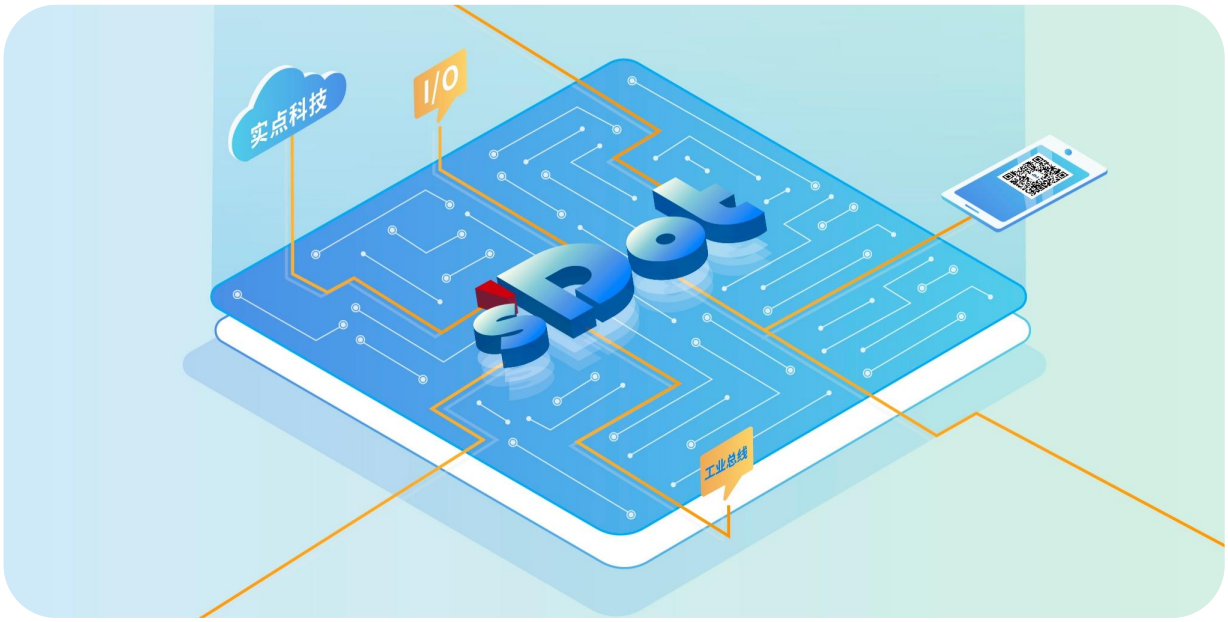

XB6S-PL20D

Differential Incremental Encoder Counter Module User Manual

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CONTENTS

1 Product Introduction

1.1 Product Overview

XB6S-PL20D is a plug-in incremental encoder counter module, which adopts X-bus backplane and can be connected to two 5V differential incremental encoders. The module supports Z-phase clear, compare output, probe latch, etc. It can be widely used in various industrial system equipment with our XB6S series coupler.

1.2 Product Characteristics

- Three Pulse Modes
  Supports AB orthogonal (ABZ), direction pulse (Pul+Dir), and double pulse (CW/CCW).
- Two Ring Count Ranges
  0~2^32-1 or 0~ ring count resolution x count multiplier-1.
- Speed Report
  Supports reporting the real-time speed of two encoder channels.
- Z-phase Clear
  Supports Z-phase clear function.
- Compare Output
  Supports the output of a time-adjustable pulse signal from the corresponding output channel when the count value reaches the set value.
- Probe Latch
  Supports latching the current count value when a voltage change occurs on the probe input pin.
- Magnification Count
  Supports 4x/2x/1x counting.
- Power-down Storage
  Supports power-down storage of count values.
- Small Volume
  Compact and small footprint.
- Easy Configuration

The configuration is simple and supports mainstream masters.

- Easy Installation
  DIN 35 mm standard rail installation
  Adopts shrapnel terminals for easy and quick wiring.

2 Product Parameters

2.1 General parameter

Interface Parameter	
Product Model	XB6S-PL20D
Bus Protocol	X-bus
Process Data Volume: Downstream	20 Bytes
Process Data Volume: Upstream	34 Bytes
Channel Type	Encoder input channels: 2 sets of channels (A-phase, B-phase and Z-phase), 5V differential
	Probe input channels: 4 channels (1 encoder with 2 probe functions), PNP/NPN
	Common digital input channels: 2 channels (1 encoder with 1 common digital input), PNP/NPN
	Compare output channels: 4 channels (1 encoder with 2 compare outputs), NPN
	General digital output channels: 4 channels (1 encoder with 2 common digital outputs), NPN
Refresh Rate	1ms

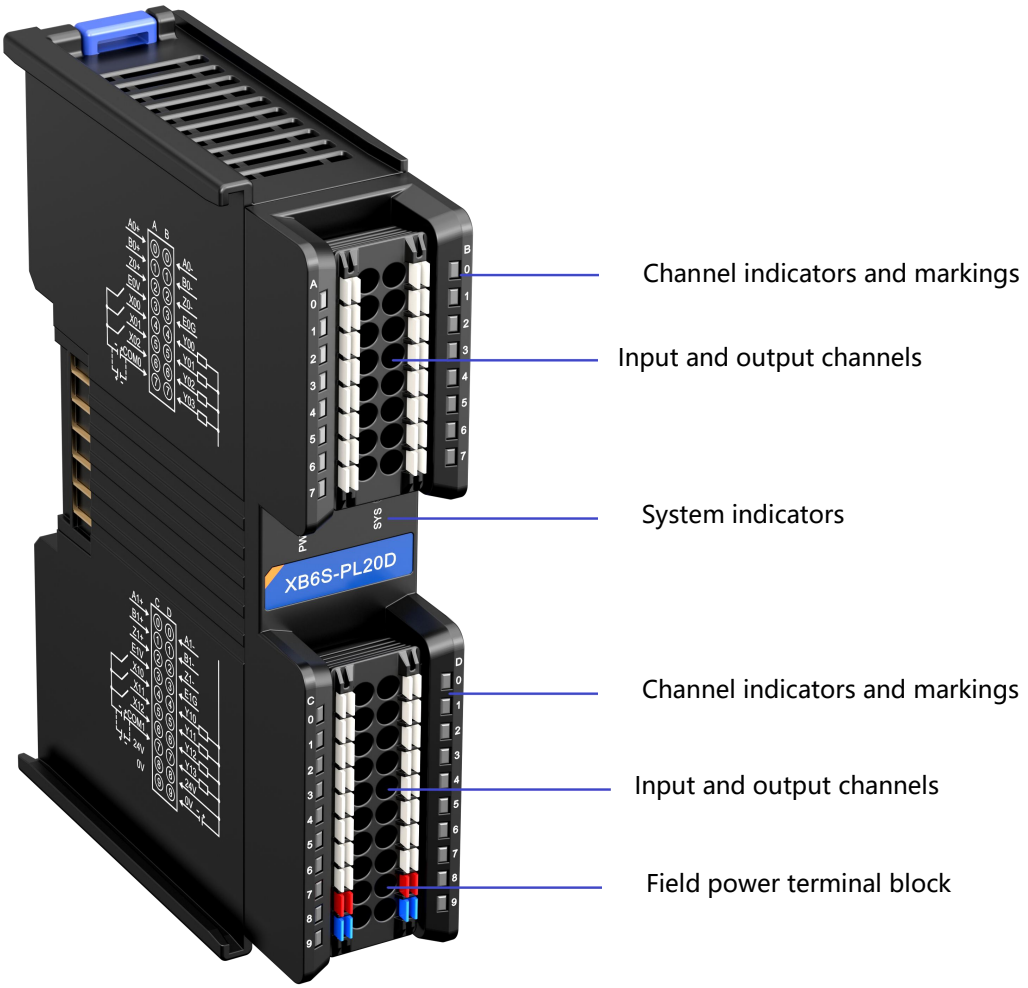
Technical Parameters	
System Input Power	5VDC (4.5V~5.5V)
Field-Side Rated Power Supply (Range)	24VDC (20.4V~28.8V)
Input Channel Rated Voltage (Range)	24VDC (20.4V~28.8V)
Encoder Pulse Input Mode	AB orthogonal (ABZ), directional pulse (Pul+Dir), double pulse (CW/CCW)
Encoder Pulse Input Frequency	Maximum 1MHz
Real-Time Speed Of The Report Channel	Support
Z-Phase Clear	Support
Counting Multiplier Setting	4x/2x/1x (default 1x)
Ring Count	Support
Count Range	0~2^32-1 or 0~Ring Count Resolution x Count Ratio-1
Encoder Ring Count Resolution Setting[1]	Support (ring count resolution setting range 0~65535)
Count Initial Value Setting	Support (count initial value setting range 0 to 2^32-1)
Reverse Count	Support
Encoder Input Hardware Filter	Support (0 to 15 levels)
Probe Function (High Speed Hardware Latch)	Support
Probe Input Frequency	1MHz
Compare Output Function	Support
Compare Output Signal Response Speed	<10us
Input And Output Pin Function Selection	Support
Power-down Storage	Support
External Dimensions	106.4 x 25.7 x 72.3mm
Weight	110g
Wiring Method	Screwless Quick Plugs
Installation	35mm standard rail installation
Operating Temperature	-20℃~+60℃
Storage Temperature	-40℃~+80℃
Relative Humidity	95%, non-condensing
Protection Class	IP20

Note [1]: The ring count resolution here is only used to set the ring count range of the encoder and is different from the physical resolution of the encoder itself.

3 Panel

3.1 Panel Structure

Name of each part of the product



3.2 Indicator light function

Name	Markings	Color	Status	Description
Power indicator	PWR	GREEN	ON	Power supply normal
			OFF	The product is not powered up or the power supply is abnormal
System operation indicator	SYS	GREEN	ON	The system is functioning normally
			Flashing 1Hz	No business data interaction, waiting for business data interaction to be established
			Flashing 10Hz	Firmware Upgrade
			OFF	System not working
Encoder input AB phase indicator	0	GREEN	ON	Encoder enabled
	1		OFF	Encoder not enabled
Encoder input Z-phase indicator	2	GREEN	ON	Encoder Z-phase clear function enabled
			OFF	Encoder Z-phase clear function disabled
Input Channel Indicator	4 to 6 (left side)	GREEN	ON	Channel has signal inputs
			OFF	No signal input for channel
Output Channel Indicator	4 to 7 (right side)	GREEN	ON	Channel has signal output
			OFF	No signal output from channel

4 Installation and uninstall

4.1 Installation Guide

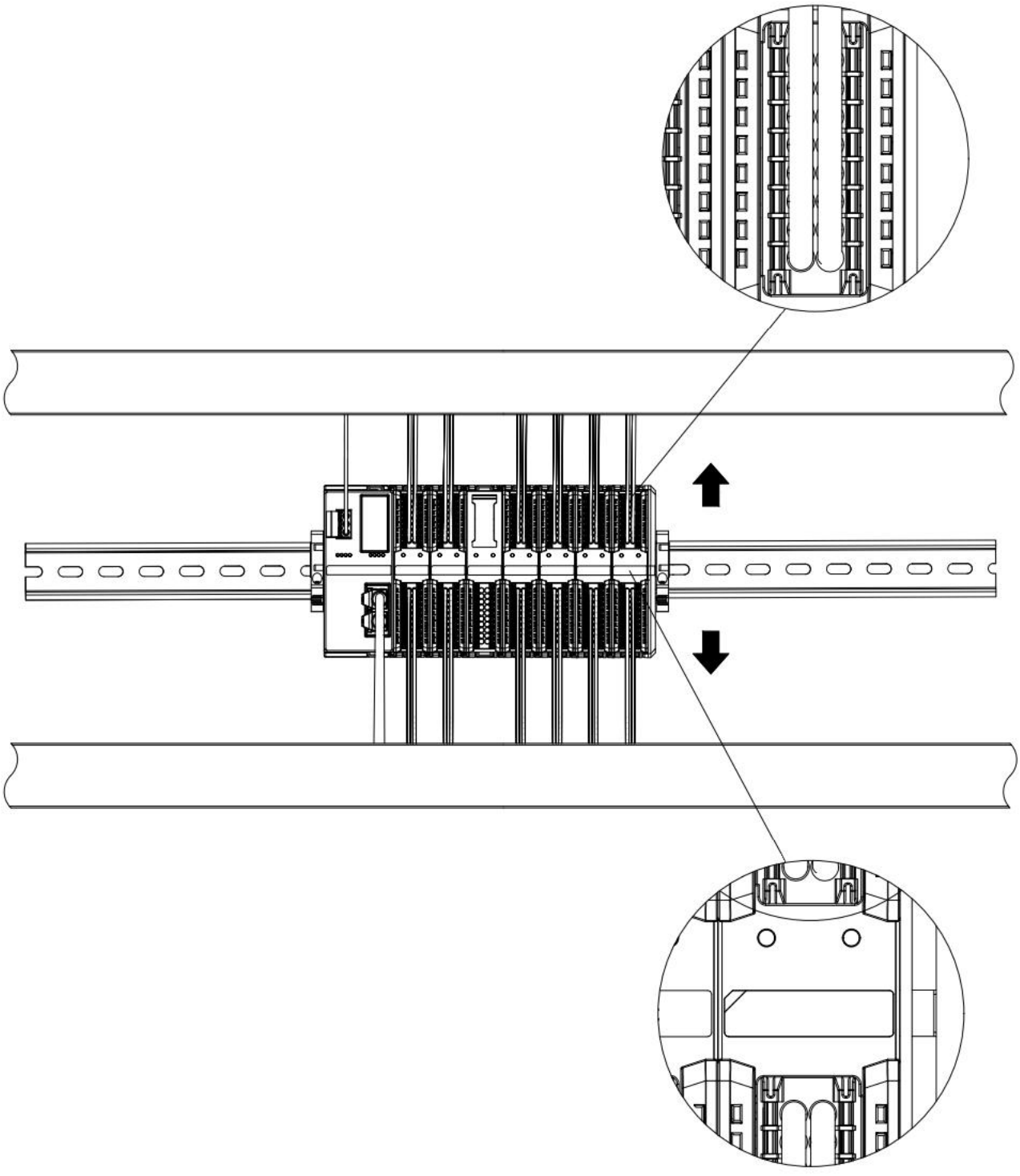
Precautions for installation\uninstall

- **The module protection class is IP20 and the module needs to be installed in the cabinet for indoor use.**
- **Ensure that the cabinet is well ventilated (e.g., the cabinet is fitted with an exhaust fan).**
- **Do not install this equipment next to or above equipment that may cause overheating.**
- **Be sure to mount the module vertically on the fixed rails and maintain air circulation around it (at least 50 mm air circulation space above and below the module).**
- **Once the module is installed, be sure to secure the module by installing rail mounts on both ends.**
- **Be sure to disconnect the power supply when installing/uninstalling.**
- **Once the module is installed, it is recommended that wiring and cabling be done in accordance with the top and bottom alignments.**

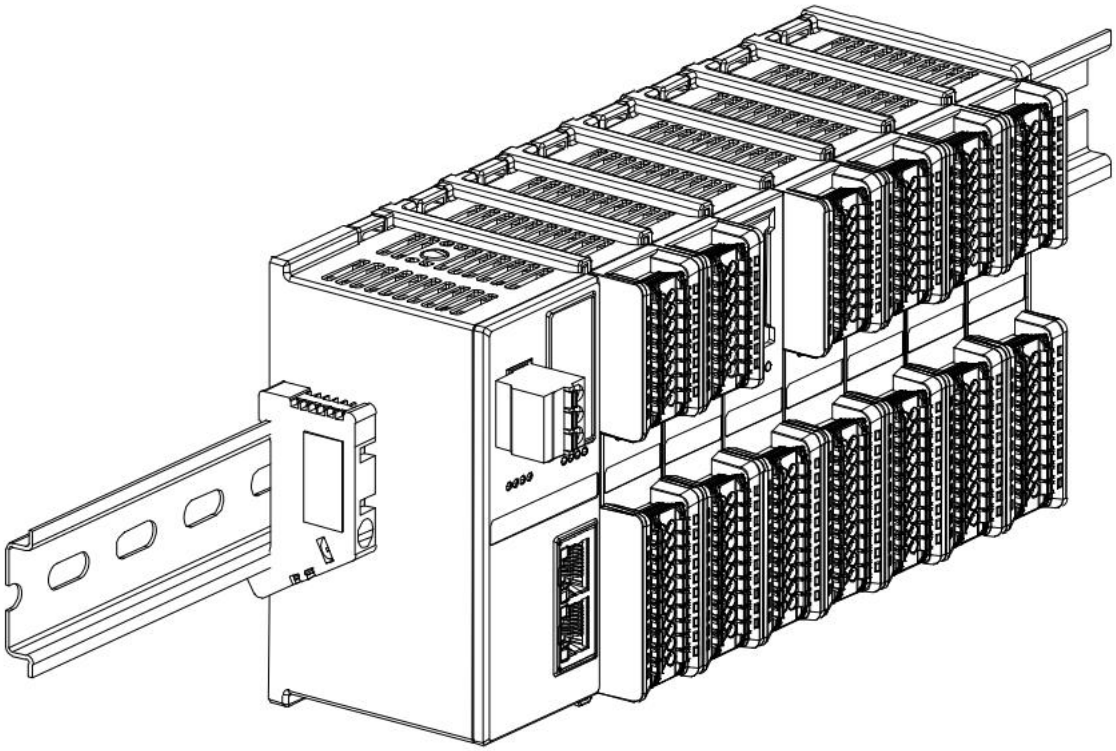
⚠ Warnings

- The protection provided by the device may be jeopardized if it is not used in accordance with the product user manual.

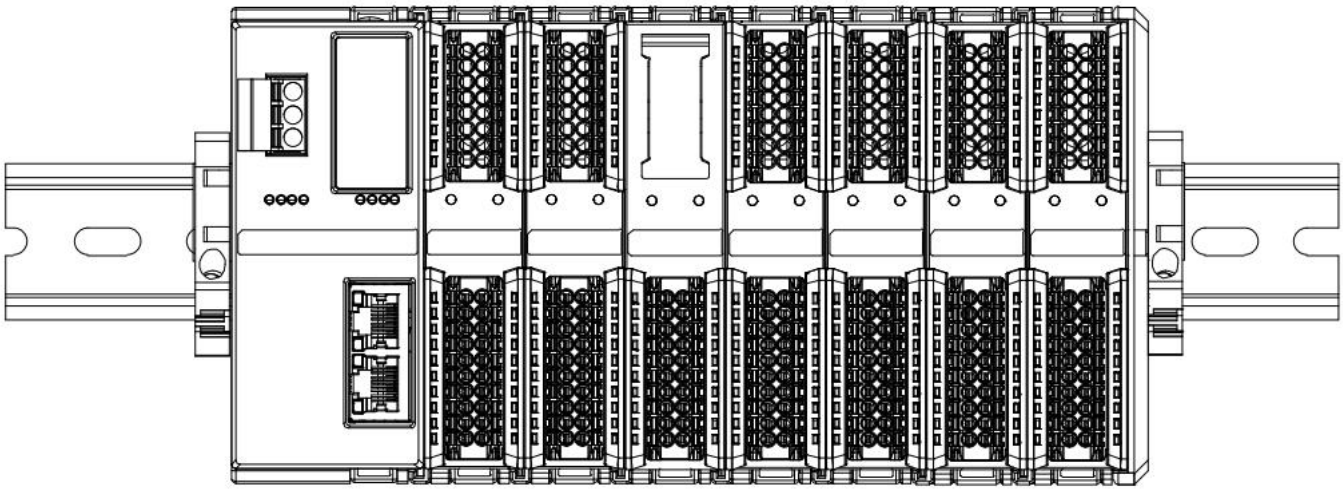
Module installation schematic, minimum clearance top and bottom (≥50mm)



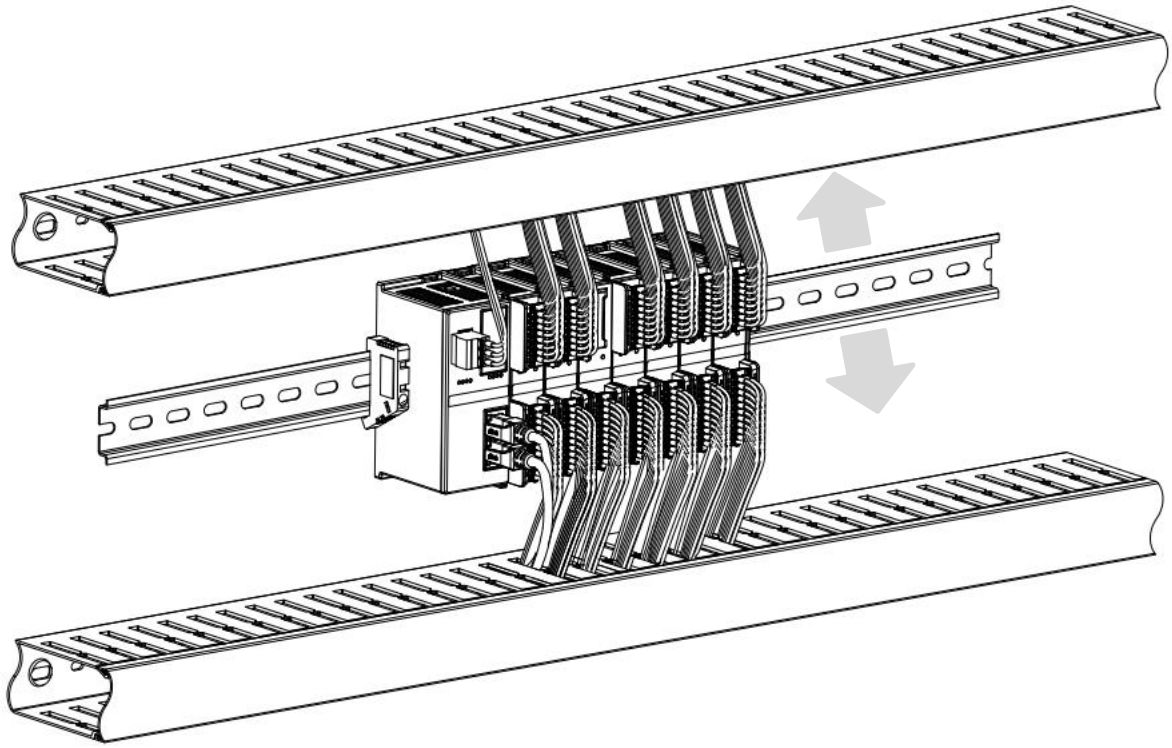
Ensure that the module is installed vertically on the fixed rail



Be sure to install the rail mounts



Schematic diagram of upper and lower wiring of the module



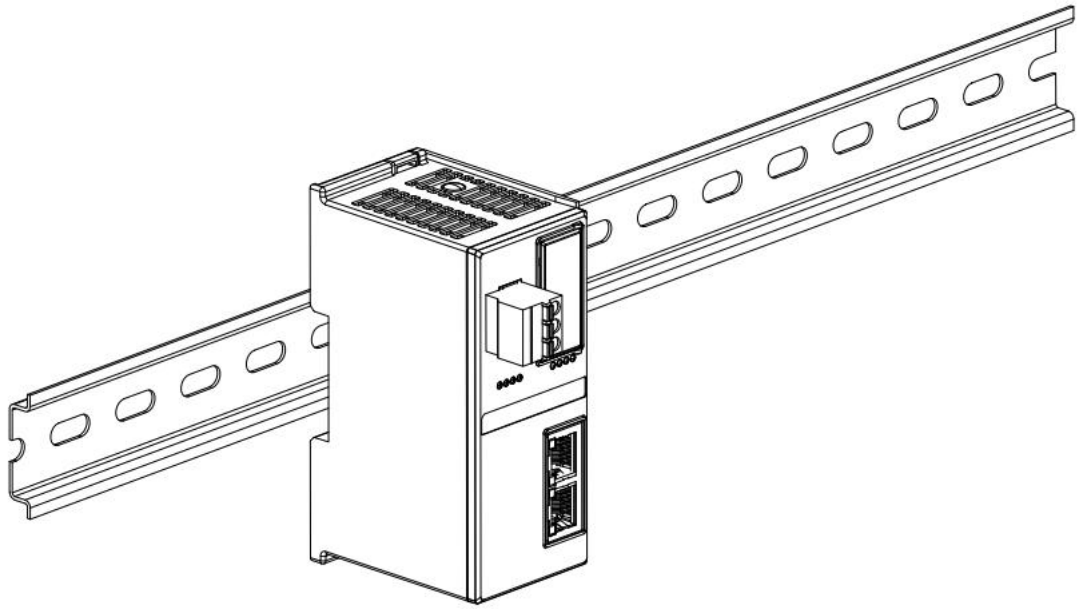
4.2 Installation and uninstall steps

Module Installation and uninstall	
Module Installation Steps	1. Install the coupler module first on the rail that has been fixed.
	2. Install the required I/O modules or function modules in order to the right of the coupler module.
	3、After installing all the required modules, install the end cap to complete the installation of the module.
	4. Install the rail fixings at both ends of the coupler module and end cap to fix the module.
Module Uninstall Steps	1. Loosen the guide rail fixings at both ends of the module.
	2. Use a slotted screwdriver to pry off the module snap.
	3. Pull out the uninstalled module.

4.3 Installation and uninstall diagram

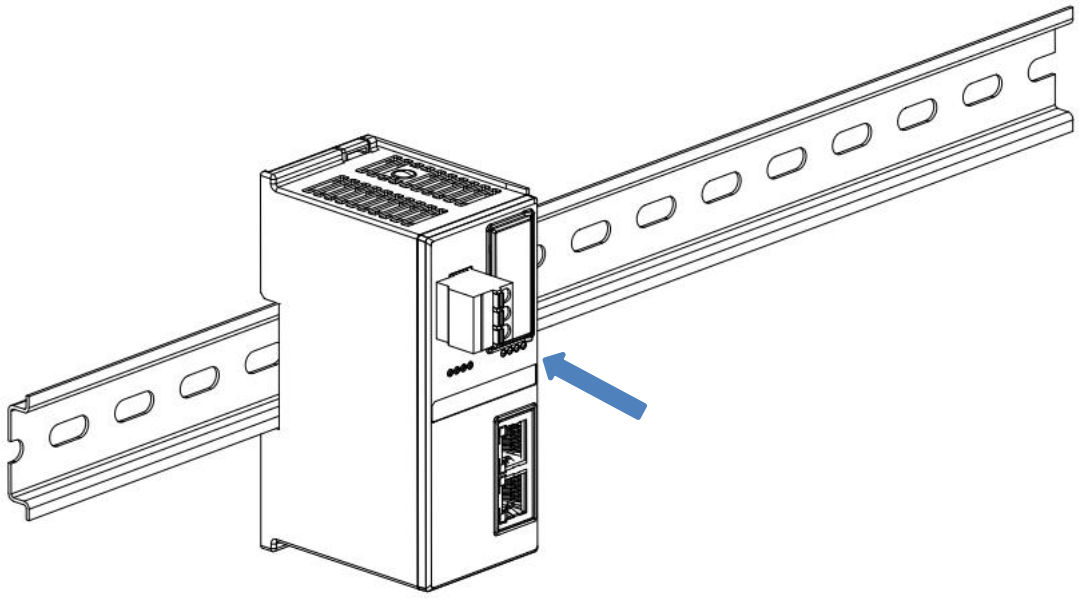
Coupler Module Installation

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



①

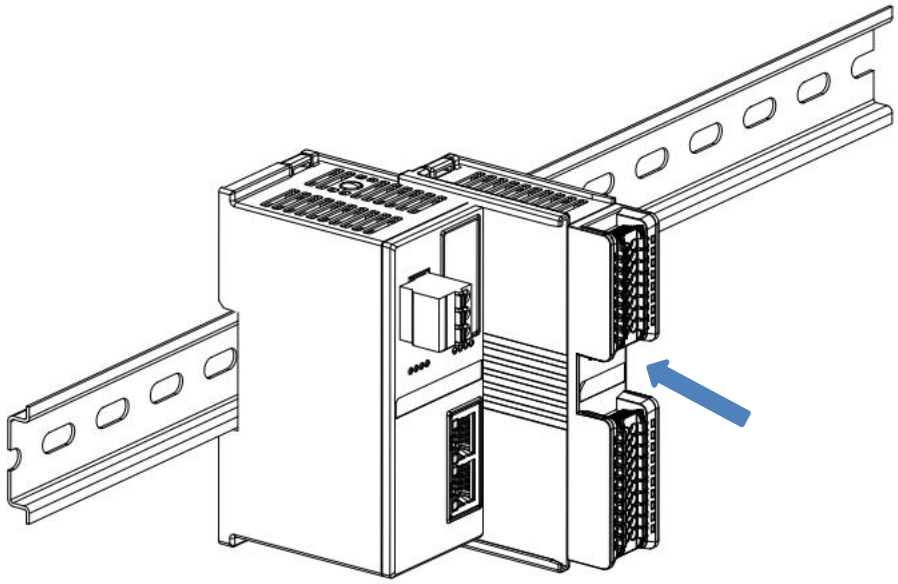
- Press the coupler module in the direction of the guide rail, and when you hear a "click" sound, the module is installed in place, as shown in Figure ② below.



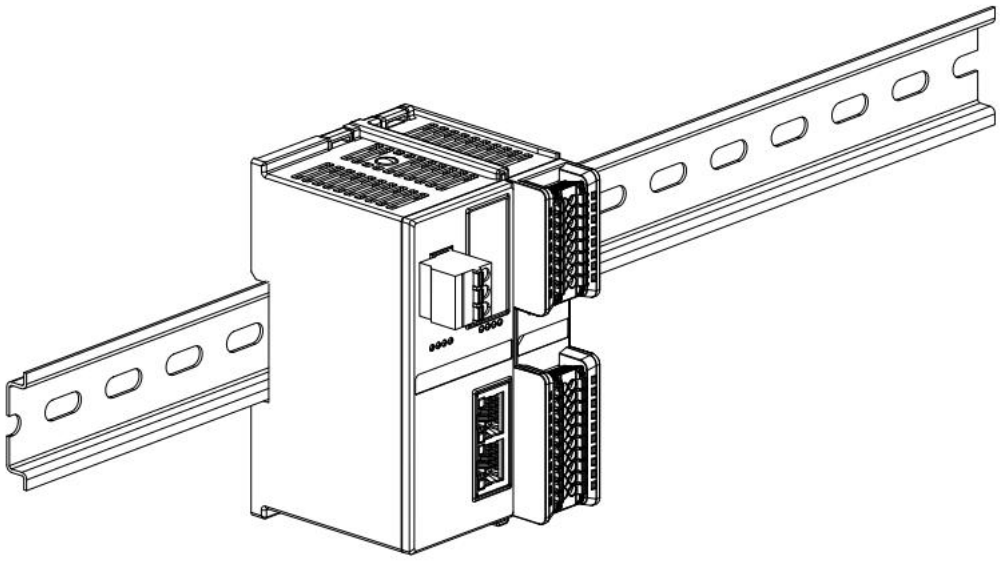
②

I/O Module Installation

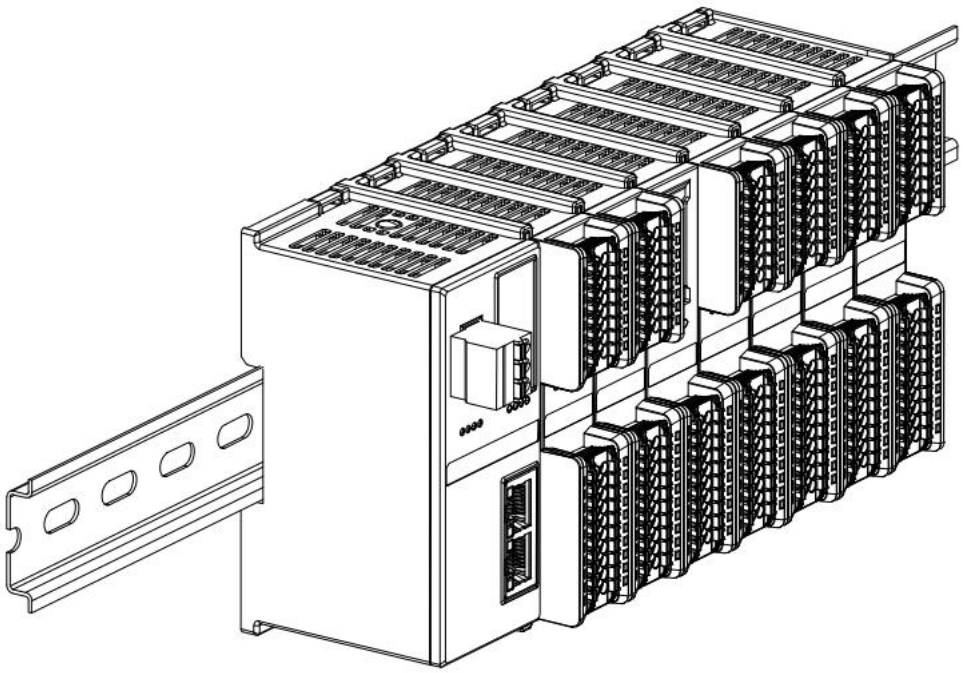
- Install the required I/O modules or function modules one by one according to the above steps of installing coupler modules as shown in Figures ③, ④ and ⑤ below, and push them in, and the modules will be installed in place when you hear the "click" sound.



③



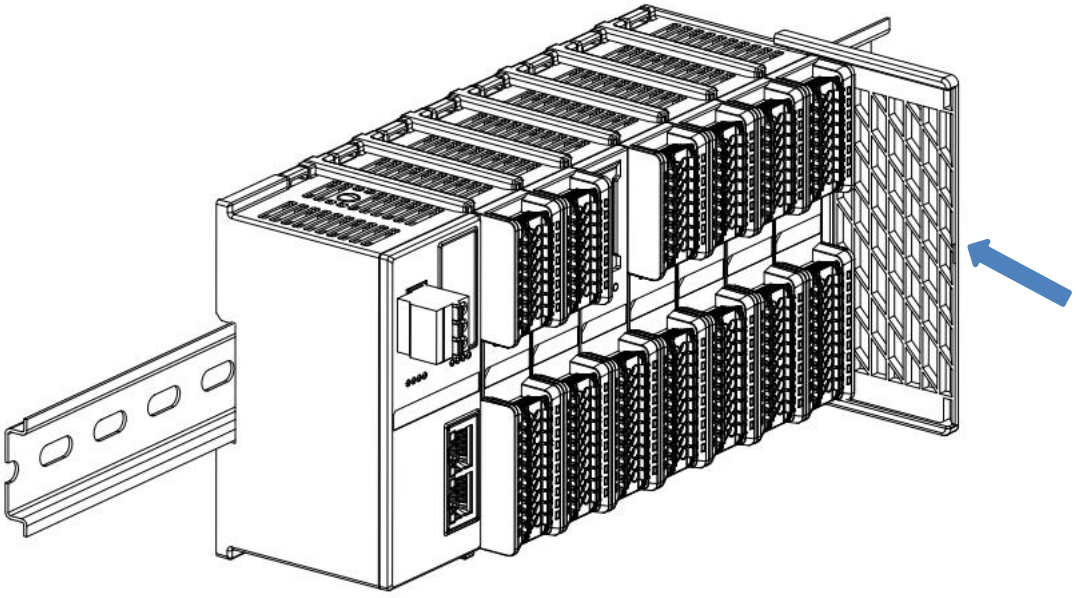
④



⑤

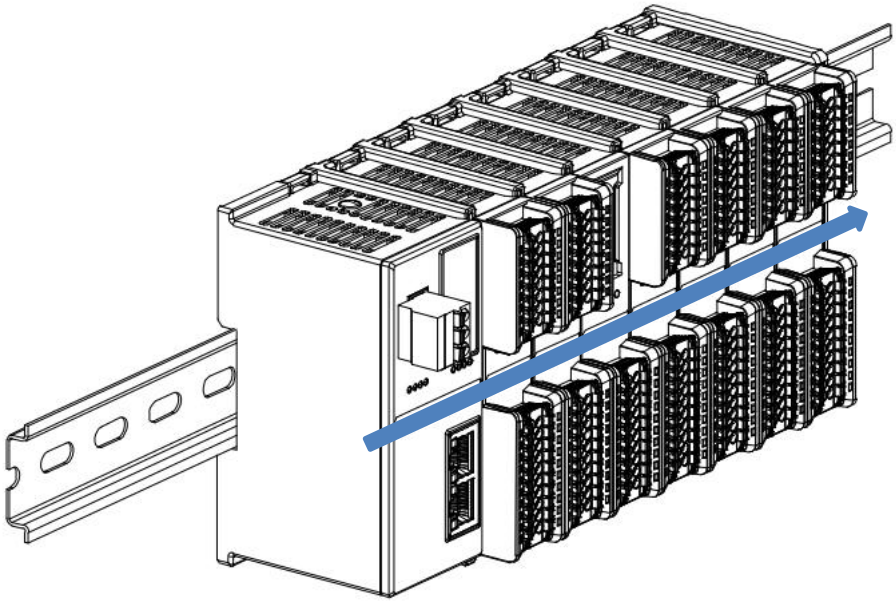
End cap installation

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



⑥

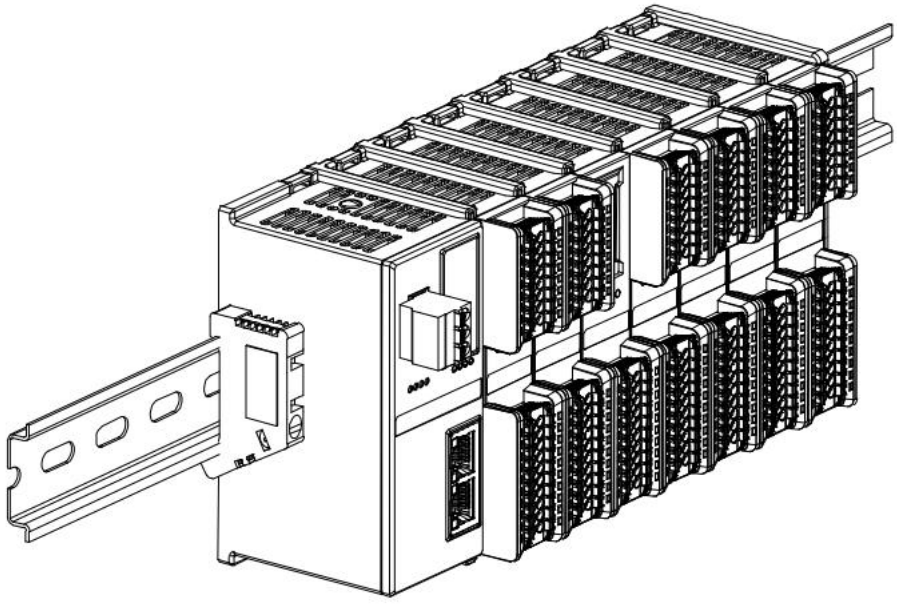
- After the end cap is installed, check whether the entire front of the module is flat to ensure that all modules and end caps are installed in place and the front is flush, as shown in Figure ⑦ below.



⑦

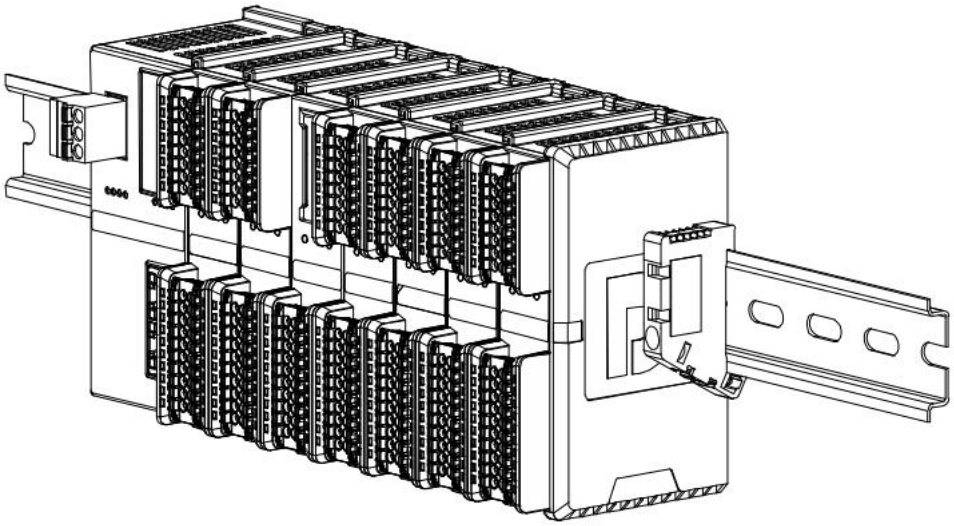
Installation of guide rail fixings

- Install and tighten the rail fixings firmly against the left side face of the coupler as shown in Figure ⑧ below.



⑧

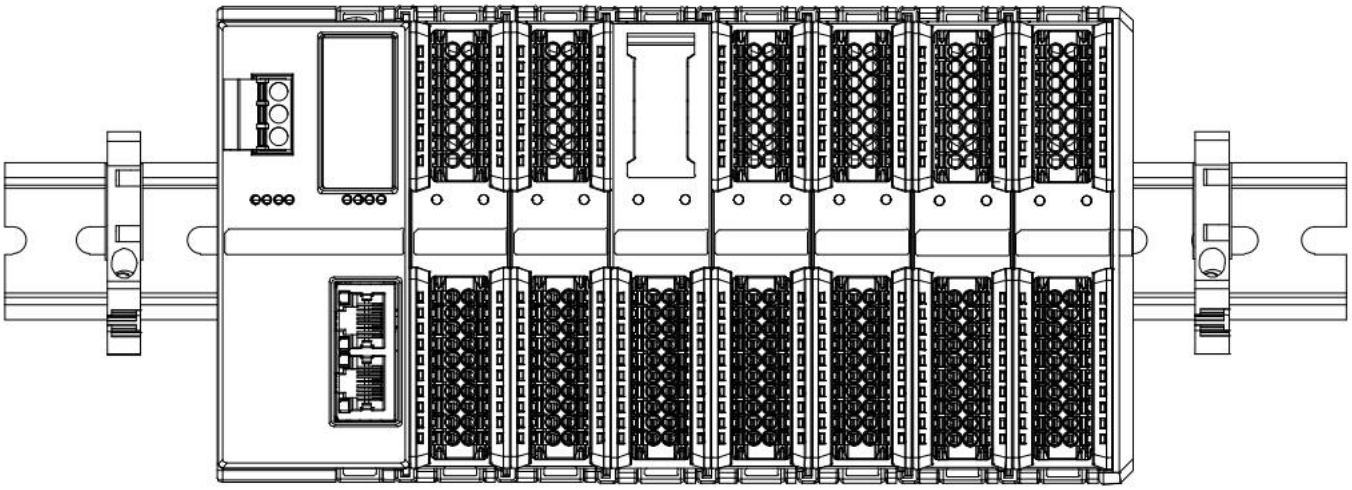
- Install the rail fixing on the right side of the end cap, first push the rail fixing firmly in the direction of the coupler to ensure that the module is installed tightly, and lock the rail fixing with a screwdriver, as shown in Figure ⑨ below.



⑨

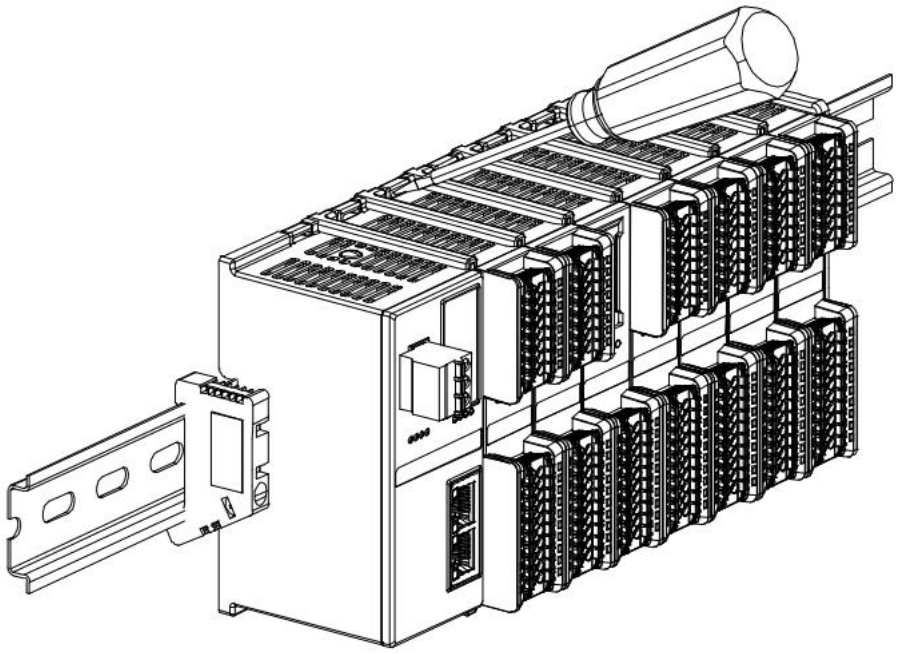
Uninstall

- Loosen the rail fixings at one end of the module with a screwdriver and move it to one side, making sure there is clearance between the module and the rail fixings, as shown in Figure ⑩ below.

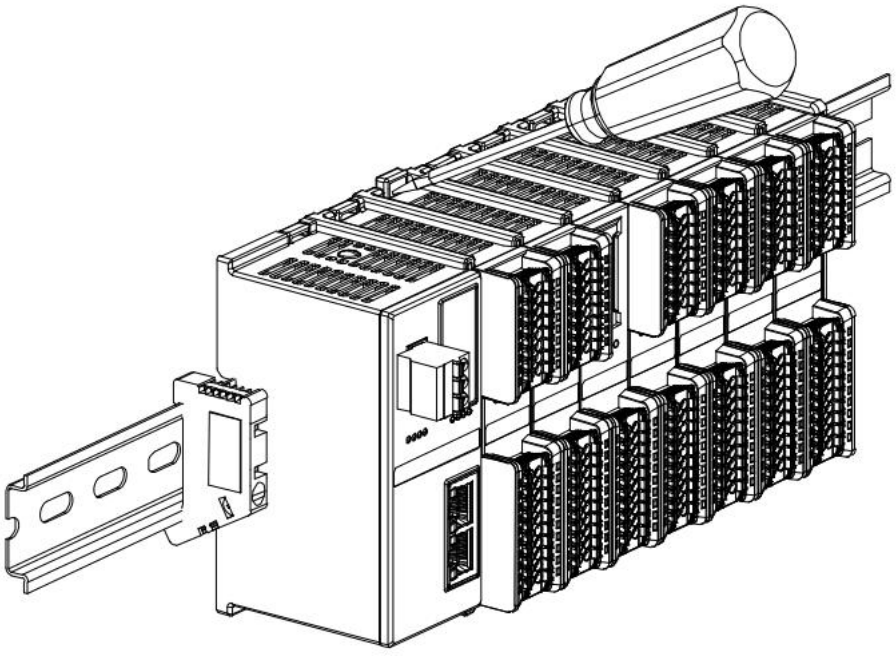


⑩

- Insert a flat head start into the snap of the module to be removed, and apply pressure (hear the rattle) in the direction of the module sideways, as shown in the following figures ⑪ and ⑫. **Note: There is one snap on the top and bottom of each module, follow this method.**

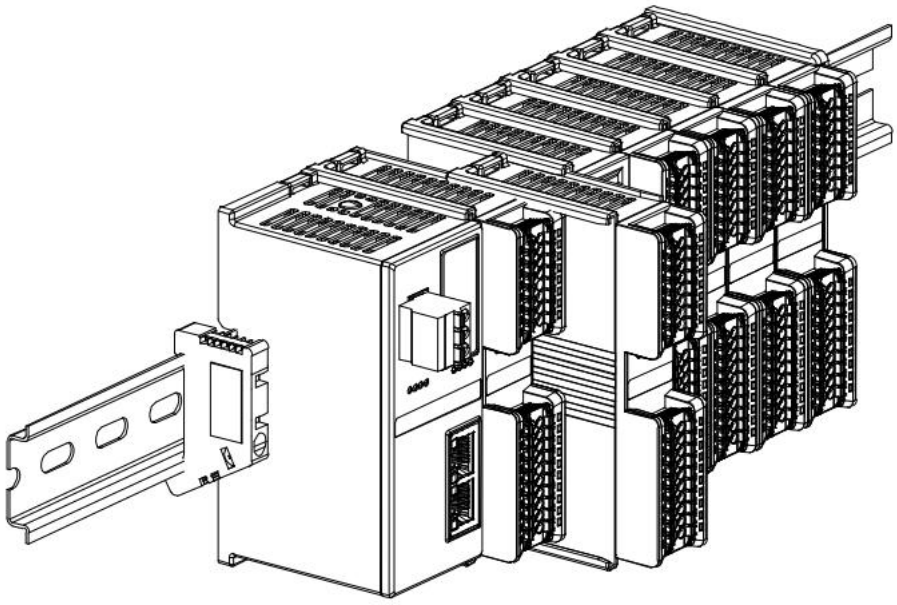


⑪



⑫

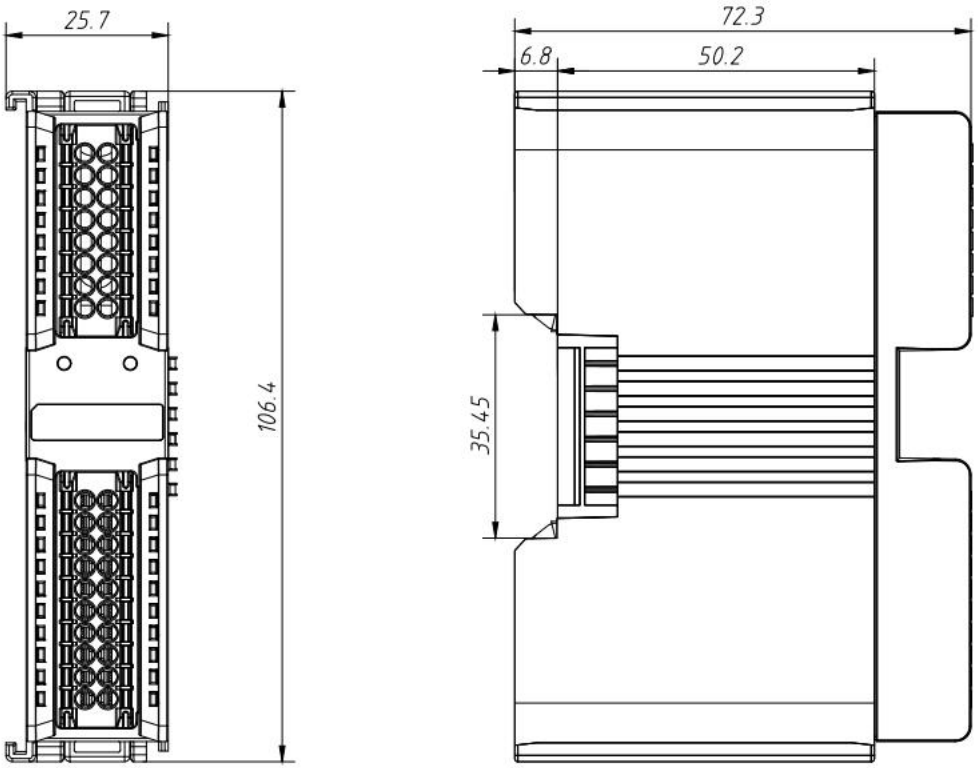
■ Remove the module as shown in figure ⑬ below, following the same procedure as for installing the module.



⑬

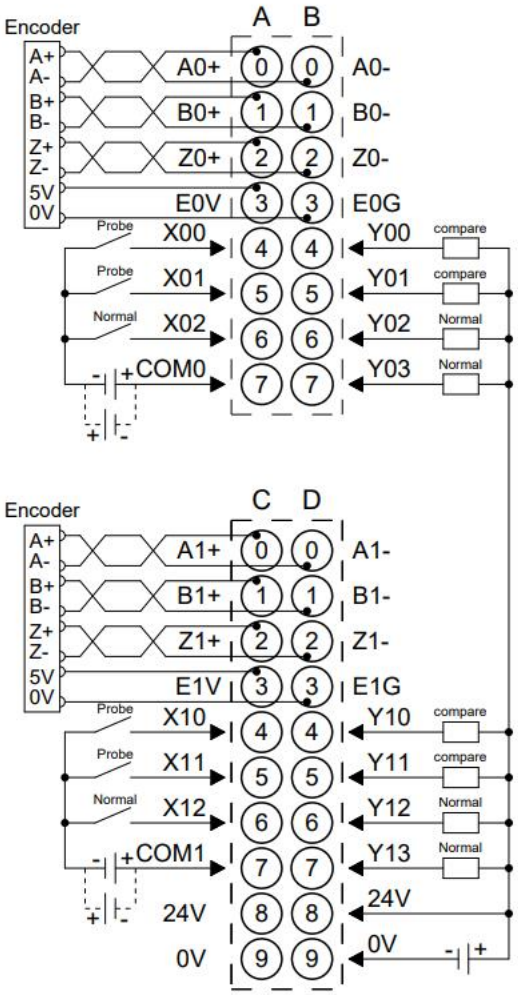
4.4 External dimensions

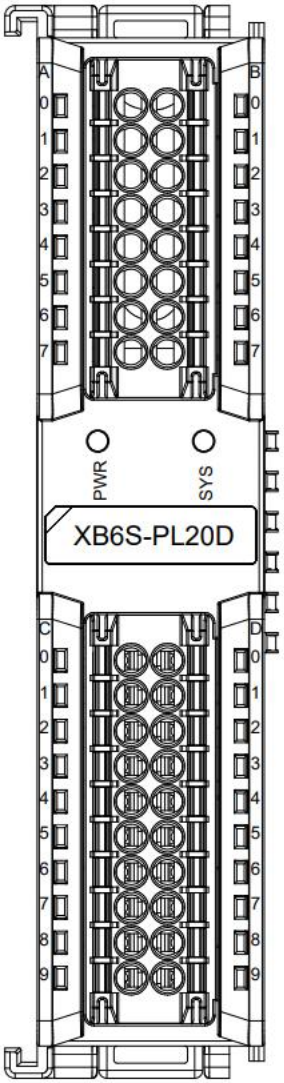
Housing specifications (unit mm)



5 Wiring

5.1 Wiring Diagram





- For personal and equipment safety, it is recommended that the power supply be disconnected during wiring operations.
- COM0 and COM1 are DI common, not internally interoperable and NPN/PNP compatible.
- 24V internal conduction, 0V internal conduction.
- The power supply on the common side of the load needs to be the same power supply as the module.

5.2 Terminal Block Definition

Encoder0					
A			B		
Terminal Identification	Terminal Definition	Description	Terminal Identification	Terminal Definition	Description
0	A0+	Encoder A0+	0	A0-	Encoder A0-
1	B0+	Encoder B0+	1	B0-	Encoder B0-
2	Z0+	Encoder Z0+	2	Z0-	Encoder Z0-
3	E0V	5V Encoder Power Supply	3	E0G	0V encoder power supply
4	X00	DI channel 0 (probe function)	4	Y00	DO channel 0 (compare output)
5	X01	DI channel 1 (probe function)	5	Y01	DO channel 1 (compare output)
6	X02	DI channel 2	6	Y02	DO channel 2
7	COM0	Input common COM0	7	Y03	DO channel 3
Encoder1					
C			D		
Terminal Identification	Terminal Definition	Description	Terminal Identification	Terminal Definition	Description
0	A1+	Encoder A1+	0	A1-	Encoder A1-
1	B1+	Encoder B1+	1	B1-	Encoder B1-
2	Z1+	Encoder Z1+	2	Z1-	Encoder Z1-
3	E1V	5V encoder power supply	3	E1G	0V encoder power supply
4	X10	DI channel 0 (probe function)	4	Y10	DO channel 0 (compare output)
5	X11	DI channel 1 (probe function)	5	Y11	DO channel 1 (compare output)
6	X12	DI channel 2	6	Y12	DO channel 2

7	COM1	Input common COM1	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

6 Operation

6.1 Process Data

6.1.1 Upstream Data

34 bytes of upstream data (17 bytes per encoder, encoder [n] takes values 0 to 1)				
Name	**Meaning**	**Range Of Values**	**Data Type**	**Lengths**
E[n] Input CH0 (Latch)	Encoder probe input signal channel 0	0: No signal input 1: With signal input	bool	1 bit
E[n] Input CH1 (Latch)	Encoder probe input signal channel 1	0: No signal input 1: With signal input	bool	1 bit
E[n] Input CH2	Encoder common input signal channel 2	0: No signal input 1: With signal input	bool	1 bit
E[n] Latched Flag CH0	Encoder probe input channel 0 latch completion flag bit	0: 1->0 latch once, reverse once 1: 0->1 latch once, reverse once	bool	1 bit
E[n] Latched Flag CH1	Encoder probe input channel 1 latch completion flag bit	0: 1->0 latch once, reverse once 1: 0->1 latch once, reverse 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

E[n] Speed	Encoder speed	-2^31~2^31-1	signed32	4 bytes

Upside Data Notes:

- **Encoder Probe Input Signal Channel E[n] Input CH0/CH1 (Latch)**
  Each encoder is equipped with 2 probe input channels, indicating the presence or absence of the input signal of the corresponding probe input channel.
  When the probe input channel latch function is not turned on, it can be used as a common digital input channel.

- **Encoder common input signal channel E[n] Input CH2**
  Each encoder is equipped with 1 common digital input channel, indicating the presence or absence of the corresponding DI channel input signal.

- **Encoder Probe Input Channel Latched Completion Flag Bit E[n] Latched Flag CH0/CH1**
  1 encoder with 2 probe input channels, after the probe input channel completes a latch, the flag bit will reverse 0->1 or 1->0.
  Example 1: The encoder 0 probe input channel 1 latch completion flag bit is 0. After completing one latch, the flag bit changes to 1, and after completing another latch, the flag bit changes to 0.

- **Encoder Count Value E[n] Count Value**
  The encoder count value is the current count size of the corresponding encoder, the value range is 0~2^32-1.

- **Encoder Probe Input Channel Latch Value E[n] Latch Value CH0/CH1**
  Each encoder is equipped with 2 probe input channels. By inputting a signal that meets the set conditions to the probe input channels, the current counting value of the corresponding encoder can be quickly latched, so that the numerical range of the latched value is the same as that of the counting value, and the numerical range is 0~2^32-1.

- **Encoder Speed E[n] Speed**
  The encoder speed is the magnitude of the pulse speed of the encoder input channel, and the value ranges from -2^31 to 2^31-1.

6.1.2 Downstream Data

Downstream instruction 20 bytes (10 bytes per encoder, encoder [n] takes values 0 to 1)				
Name	**Meaning**	**Range Of Values**	**Data Type**	**Lengths**
E[n] Enable	Encoder Count Enable	0: Disabled 1: Enabled	bool	1 bit0
E[n] Z Phase Clear Enable	Encoder Z-phase clear enable	0: Disabled 1: Enabled	bool	1 bit1
E[n] Count Clear	Encoder count value clear	0: Disabled 1: Enabled	bool	1 bit2
E[n] Compare Output CH0 Enable	Encoder compare output channel 0 enable	0: Disabled 1: Enabled	bool	1 bit3
E[n] Compare Output CH 1 Enable	Encoder compare output channel 1 enable	0: Disabled 1: Enabled	bool	1 bit4
E[n] Compare Output CH0 Direction	Encoder compare output channel 0 Compare direction	0: Decreasing comparison 1: Incremental comparison	bool	1 bit5
E[n] Compare Output CH1 Direction	Encoder Compare Output Channel 1 Compare Direction	0: Decreasing comparison 1: Incremental comparison	bool	1 bit6
E[n] Compare Output CH0 Mode	Encoder compare output channel 0 trigger mode	0: Single trigger 1: Repeat trigger	bool	1 bit7
E[n] Compare Output CH1 Mode	Encoder compare output channel 1 trigger mode	0: Single trigger 1: Repeat Trigger	bool	1 bit0
E[n] Output CH0 (Compare)	Encoder output channel 0 (compare output)	0: Output high level 24V 1: Output low level 0V	bool	1 bit1
E[n] Output CH1 (Compare)	Encoder output channel 1 (compare output)	0: Output high level 24V 1: Output low level 0V	bool	1 bit2
E[n] Output CH2	Encoder output channel 2 (normal output)	0: Output high level 24V 1: Output low level 0V	bool	1 bit3
E[n] Output CH3	Encoder output channel 3 (normal output)	0: Output high level 24V 1: Output low level 0V	bool	1 bit4

E[n] Latch CH0 Enable	Encoder probe input channel 0 latch enable	0: Disabled 1: Enabled	bool	1 bit5
E[n] Latch CH1 Enable	Encoder probe input channel 1 latch enable	0: Disabled 1: Enabled	bool	1 bit6
E[n] Compare Value CH0	Encoder compare output channel 0 set value	0~2^32-1	unsigned32	4 bytes
E[n] Compare Value CH1	Encoder compare output channel 1 set value	0~2^32-1	unsigned32	4 bytes

Downside Data Notes:

- **Encoder Count Enable E[n] Enable**
  Encoder count enable is disabled when set to 0, and enabled when set to 1..

- **Encoder Z Phase Clear Enable E[n] Z Phase Clear Enable**
  Encoder Z-phase zero enable is disabled when set to 0, and is enabled when set to 1.
  The Z-phase clear enable clears the current count value by detecting the Z-phase signal of the encoder. For each rotation of the encoder, a Z-phase pulse is generated and the count value is cleared once.
  The physical resolution of the encoder is the number of pulses output by one rotation of the encoder, and the count ratio×physical resolution is the maximum value of single rotation counting. Z-phase clear function is on, and the count value is cleared once for each rotation of the encoder when the count value is incremented or decremented.

- **Encoder Count Clear E[n] Count Clear**
  Edge control, the corresponding encoder count value is cleared to zero when the bit is detected to be set from 0 to 1. If the initial value of the encoder count is set, the count value is also set to 0.

- **Encoder Compare Output - Channel Enable E[n] Compare Output CH0/CH1 Enable**
  Encoder compare output enable is disabled when set to 0, and is enabled when set to 1.
  When the compare output channel function is not enabled, it can be used as a common digital output channel.
  Note: You must ensure that the compare output channel is not output before enabling the compare output, otherwise enabling the compare output in the output state will result in an output all the time.
  See 6.2.3 Compare Output Function for details.

- **Encoder Compare Output - Channel Compare Direction E[n] Compare Output CH0/CH1 Direction**
  The compare direction of the encoder compare output channel is set to 0 for decreasing comparison, i.e., the direction of count value from large to small; set to 1 for increasing comparison, i.e., the direction of count value from small to large.

- **Encoder Compare Output - Channel Trigger Mode E[n] Compare Output CH0/CH1 Mode**
  The encoder compare output channel trigger mode can be set to 0 (single trigger), 1 (repeat trigger).
  Single trigger, i.e., after the compare output function is enabled, the pulse output is triggered once when the count value meets the condition, after that, no more comparison is made, and the compare output is triggered again by re-enabling the compare output function.
  Repeat trigger, i.e., after the compare output function is enabled, a pulse output is triggered once when the count value meets the condition, and then the next comparison will start immediately, but the pulse output will not restart for a period of time again within the time of the compare output pulse. After a period of time is completed, the pulse output will be triggered again when the conditions of the compare output are met. For details, see 6.2.3 Compare Output Function.

- **Encoder output channel (Compare output) E[n] Output CH0/CH1 (Compare)**
  When the compare output channel function is not enabled, it can be used as a common digital output channel. Digital output (NPN type output): Setting "0" outputs high level 24V, setting "1" outputs low level 0V.
  When the compare output is established, the level of this pin will be reversed, so the invalid/valid level corresponding to the compare output can be set by setting this bit first and then enabling the compare output.

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

- **Encoder Probe Input Channel Latch Enable E[n] Latch CH0/CH1 Enable**
  The encoder input latch channel enable flag bit set to 1 enables the latch function, and set to 0 disables the latch function.

- **Encoder Compare Output Channel Setting Value E[n] Compare Value CH0/CH1**
  The encoder compare output channel setting value is consistent with the encoder count range, which ranges from 0 to 2^32-1.
  When the compare output function is enabled, the module will compare the current count value with the set value to see if it is the same. When both the compare direction and the setting compare value are the same, the corresponding compare output channel will output a time-adjustable pulse. For details, see 6.2.3 Compare output function.

6.2 Configuration Parameter Definitions

Module configuration has a total of 23 parameters, two encoders have 11 configuration parameters are the same and independently configured, there is one configuration parameter for the two encoders common (common parameters have been marked green in the following table), encoder 0 as an example of the introduction of configuration parameters, as shown in the table below. **Note: The configuration parameters will take effect when the encoder is enabled next time.**

Functionality	Parameter Name	Range Of Values	Default Value
Encoder 0 Pulse Mode	E0 Pulse Mode	0: ABZ (AB orthogonal) 1: Pul+Dir (directional pulse) 2: CW/CCW (double pulse)	0
Encoder 0 Filter	E0 Filter Level	0 to 15 levels	7
Encoder 0 Count Ratio	E0 Count Ratio	MUL_1, 2, 4 (effective only in AB orthogonal mode)	MUL_1
Encoder 0 Count Range	E0 Count Range	0: 2^32 (0~2^32-1) 1: Resolution x Multiple (0 ~ ring count resolution x count ratio -1)	0
Encoder 0 Ring Count Resolution	E0 Count Resolution	0~65535	1
Encoder 0 Count Direction	E0 Count Direction	0: Forward 1: Backward	0
Encoder 0 Count Initial Value	E0 Initial Value	0~2^32-1	0
Encoder 0 Probe Mode	E0 Latch Mode	0: CH0 Single, CH1 Single Channel 0 Single, Channel 1 Single 1: CH0 Repeat, CH1 Single Channel 0 Repeat, Channel 1 Single 2: CH0 Single, CH1 Repeat Channel 0 Single, Channel 1 Repeat 3: CH0 Repeat, CH1 Repeat Channel 0 Repeat, Channel 1 Repeat	0
Encoder 0 Probe Trigger Edge	E0 Latch Edge	0: CH0 Raising, CH1 Raising Channel 0 rising edge, Channel 1 rising edge 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	0

		edge	
		3: CH1 Falling, CH1 Falling Channel 0 falling edge, Channel 1 falling edge	
Encoder 0 Compare Output Channel 0 Pulse Time	E0 Compare Output Time CH0	0~65535 (unit: ms)	10
Encoder 0 Compare Output Channel 1 Pulse Time	E0 Compare Output Time CH1	0~65535 (unit: ms)	10
Power-down Storage Enable	Power Down Storage	0: OFF OFF	1
		1: ON turn on	

6.2.1 Encoder Count Function

The encoder counting parameters include seven parameters: **encoder pulse mode**, **filter**, **count ratio**, **count range**, **ring count resolution**, **count direction** and **count initial value**.

Encoder Pulse Modes: The input pulse modes supported by the encoder counter are AB orthogonal mode, directional pulse mode and CW/CCW mode.

Encoder Filter: Encoder filter is valid in all three pulse modes, and there are 16 levels of filter (0~15), level 0 means no filter, and level 15 means the maximum degree of filter. The default encoder filter parameter is level 7, which can be configured as needed.

Encoder Count Ratio: The encoder count multiplier is only valid in AB orthogonal pulse mode.

Encoder Counting Range: The count range of the encoder can be set to 0~2^32-1 or 0~Ring count resolution x count ratio -1, the former is suitable for most cases, the latter is suitable for the case where the encoder does not have a Z-phase signal, but is still needed for single-turn counting.

Encoder Ring Count Resolution: The ring count resolution is used to set the count range of the encoder, the setting range is 0~65535.

Note: The ring count resolution here is different from the physical resolution of the encoder itself. When the resolution is set to 0 and the count range is set to 1 i.e. 0~Ring Count Resolution x Count Ratio -1, ring counting does not take effect.

Encoder Count Direction: The default encoder counting direction is 0 for forward counting; when set to 1, the encoder will be counted in reverse direction after the encoder is re-enabled.

Encoder Count Initial Value: The count initial value of the encoder supports configuration and takes effect automatically after the encoder is re-enabled. The setting range of the count initial value is 0~2^32-1. Note: When the power-down storage function is enabled, the count initial value is invalid, and the encoder count initial values are all 0. When the count initial value is larger than the maximum value of the ring count, the ring count does not take effect.

Example 1: The encoder 0 pulse mode is set to AB orthogonal mode, the count range of the encoder is selected from 0 to ring count resolution × count ratio -1, the ring count resolution is set to 50000, the count ratio is 4, the count direction is forward, the initial value of counting is 0, then the count range is 0~200000. the module is connected to an encoder with a physical resolution of 1000, and the counting starts from 0 and increases. The module is connected to an encoder with a physical resolution of 1000,

after the counting starts, the counting starts from 0 and increases, the encoder rotates one turn and the counting value is 1000×4=4000, and after it reaches 200000, it returns to 0 and continues to count.

6.2.2 Probe Functions

The probe function parameters include two parameters: **probe mode** and **probe trigger edge**. Each encoder is equipped with two probe input channels. By inputting the corresponding signals to the probe input channels, the count value of the corresponding encoder can be latched.

Probe Mode: The Probe Mode parameter can be configured for single/continuous mode for each probe function channel of the encoder.

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

If the probe function channel is configured as 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, which can be latched several times.

Probe Trigger Edge: The Probe Trigger Edge parameter allows you to configure each probe function channel of the encoder to be triggered on the rising/falling edge. The latch trigger signals of the two probe channels of each encoder can be configured individually, and the latch values can be displayed separately.

The probe input channel is compatible with PNP/NPN signals through the COM terminal. When the COM terminal is connected to 0V, the input signal is PNP type, the input high level 24V signal is valid, the input low level 0V signal is invalid; when the COM terminal is connected to 24V, the input signal is NPN type, the input low level 0V signal is valid, the input high level 24V signal is invalid.

A rising edge trigger indicates that the probe input channel is triggered from an invalid signal to a valid signal, and a falling edge trigger indicates that it is triggered from a valid signal to an invalid signal.

6.2.3 Compare Output Function

Compare output function is configured by enabling the compare output channel, compare output set value, compare direction, single/repeat trigger mode and compare output channel pulse time. When the encoder count value reaches the set value and the compare direction is satisfied, the corresponding compare output channel will output a pulse with adjustable time, and the adjustable time is the compare output pulse time. The pulse response speed of the compare output function can reach 10us level.

Compare output function configuration parameters include **encoder compare output channel pulse time**, configurable time range is 0~65535ms.

Each encoder is equipped with 2 compare output channels. Compare output channel enable, compare output set value, compare direction and single/repeat trigger mode can be set in the downstream data. When the compare output channel function is not enabled, the compare output channels can be used as common digital outputs.

Example 1: When the compare output channel 1 of encoder 0 is used as a common digital output, the output value is set to 0 (NPN type output, at which time the output is 24V), and the channel indicator is off.

The set value of the compare output channel 1 of encoder 0 is set to 1000, the compare direction is set to incremental comparison, the compare output trigger mode is single trigger, the pulse time of the compare output channel 1 is configured as 5s, after the function of compare output channel 1 is enabled, when the count value of encoder 0 reaches 1000 from small to large (to satisfy the comparison direction), the compare output channel 1 will be output as a compare output channel, and the status will be reversed, from the original high level output to low level output, the pulse output time is 5s, the channel indicator will be on for 5s. 5 seconds later, the high level output will be resumed, and the channel indicator will be off. When the count value meets the set value of compare output and the compare direction again, the compare output channel has no reaction because the compare output trigger mode is single trigger.

Example 2: When the compare output channel 1 of encoder 0 is used as a common digital output, the output value is set to 1 (NPN type output, at which time the output is 0V), and the channel indicator is on.

Encoder 0 compare output channel 1 set value is set to 1000, the compare direction is set to decreasing comparison, the compare output trigger mode is repeat trigger, the compare output channel 1 pulse time is configured to 5s, the compare output channel 1 function is enabled, when the count value of encoder 0 reaches 1000 from small to large (does not satisfy the compare direction), the compare output channel 1 has no reaction; when the count value of encoder 0 When the count value of encoder 0 reaches 1000 from large to small (to satisfy the compare direction), the compare output channel will be output as a compare output channel, and the state will be reversed from the original low level output to high level output, the pulse output time is 5s, and the channel indicator will be off for 5s. 5 seconds later, the low level output will be restored, and the channel indicator is on.

Compare output trigger mode is repeat trigger, pulse output time 5s within the count value again to meet the compare output set value and compare direction, the compare output channel will not change the pulse output state, still continue to complete the 5s pulse output. 5s to meet the conditions of the comparison again, the state will be reversed again, from the original high level output to a low level output, the pulse output time of 5s, the channel indicator will be off for 5s. Compare output is triggered repeatedly and so on.

6.2.4 Power-down Storage Function

When the power-down storage enable parameter is turned on, the encoder count value can be stored in case of system power failure. The default value is 1 to enable the power-down storage function, and 0 to disable the power-down storage function.

When the power-down storage function is enabled, the initial value of the encoder count is invalid and the initial values of the encoder counts are all 0.

6.3 Application Cases

- **Encoder 0 Input AB orthogonal pulses, 40,000 pulses , Encoder 0 probe input channel 0 for latching**
  a. Configure the configuration parameters;
     a) The Encoder 0 Pulse Mode is set to AB orthogonal Pulse Mode, i.e., E0 Pulse Mode is set to 0: ABZ;
     b) The Encoder 0 Count Ratio is set to 4x, i.e. E0 Count Ratio is set to MUL_4;
     c) The Encoder 0 Count Range is set to 0~Ring Count Resolution x Count Multiple-1, i.e., E0 Count Range is set to 1: Resolution x Multiple;
     d) Encoder 0 Ring Count Resolution is set to 20000, i.e. E0 Count Resolution is set to 20000;
     e) The Encoder 0 Count Direction is set to Forward Count, i.e., E0 Count Direction is set to 0: Forward;
     f) The Encoder 0 Count Initial Value is set to 0, i.e., E0 Initial Value is set to 0;
     g) Encoder 0 Probe Mode is set to Channel 0 Single, Channel 1 Single, i.e. E0 Latch Mode is set to 0: CH0 Single, CH1 Single;
     h) The Encoder 0 Probe Trigger Edge is set to Channel 0 Rising Edge, Channel 1 Rising Edge, i.e. E0 Latch Edge is set to 0: CH0 Raising, CH1 Raising;
  b. Set the encoder 0 count enable and the encoder 0 probe input channel 0 latch enable;
     a) Downstream Data E0 Enable is set to 1;
     b) Downstream Data E0 Latch CH0 Enable is set to 1;
  c. Encoder 0 starts to input pulses and Encoder 0 probe input channel 0 inputs a valid signal.

- **Encoder 0 inputs directional pulses, 40,000 pulses, encoder 0 compare output channel 0 for compare outputs**
  a. Configure the configuration parameters;
     a) The Encoder 0 Pulse Mode is set to Direction Pulse Mode, i.e. E0 Pulse Mode is set to 1: Pul+Dir;
     b) The Encoder 0 Count Range is set to 0~2^32-1, i.e., the E0 Count Range is set to 0:2^32;
     c) The Encoder 0 Count Direction is set to Forward Count, i.e. E0 Count Direction is set to 0: Forward;
     d) The Encoder 0 Count Initial Value is set to 0, i.e., E0 Initial Value is set to 0;
     e) The Encoder 0 Compare Output Channel 0 pulse time is set to 10s, i.e. E0 Compare Output Time CH0 is set to 10000;
  b. Set encoder 0 count enable, and encoder 0 compare output channel 0 sets and enables the compare set value, compare direction, and compare mode;
     a) Downstream data E0 Enable is set to 1;
     b) Downstream data E0 Compare Value CH0 is set to 1000;
     c) Downstream Data E0 Compare Output CH0 Direction set to 1 Incremental Compare;
     d) Downstream Data E0 Compare Output CH0 Mode is set to 1 Repeat Trigger;
     e) Downstream Data E0 Compare Output CH0 Enable is set to 1 to enable;
  c. Encoder 0 starts inputting pulses.

6.4 Module Configuration Description

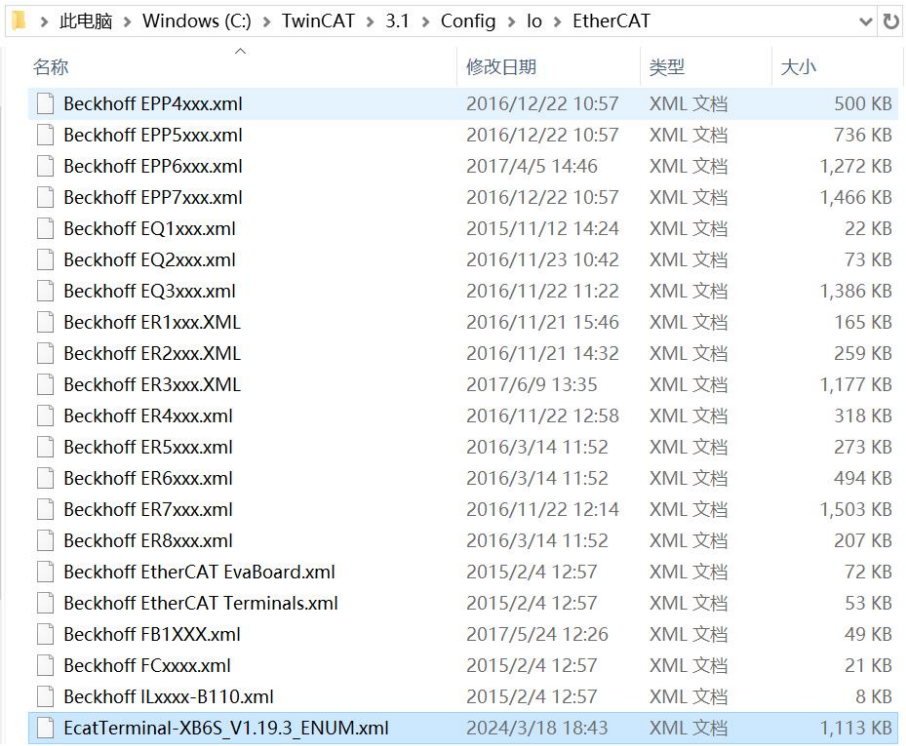
6.4.1 Application in TwinCAT3 software environment

1、preliminary

- **hardware environment**
  - **Module Model XB6S-PL20D**
  - **EtherCAT Coupler, End Cap**
    This description uses the XB6S-EC2002 coupler as an example
  - **A computer with pre-installed TwinCAT3 software**
  - **Shielded cables for EtherCAT**
  - **Encoders and other equipment**
  - **One switching power supply**
  - **Module mounting rails and rail mounts**
  - **Device Configuration Files**
    Configuration file access: https://www.solidotech.com/documents/configfile
- **Hardware configuration and wiring**
  Follow "4 Mounting and dismounting" and "5 Wiring".

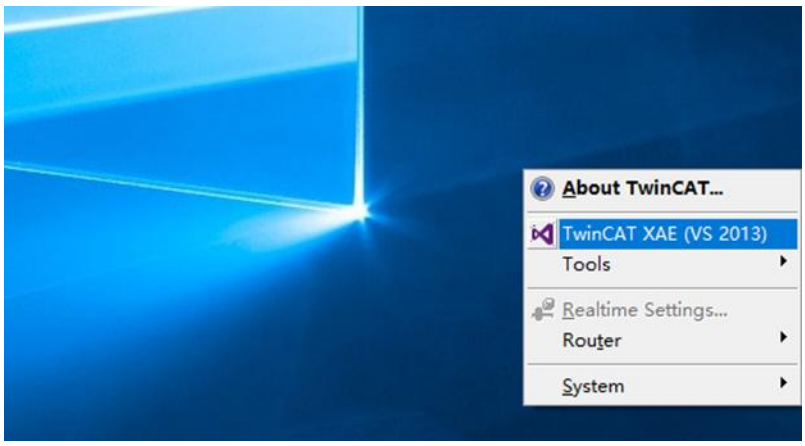
2、Preset Profiles

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

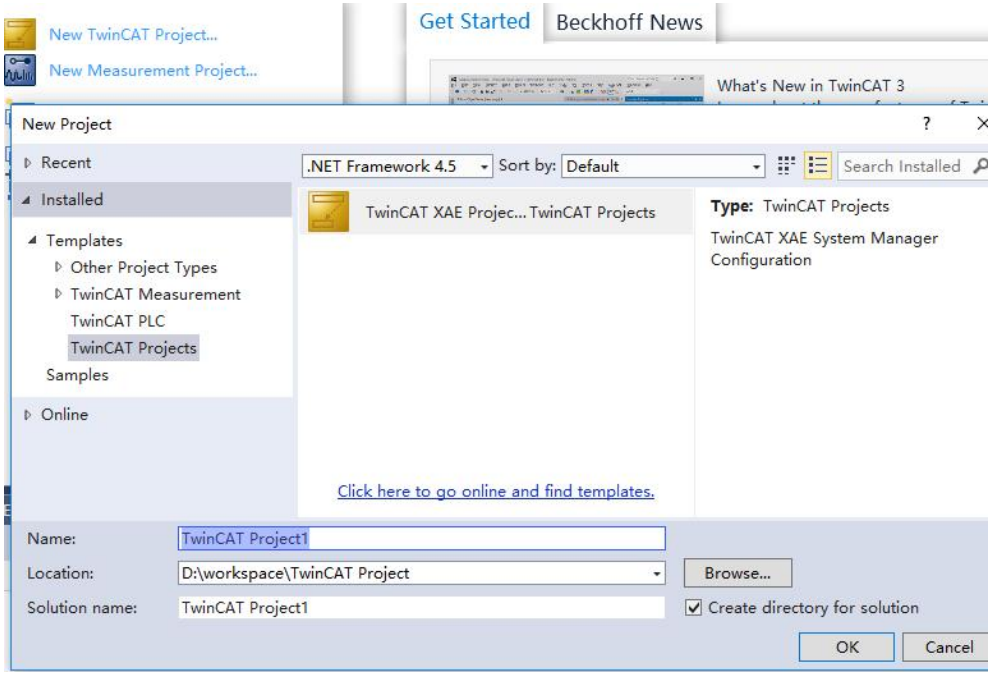


3、Create Project

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 below.



b. Click "New TwinCAT Project", in the pop-up window, "Name" and "Solution name" correspond to the project name and solution name respectively. In the pop-up window, "Name" and "Solution name" correspond to the project name and solution name, respectively, and "Location" corresponds to the project path, and these three items can be selected by default, then click "OK", the project is created successfully, as shown in the following figure.



4、scanning device

a. After creating the project, right-click on the "Scan" option under "I/O -> Devices" to perform a slave device scan, as shown in the following

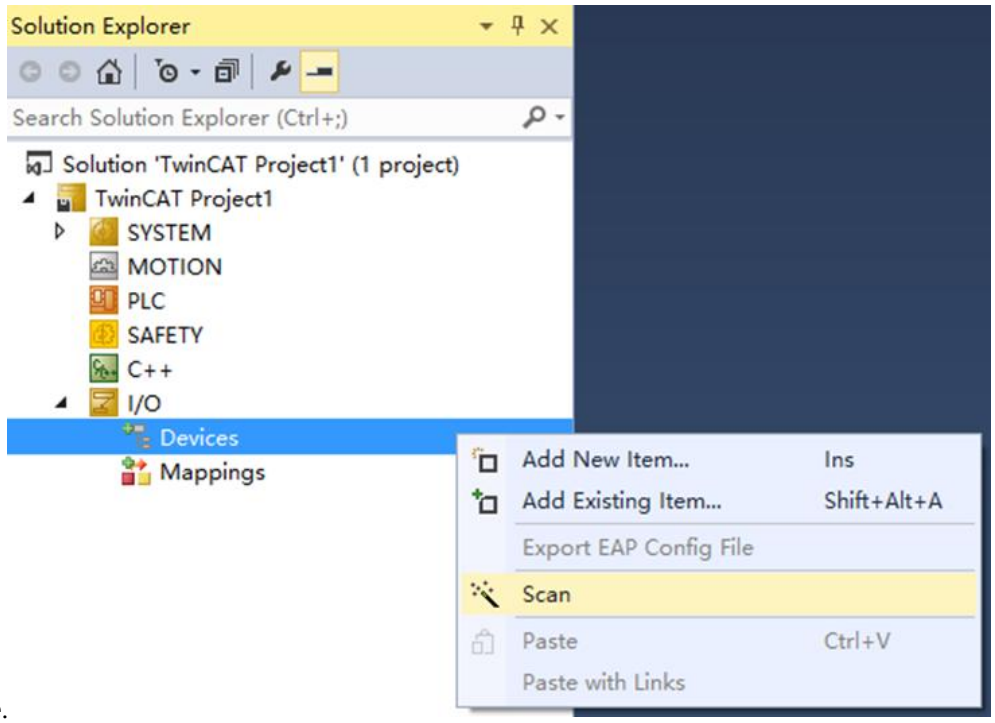
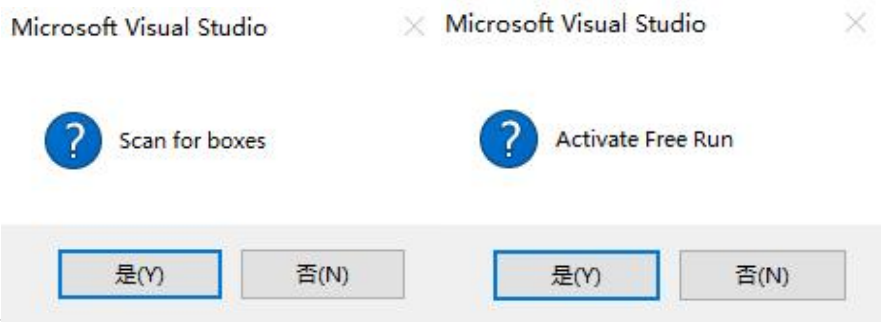


figure.

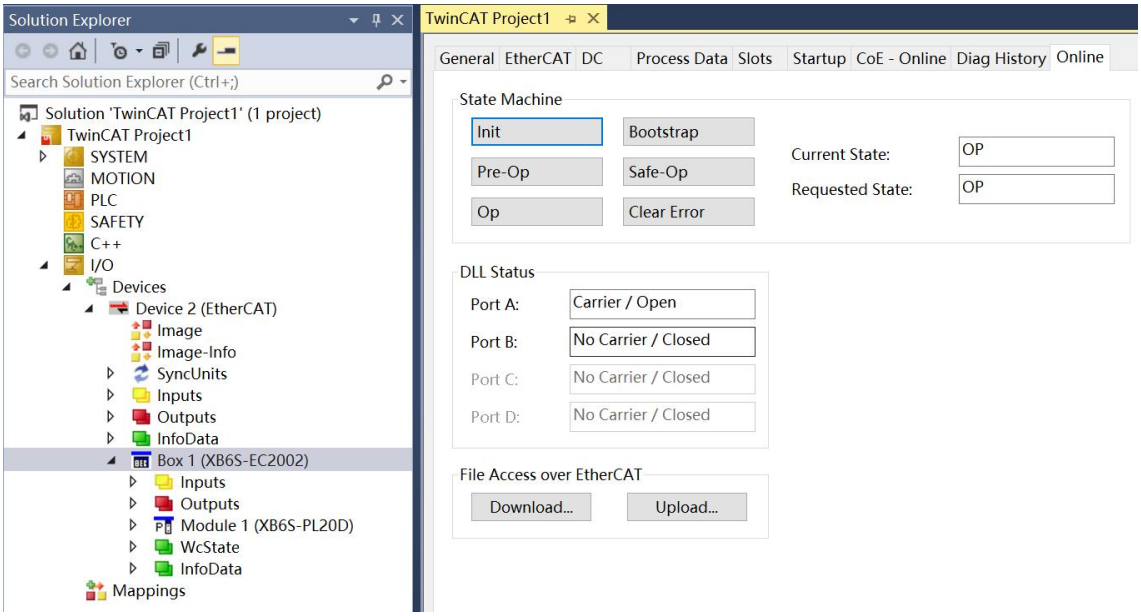
b. Check the "Local Connection" box, as shown in the following

figure.

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

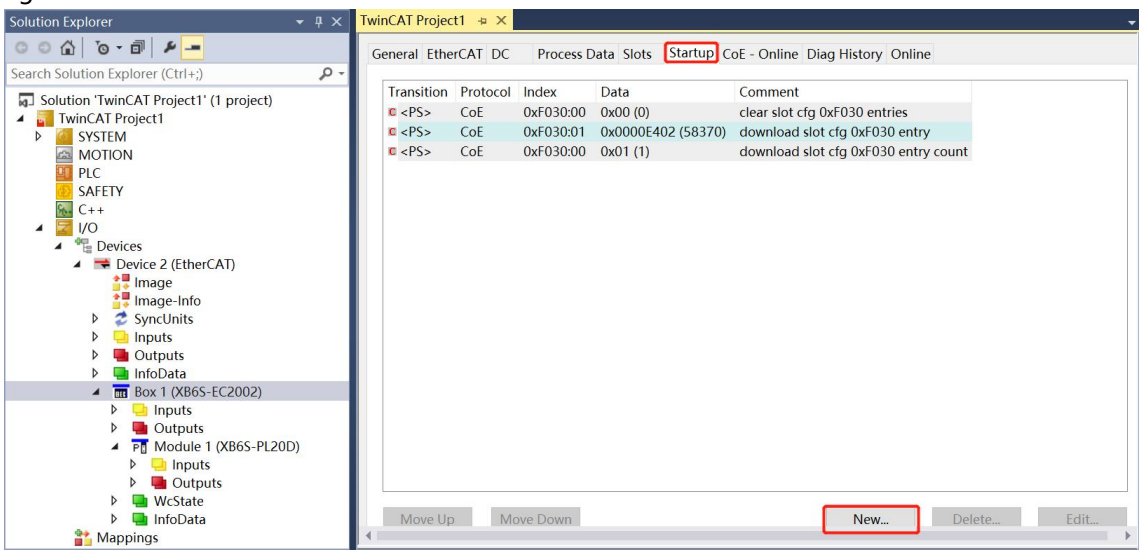


d. After scanning to the device, you can see Box1 (XB6S-EC2002) and Module 1 (XB6S-PL20D) on the left side of the navigation tree, and you can see TwinCAT is in the "OP" state at "Online". At "Online", you can see that TwinCAT is in the "OP" state, and you can observe that the RUN lamp of the slave device is always on, as shown in the figure below.

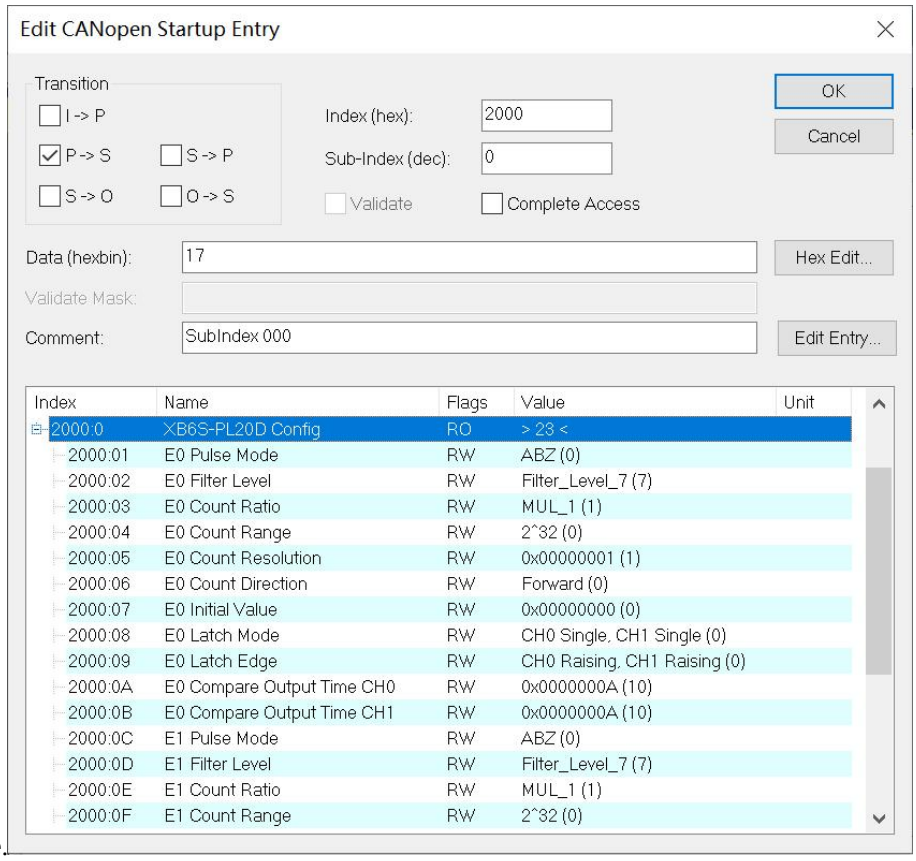


5、Validating Basic Functions

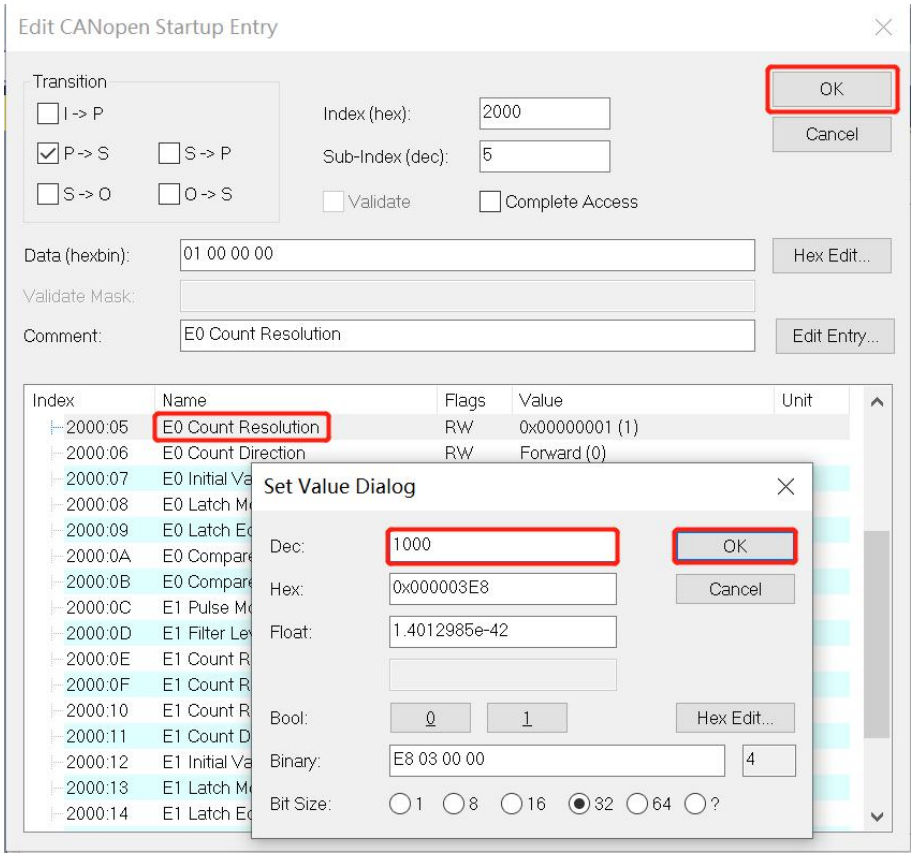
a. Click "Box1 -> Startup -> New" in the left navigation tree to enter the configuration parameter editing page, as shown in the following figure.



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 23 configuration parameters, click on any one of the parameters, you can set the relevant configuration, as shown in the following figure.

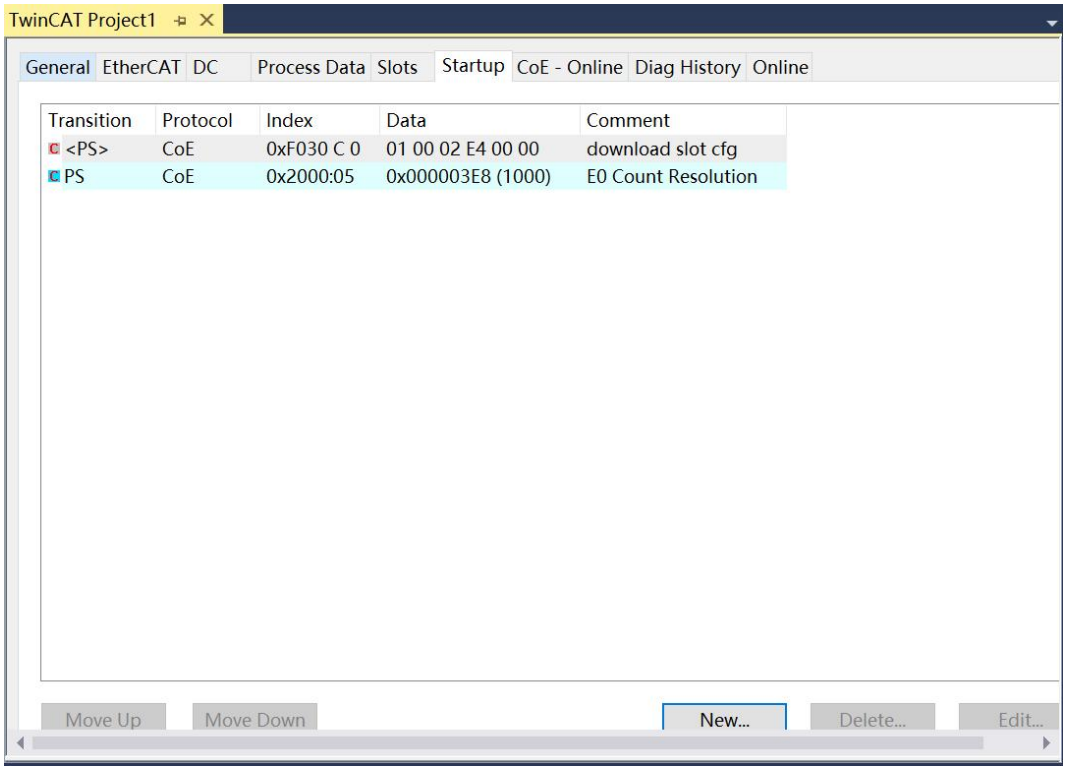


c. For example, to modify the encoder 0 ring count resolution parameter, you can double-click "E0 Count Resolution" to modify the parameter value, as shown in the following figure.

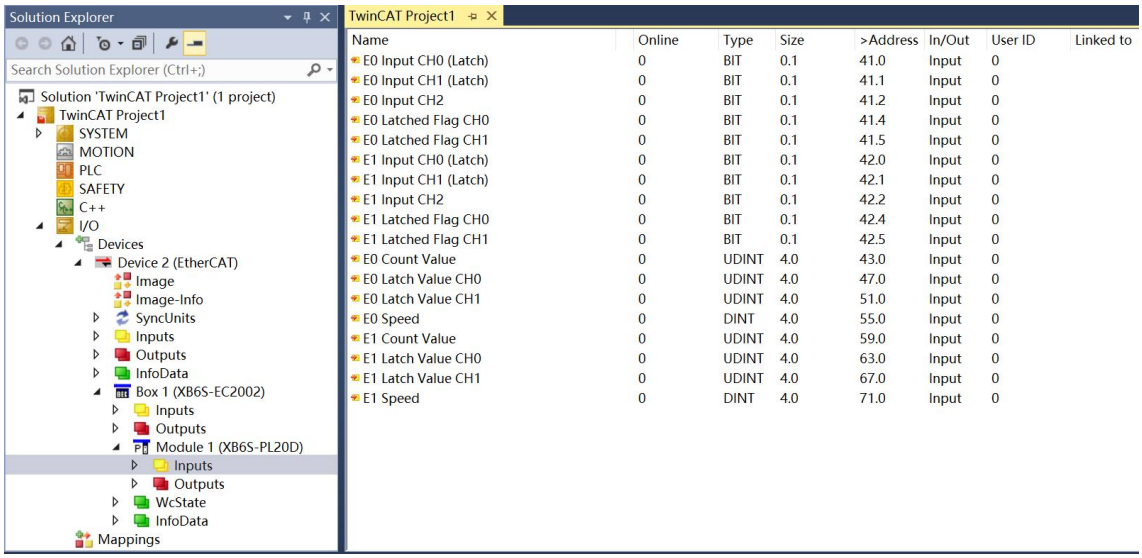


d. After the parameter modification is completed, you can see the modified parameter items and parameter values under Startup, as shown in the following figure. After the parameter setting is completed, it is necessary to carry out Reload operation and re-power up the module to realize that the master station automatically sends down the parameter

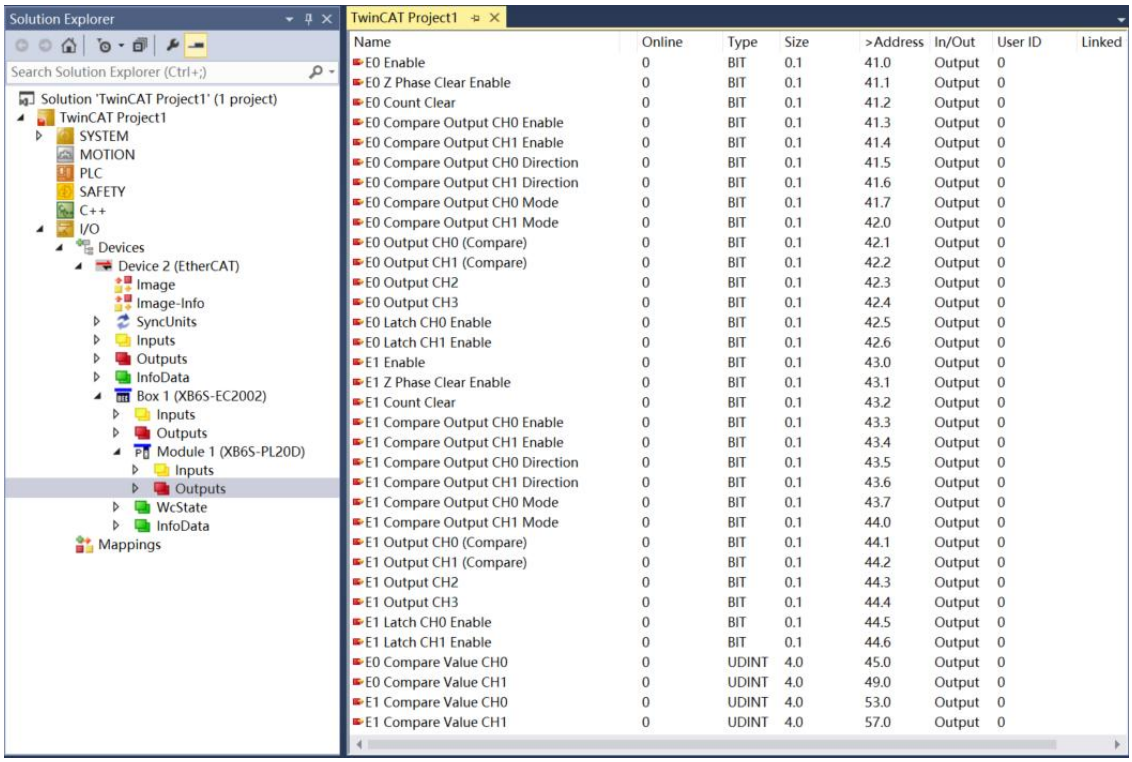
setting.



e. The left navigation tree "Module 1 -> Inputs" displays the upstream data of the module, which is used to monitor the inputs of the module, as shown in the following figure.



f. The left navigation tree "Module 1 -> Outputs" displays the downstream data of the module, which is used to control the outputs of the module, as shown in the following figure.



Name	Online	Type	Size	>Address	In/Out	User ID	Linked
E0 Enable	0	BIT	0.1	41.0	Output	0	
E0 Z Phase Clear Enable	0	BIT	0.1	41.1	Output	0	
E0 Count Clear	0	BIT	0.1	41.2	Output	0	
E0 Compare Output CH0 Enable	0	BIT	0.1	41.3	Output	0	
E0 Compare Output CH1 Enable	0	BIT	0.1	41.4	Output	0	
E0 Compare Output CH0 Direction	0	BIT	0.1	41.5	Output	0	
E0 Compare Output CH1 Direction	0	BIT	0.1	41.6	Output	0	
E0 Compare Output CH0 Mode	0	BIT	0.1	41.7	Output	0	
E0 Compare Output CH1 Mode	0	BIT	0.1	42.0	Output	0	
E0 Output CH0 (Compare)	0	BIT	0.1	42.1	Output	0	
E0 Output CH1 (Compare)	0	BIT	0.1	42.2	Output	0	
E0 Output CH2	0	BIT	0.1	42.3	Output	0	
E0 Output CH3	0	BIT	0.1	42.4	Output	0	
E0 Latch CH0 Enable	0	BIT	0.1	42.5	Output	0	
E0 Latch CH1 Enable	0	BIT	0.1	42.6	Output	0	
E1 Enable	0	BIT	0.1	43.0	Output	0	
E1 Z Phase Clear Enable	0	BIT	0.1	43.1	Output	0	
E1 Count Clear	0	BIT	0.1	43.2	Output	0	
E1 Compare Output CH0 Enable	0	BIT	0.1	43.3	Output	0	
E1 Compare Output CH1 Enable	0	BIT	0.1	43.4	Output	0	
E1 Compare Output CH0 Direction	0	BIT	0.1	43.5	Output	0	
E1 Compare Output CH1 Direction	0	BIT	0.1	43.6	Output	0	
E1 Compare Output CH0 Mode	0	BIT	0.1	43.7	Output	0	
E1 Compare Output CH1 Mode	0	BIT	0.1	44.0	Output	0	
E1 Output CH0 (Compare)	0	BIT	0.1	44.1	Output	0	
E1 Output CH1 (Compare)	0	BIT	0.1	44.2	Output	0	
E1 Output CH2	0	BIT	0.1	44.3	Output	0	
E1 Output CH3	0	BIT	0.1	44.4	Output	0	
E1 Latch CH0 Enable	0	BIT	0.1	44.5	Output	0	
E1 Latch CH1 Enable	0	BIT	0.1	44.6	Output	0	
E0 Compare Value CH0	0	UDINT	4.0	45.0	Output	0	
E0 Compare Value CH1	0	UDINT	4.0	49.0	Output	0	
E1 Compare Value CH0	0	UDINT	4.0	53.0	Output	0	
E1 Compare Value CH1	0	UDINT	4.0	57.0	Output	0	

Examples of Module Functions

- **Encoder 0 input AB orthogonal pulses, 40,000 pulses, encoder 0 probe input channel 0 for latching**

a. Configure the configuration parameters as shown below.

a) The Encoder 0 Pulse Mode is set to AB orthogonal Pulse Mode, i.e., E0 Pulse Mode is set to 0:ABZ;

b) The Encoder 0 Count Ratio is set to 4x, i.e. E0 Count Ratio is set to MUL_4;

c) The Encoder 0 Count Range is set to 0~Ring Count Resolution x Count Multiple-1, i.e., E0 Count Range is set to 1: Resolution x Multiple;

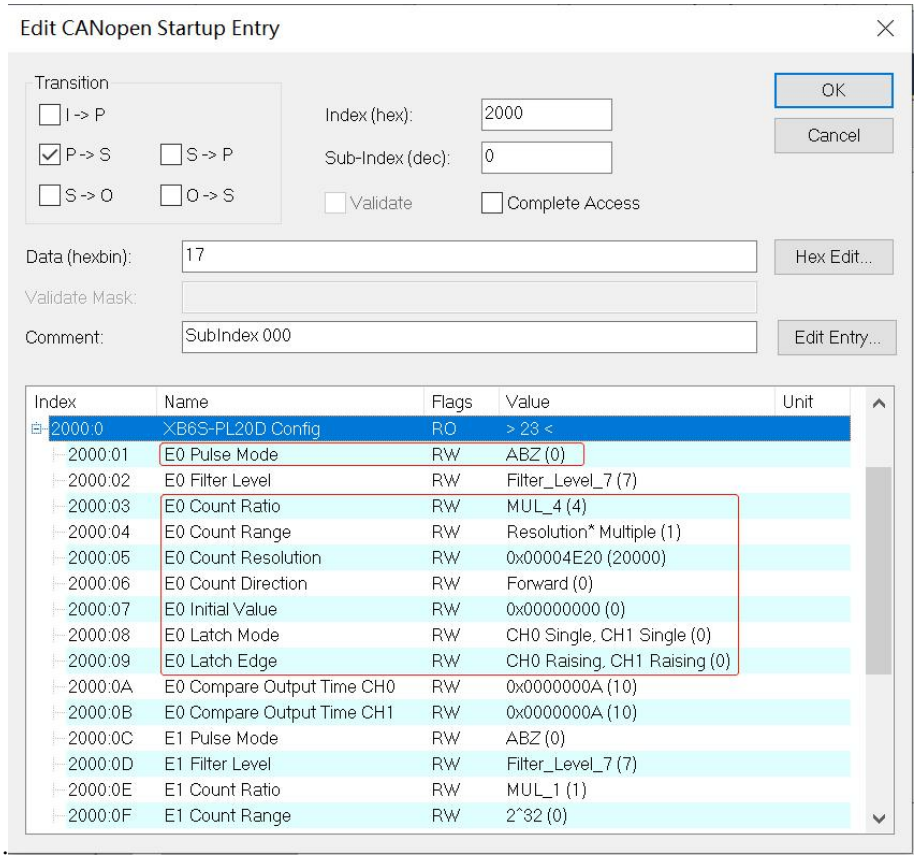
d) Encoder 0 Ring Count Resolution is set to 20000, i.e. E0 Count Resolution is set to 20000;

e) The Encoder 0 Count Direction is set to Forward Count, i.e. E0 Count Direction is set to 0: Forward;

f) The Encoder 0 Count Initial Value is set to 0, i.e., E0 Initial Value is set to 0;

g) Encoder 0 Probe Mode is set to Channel 0 Single, Channel 1 Single, i.e. E0 Latch Mode is set to 0: CH0 Single, CH1 Single;

h) The Encoder 0 Probe Trigger Edge is set to Channel 0 Rising Edge, Channel 1 Rising Edge, i.e. E0 Latch Edge is set to 0: CH0 Raising, CH1 Raising .

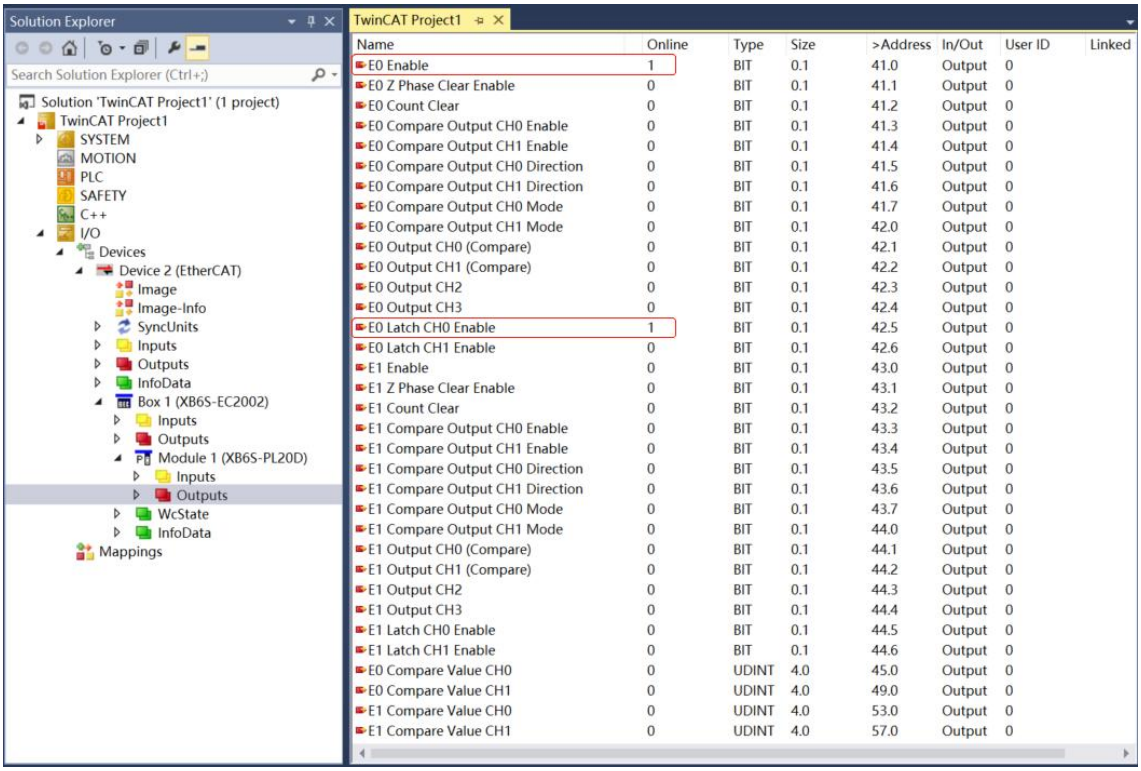


After the parameter setting is completed, Reload operation and module re-powering are required to realize the master station automatically sends down the parameter setting.

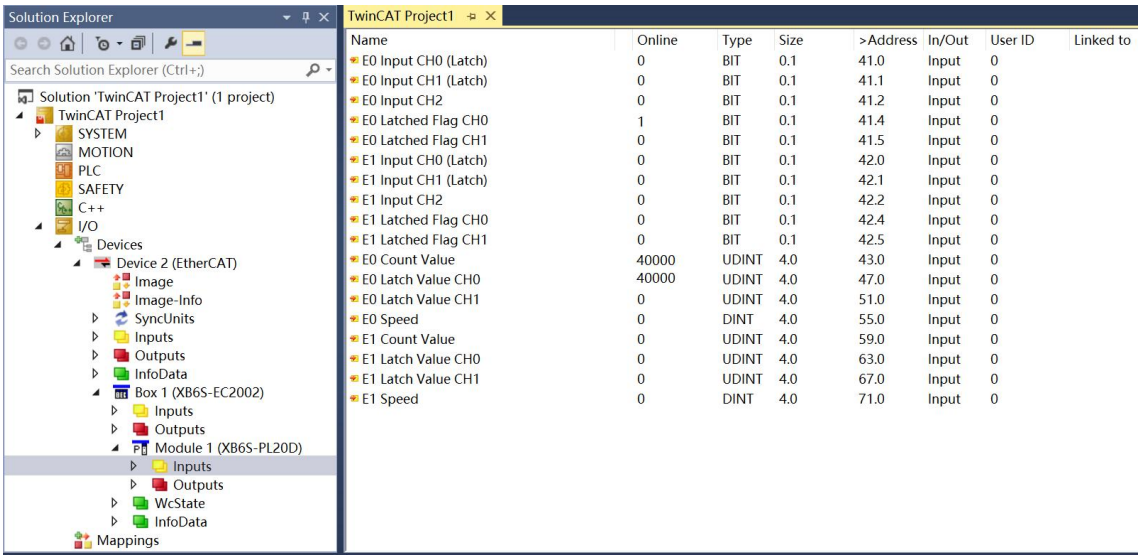
b. Set the encoder 0 count enable and the encoder 0 probe input channel 0 latch enable as shown below.

a) Downstream data E0 Enable is set to 1;

b) Downstream Data E0 Latch CH0 Enable is set to 1.



c. Encoder 0 starts to input 40000 pulses, after the pulse counting is completed, encoder 0 probe input channel 0 inputs a valid signal, encoder 0 counts the value of 40000, probe input channel 0 latches the value of 40000, and the encoder probe input channel 0 latches the value of the completion flag bit value reversed once to 1, as shown in the following figure.



- **Encoder 0 input directional pulses, number of pulses 40,000, encoder 0 compare output channel 0 for compare outputs**

a. Configure the configuration parameters as shown below.

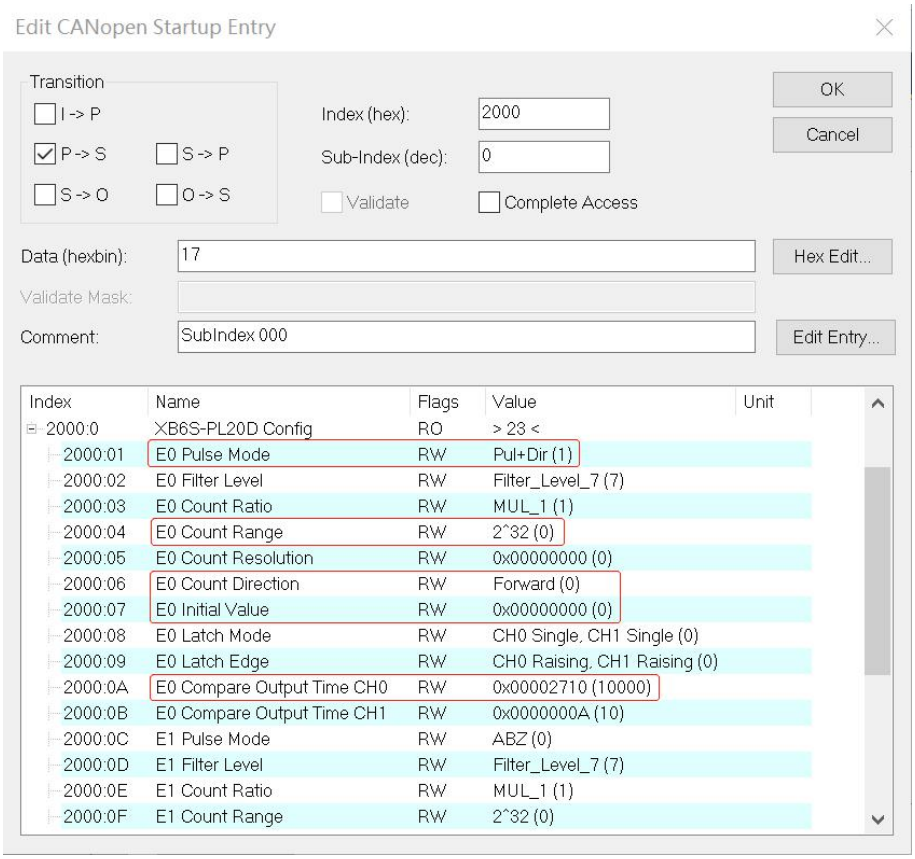
a) The Encoder 0 Pulse Mode is set to Direction Pulse Mode, i.e. E0 Pulse Mode is set to 1: Pul+Dir;

b) The Encoder 0 Count Range is set to 0~2^32-1, i.e., the E0 Count Range is set to 0:2^32;

c) The Encoder 0 Count Direction is set to Forward Count, i.e. E0 Count Direction is set to 0: Forward;

d) The Encoder 0 Count Initial Value is set to 0, i.e., E0 Initial Value is set to 0;

e) The Encoder 0 Compare Output Channel 0 pulse time is set to 10s, i.e. E0 Compare Output Time CH0 is set to 10000.



After the parameter setting is completed, Reload operation and module re-power-up are required to realize the master station automatically sends down the parameter setting.

b. Set the encoder 0 count enable, and the encoder 0 compare output channel 0 sets the compare set value, compare direction, and compare mode and enables them as shown below.

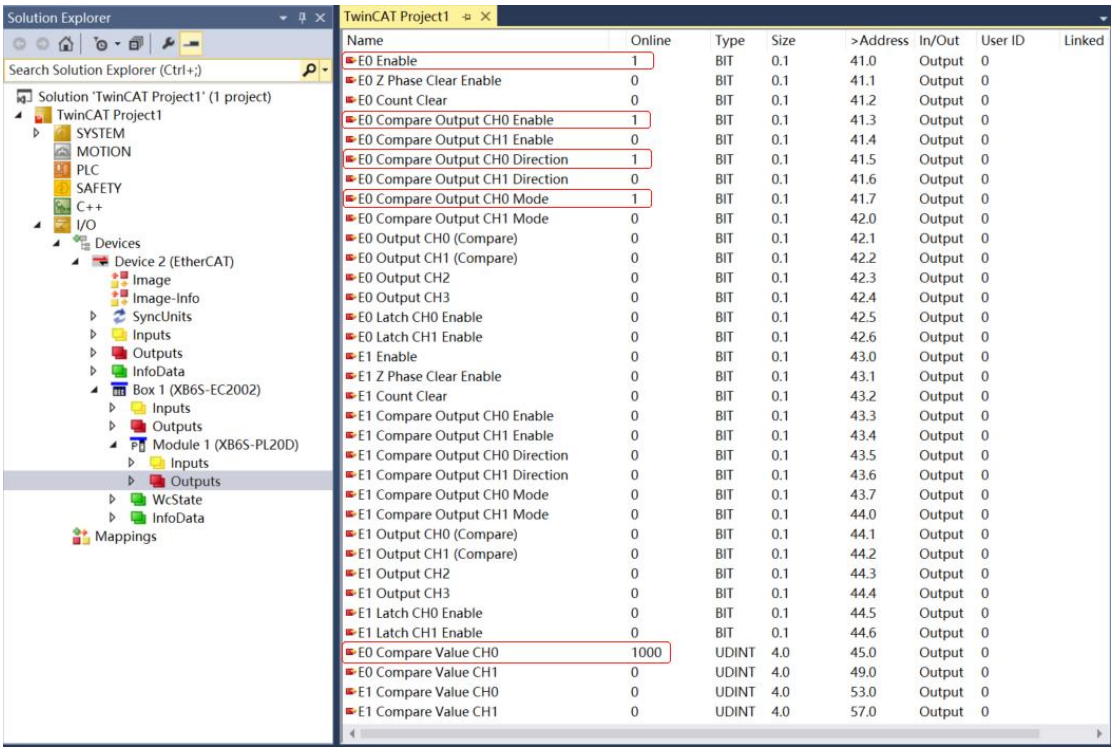
a) Downstream data E0 Enable is set to 1;

b) Downstream data E0 Compare Value CH0 is set to 1000;

c) Downstream Data E0 Compare Output CH0 Direction is set to 1 Incremental Compare;

d) Downstream Data E0 Compare Output CH0 Mode is set to 1 Repeat Trigger;

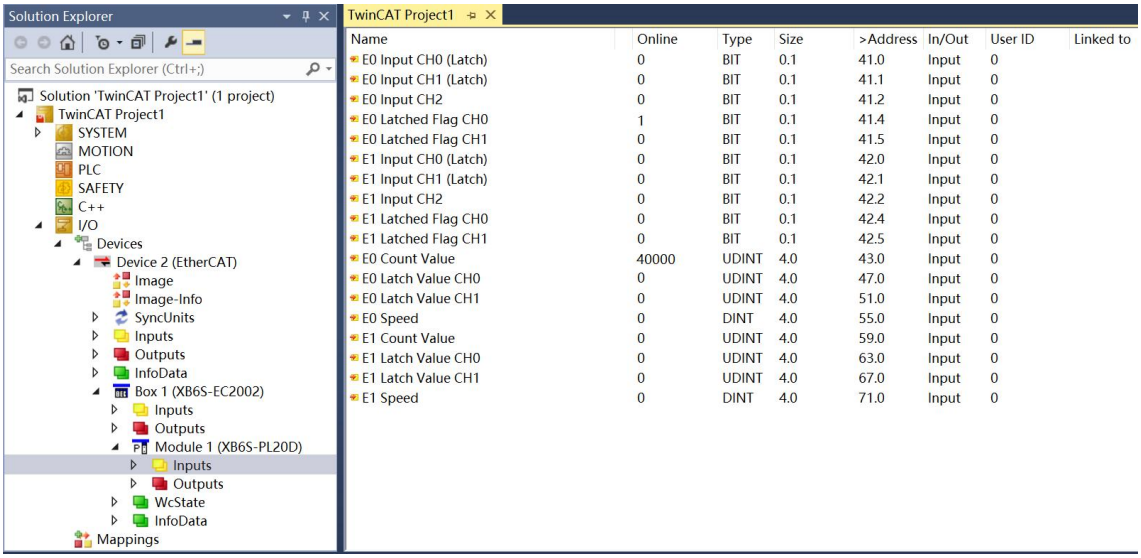
e) Downstream Data E0 Compare Output CH0 Enable is set to 1 to enable.



Name	Online	Type	Size	>Address	In/Out	User ID	Linked
E0 Enable	1	BIT	0.1	41.0	Output	0	
E0 Z Phase Clear Enable	0	BIT	0.1	41.1	Output	0	
E0 Count Clear	0	BIT	0.1	41.2	Output	0	
E0 Compare Output CH0 Enable	1	BIT	0.1	41.3	Output	0	
E0 Compare Output CH1 Enable	0	BIT	0.1	41.4	Output	0	
E0 Compare Output CH0 Direction	1	BIT	0.1	41.5	Output	0	
E0 Compare Output CH1 Direction	0	BIT	0.1	41.6	Output	0	
E0 Compare Output CH0 Mode	1	BIT	0.1	41.7	Output	0	
E0 Compare Output CH1 Mode	0	BIT	0.1	42.0	Output	0	
E0 Output CH0 (Compare)	0	BIT	0.1	42.1	Output	0	
E0 Output CH1 (Compare)	0	BIT	0.1	42.2	Output	0	
E0 Output CH2	0	BIT	0.1	42.3	Output	0	
E0 Output CH3	0	BIT	0.1	42.4	Output	0	
E0 Latch CH0 Enable	0	BIT	0.1	42.5	Output	0	
E0 Latch CH1 Enable	0	BIT	0.1	42.6	Output	0	
E1 Enable	0	BIT	0.1	43.0	Output	0	
E1 Z Phase Clear Enable	0	BIT	0.1	43.1	Output	0	
E1 Count Clear	0	BIT	0.1	43.2	Output	0	
E1 Compare Output CH0 Enable	0	BIT	0.1	43.3	Output	0	
E1 Compare Output CH1 Enable	0	BIT	0.1	43.4	Output	0	
E1 Compare Output CH0 Direction	0	BIT	0.1	43.5	Output	0	
E1 Compare Output CH1 Direction	0	BIT	0.1	43.6	Output	0	
E1 Compare Output CH0 Mode	0	BIT	0.1	43.7	Output	0	
E1 Compare Output CH1 Mode	0	BIT	0.1	44.0	Output	0	
E1 Output CH0 (Compare)	0	BIT	0.1	44.1	Output	0	
E1 Output CH1 (Compare)	0	BIT	0.1	44.2	Output	0	
E1 Output CH2	0	BIT	0.1	44.3	Output	0	
E1 Output CH3	0	BIT	0.1	44.4	Output	0	
E1 Latch CH0 Enable	0	BIT	0.1	44.5	Output	0	
E1 Latch CH1 Enable	0	BIT	0.1	44.6	Output	0	
E0 Compare Value CH0	1000	UDINT	4.0	45.0	Output	0	
E0 Compare Value CH1	0	UDINT	4.0	49.0	Output	0	
E1 Compare Value CH0	0	UDINT	4.0	53.0	Output	0	
E1 Compare Value CH1	0	UDINT	4.0	57.0	Output	0	

c. Encoder 0 starts to input 40000 pulses, the count value is up from 0, when it reaches 1000 (to meet the comparison set value and direction), the compare output channel 0 state is reversed, from the original low level output to high level output, the pulse output time is 10s, the channel indicator will be always lit for 10s. after the counting is completed, the count value of encoder 0 is 40000, as shown in the figure

below.



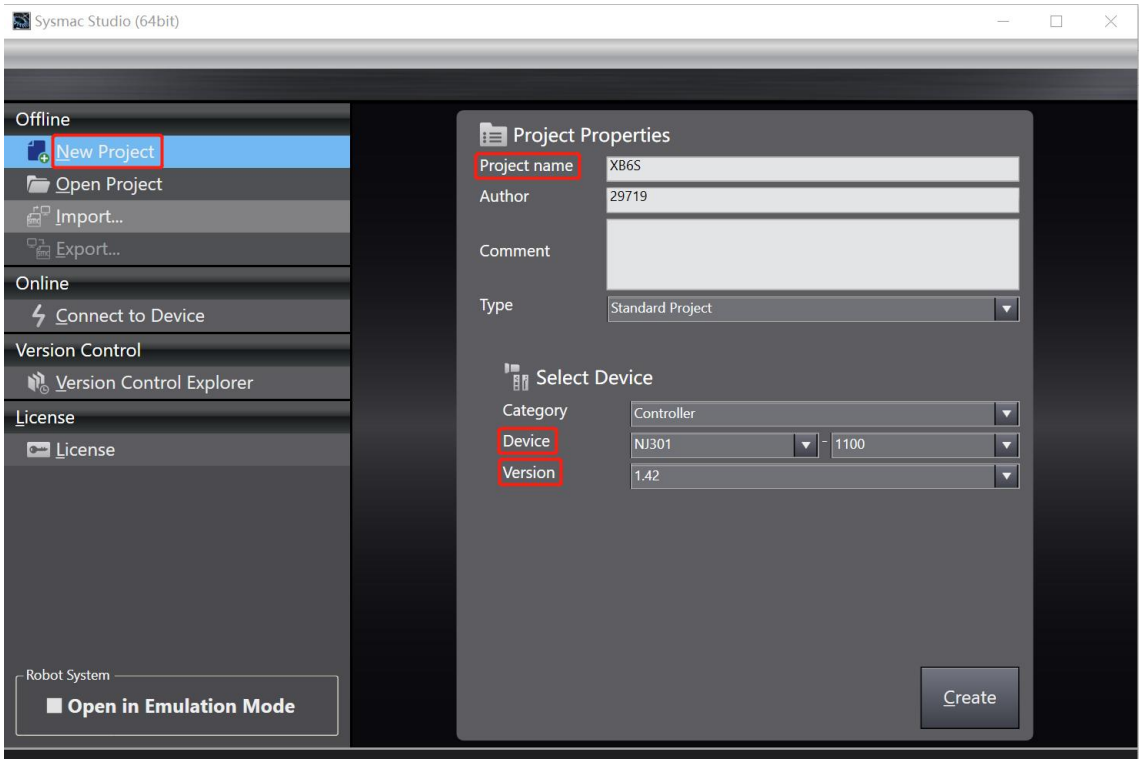
6.4.2 Application in Sysmac Studio software environment

1、preliminary

- **hardware environment**
  - **Module Model XB6S-PL20D**
  - **EtherCAT Coupler, End Cap**
    This description uses the XB6S-EC2002 coupler as an example
  - **One computer with Sysmac Studio software pre-installed**
  - **One Omron PLC, this description takes model NJ301-1100 as an example.**
  - **Shielded cables for EtherCAT**
  - **Encoders and other equipment**
  - **One switching power supply**
  - **Device Configuration Files**
    Configuration file access: https://www.solidotech.com/documents/configfile
- **Hardware configuration and wiring**
  Follow "4 Installation and Disinstallation" and "5 Wiring".
- **Computer IP requirements**
  Set the IP address of the computer and the IP address of the PLC to make sure they are on the same network segment.

2、New construction

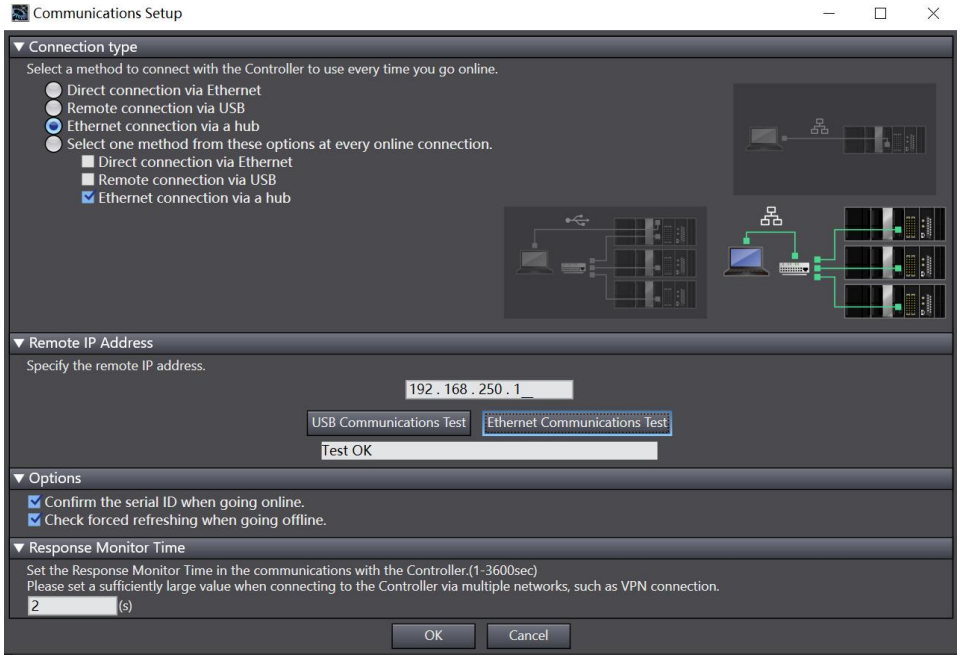
a. Open Sysmac Studio software and click "New Project".



- Project name: Customize.
- Select device: "Device" selects the corresponding PLC model and "Version" selects the corresponding PLC version number.

b. When you have finished entering the project properties, click Create.

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

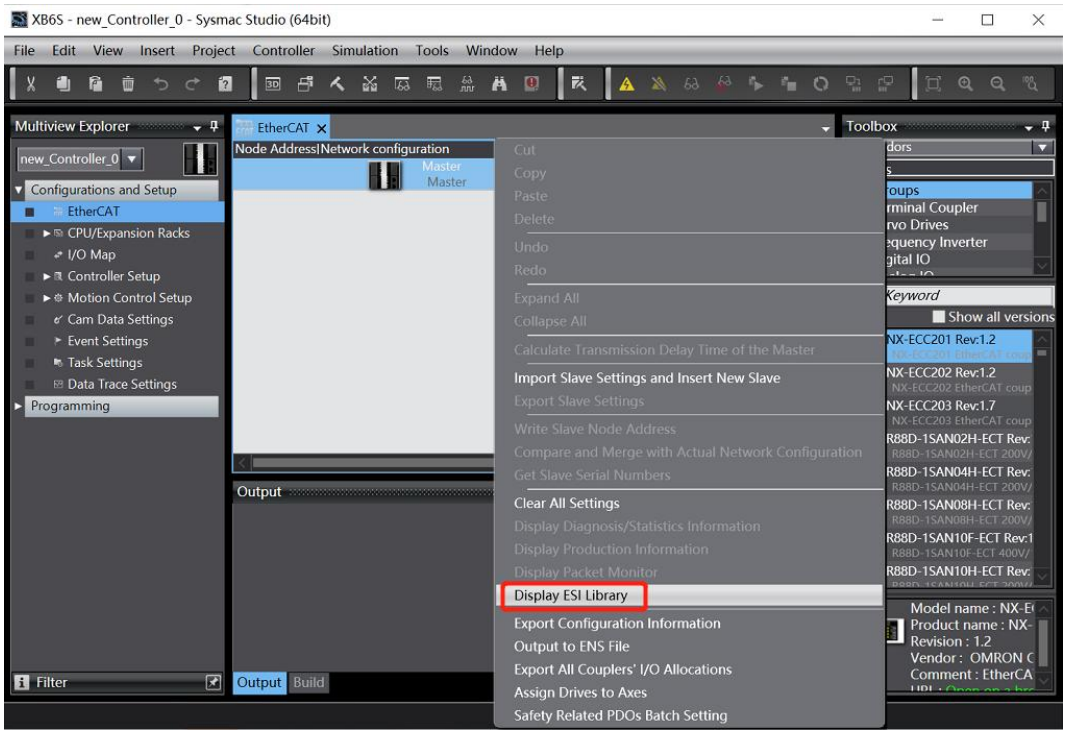


d. Click "Ethernet communication test", the system shows that the test is successful.

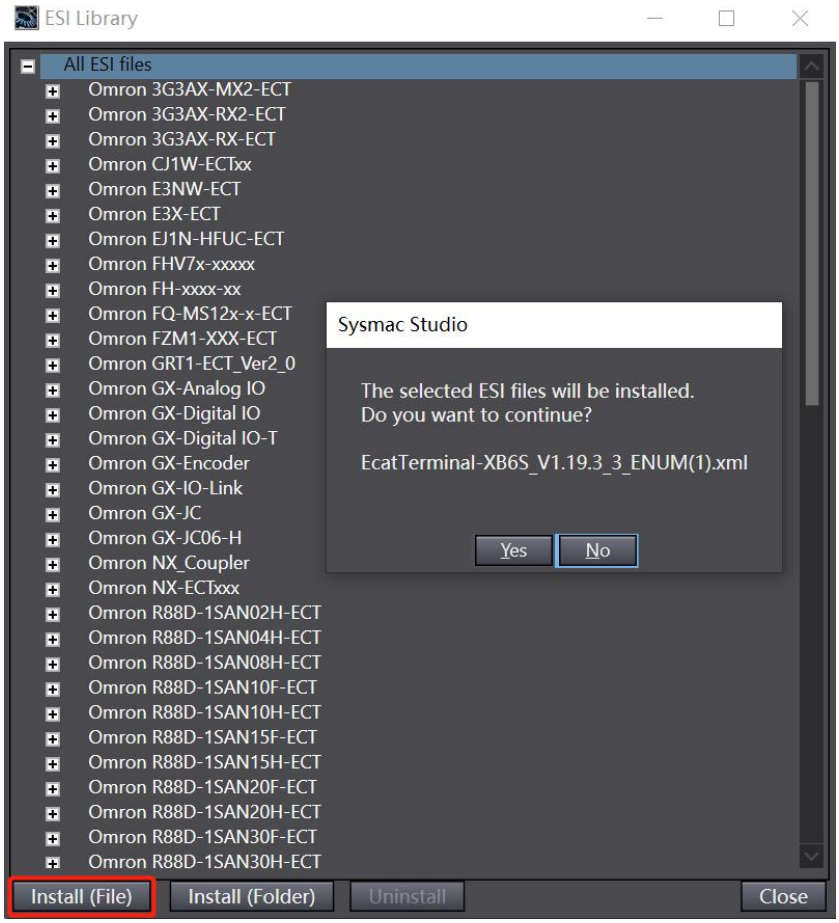
3、Installation of XML files

a. Expand "Configurations and Setup" in the left navigation tree and double click on "EtherCAT".

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



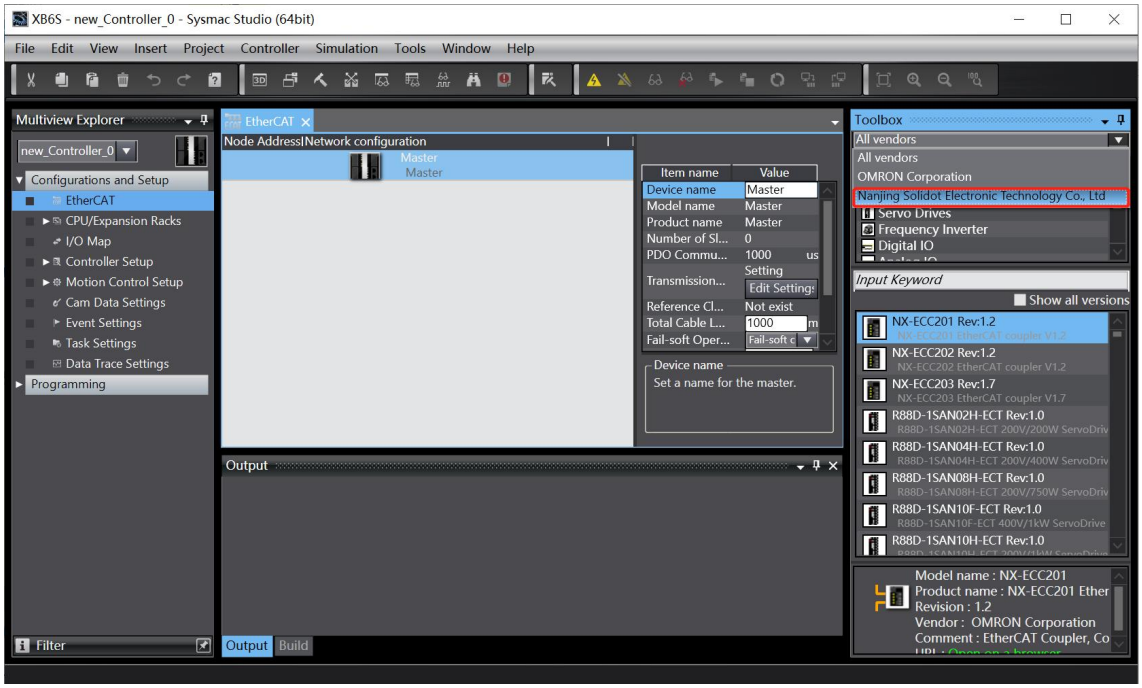
c. In the pop-up "ESI Library" window, click "Install (File)", select the module's XML file path, click "Yes". Click Yes to complete the installation, as shown in the following figure.



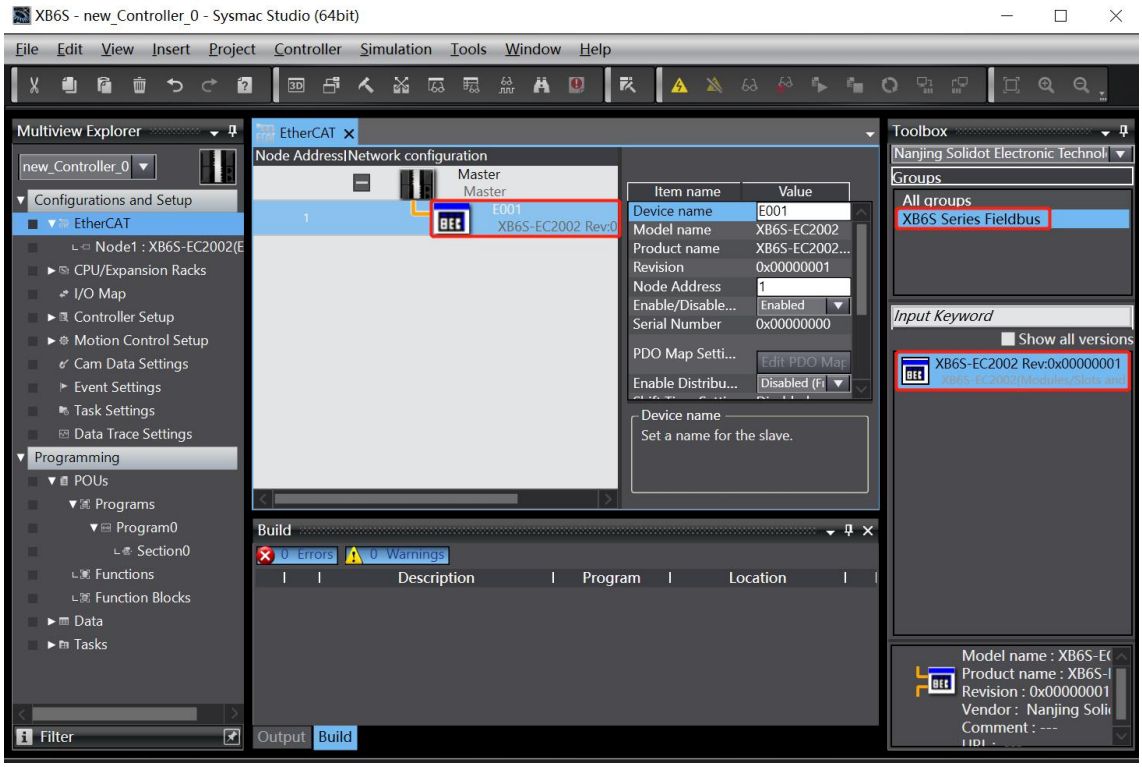
4、Add Device

There are two ways to add devices: online scanning and offline adding, and this note introduces offline adding as an example.

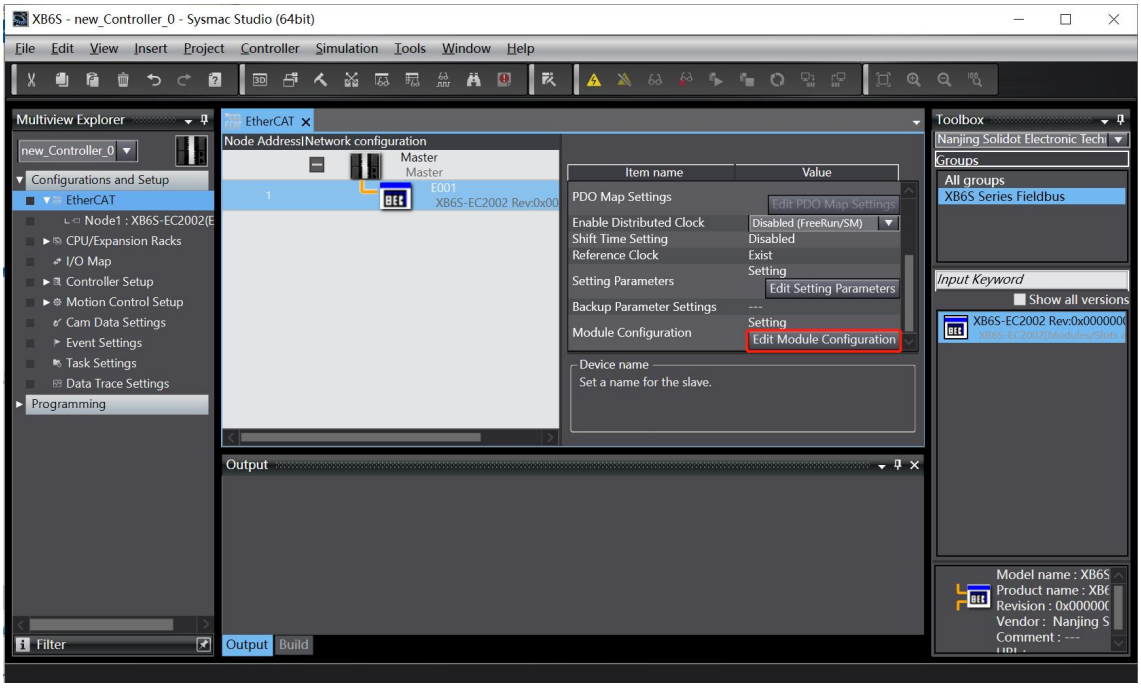
a. In the right side of the "Toolbox" column, click to expand all suppliers, select "Nanjing Solidot Electronic Technology
Co.



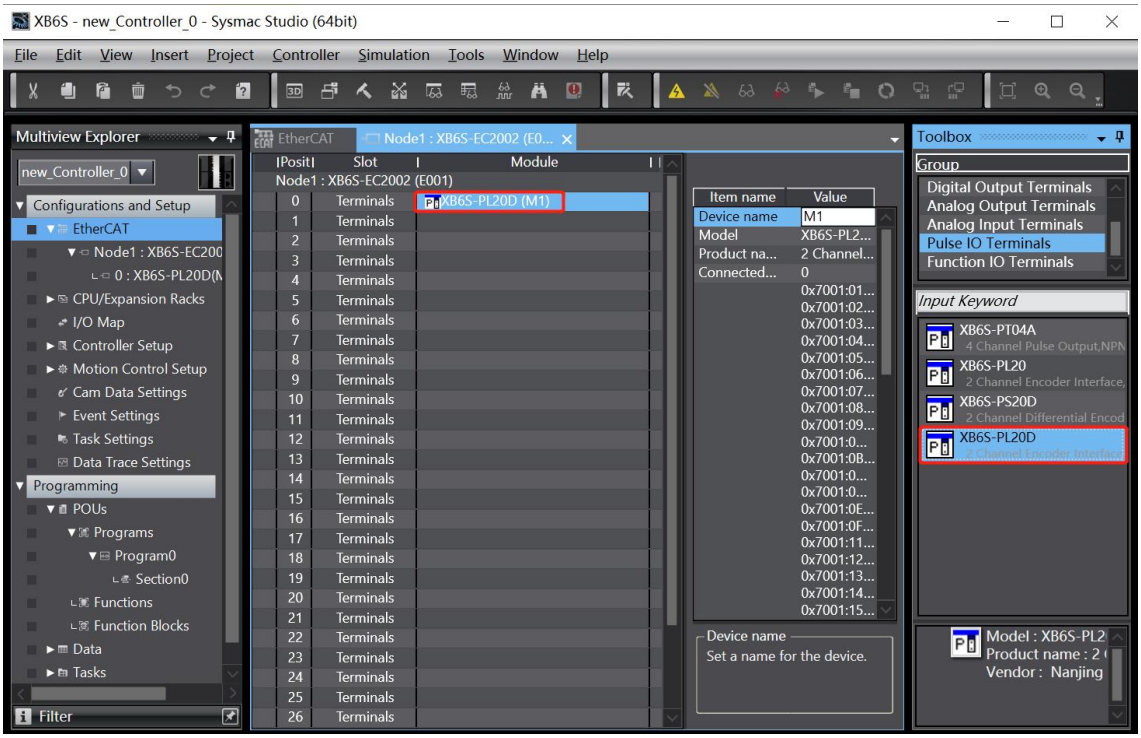
b. Click to select XB6S Series Fieldbus and double-click the XB6S-EC2002 Coupler Module to add a slave device, as shown below.



c. In the EtherCAT main page, select the XB6S-EC2002 coupler module you just added, and choose "Edit Module Configuration", as shown in the following figure.

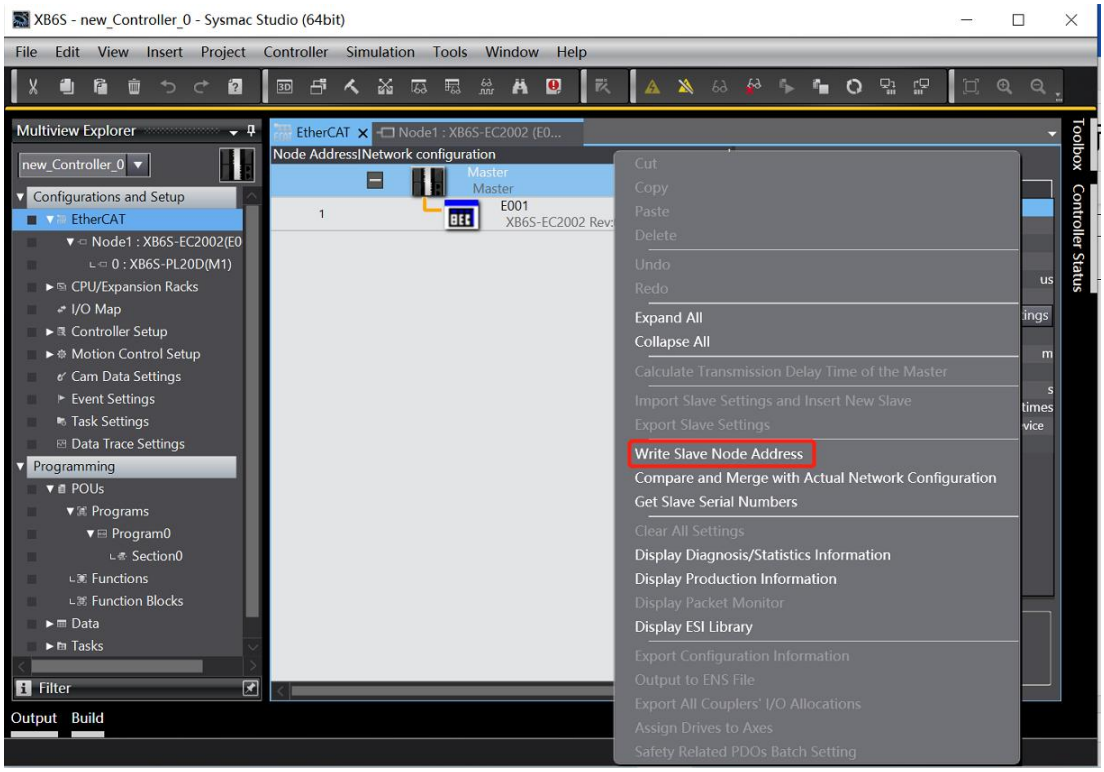


d. Position the cursor in the "Module Module", click on the module in the right toolbox module list, and add I/O modules one by one in the order of I/O module configuration. Note: The order and model number must be consistent with the physical topology!

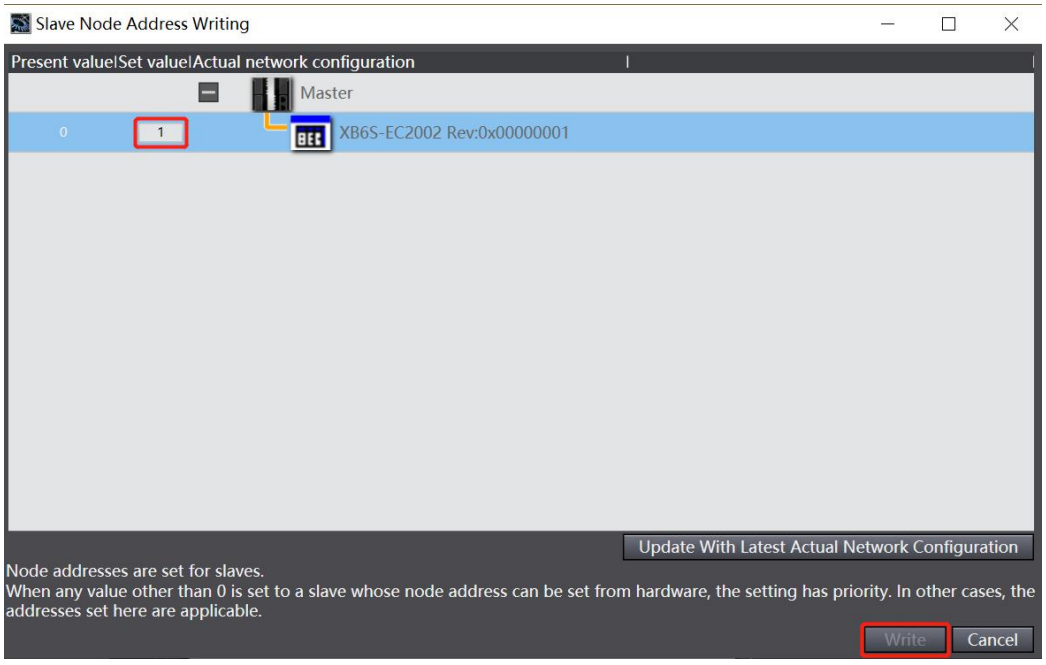


5、Setting the node address

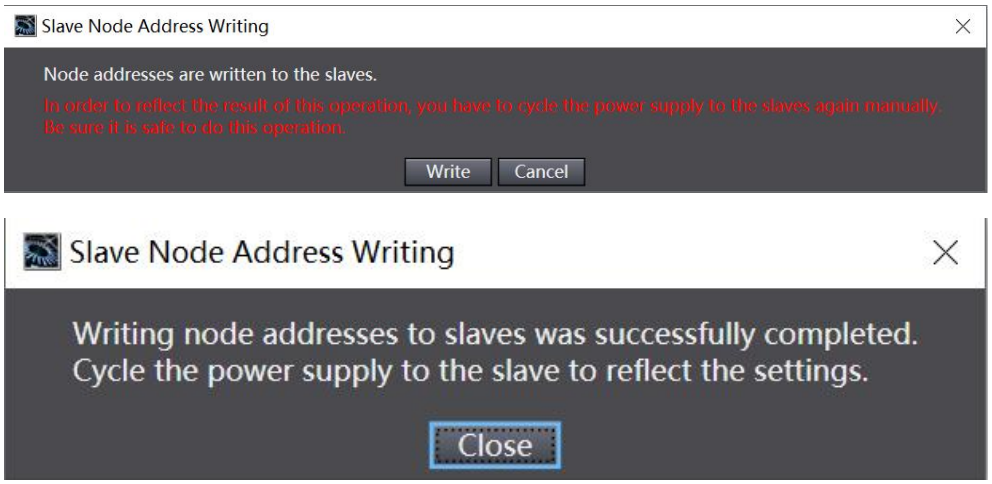
a. Click "Controller -> Online" in the menu bar to turn the controller to online status. Right-click the master device, click and select "Write Slave Node Address", as shown in the following figure.



b. In the Set Node Address window, click the value under Set Value, enter the node address, and click Write to change the slave device node address, as shown in the following figure.

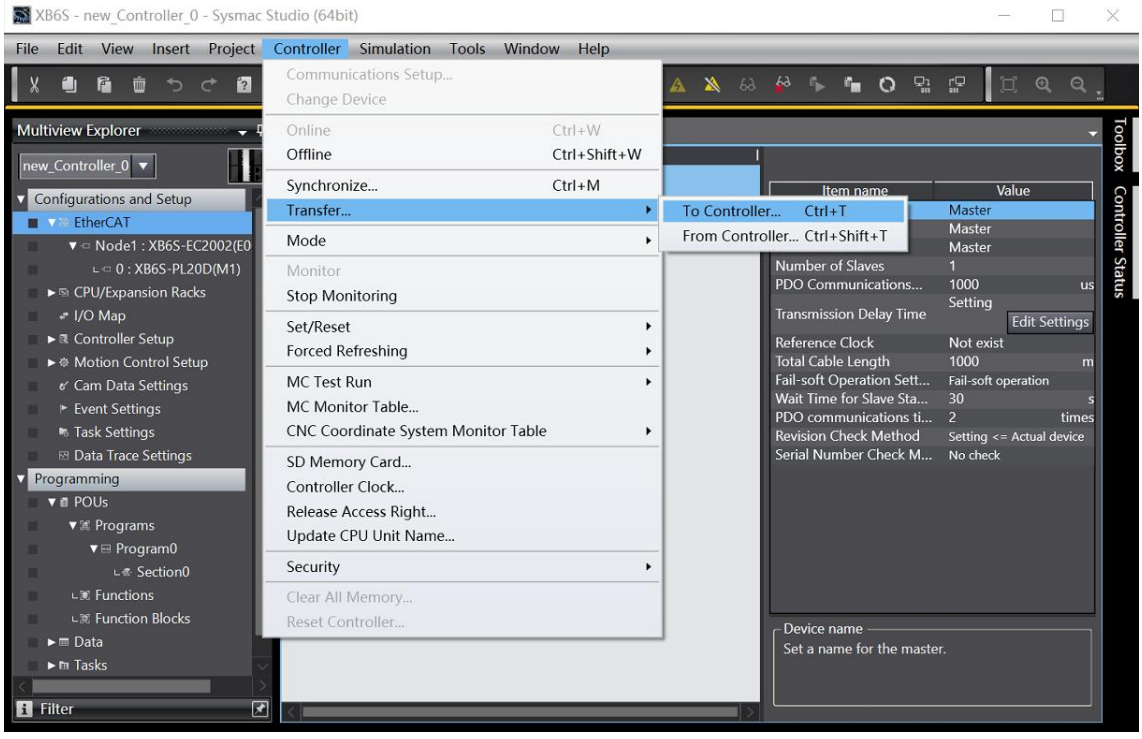


c. After writing, a re-power prompt will pop up, as shown in the following figure, click "Write", and then follow the prompts to reboot the power from the device.

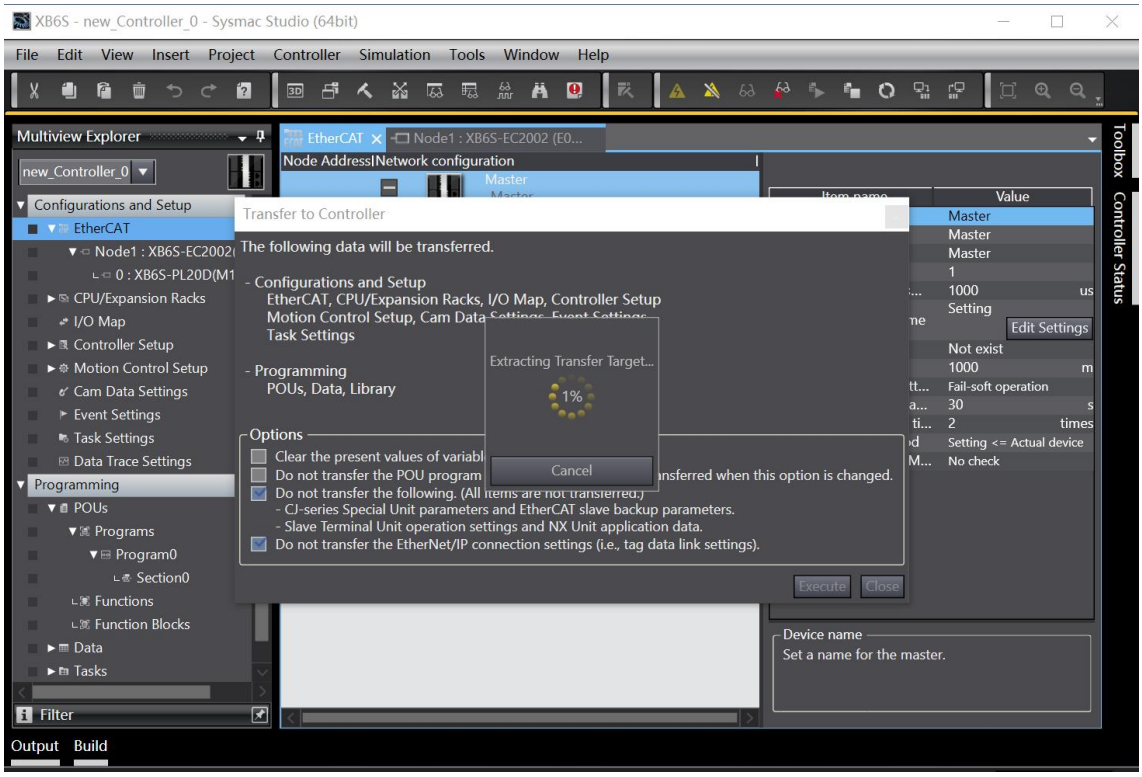


6、Download configuration to PLC

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

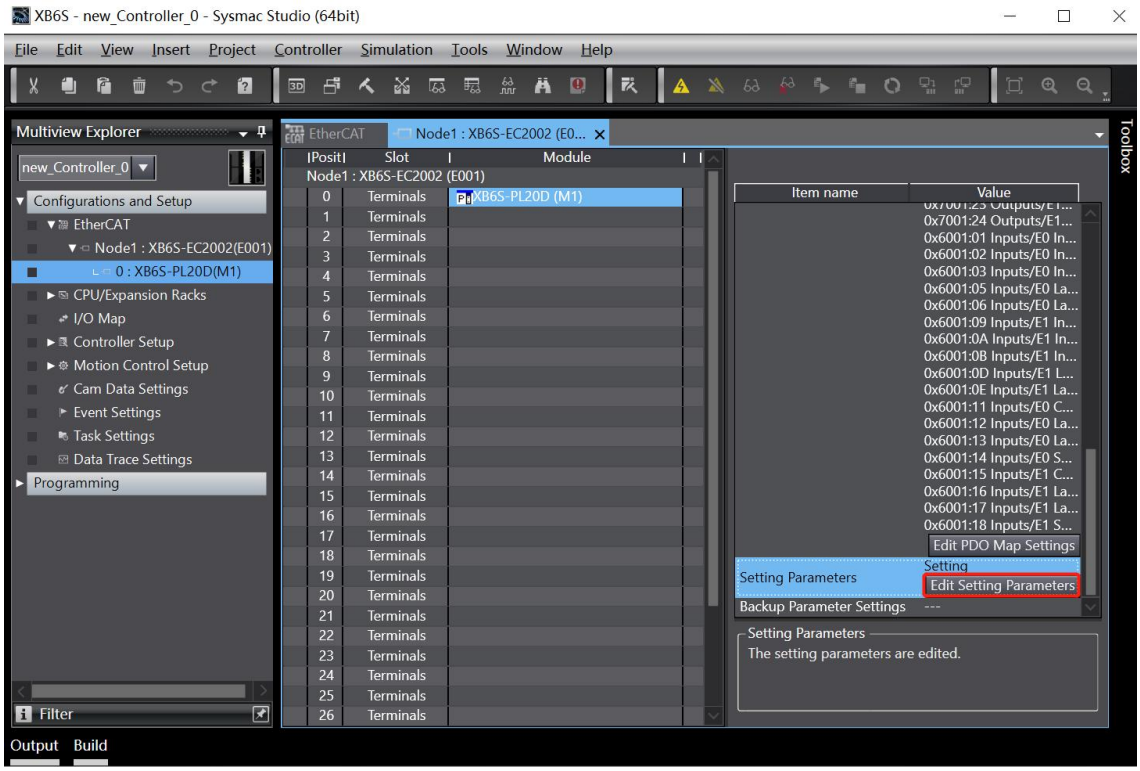


b. The configuration will be downloaded to the PLC, the transmission confirmation pop-up window will appear, click "Execute", and then click "Yes/OK" in the subsequent pop-up window, as shown in the figure below, after the download is completed, you need to re-power up.



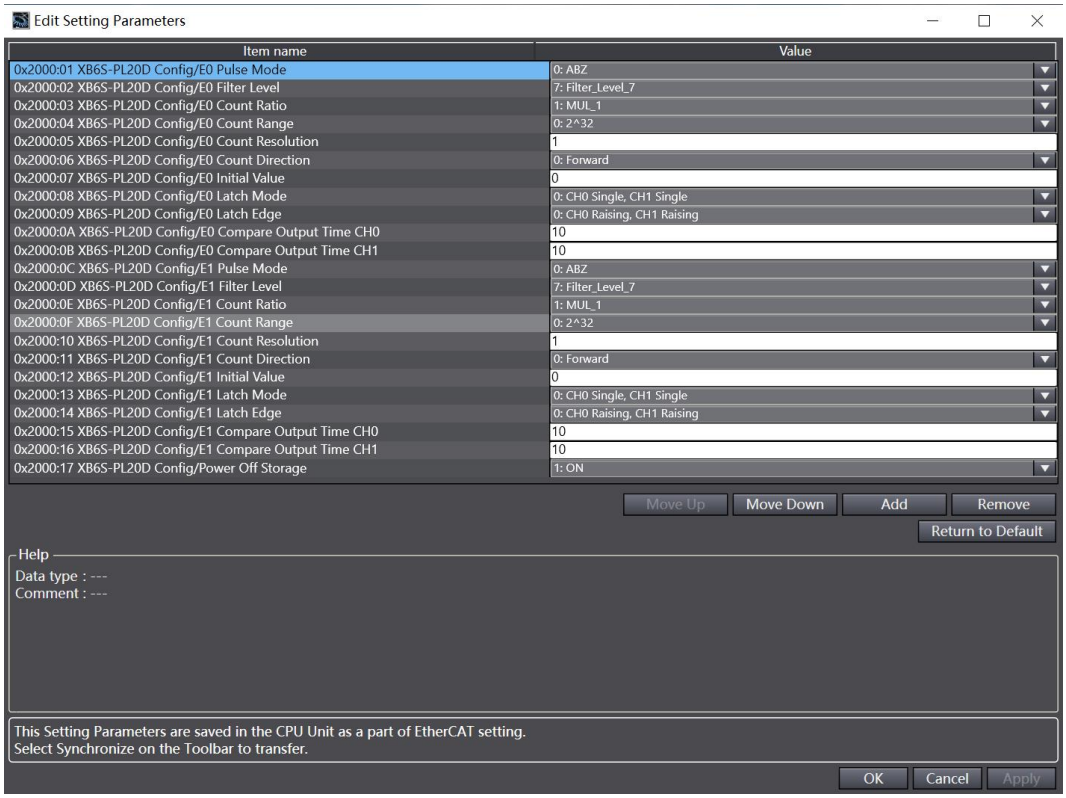
7、 parameterization

a. Switch the configuration to offline state, edit the module configuration page in node 1, select XB6S-PL20D module, click "Edit Initialization Parameters Setting Edit Setting Parameters", as shown in the following figure.

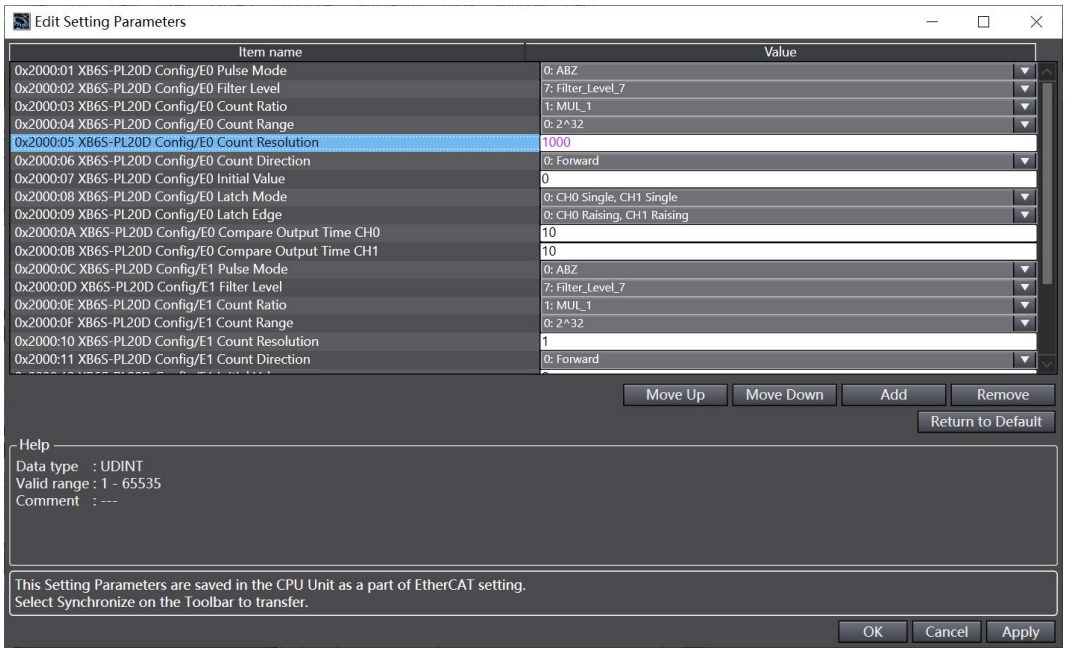


Note: If the PLC firmware version is too low, you need to use EC_CoESDOWrite, EC_CoESDORead instruction to write and read the SDO address.

b. In the XB6S-PL20D Parameter Setting page, you can see 23 configuration parameters, click on any parameter to set the related configuration, as shown in the following figure.

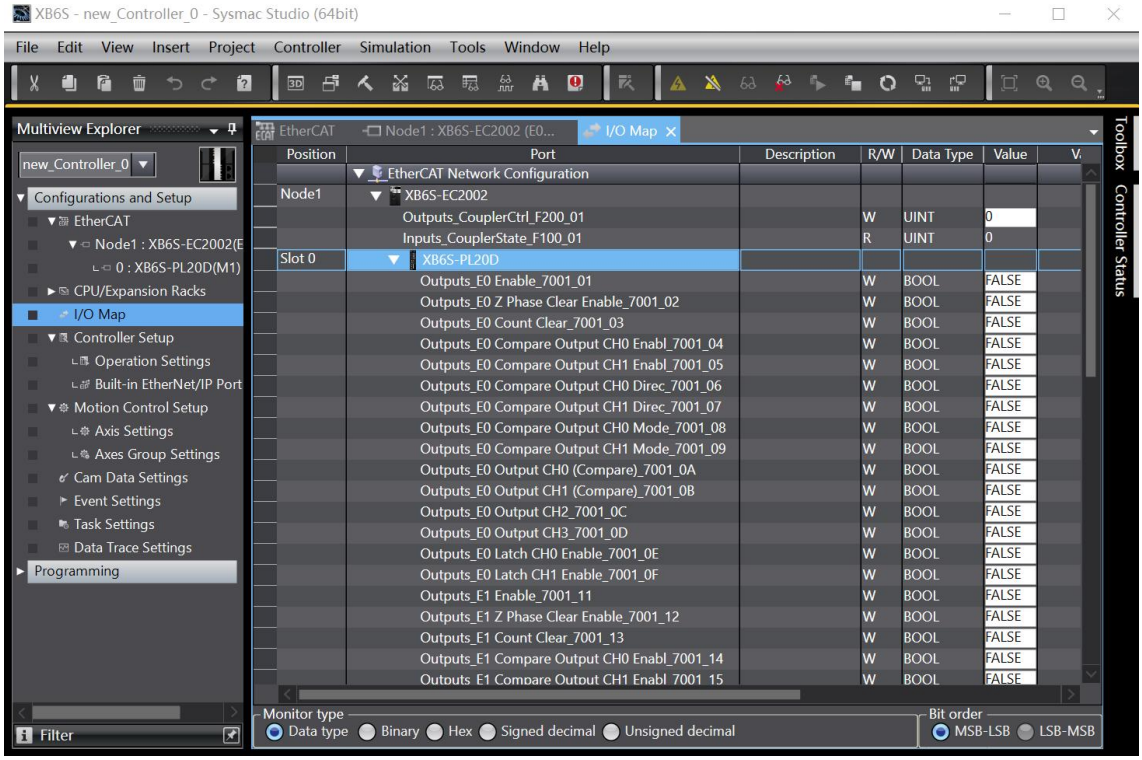


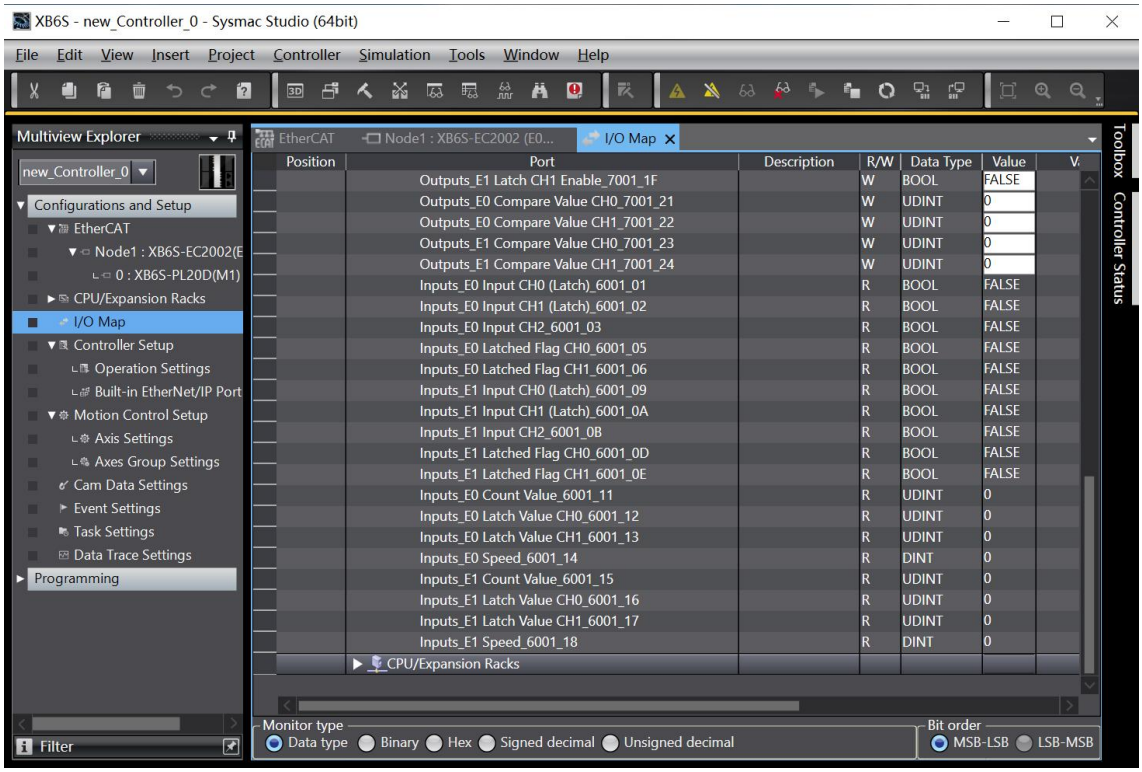
c. For example, to modify the encoder 0 ring count resolution parameter, you can click "E0 Count Resolution" to modify the parameter value, as shown in the figure below. After all the parameters have been configured, you need to re-download the program to the PLC, and the PLC and module need to be re-powered.



8、I/O Functions

a. Double-click "I/O Mapping" in the left navigation tree to see the mapping table of the modules in the topology, so that you can monitor the input and output values of the channels, as shown in the figure
below.





Examples of Module Functions

- **Encoder 0 input AB orthogonal pulses, 40,000 pulses, encoder 0 probe input channel 0 for latching**

a. Configure the configuration parameters as shown below.

a) The Encoder 0 Pulse Mode is set to AB orthogonal Pulse Mode, i.e., E0 Pulse Mode is set to 0:ABZ;

b) The Encoder 0 Count Ratio is set to 4x, i.e. E0 Count Ratio is set to MUL_4;

c) The Encoder 0 Count Range is set to 0~Ring Count Resolution x Count Multiple-1, i.e., E0 Count Range is set to 1: Resolution x Multiple;

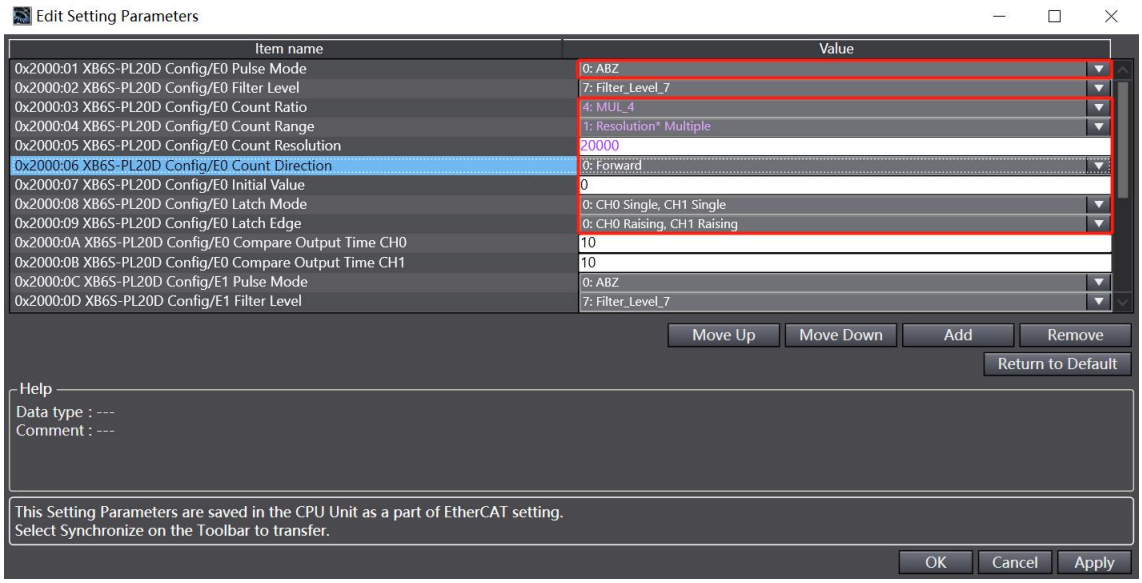
d) Encoder 0 Ring Count Resolution is set to 20000, i.e. E0 Count Resolution is set to 20000;

e) The Encoder 0 Count Direction is set to Forward Count, i.e. E0 Count Direction is set to 0: Forward;

f) The Encoder 0 Count Initial Value is set to 0, i.e., E0 Initial Value is set to 0;

g) Encoder 0 Probe Mode is set to Channel 0 Single, Channel 1 Single, i.e. E0 Latch Mode is set to 0: CH0 Single, CH1 Single;

h) Encoder 0 Probe Trigger Edge is set to Channel 0 Rising Edge, Channel 1 Rising Edge, i.e., E0 Latch Edge is set to 0: CH0 Raising, CH1 Raising.

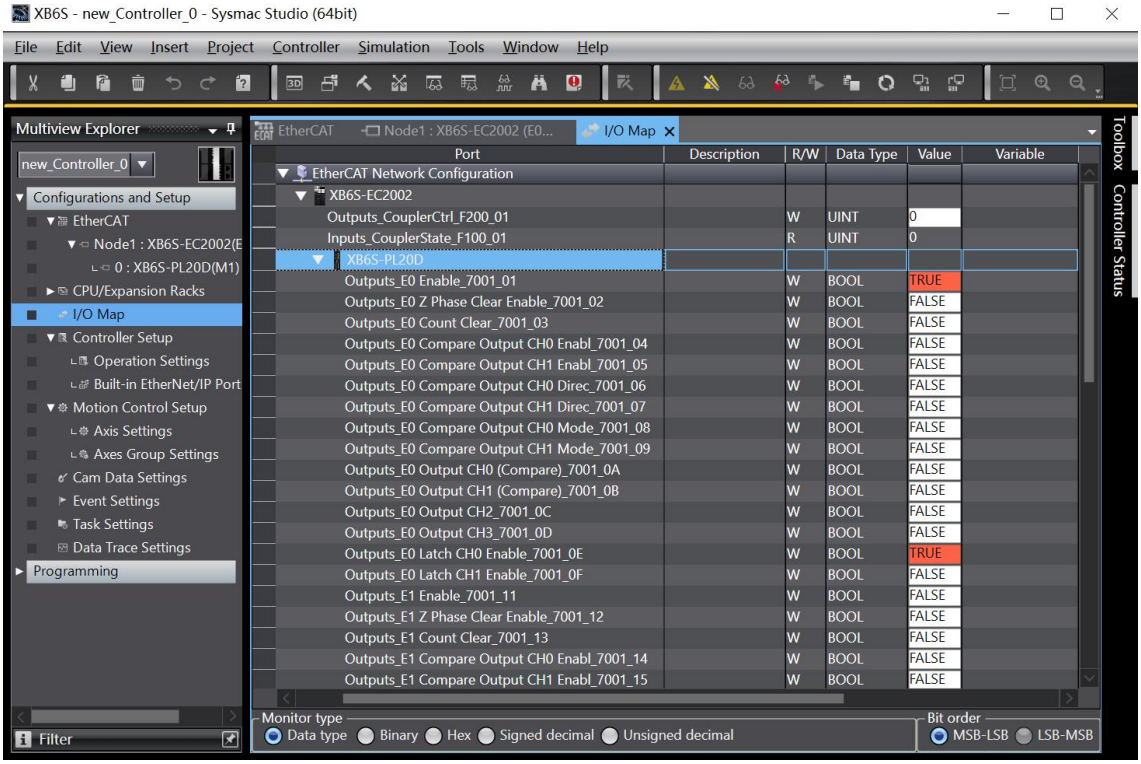


After all the parameters are configured, the program needs to be re-downloaded to the PLC, and the PLC and the module need to be re-powered.

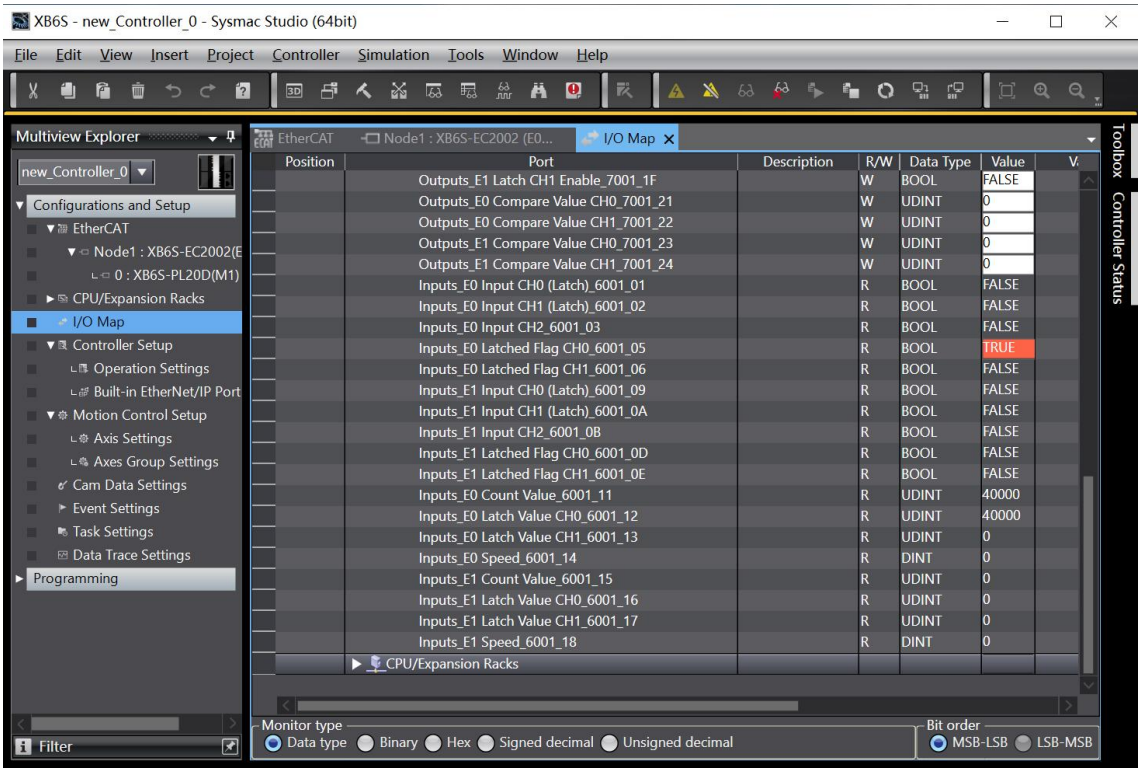
b. Set the encoder 0 count enable and the encoder 0 probe input channel 0 latch enable as shown below.

a) Downstream data E0 Enable is set to 1;

b) Downstream Data E0 Latch CH0 Enable is set to 1.



c. Encoder 0 starts to input 40000 pulses, after the pulse counting is completed, encoder 0 probe input channel 0 inputs a valid signal, encoder 0 counts the value of 40000, probe input channel 0 latches the value of 40000, and the encoder probe input channel 0 latches the value of the completion flag bit value reversed once to 1, as shown in the following figure.



◆ **Encoder 0 inputs directional pulses, 40,000 pulses, encoder 0 compare output channel 0 for compare outputs**

a. Configure the configuration parameters as shown below.

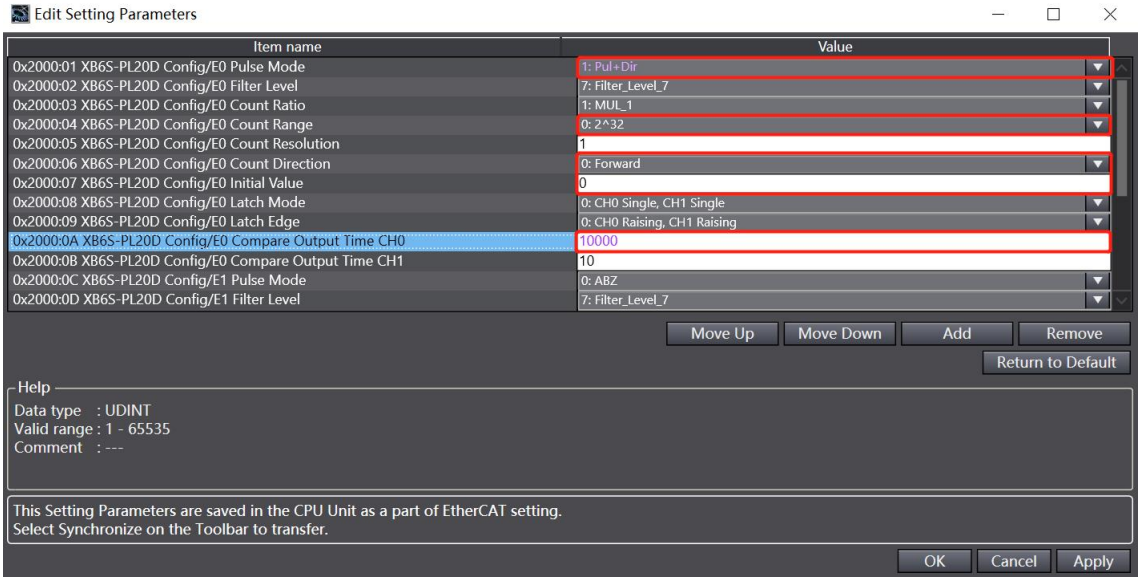
a) The Encoder 0 Pulse Mode is set to Direction Pulse Mode, i.e. E0 Pulse Mode is set to 1: Pul+Dir;

b) The Encoder 0 Count Range is set to 0~2^32-1, i.e., the E0 Count Range is set to 0:2^32;

c) The Encoder 0 Count Direction is set to Forward Count, i.e. E0 Count Direction is set to 0: Forward;

d) The Encoder 0 Count Initial Value is set to 0, i.e., E0 Initial Value is set to 0;

e) The Encoder 0 Compare Output Channel 0 pulse time is set to 10s, i.e. E0 Compare Output Time CH0 is set to 10000.



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

b. Set the encoder 0 count enable, and the encoder 0 compare output channel 0 sets the compare set value, compare direction, and compare mode and enables them as shown below.

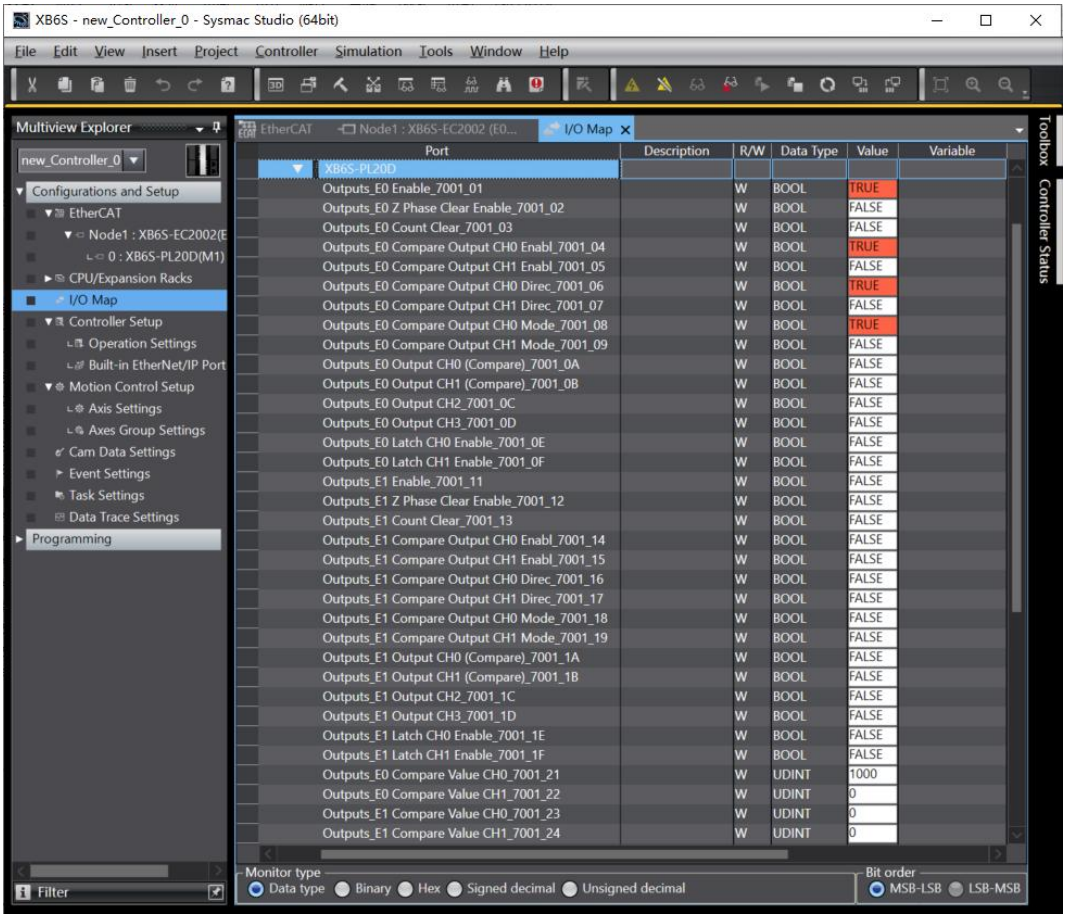
a) Downstream data E0 Enable is set to 1;

b) Downstream data E0 Compare Value CH0 is set to 1000;

c) Downstream Data E0 Compare Output CH0 Direction is set to 1 Incremental Compare;

d) Downstream Data E0 Compare Output CH0 Mode is set to 1 Repeat Trigger;

e) Downstream Data E0 Compare Output CH0 Enable is set to 1 to enable.



Port	Description	R/W	Data Type	Value	Variable
XB6S-PL20D					
Outputs_E0 Enable_7001_01		W	BOOL	TRUE	
Outputs_E0 Z Phase Clear Enable_7001_02		W	BOOL	FALSE	
Outputs_E0 Count Clear_7001_03		W	BOOL	FALSE	
Outputs_E0 Compare Output CH0 Enabl_7001_04		W	BOOL	TRUE	
Outputs_E0 Compare Output CH1 Enabl_7001_05		W	BOOL	FALSE	
Outputs_E0 Compare Output CH0 Direc_7001_06		W	BOOL	TRUE	
Outputs_E0 Compare Output CH1 Direc_7001_07		W	BOOL	FALSE	
Outputs_E0 Compare Output CH0 Mode_7001_08		W	BOOL	TRUE	
Outputs_E0 Compare Output CH1 Mode_7001_09		W	BOOL	FALSE	
Outputs_E0 Output CH0 (Compare)_7001_0A		W	BOOL	FALSE	
Outputs_E0 Output CH1 (Compare)_7001_0B		W	BOOL	FALSE	
Outputs_E0 Output CH2_7001_0C		W	BOOL	FALSE	
Outputs_E0 Output CH3_7001_0D		W	BOOL	FALSE	
Outputs_E0 Latch CH0 Enable_7001_0E		W	BOOL	FALSE	
Outputs_E0 Latch CH1 Enable_7001_0F		W	BOOL	FALSE	
Outputs_E1 Enable_7001_11		W	BOOL	FALSE	
Outputs_E1 Z Phase Clear Enable_7001_12		W	BOOL	FALSE	
Outputs_E1 Count Clear_7001_13		W	BOOL	FALSE	
Outputs_E1 Compare Output CH0 Enabl_7001_14		W	BOOL	FALSE	
Outputs_E1 Compare Output CH1 Enabl_7001_15		W	BOOL	FALSE	
Outputs_E1 Compare Output CH0 Direc_7001_16		W	BOOL	FALSE	
Outputs_E1 Compare Output CH1 Direc_7001_17		W	BOOL	FALSE	
Outputs_E1 Compare Output CH0 Mode_7001_18		W	BOOL	FALSE	
Outputs_E1 Compare Output CH1 Mode_7001_19		W	BOOL	FALSE	
Outputs_E1 Output CH0 (Compare)_7001_1A		W	BOOL	FALSE	
Outputs_E1 Output CH1 (Compare)_7001_1B		W	BOOL	FALSE	
Outputs_E1 Output CH2_7001_1C		W	BOOL	FALSE	
Outputs_E1 Output CH3_7001_1D		W	BOOL	FALSE	
Outputs_E1 Latch CH0 Enable_7001_1E		W	BOOL	FALSE	
Outputs_E1 Latch CH1 Enable_7001_1F		W	BOOL	FALSE	
Outputs_E0 Compare Value CH0_7001_21		W	UDINT	1000	
Outputs_E0 Compare Value CH1_7001_22		W	UDINT	0	
Outputs_E1 Compare Value CH0_7001_23		W	UDINT	0	
Outputs_E1 Compare Value CH1_7001_24		W	UDINT	0	

c. Encoder 0 starts to input 40000 pulses, the count value is up from 0, when it reaches 1000 (to meet the comparison set value and direction), the compare output channel 0 state is reversed, from the original low level output to high level output, the pulse output time is 10s, the channel indicator will be always lit for 10s. after the counting is completed, the count value of encoder 0 is 40000, as shown in the figure
below.