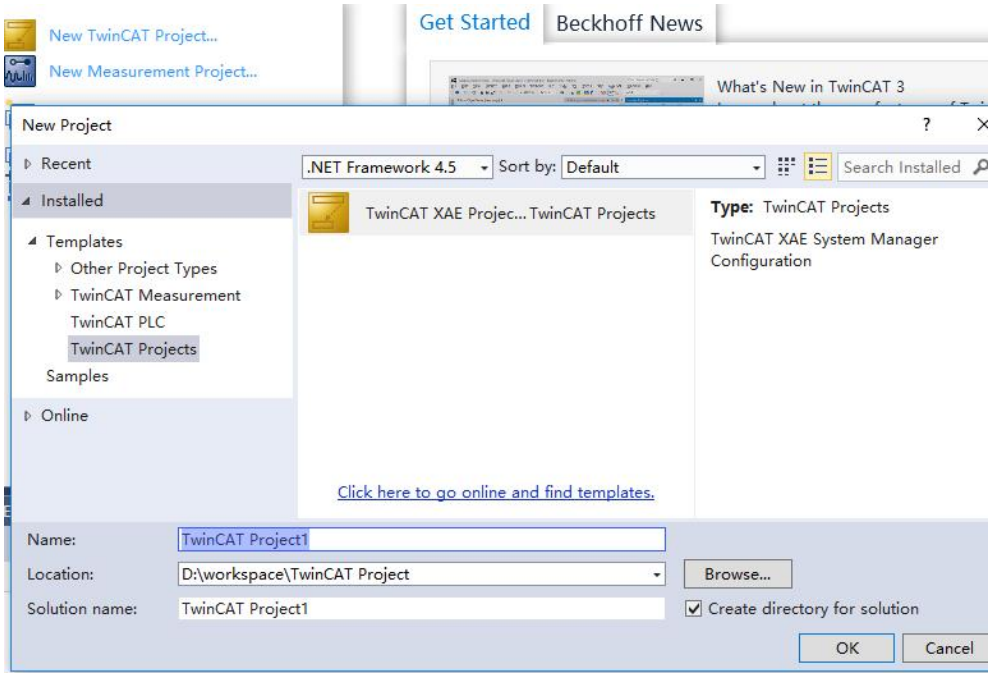


3、Create a project

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

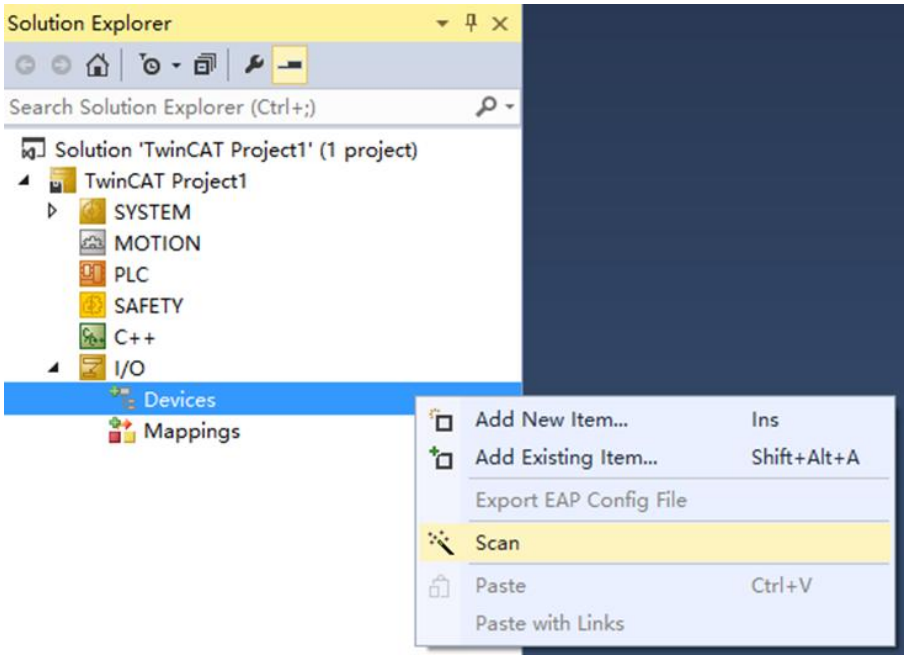


b. Click "New TwinCAT Project". In the pop-up window, enter the project name and solution name in "Name" and "Solution name" respectively, and the project path in "Location". You can select the default values for these three items. Then click "OK". The project is created successfully, as shown in the figure below.

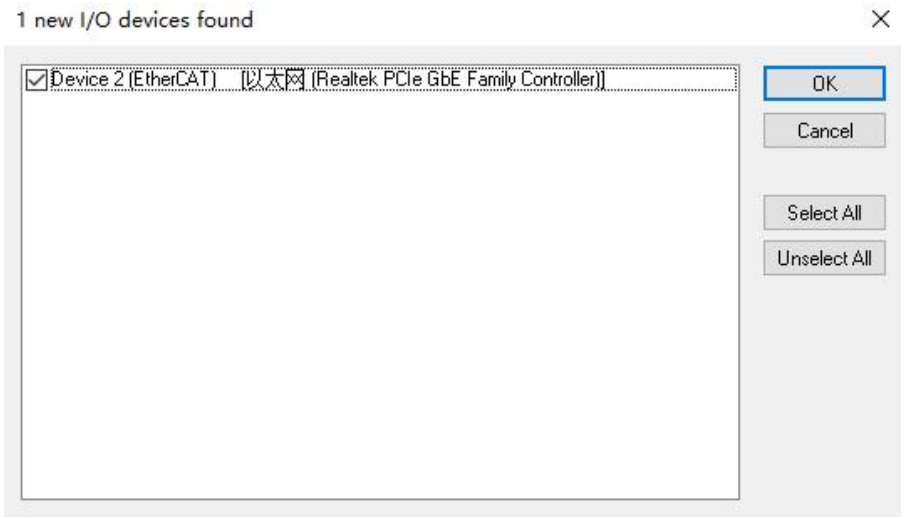


4、Scanning Devices

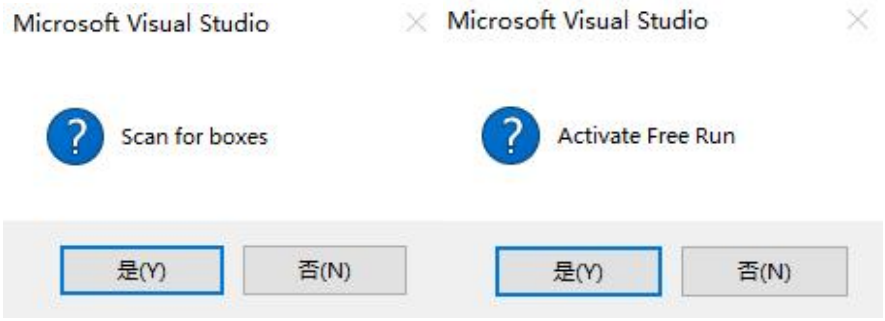
a. After creating the project, right-click the "Scan" option under "I/O -> Devices" to scan the slave devices, as shown in the figure below.



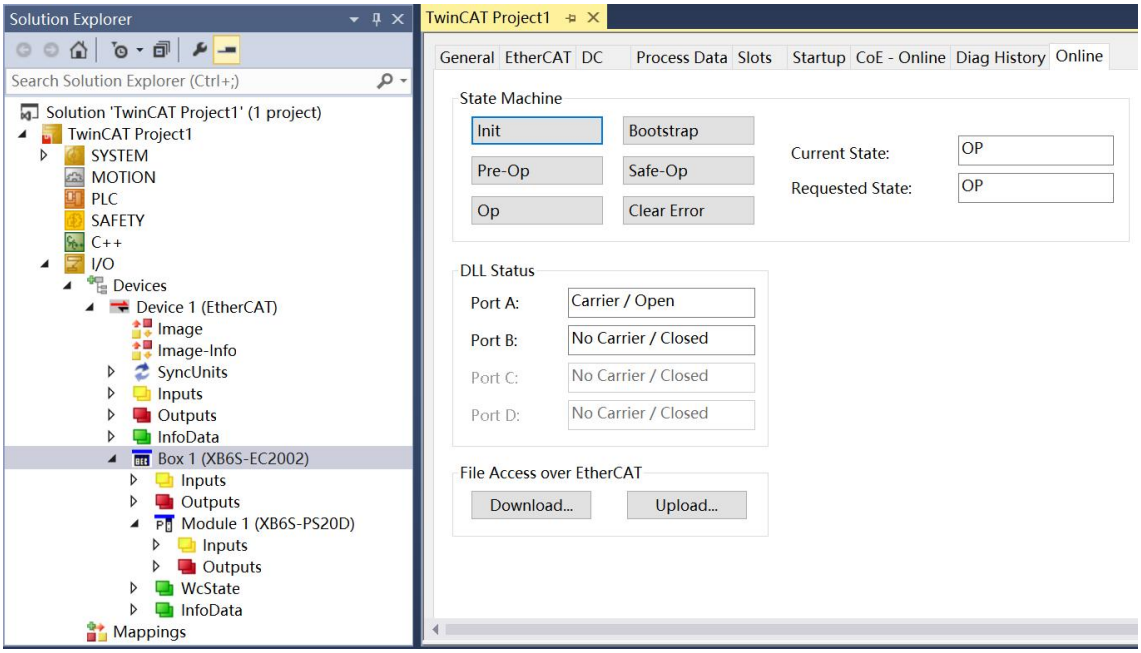
b. Check the "Local Area Connection" network card, as shown below.



c. In the pop-up window "Scan for boxes", click and select "Yes"; in the pop-up window "Activate Free Run", click and select "Yes", as shown in the following figure.

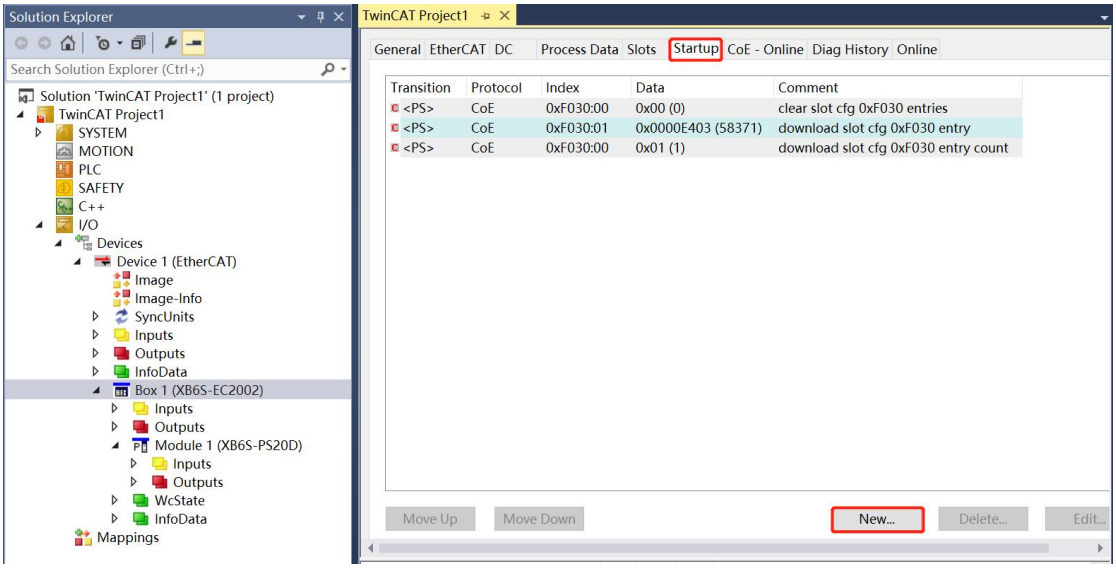


d. After scanning the devices, you can see Box 1 (XB6S-EC2002) and Module 1 (XB6S-PS20D) in the left navigation tree. Under "Online", you can see that TwinCAT is in "OP" status, and the RUN indicator of the slave device is steady on, as shown in the figure below.

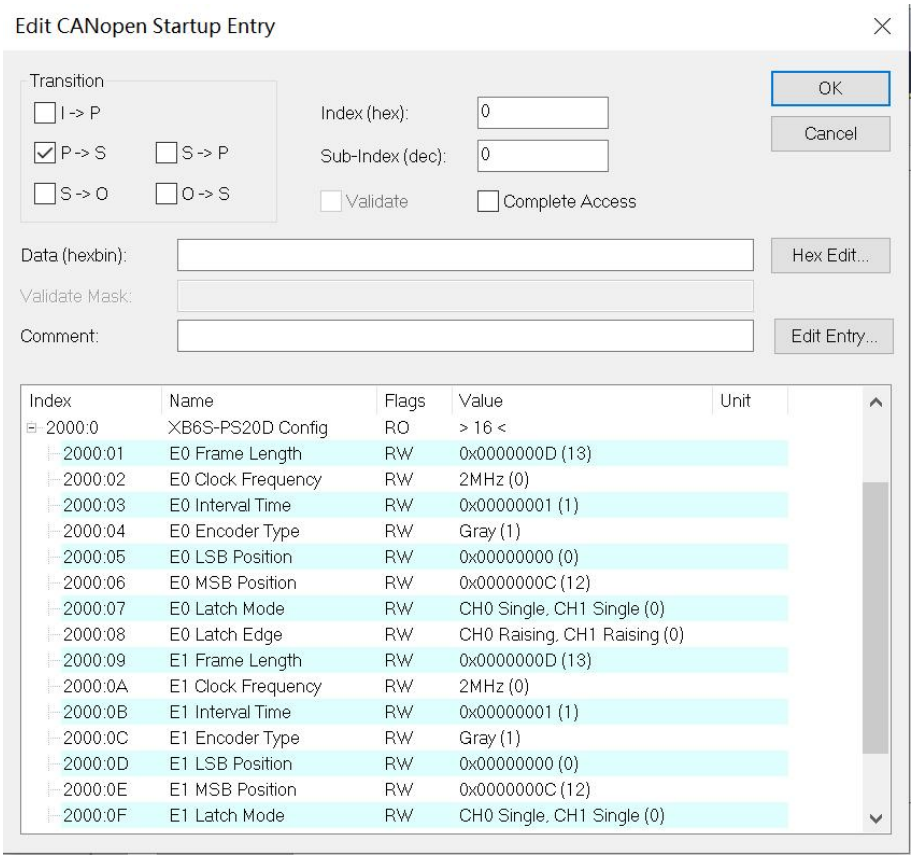


5、Verify basic functionality

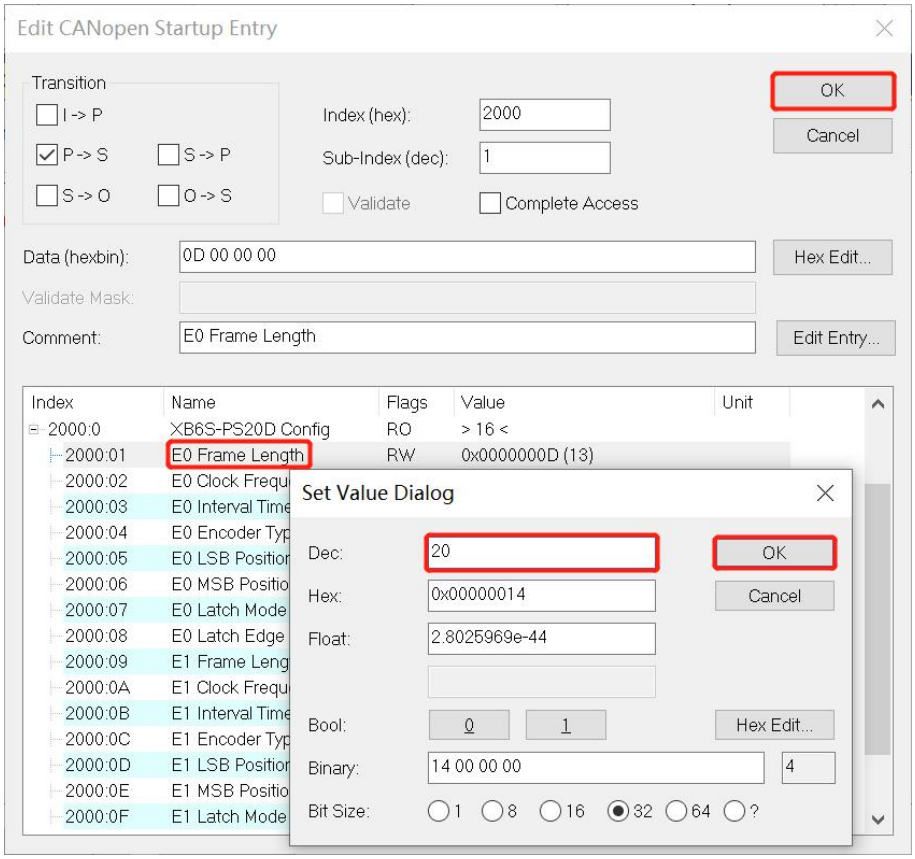
a. Click "Box1 -> Startup -> New" in the left navigation tree to enter the configuration parameter editing page, as shown in the figure below.



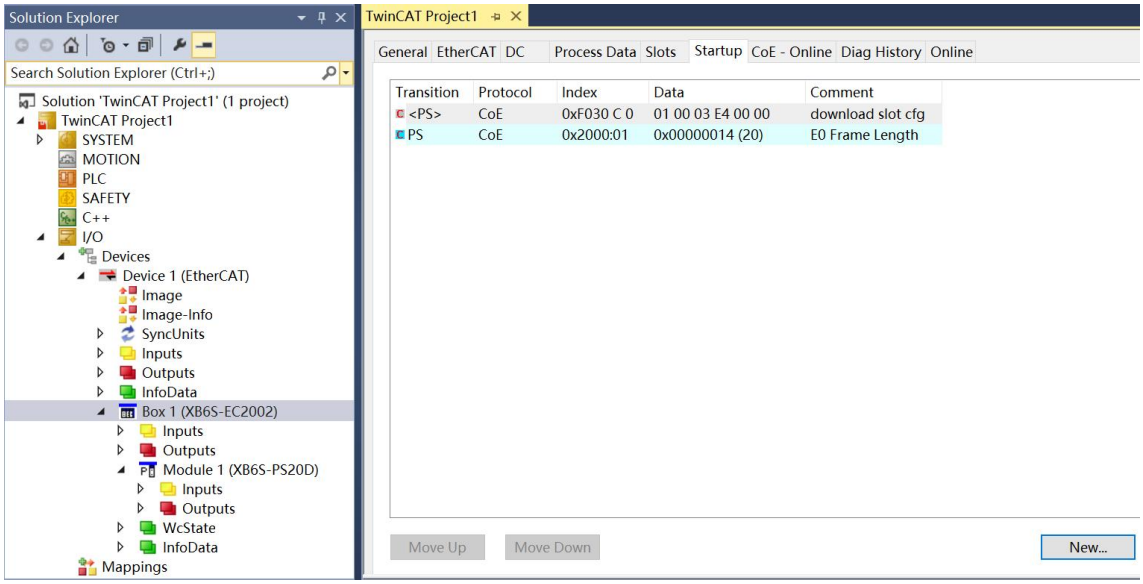
b. In the Edit CANopen Startup Entry pop-up window, click the "+" in front of Index 2000:0 to expand the configuration parameter menu. You can see 16 configuration parameters. Click any parameter to set the related configuration, as shown in the figure below.



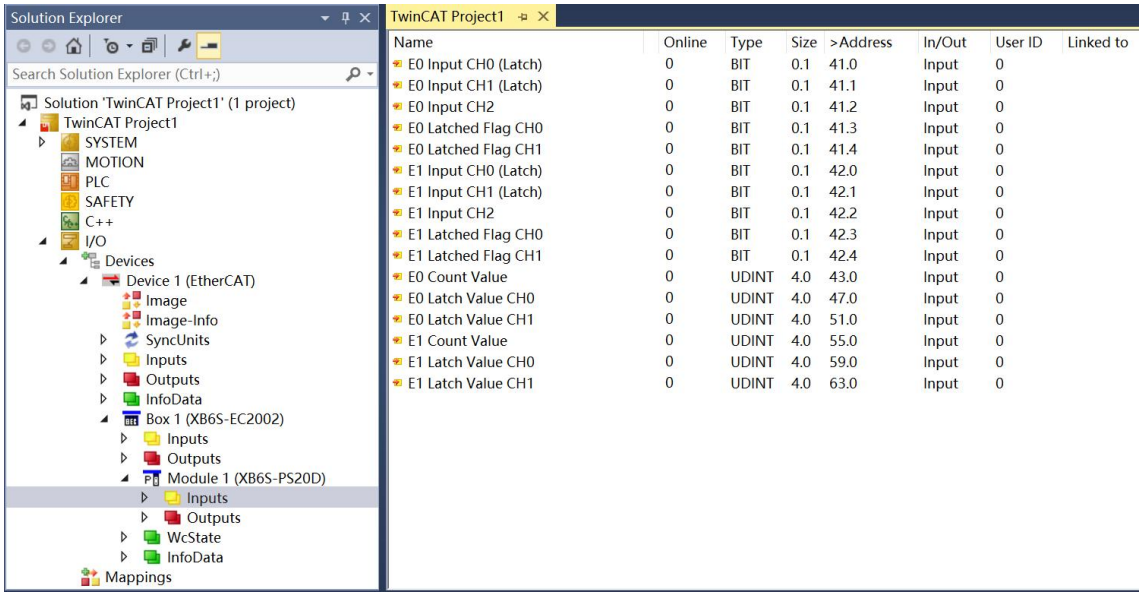
c. For example, to modify the SSI frame length parameter of encoder 0, double-click "E0 Frame Length" and modify the parameter value, as shown in the figure below.



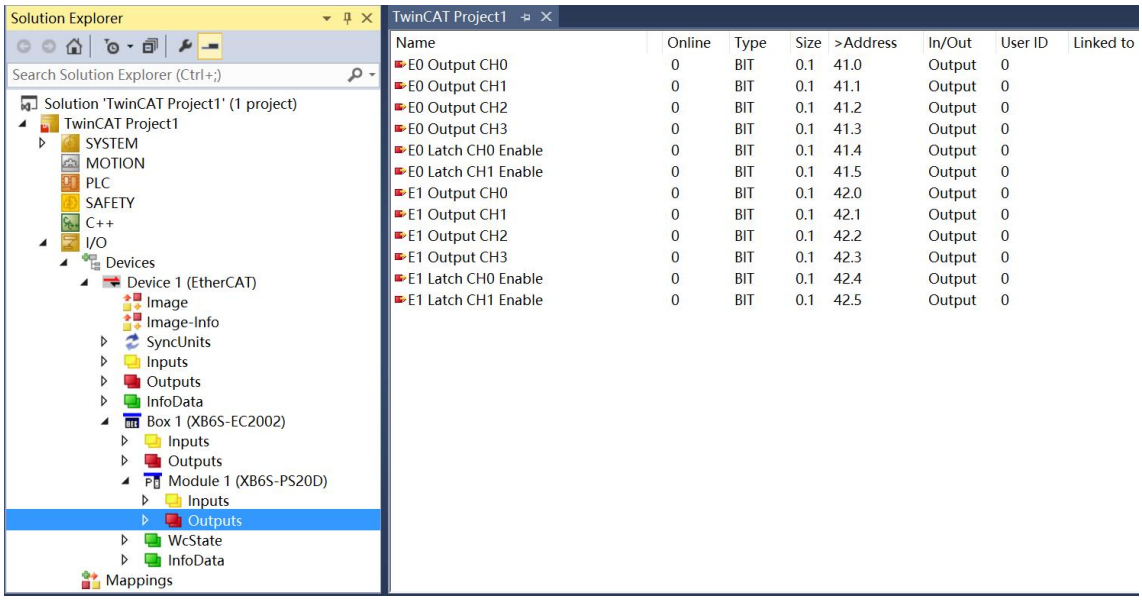
d. After the parameter modification is completed, the modified parameter items and parameter values can be seen under Startup, as shown in the figure below. After the parameter setting is completed, the Reload operation and the module power-on are required to realize the automatic transmission of parameter settings by the master station.



e. The left navigation tree "Module 1 -> Inputs" displays the module's uplink data and is used to monitor the module's input, as shown in the following figure.



f. The left navigation tree "Module 1 -> Outputs" displays the module's downlink data, which is used to control the module's output, as shown in the following figure.



Module function examples

- **Encoder 0 is connected, the encoder is rotated to count, and the encoder 0 probe input channel 0 is latched**

a. Configure the configuration parameters as shown in the figure below. Note: During application, the configuration parameters must be set according to the encoder parameters.

a) The encoder 0 SSI frame length is set to 25, that is, the E0 Frame Length is set to 25;

b) The clock frequency when encoder 0 reads data is set to 1MHz, that is, E0 Clock Frequency is set to 2:1MHz;

c) The encoder 0 interval time is set to 50ms, that is, the E0 Interval Time is set to 500;

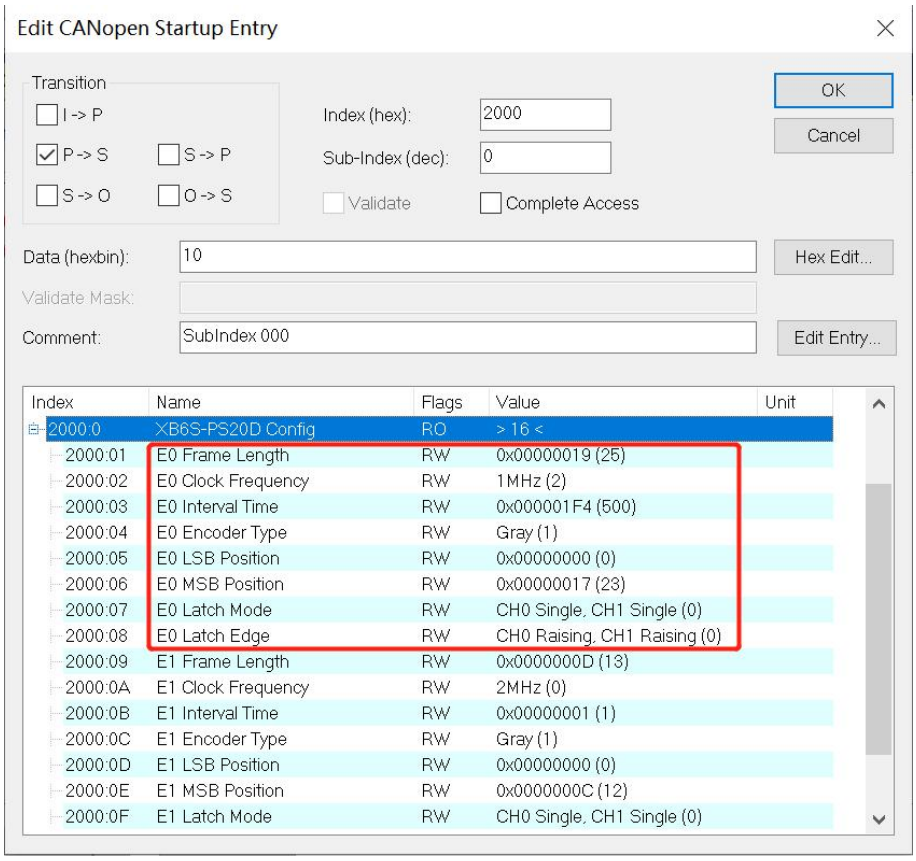
d) The encoding mode of encoder 0 is set to Gray code, that is, E0 Encoder Type is set to 1: Gray;

e) The LSB position number of the encoder 0 position value is set to 0, that is, E0 LSB Position is set to 0;

f) The MSB position number of encoder 0 is set to 23, that is, E0 MSB Position is set to 23;

g) The encoder 0 probe mode is set to channel 0 single and channel 1 single, that is, E0 Latch Mode is set to 0: CH0 Single, CH1 Single;

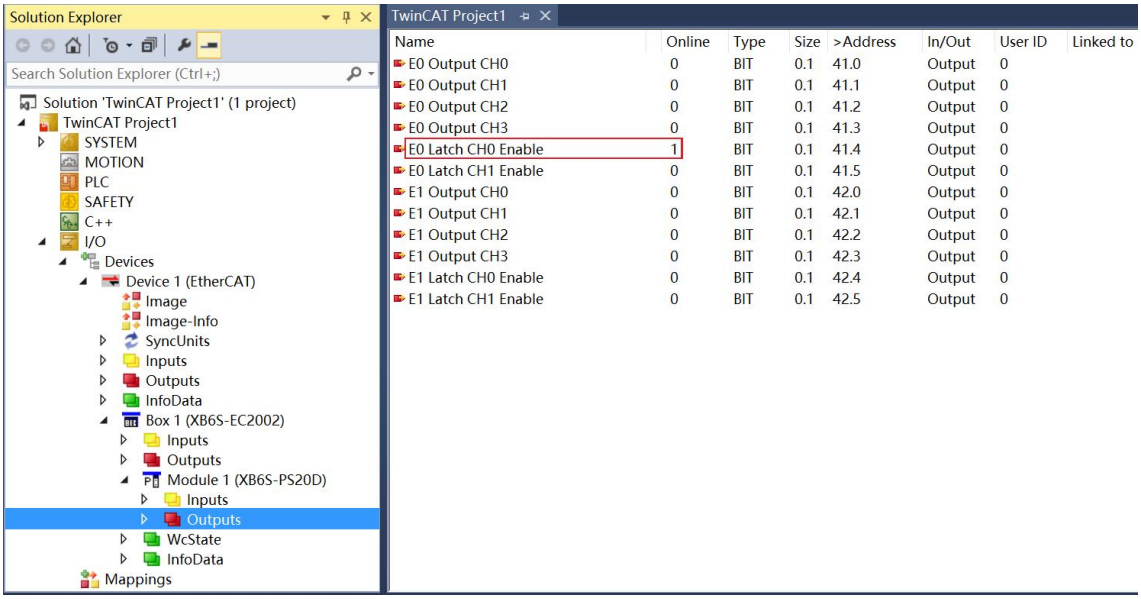
h) The encoder 0 probe trigger edge is set to the rising edge of channel 0 and the rising edge of channel 1, that is, E0 Latch Edge is set to 0: CH0 Raising, CH1 Raising.



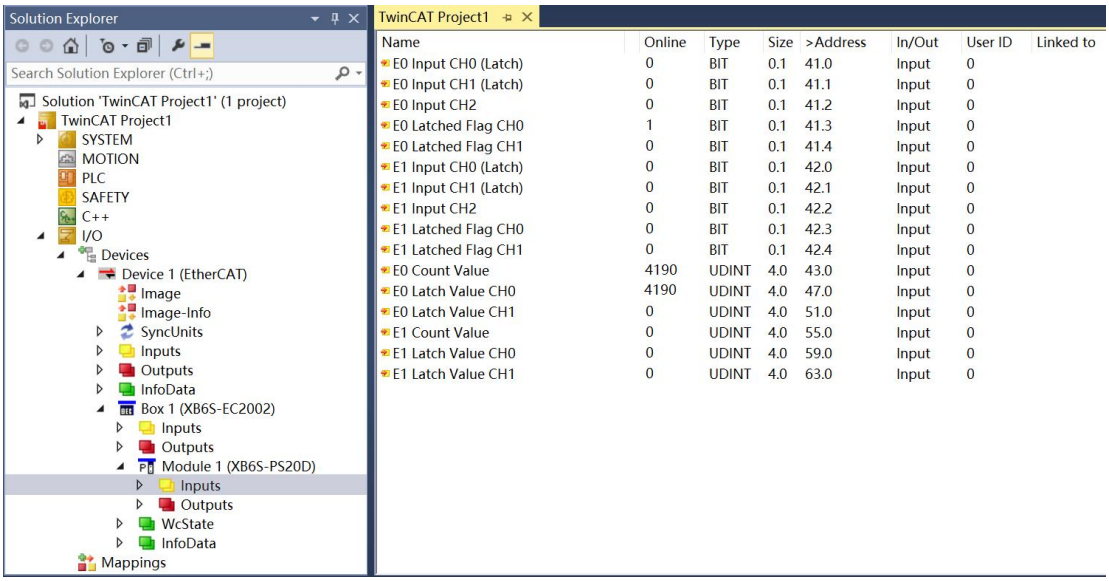
After the parameter settings are completed, you need to perform the Reload operation and re-power the module to enable the master station to automatically send the parameter settings.

b. Set the encoder 0 probe input channel 0 latch enable, as shown in the figure below.

a) Set the downlink data E0 Latch CH0 Enable to 1.



c. Encoder 0 starts to rotate. After the counting is completed, encoder 0 probe input channel 0 inputs a valid signal. The encoder 0 count value is 4190, the probe input channel 0 latch value is 4190, and the encoder probe input channel 0 latch completion flag value flips once to 1, as shown in the figure below.



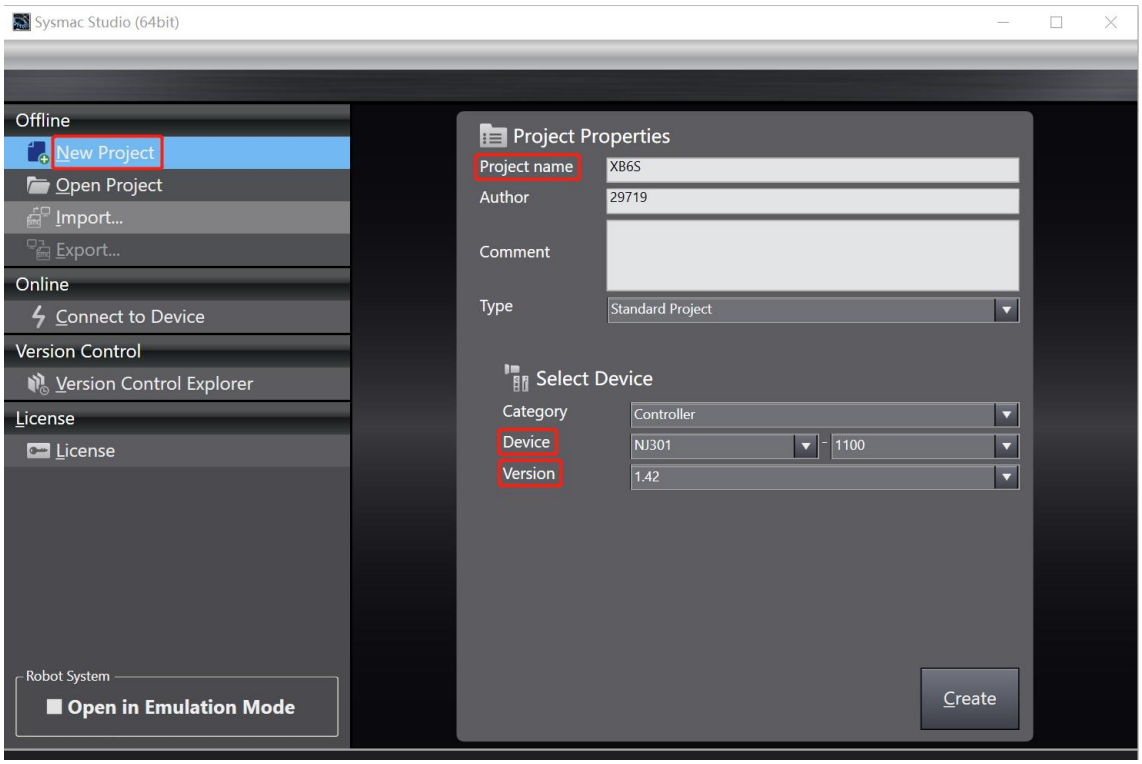
7.3.2 Application in Sysmac Studio software environment

1、Preparation

- **Hardware environment**
  - **Module model XB6S-PS20D**
  - **EtherCAT coupler, end cap**
    This description takes the XB6S-EC2002 coupler as an example
  - **A computer with Sysmac Studio pre-installed**
  - **An Omron PLC. This description uses model NJ301-1100 as an example.**
  - **EtherCAT dedicated shielded cable**
  - **Handwheel/encoder/orthogonal pulse generator and other equipment**
  - **A switching power supply**
  - **Device Profile**
    Configuration file acquisition address:
    https://www.solidotech.com/cn/resources/configuration-files
- **Hardware configuration and wiring**
  Please follow the "5 Installation and removal"and"6 Wiring"
- **Computer IP requirements**
  Set the IP address of the computer and the IP address of the PLC, and ensure that they are in the same network segment.

2、New construction projects

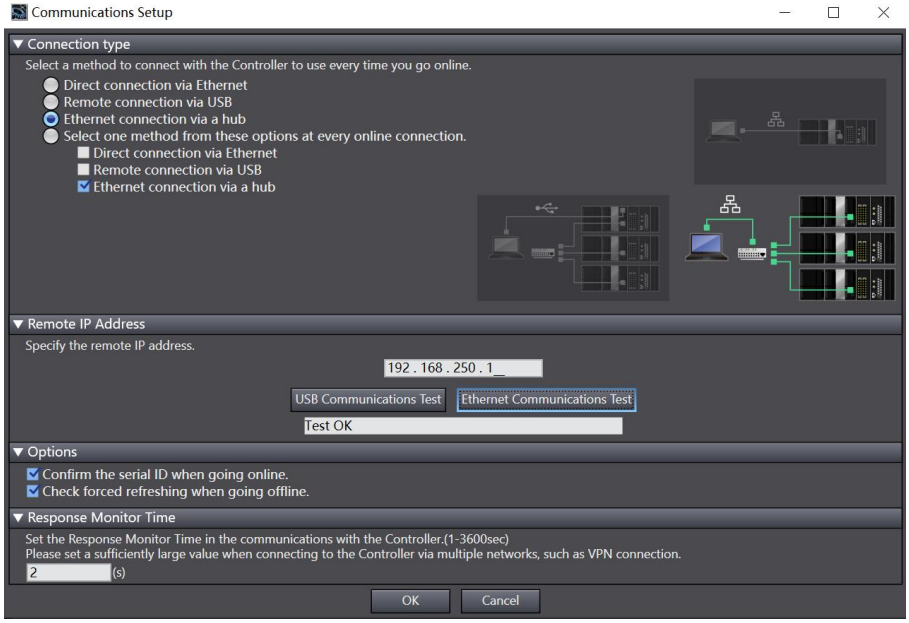
a. Open Sysmac Studio and click “New Project”.



- Project name: Customization.
- Select the device: Select the corresponding PLC model in "Device" and the corresponding version number of the PLC in "Version".

b. After entering the project properties, click “Create”.

c. Click "Controller -> Communications Setup" in the menu bar, select the method to be used each time you connect to the controller while online, and enter the "Remote IP Address", as shown in the figure below.

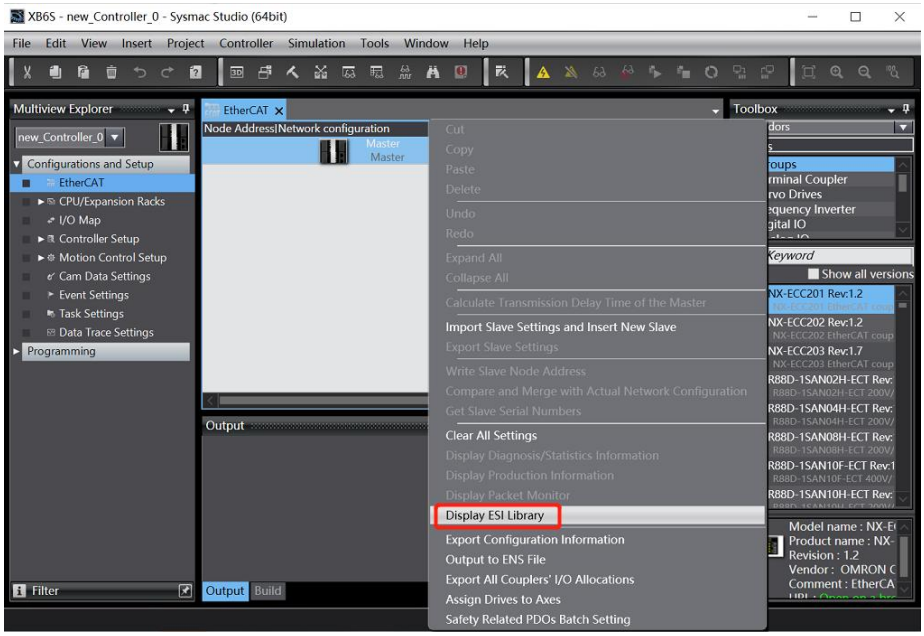


d. Click “Ethernet Communication Test”. The system displays a message indicating that the test was successful.

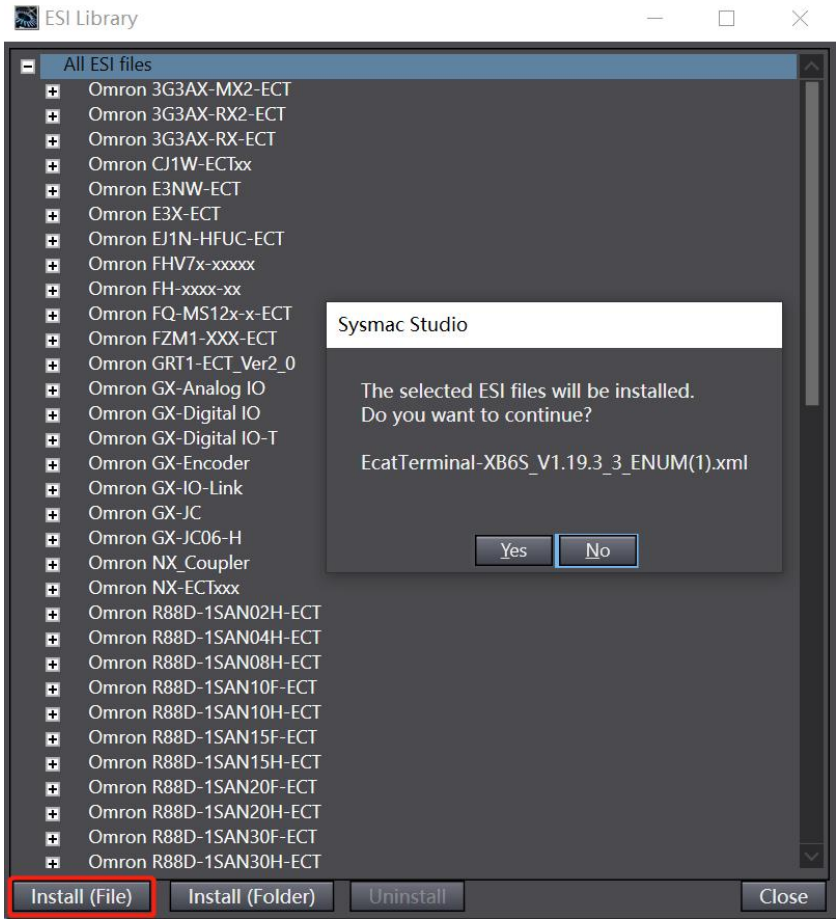
3、Installation XML File

a. In the left navigation tree, expand Configurations and Setup and double-click “EtherCAT”.

b. Right-click "Master" and select "Display ESI Library", as shown in the figure below.



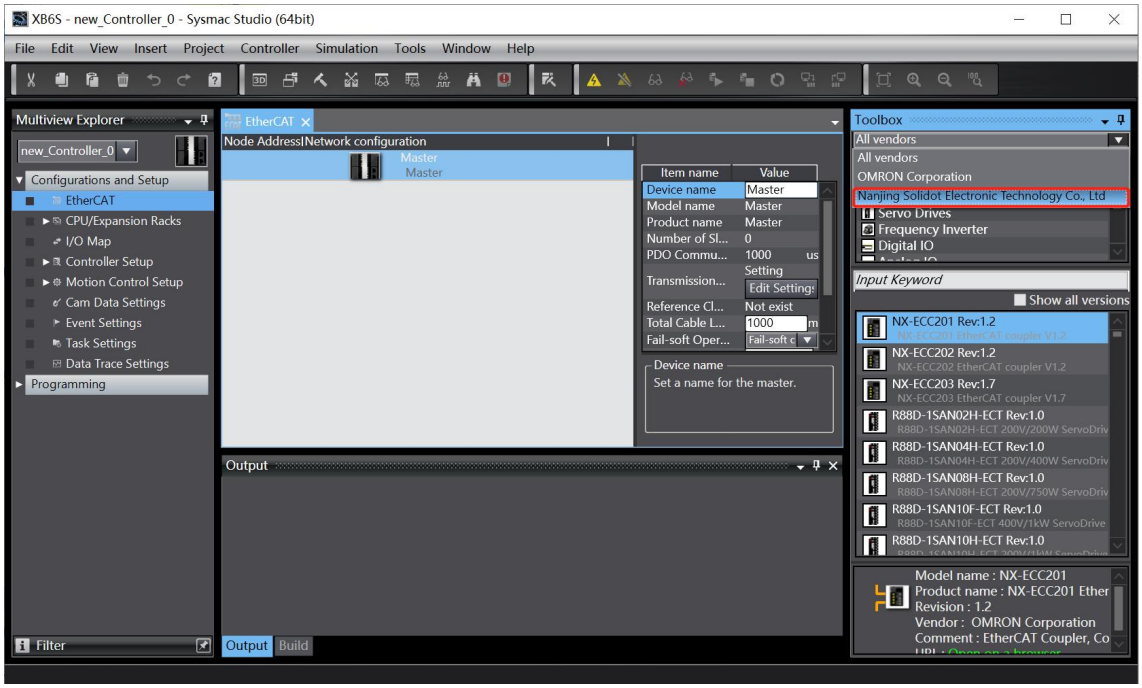
c. In the pop-up "ESI Library" window, click "Install (File)", select the module's XML file path, and click "Yes" to complete the installation, as shown in the following figure.



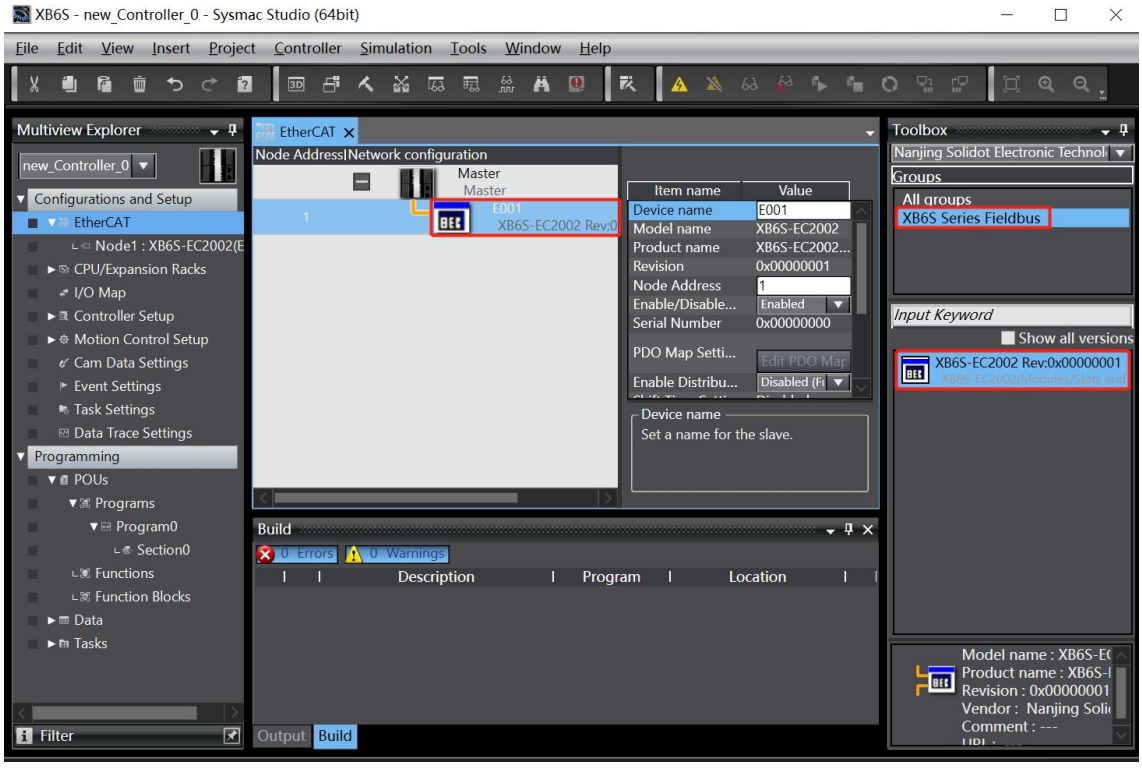
4、Add a device

There are two ways to add devices: online scanning and offline adding. This instruction takes offline adding as an example.

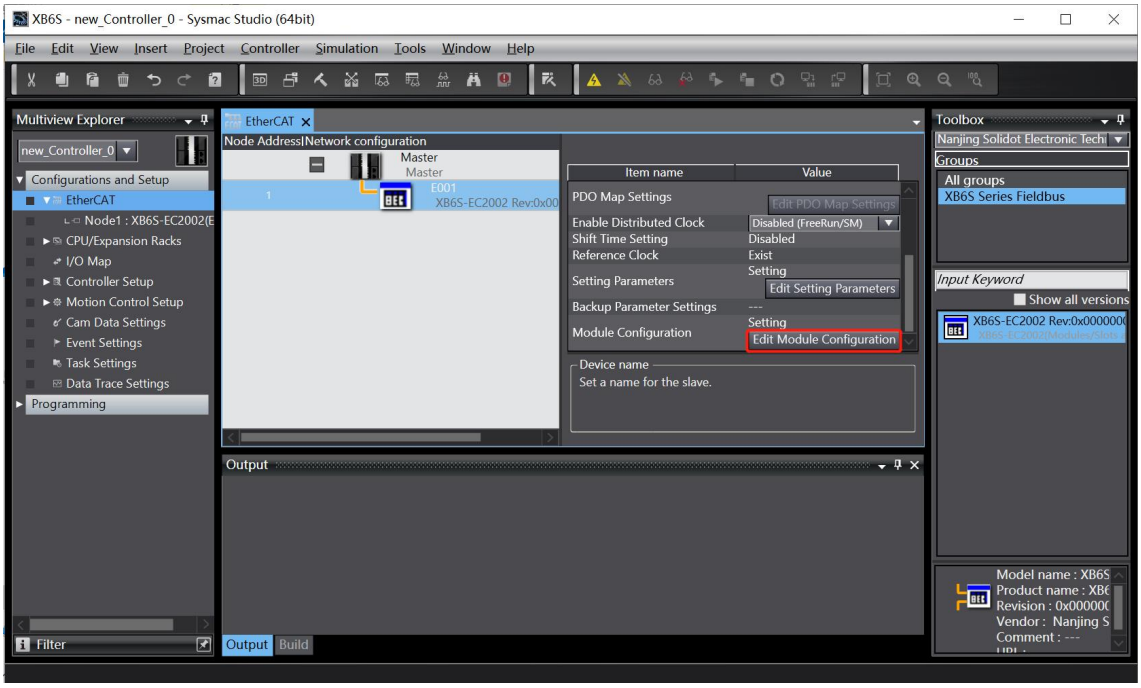
a. Under the "Toolbox" column on the right, click to expand all suppliers and select "Nanjing Solidot Electronic Technology Co., Ltd.", as shown in the figure below.



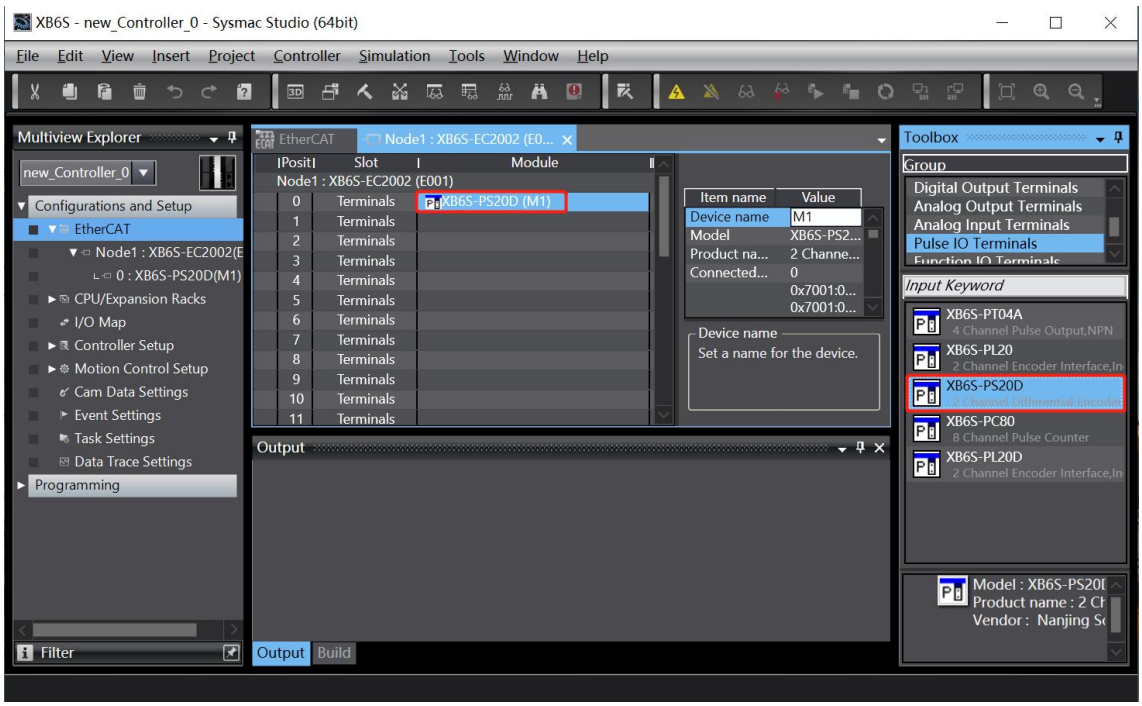
b. Click to select XB6S Series Fieldbus, double-click the XB6S-EC2002 coupler module, and add a slave device, as shown in the figure below.



c. On the EtherCAT main page, select the newly added XB6S-EC2002 coupler module and choose “Edit Module Configuration”，as shown below.

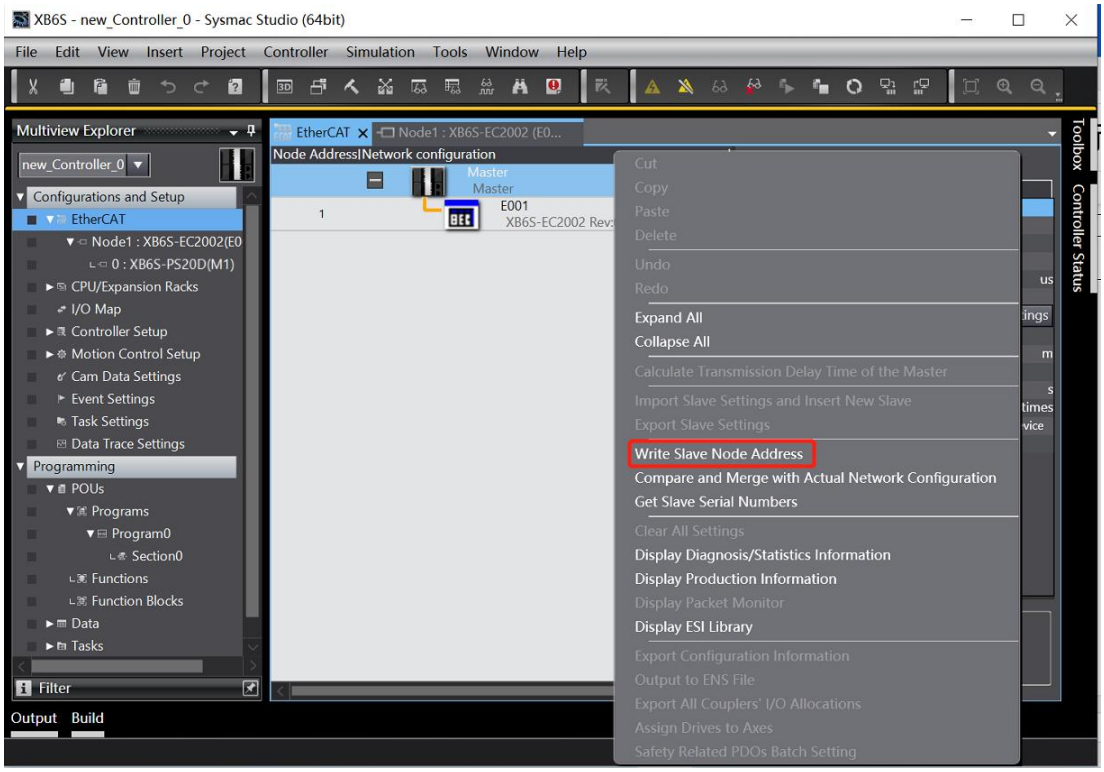


d. Position the cursor in "Module" and click the module in the toolbox module list on the right. Add I/O modules one by one according to the order in which they are configured. Note: The order and model must be consistent with the physical topology!

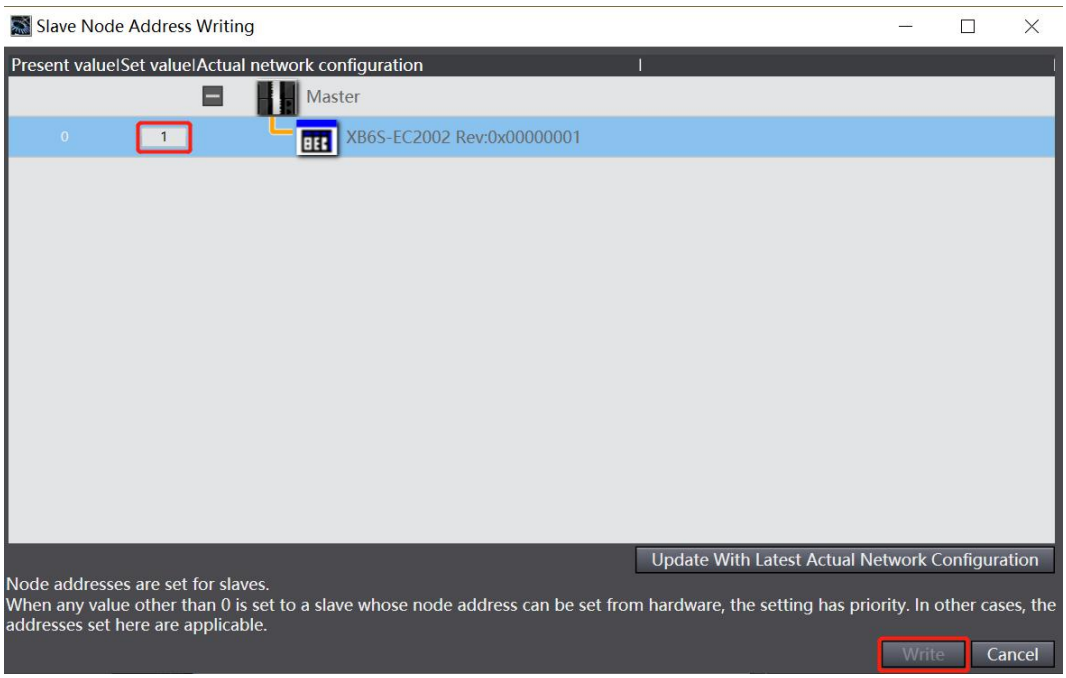


5、Set the node address

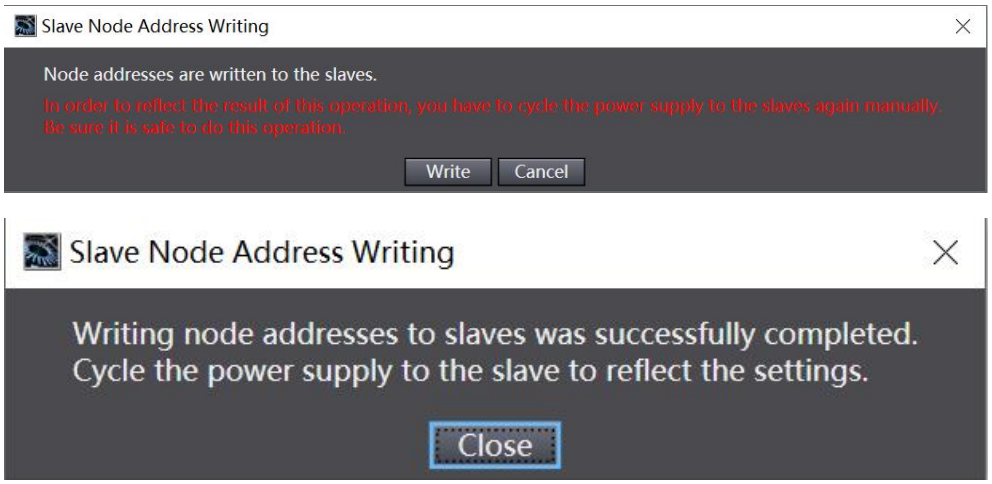
a. Click "Controller -> Online" in the menu bar to put the controller into online state. Right-click the master device and click "Write Slave Node Address", as shown below.



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 node address of the slave device, as shown in the figure below.

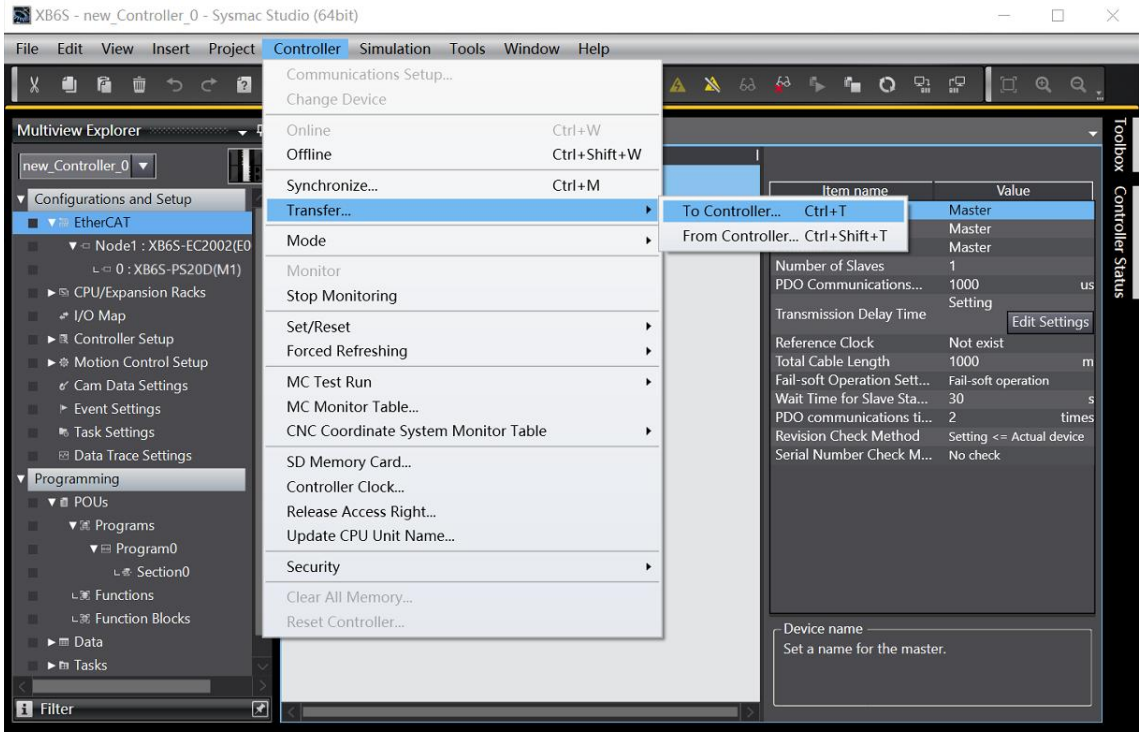


c. After writing, a power-on prompt will pop up, as shown in the figure below. Click "Write" and then restart the slave device power according to the prompt.

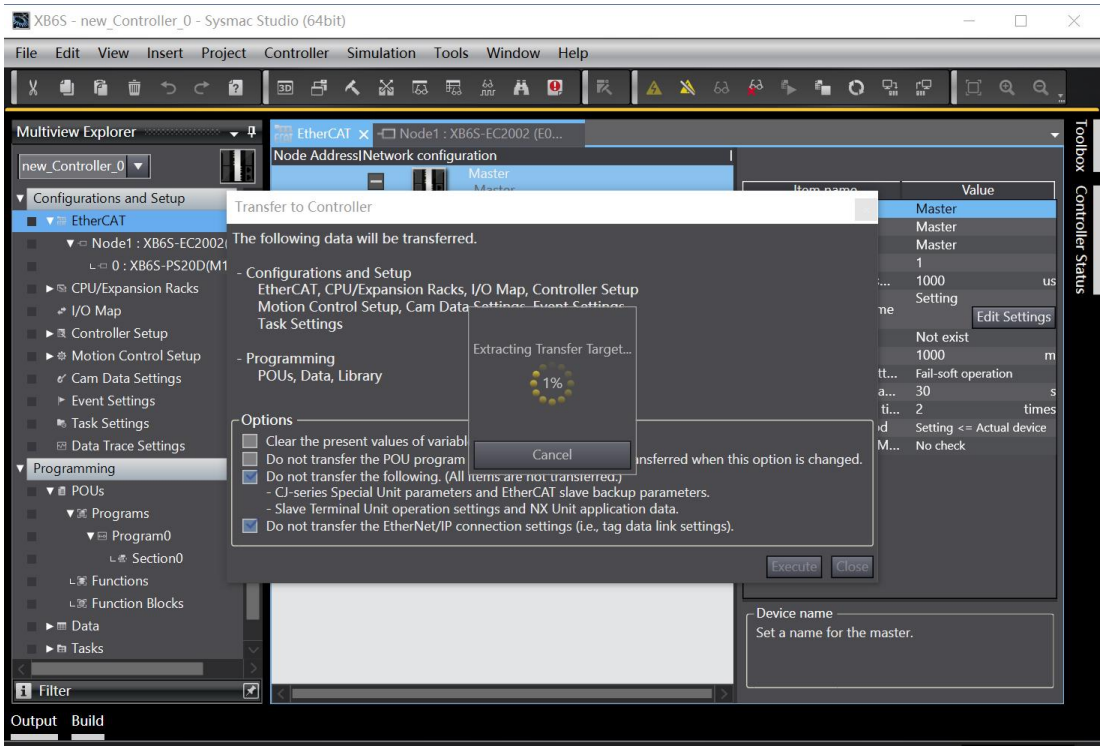


6、Download the configuration to the PLC

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

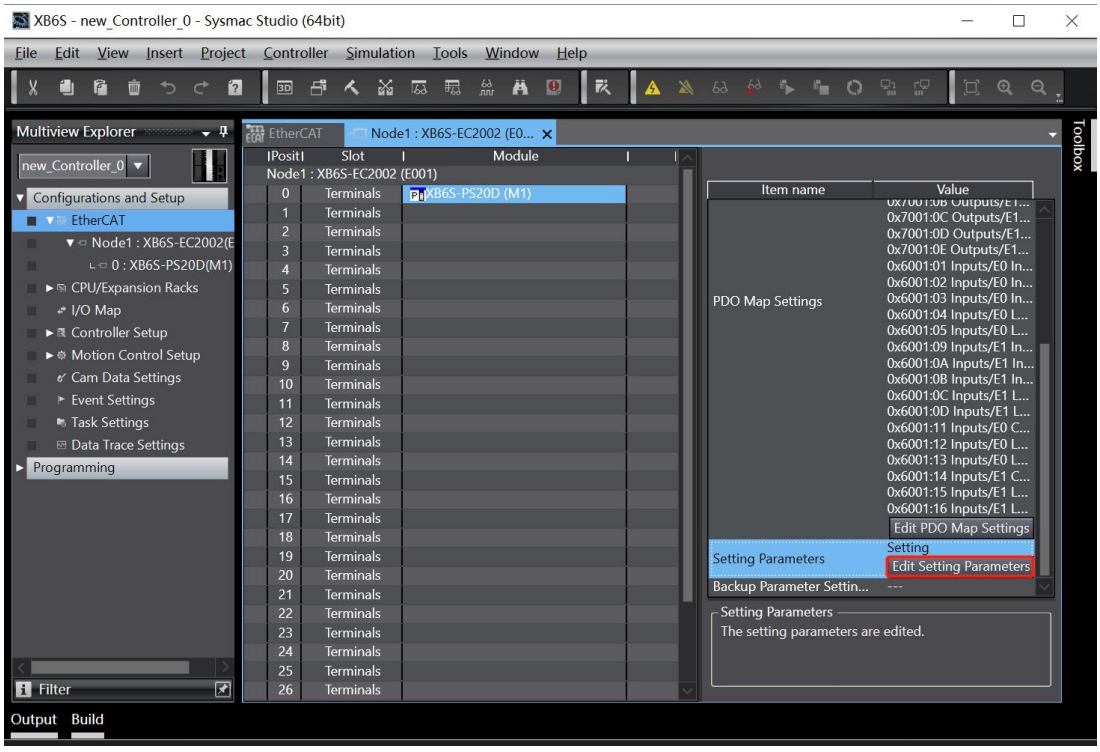


b. Download the configuration to the PLC. A transfer confirmation window will pop up. Click "Execute". In the subsequent pop-up windows, click "Yes/OK" in sequence, as shown in the figure below. After the download is complete, you need to restart the power supply.



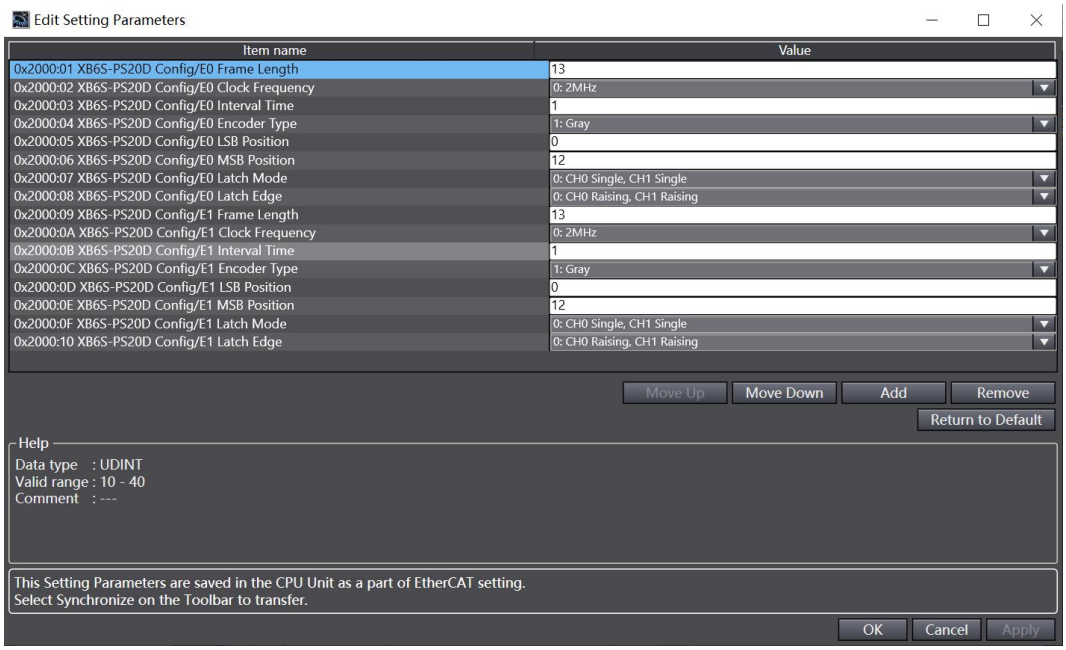
7、Parameter settings

a. Switch the configuration to offline state, go to the Node 1 module configuration page, select the XB6S-PS20D module, and click “Edit Setting Parameters”, as shown in the following figure.

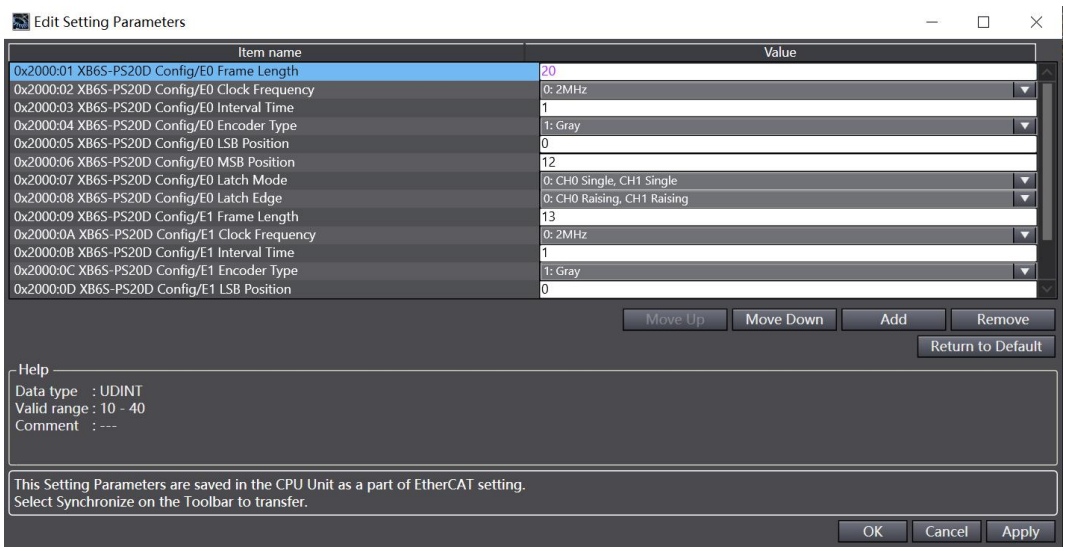


Note: IfThe PLC firmware version is too low, and the EC_CoESDOWrite and EC_CoESDORead instructions are required to write and read the SDO address.

b. On the XB6S-PS20D parameter setting page, you can see 16 configuration parameters. Click any parameter to set the related configuration, as shown in the figure below.

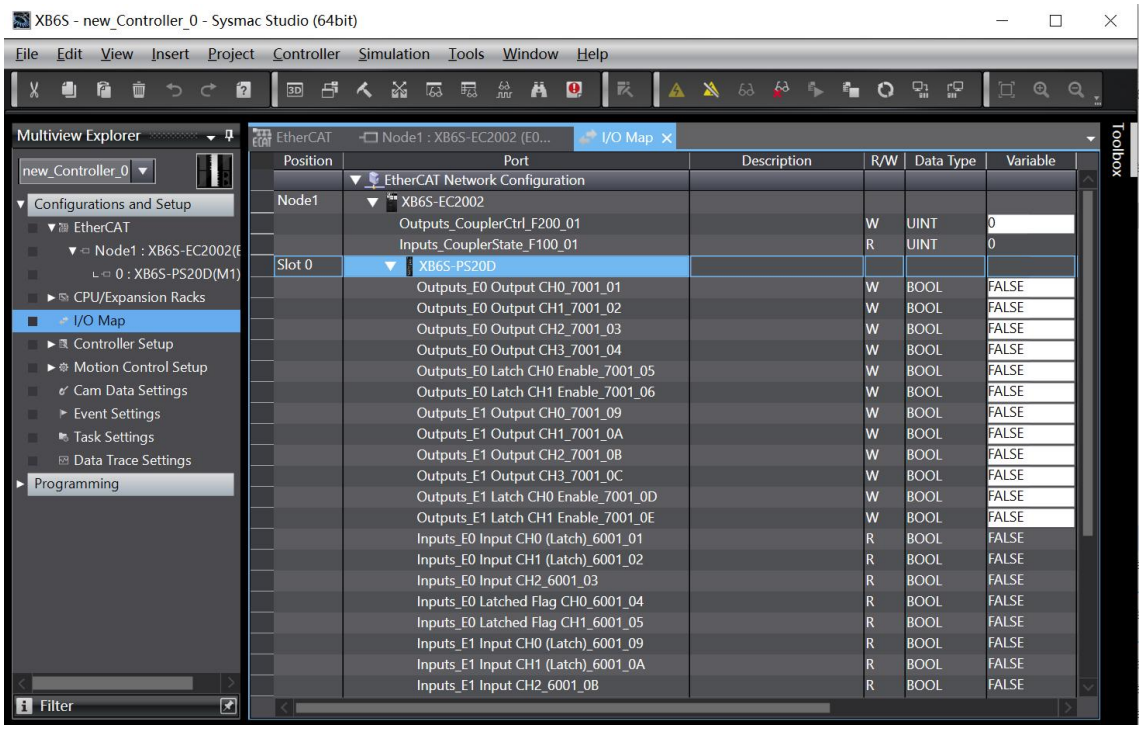


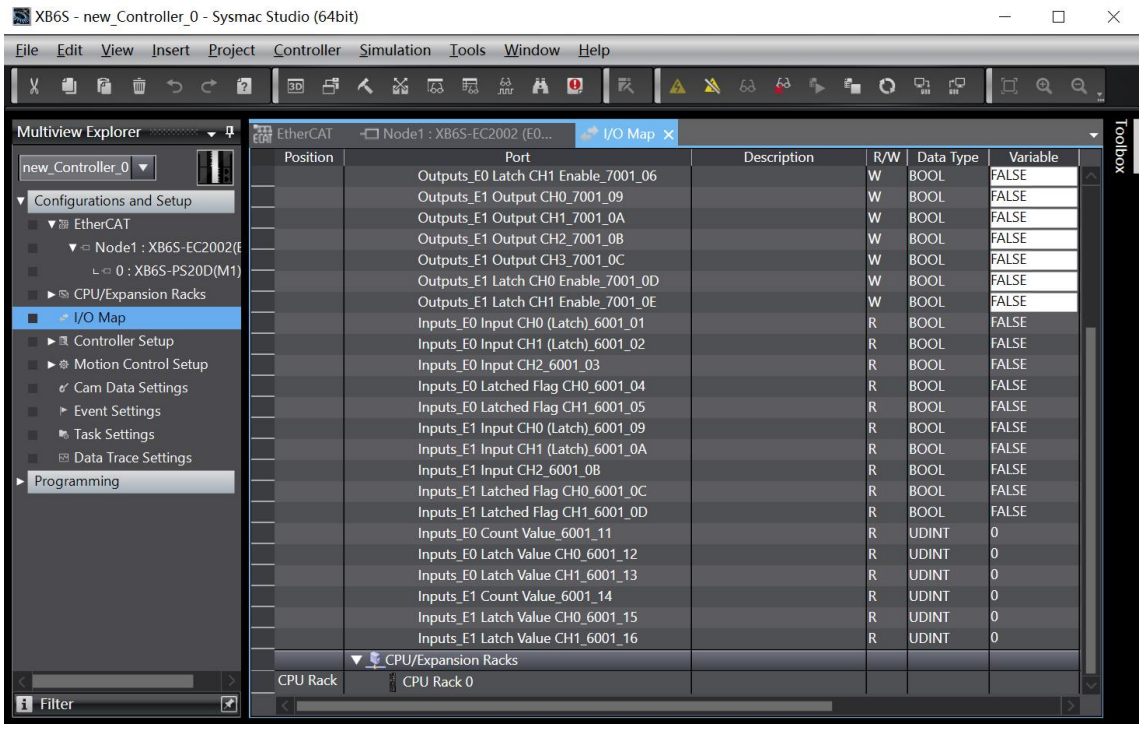
c. For example, to modify the SSI frame length parameter of encoder 0, double-click "E0 Frame Length" and modify the parameter value, as shown in the figure below. After all parameters are configured, you need to re-download the program to the PLC and re-power on the PLC and module.



8、I/O function

a. Double-click “I/O Map” in the left navigation tree to view the mapping table of the modules in the topology, allowing you to monitor the channel input and output values, as shown in the following figure.





Module function examples

- **Encoder 0 is connected, the encoder is rotated to count, and the encoder 0 probe input channel 0 is latched**

a. Configure the configuration parameters as shown in the figure below. Note: During application, the configuration parameters must be set according to the encoder parameters.

a) The encoder 0 SSI frame length is set to 25, that is, the E0 Frame Length is set to 25;

b) The clock frequency when encoder 0 reads data is set to 1MHz, that is, E0 Clock FrequencySet to 2:1MHz;

c) The encoder 0 interval time is set to 50ms, that is, the E0 Interval Time is set to 500;

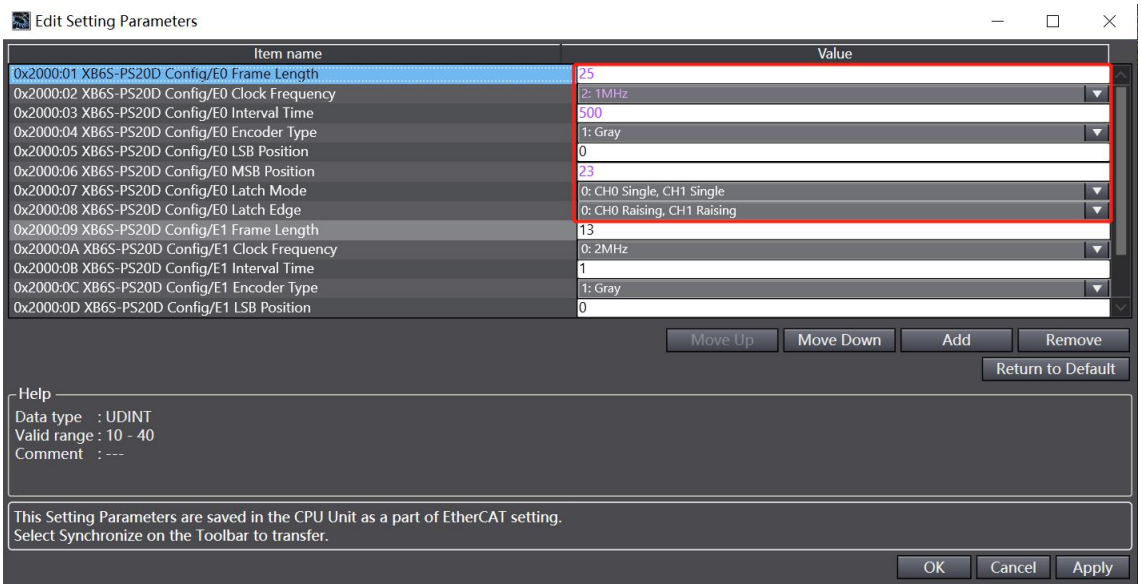
d) The encoding mode of encoder 0 is set to Gray code, that is, E0 Encoder Type is set to 1: Gray;

e) The LSB position number of the encoder 0 position value is set to 0, that is, E0 LSB Position is set to 0;

f) The MSB position number of encoder 0 is set to 23, that is, E0 MSB Position is set to 23;

g) The encoder 0 probe mode is set to channel 0 single and channel 1 single, that is, E0 Latch Mode is set to 0: CH0 Single, CH1 Single;

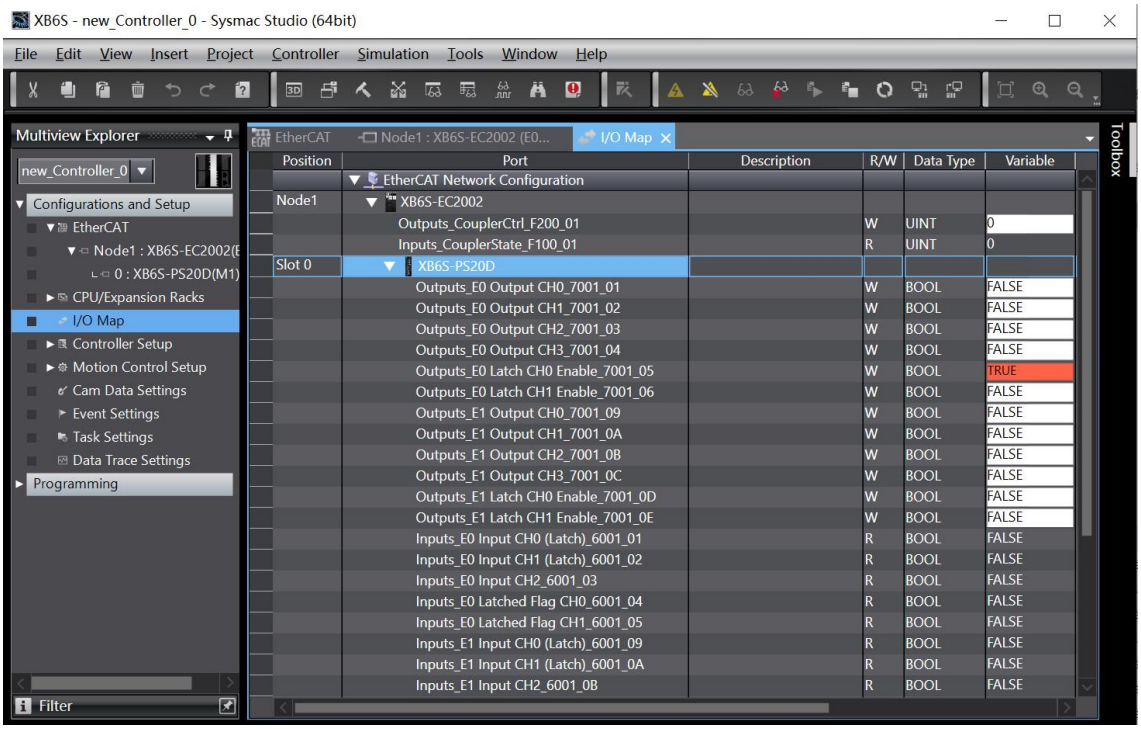
h) The encoder 0 probe trigger edge is set to the rising edge of channel 0 and the rising edge of channel 1, that is, E0 Latch Edge is set to 0: CH0 Raising, CH1 Raising.



After the parameter settings are completed, you need to perform the Reload operation and re-power the module to enable the master station to automatically send the parameter settings.

b. Set the encoder 0 probe input channel 0 latch enable, as shown in the figure below.

a) Set the downlink data E0 Latch CH0 Enable to 1.



c. Encoder 0 starts to rotate. After the counting is completed, encoder 0 probe input channel 0 inputs a valid signal. The encoder 0 count value is 4190, the probe input channel 0 latch value is 4190, and the encoder probe input channel 0 latch completion flag value flips once to 1, as shown in the figure below.