PN-MB Series Module User Manual

-- V1.0

Table of contents

1. Product overview

1.1. Product Introduction

PN-MB series modules mainly convert Profinet protocol into Modbus Rtu protocol. Support Siemens smart 200,

Siemens 300, Siemens 1200, and Siemens 1500 are products with stable economy, easy installation and strong applicability.

1.2. Features and functions

ÿ Profinet protocol to Modbus protocol

ÿ Using standard profinet protocol communication, can be networked with PLC, configuration, host computer, etc.

ÿ It adopts standard Modbus communication, supports up to 4Mbps baud rate, and can control standard Modbus slave stations.

ÿ Up to 64 command nodes are supported, and some PLCs may only support a part of them.

ÿ PN2 series dual network ports support switching function

ÿ The power circuit adopts anti-reverse connection design

ÿ Widely used in the acquisition and control of Modbus equipment in industrial field equipment

1.3. Application scenarios

It is mainly used for Siemens PLC to read and write MODBUS RTU protocol frequency converters, smart meters, and temperature controllers through the Profinet protocol.

Data of control meters, weighing instruments, intelligent high and low voltage electrical appliances, power measuring devices, various transmitter instruments, etc.

2. Main parameters

2.1. Product parameters

Network port parameters	
Interface Type	RJ45
Protocol	Profinet
Maximum communication cycle	4ms
communication bandwidth	100Mbps
Serial port parameters (RS422 communication parameters)	
Interface Type	RS422 (5.08mm pitch industrial grade terminal blocks)
baud rate	1200~4.6875Mbps
The default communication format is 8-bit data, 1-bit stop, no parity	
When the transmission distance is 100kb/s and the baud rate is 100kb/s, the 422 serial port communication is 1200 meters, subject to the actual situation	
Serial port parameters (RS485 communication parameters)	
Interface Type	RS485 (5.08mm pitch industrial grade terminal blocks)
Baud Rate	1200~4.6875Mbps
Communication	Default 8-bit data, 1-bit stop, no parity
Format Transmission	When the baud rate is 9600, the 485 serial port communication is 1200 meters, subject to the actual situation
Distance Power Parameters	
Working voltage and	DC 24V; with anti-reverse protection
power	2W~4W
consumption Working environment	
Working Temperature	-10ÿ~+60ÿ
Storage Temperature	-20ÿ~+70ÿ
Others	
Installation	guide
method size	29MM(L)*92MM(W)*65MM(H), subject to the actual product

2.2. Indicator light description

name	illustrate
PWR power light	
SYS	Profinet communication status indicator
ERR Communication error indicator light	
422	RS422 working indicator light
485	RS485 working indicator light

SYS ERR RS422 RS485			meaning	measure
1s Flash x	x	x	Profinet established AR communication	
0.1s flash x	x	x	Profinet does not establish AR communication	Check PLC configuration, site name, IP address, etc. Is it normal
x blinking			The module communicates with the modbus device and works normally communication.	
x shiny			The module communicates with modbus devices, but the communication unusual.	Check whether the communication baud rate and parity are consistent.
x sparkle			The module communicates with the modbus device, some messages The reply is incorrect, and some messages are replied correctly.	Detect message communication monitoring bit, found incorrect messages and their reasons.
x on off off			There is no communication between the module and the modbus device, the module No data is sent between blocks and modbus devices.	Check whether the modbus message trigger condition is full legs

3. Product function

3.1. Overview of PN-MB functions

The RTU master station of this module can support up to 63 slave station commands, and each command can set the command type, length and communication interface.

When using the Modbus RTU function, each slave station will generate its own read and write names, and each command will be executed at a certain period (configurable).

Line polling, when the cycle is too small, the master station will give a warning, but it will still issue the next command as soon as possible after the timeout.

When using the Modbus RTU function, the write function call cannot be less than 2 times the polling period, otherwise there will be a frame write function

The case where the data is not refreshed.

Modbus communication can choose to use RS422 or RS485 interface, which can be used at the same time. Each interface parameter is set separately.

3.2. Modify IP address

The IP address of this module can be modified by software such as Botu/step7. For detailed setting methods, see Chapter 4 and Chapter 5.

In addition, special software is also provided for quick modification of ip and other information. For details, see the document "Aimoxun PN Firmware Upgrade and IP

Modify the tool instruction manual.doc".

3.4. Upgrade function

When the module is powered on, the DIP switch 1 is turned ON until the SYS light, ERR light, RS422 and RS485 lights of PN-MB

After flashing quickly, the button can be reset, and the module enters the upgrade mode. For details on the upgrade mode, see "Aimoxun PN Firmware Upgrade and

IP Modification Tool User Manual.doc".

4. Use Botu TIA to connect and use this module

This chapter introduces the process of connecting Portal TIA to PN-MB to realize corresponding functional requirements.

4.1. Preparation before connection

ÿ Prepare the XML file required by the TIA software, as follows:

ÿ Connect the DC 24V external power supply to the module and turn on the power. Before turning on the power, please check whether the positive and negative poles of the power supply are connected correctly.

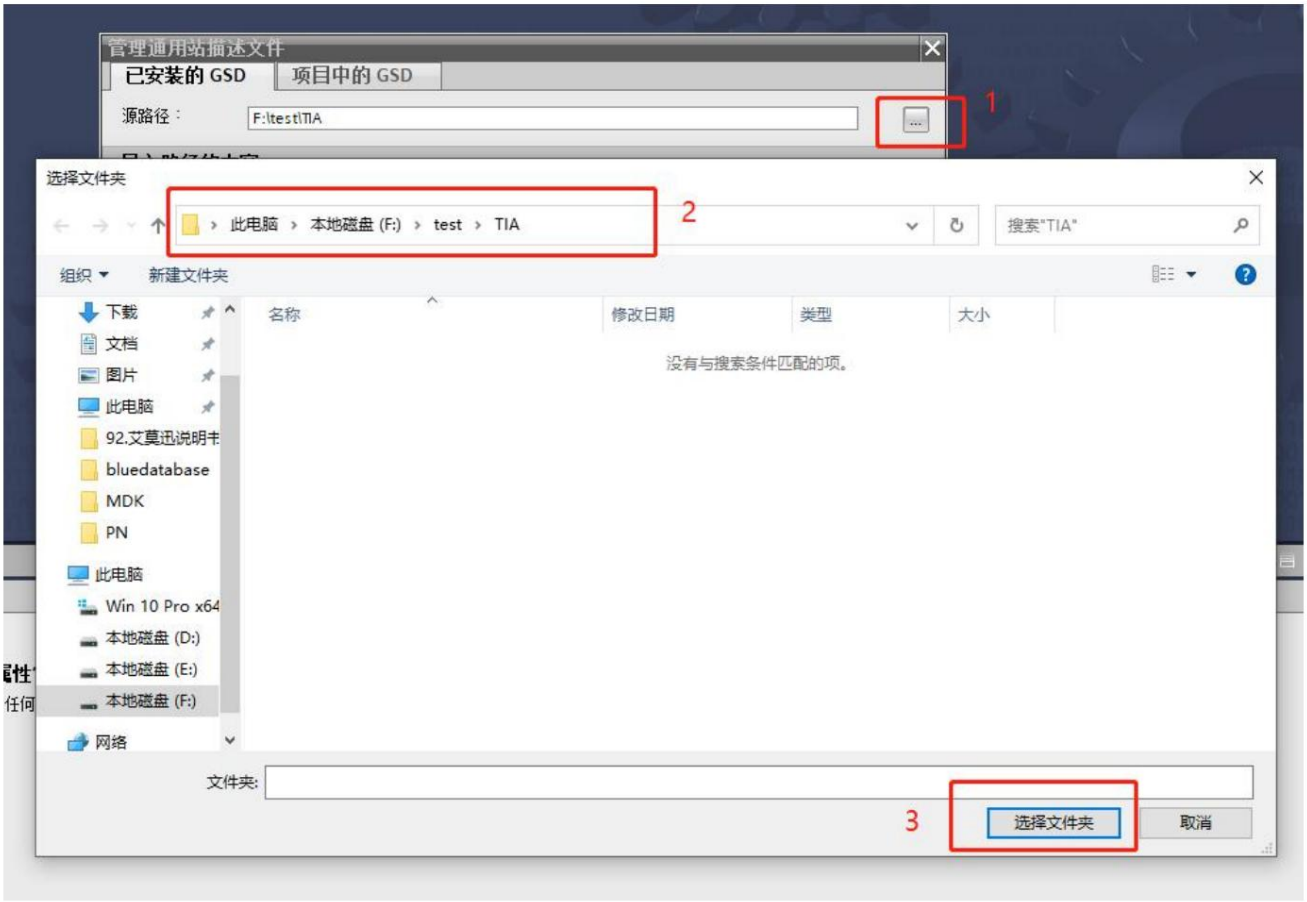
ÿUse a network cable to connect the module to the Profinet interface of the PLC controller.

4.2. Add GSDML file to Botu

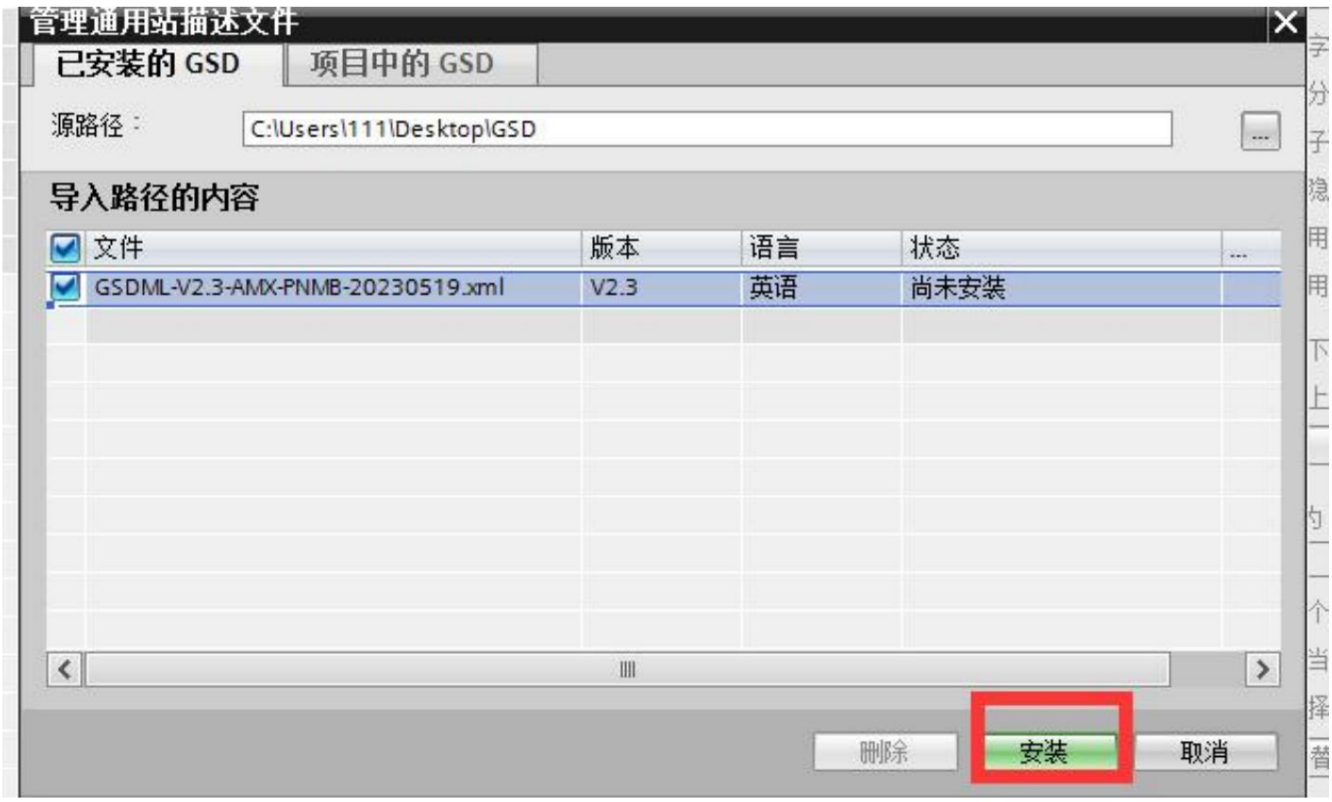
ÿ Open the Botu software, select the project view, and click Options > Manage General Station Description File (GSD).

ÿ In the source path, select the folder where the GSDML was prepared before, and click to select the folder after completion, and Botu will automatically scan

GSDML files under this folder.



ÿ Click the left side of the GSDML file to be installed, check the file, and click Install to install the corresponding GSDML file.

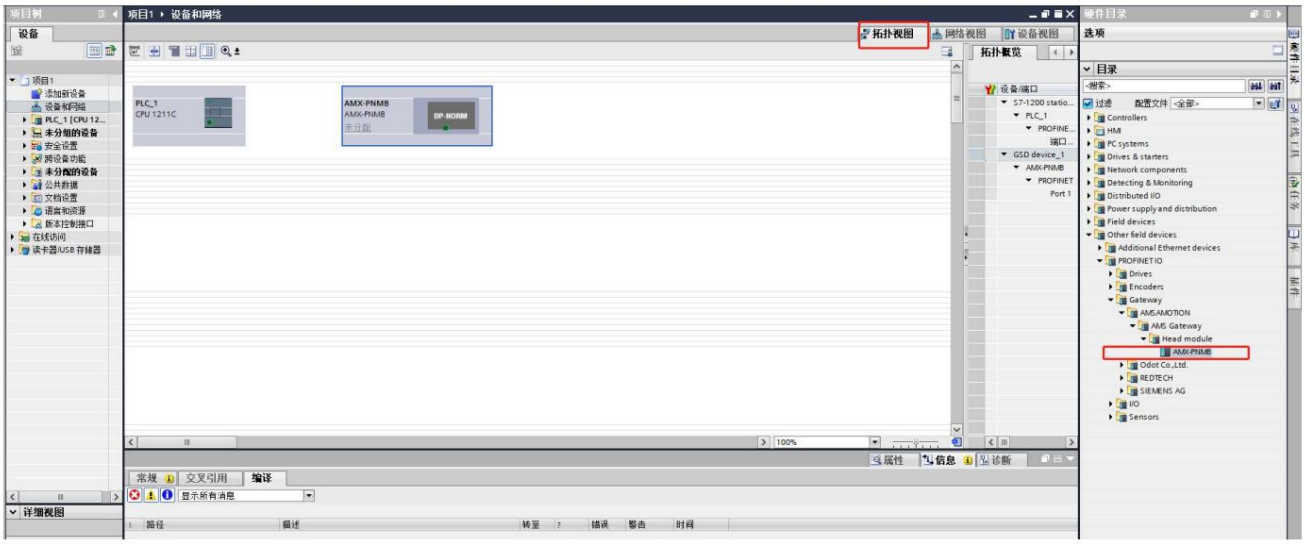


ÿ After the installation is complete, click Close, and the GSDML file is installed successfully.

4.3. Add PROFINET devices to the project

ÿ Create or open a project. If it is a new project, add the controller device first, and then add the module in the device configuration interface.

As shown below:



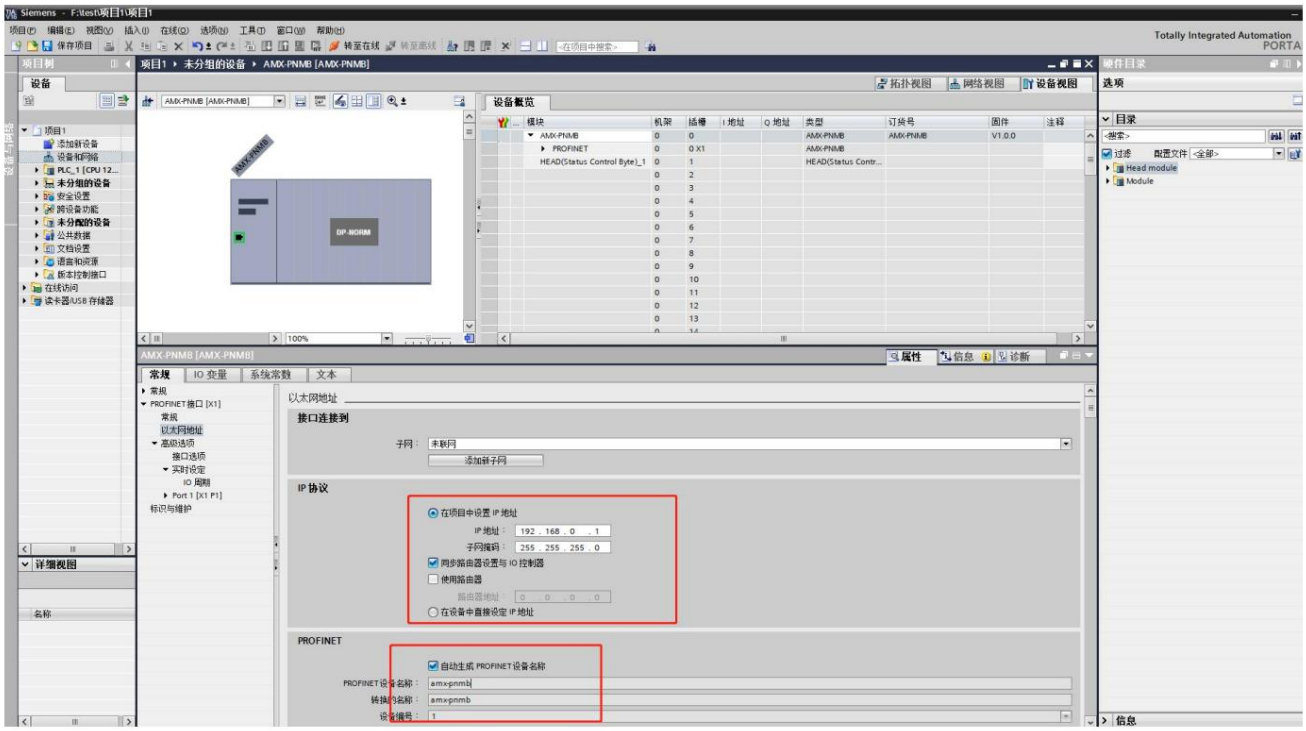
ÿ Select the newly added device in the device view, double-click the module in the figure, and modify the Ethernet address tab in the general

Change the IP address and device name to be consistent with the module itself. Or select "Set the IP address directly in the device".

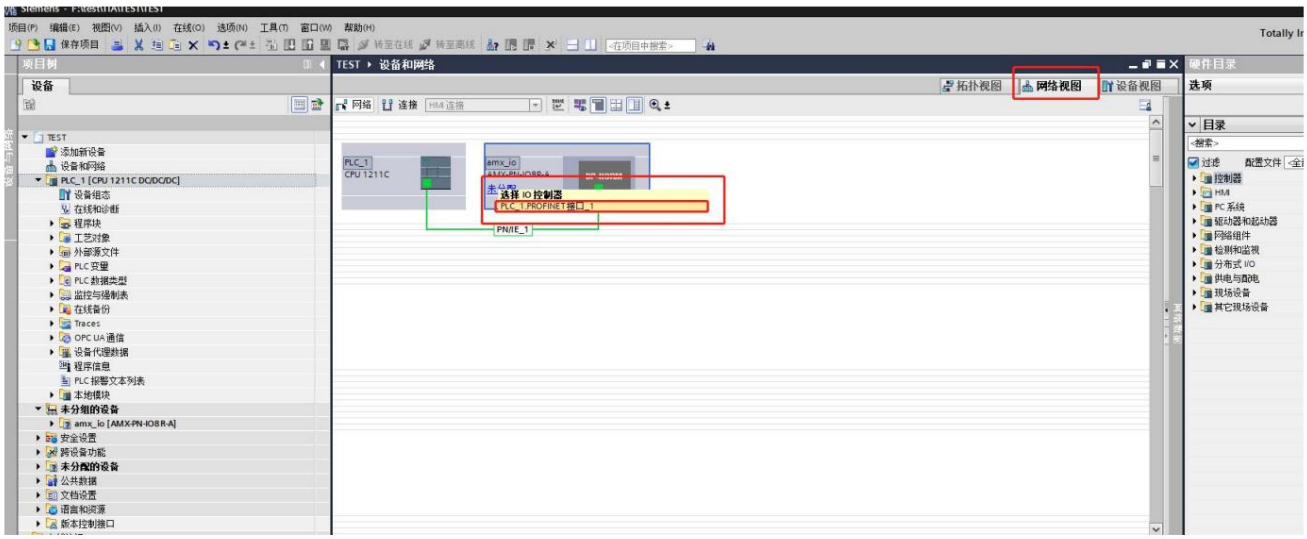
ÿ Note: When the IP address is not directly set in the device, the IP address and device name set at this time should be the same as the device itself.

If you do not know the IP address and device name of the device, you can set it at will first, and then set the IP address and device name of the module

The name of the device can be changed to be the same.



ÿ Assign the added modules to the PLC in the network view:



4.4. Configure modus communication parameters

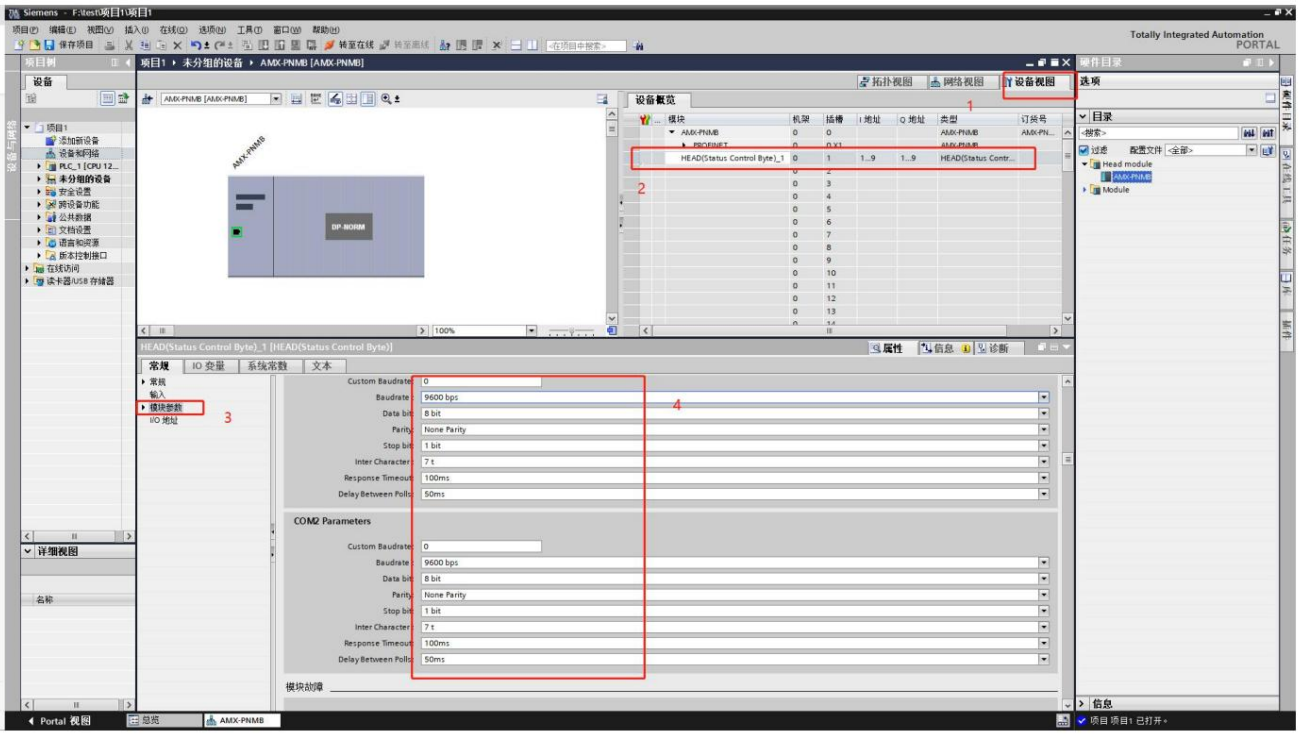
ÿ After finishing, click the device view to enter the device view operation interface.

ÿ In the device overview area, the system provides 64 slots, of which the first slot is the default device status word and

Device control word slot (HEAD(Status Control Byte)_1), through the status word PLC can read the operation status of the device

Line status, through the control word, PLC can operate PN-MB equipment.

ÿ Select the first slot and select Properties to set the MODBUS interface parameters of the PN-MB device.



ÿ PN-MB equipment module Modbus communication interface parameters:

--Modbus as Master Or Slave : This module only supports master station mode temporarily, this option is gray and cannot be selected.

--Modbus Slave Address: set in Modbus slave mode, not in master mode.

--Custom Baudrate: Customer non-standard baudrate setting, when this option is 0, the following option baudrates are available.

--Baudrate: Standard baud rate. Supported baud rate range: 2400-115.2k, the default is 9600, available when the Custom Baudrate option is 0.

--Data bit: set the data bit, 8 bits and 7 bits can be selected. The default is 8 bits.

--Parity: Set data parity, you can choose no parity, odd/even parity. The default is no checksum.

--Stop bit: Set the data stop bit, you can choose 1 stop bit or 2 stop bits. The default is 1 bit.

--Inter Character: Set the data interval character. After receiving the first frame of data, the master station will confirm how long it will wait before receiving the message. 3.5t-49t can be selected. The default is 7t.

--Max retry number: Set the number of error retries, 0-255, 0 does not resend, 255 infinite resends, 1-254 resends by the number of times.

--Response Timeout: After the module sends a Modbus message, it waits for the response time of the Modbus device. If the MODBUS device still does not respond within the set waiting time, the module stops waiting and continues to send the next MODBUS message. Select the range of 10ms-1000ms and wait for an answer indefinitely (Keep waiting...).

--Delay Between Polls: After the bus conversion module receives the correct message from the MODBUS slave station, it delays sending the message from the MODBUS master station time. If the MODBUS slave device responds slowly to the master station message, if the bus conversion module sends the MODBUS message too fast, then there will be a communication failure. If there is a fault, the interval between sending packets can be appropriately increased. The selection range is 10ms-1500ms or no waiting (No Delay). The default value is 50 ms.

--COM2 interface parameters are the same as COM1 interface parameters, please refer to COM1 interface description for details.

4.5. Configuration status word and control word

From the device overview configuration, we can see that slot number 1 is automatically occupied by the system (HEAD(Status Control Byte)_1), where in the column of I address, The corresponding PROFINET input address IB1-9 is the communication status monitoring bit. In the Q address column, the corresponding PROFINET output address QB1-9, QB1 is the communication control word (control) of this bus conversion module, and QB2-9 are the control bits sent by each message.

ÿ Communication status monitoring:

The first byte: RS485 error slot number

The 2nd byte: RS485 error code

The 3rd byte: RS422 error slot number

The 4th byte: RS422 error code

Other bytes are reserved.

Error Code Meaning		
-1	No telegrams are set, modbus is enabled	
-2	There are no writable nodes, all nodes are disabled or only read and write once	
-21 The length of the received byte is less than 5 bytes, and the data sent by the modbus slave device is not complete	complete or no response from the device.	Check slave device status or increase Inter Character parameter.
-22	The CRC check failed, the Modbus communication was disturbed or the slave device sent an error Error, the received byte length is greater than 5 bytes, but the complete packet is not actually sent	
1	Illegal Function	Modbus slave device does not support this command
2	Illegal Data Address Illegal	The length of the message setting read or write command is wrong
3	Data Value Slave	Message setting write command data is incorrect
4	Device Fault Slave Device	Modbus slave device cannot receive data command
6	Busy	Modbus slave busy

ÿ Communication control bit:

-- 1st byte:

Bit 0: Whether the Modbus function RS485 interface is enabled, 1 = enabled, 0 = not enabled

Bit 1: Whether the RS422 interface of the Modbus function is enabled, 1 = enabled, 0 = not enabled

Bit 4: Clear the fault code. When a rising edge (0->1) is detected, the communication status monitoring is cleared.

Other bits are reserved.

2nd byte to 9th byte:

Each slot of the message corresponds to one bit. The corresponding form is shown in the table below.

When the message is configured to be triggered by a rising edge (see 4.6 message setting), when this bit is changed from 0 to 1, the message is enabled to be sent once.

When the message is configured as level trigger (see message setting in Chapter 4.6), when this bit is set to 1, the message will be sent cyclically, and when it is set to 0, the message will stop stop looping.

-- 2nd byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Slot 8 Slot 7 Slot 6 Slot 5 Slot 4 Slot 3 Slot 2 Empty							

--The 3rd byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Slot 16 Slot 15 Slot 14 Slot 13 Slot 12 Slot 11 Slot 10 Slot 9							

--The 4th byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Slot 24 Slot 23 Slot 22 Slot 21 Slot 20 Slot 19 Slot 18 Slot 17							

--The 5th byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Slot 32 Slot 31 Slot 30 Slot 29 Slot 28 Slot 27 Slot 26 Slot 25							

--The 6th byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Slot 40 Slot 39 Slot 38 Slot 37 Slot 36 Slot 35 Slot 34 Slot 33							

--The 7th byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Slot 48 Slot 47 Slot 46 Slot 45 Slot 44 Slot 43 Slot 42 Slot 41							

--The 8th byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Slot 56 Slot 55 Slot 54 Slot 53 Slot 52 Slot 51 Slot 50 Slot 49							

--The 9th byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Slot 64 Slot 63 Slot 62 Slot 61 Slot 60 Slot 59 Slot 58 Slot 57							

4.6. Configure Modbus message

There are a total of 64 slots in the device overview, the first slot is occupied as a status word and control word, and the remaining 63 slots are available for configuration MODBUS telegram (command). Each slot can be used to insert a MODBUS communication message (command), so a total of 63 MODBUS Communication messages (commands).

Click on the module in the hardware catalog on the right and there are four Modbus address operation folders. Click on each folder to select the corresponding Operations on the number of addresses.

Directly double-click the message in the hardware catalog with the left button, and the message can be configured in the MODBUS message queue according to the order of the blank slot.

Each message has six attributes.

—UART Number: Select COM1 or COM2 port.

—Modbus Slave Address (modbus slave station number address): Select the station number of the slave station device to be sent, and you can choose 1-255.

—Function Code: The function code of the MODBUS message, which is automatically generated according to the MODBUS command inserted into the slot, and cannot be changed change.

—Start Adress (start address): start address of MODBUS slave data operation. Non-register PLC address. That is, no prefix. straight Connect from 0-65535.

—UART Data Length (transmitting and receiving data length): automatically generated according to the length of the MODBUS command inserted into the slot, and cannot be changed.

—Transmission Type: Three transmission types are available.

Poll trigger (polling sending): After the 0th bit of the 1st byte of the control word is set to 1 by the PLC program, the message will be sorted from the slot number from small to Larger orders are sent sequentially. In this sending mode, both read/write commands will be executed forcibly, regardless of whether the data is changed during the write command. Read command defaults to this mode. (In the previous section, for example, the PLC address Q2.0 is bit 0 of the first byte of the control word)

Level trigger (level sending): For the read command, after the control sending flag bit corresponding to the slot number changes from 0 to 1, the message will be sent according to Slot numbers are sent sequentially from small to large; after the control sending flag bit corresponding to the slot number changes from 1 to 0, the message will stop sending. For write commands, It will only be executed if the data has changed. Write command defaults to this mode. (In the previous section, for example, the PLC address QB2-QB9 is to send the trigger control bit)

Rising trigger (rising edge sending): After the trigger control bit corresponding to the slot number changes from 0 to 1, the message will be sent once. this sender In this mode, the read and write commands will only be executed once when the rising edge of the corresponding slot is detected. (In the previous section, for example, the PLC address QB2-QB9 is to send trigger control bit)

The module supports the following eight MODBUS communication commands

function code	Function	Operation address area (non-register PLC address site)	operation type
01H	Read multiple coil output states Read	0XXXX	read
02H	multiple input coil states Read multiple	1XXXX	read
03H	holding registers Read input registers	4XXXX	read
04H	Force a single coil Preset a	3XXXX	read
05H	single holding register	0XXXX	Write
06H	Force multiple coils Preset multiple	4XXXX	Write
0FH	holding registers	0XXXX	Write
10H		4XXXX	Write

Example: Function 01H-read the status of N output coils 0xxxx

Read the coil status whose station number is 1 and whose MODBUS device address is 00020~00043, and store the read coil status in plc whose address is In IB10, IB11, and IB12, the read quantity is 24 Bits.

A Double-click "read 24 bits(0xxxx)" under Coils 0xxxx, as shown in the figure.

B Added a "read 24 bits (0xxxx)" message in slot number 2. "10...12" in the I address column

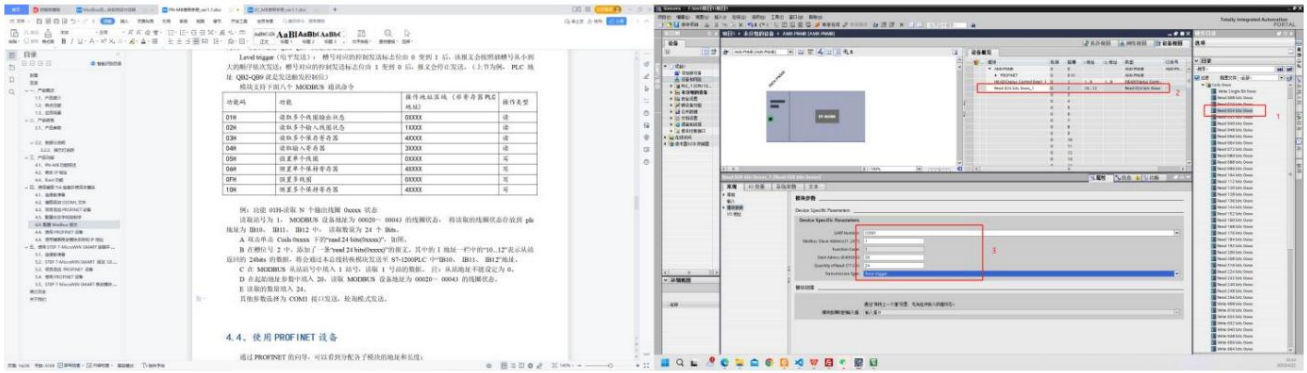
The 24bits data returned by the slave station will be sent to the "IB10, IB11, IB12" addresses in S7-1200PLC through this bus conversion module.

C Fill in the station number 1 in the station number of the MODBUS slave station, and read the data of station 1. Note: The slave station address cannot be set to 0.

D Fill in 20 in the initial address parameter, and read the coil status of the MODBUS device whose address is 00020~00043.

E Fill in 24 for the number of reads.

Other parameters are selected as COM1 interface sending and polling mode sending.



MODBUS message analysis

Master station inquiry message format

address	Function code high start address low start address number of coils high number of coils low CRC					
01	01	00	14	00	18	WJEC

Message start address=0014(H)

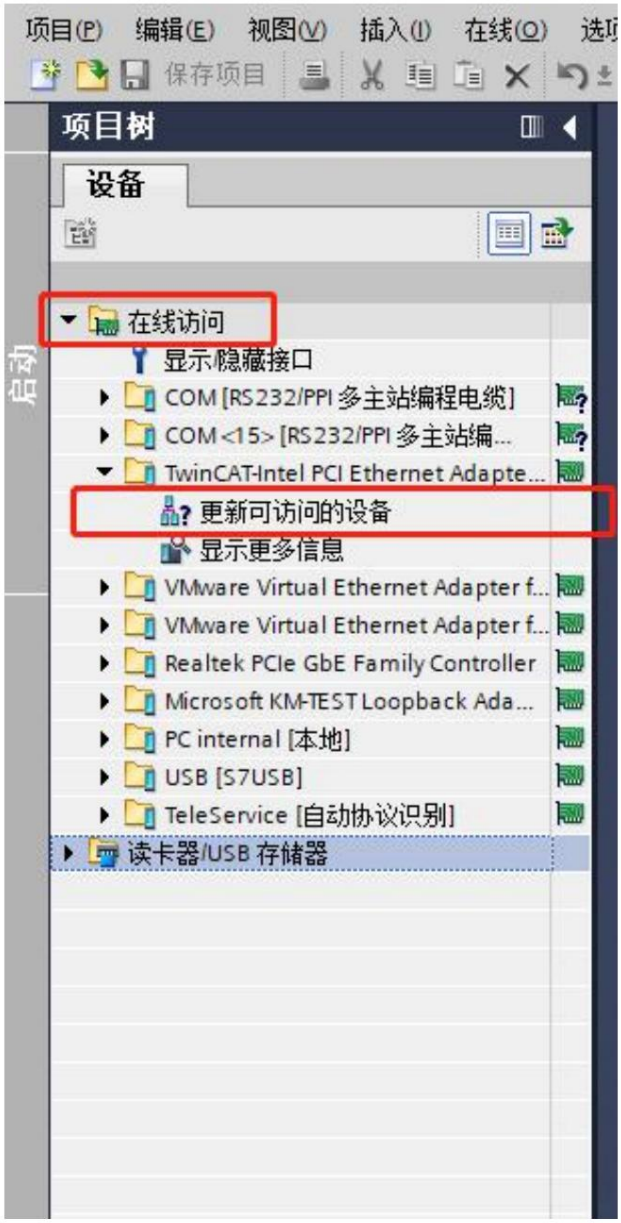
Slave response format:

Address function code byte count			coil status 20-27	coil status 28-35	coil status 36-43	coil status 44-51	coil state 52-56	CRC
11	01	05	CD	6b	B2	0E	1B	44EA

4.7. Use Botu to modify the module name and IP address

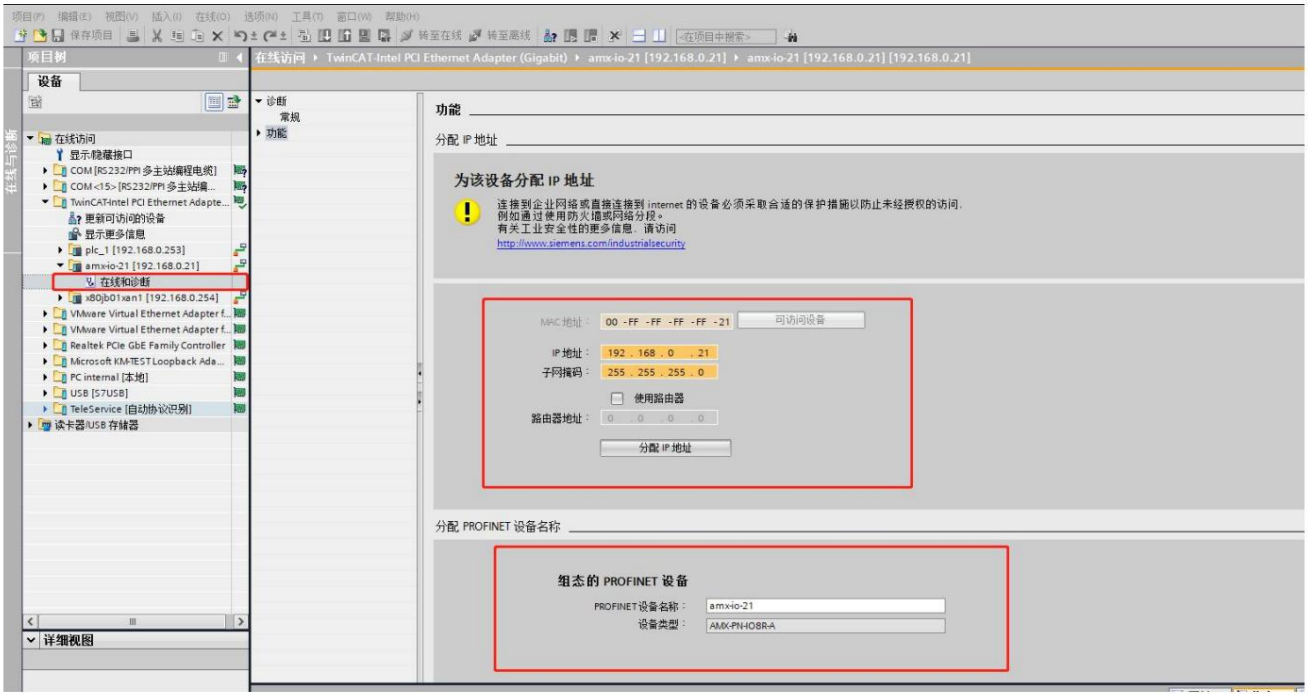
ÿ Open the Botu software and select to enter the project view.

ÿ Expand online access, select the network card connected to the module, and double-click to update the accessible device after expanding.



ÿ As shown in the figure below, the updated network card is connected to a module, a PLC and a switch. Click on the module to be modified, expand

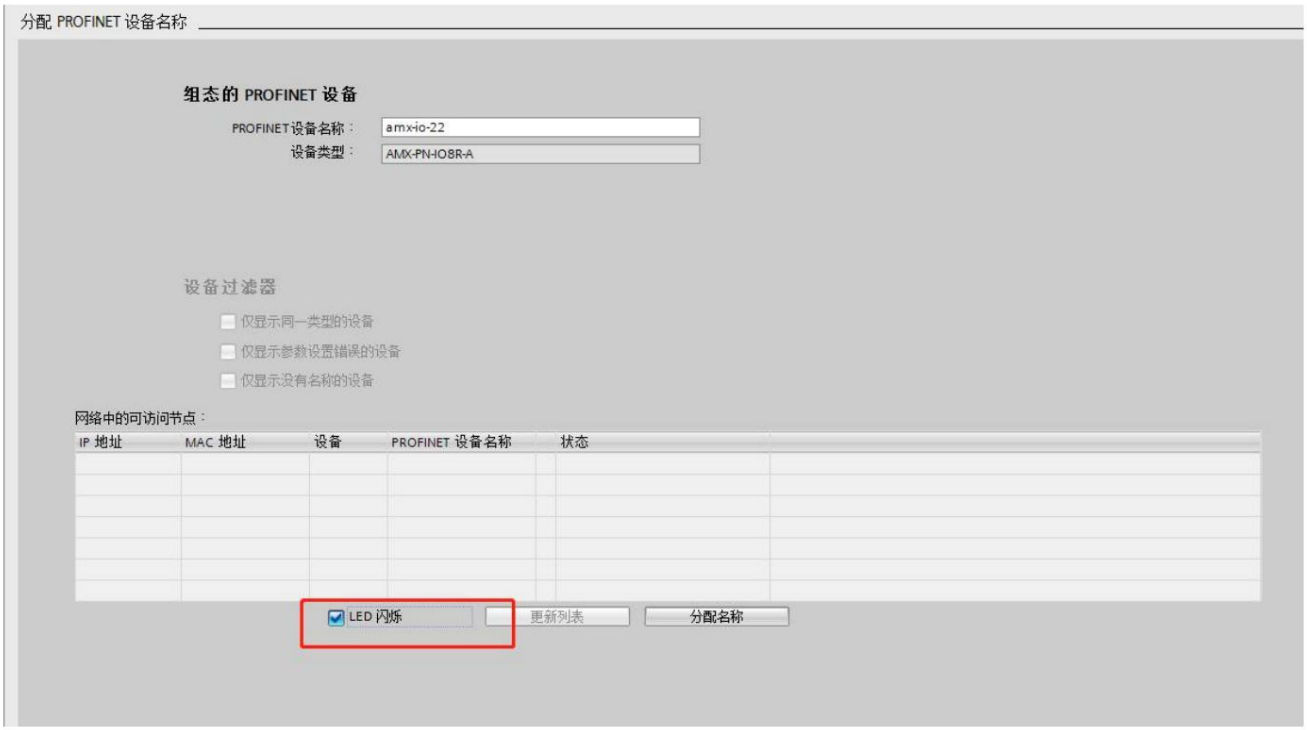
Open, double-click online and diagnosis, and modify the IP and module name in the pop-up interface.



ÿ When there are multiple modules and you don't know which one to modify, you can click the LED shown in the figure below to flash. At this time, the red LED on the module indicates

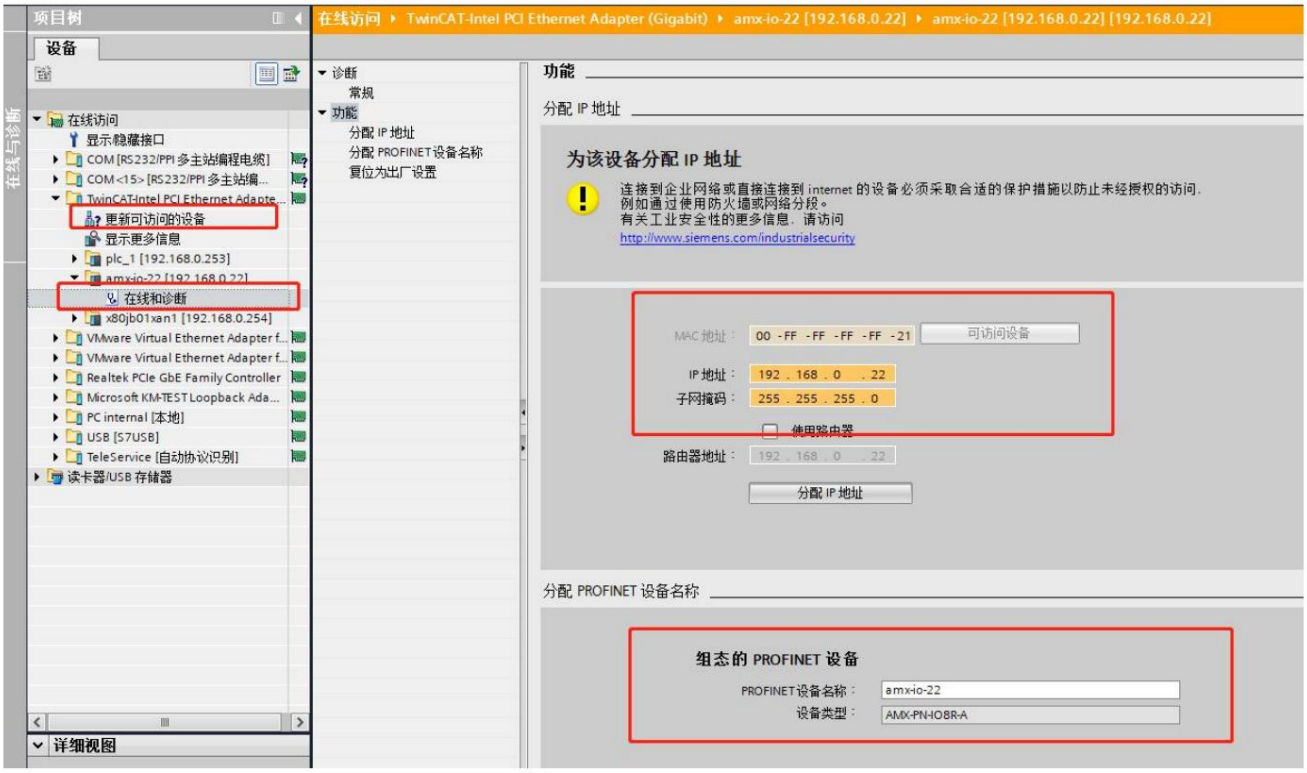
The light will start blinking. After the name or IP is modified, click Assign Name and Assign IP Address, and the module name and IP address will be updated.

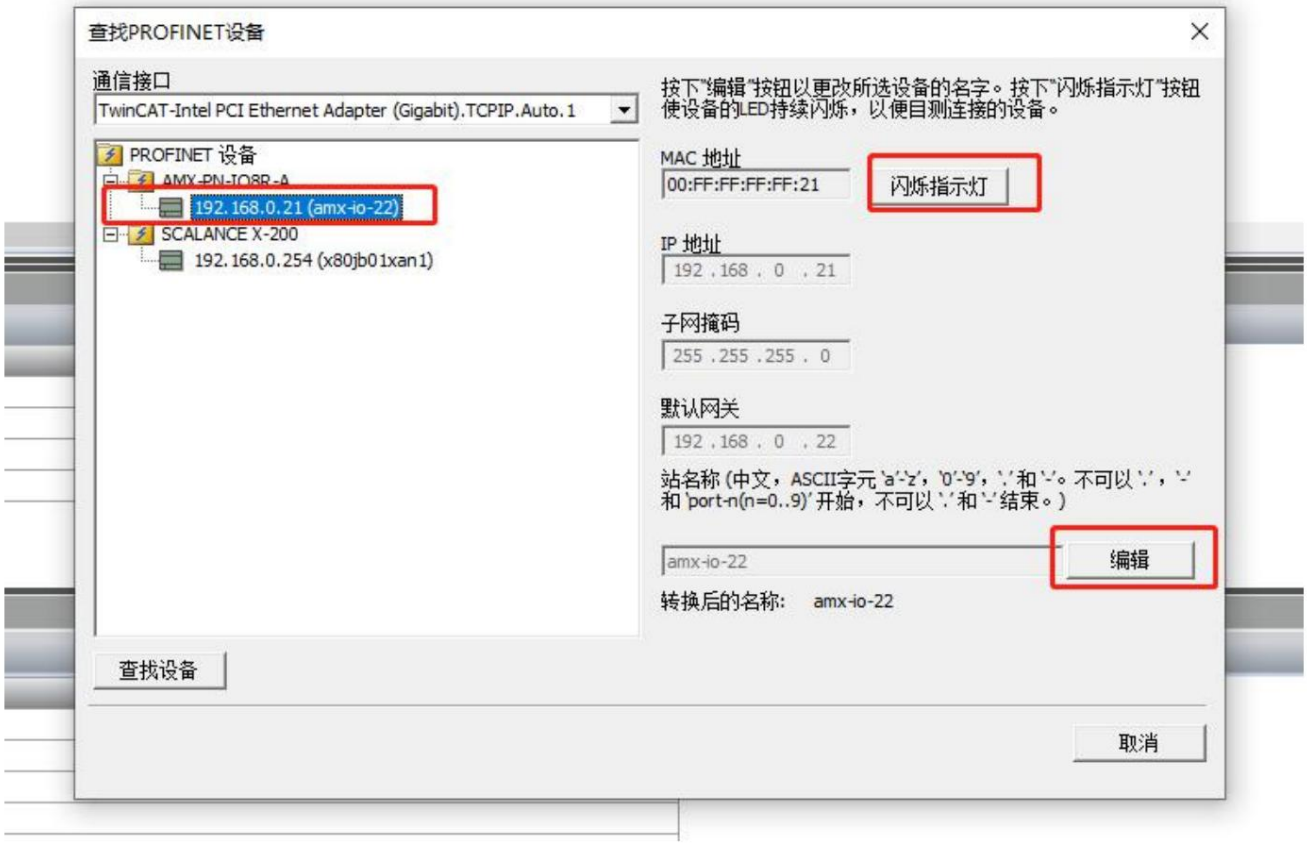
site.



ÿ Double-click the update accessible device on the left column again, wait for the update to complete, then select the station name and IP of the module just modified, expand,

Double-click Online and Diagnostics. At this point, you can see that the module IP and station name have been updated.


项目树
设备
在线访问
显示隐藏接口
COM [RS232/PPI 多主站编程电缆]
COM <15> [RS232/PPI 多主站编...
TwinCAT-Intel PCI Ethernet Adapte...
更新可访问的设备
显示更多信息
plc_1 [192.168.0.253]
amx-io-22 [192.168.0.22]
在线和诊断
x80jb01xan1 [192.168.0.254]
VMware Virtual Ethernet Adapter f...
VMware Virtual Ethernet Adapter f...
Realtek PCIe GbE Family Controller
Microsoft KM-TEST Loopback Ada...
PC internal [本地]
USB [S7USB]
TeleService [自动协议识别]
读卡器/USB 存储器
详细视图
在线访问 ▸ TwinCAT-Intel PCI Ethernet Adapter (Gigabit) ▸ amx-io-22 [192.168.0.22] ▸ amx-io-22 [192.168.0.22] [192.168.0.22]
诊断
常规
功能
分配 IP 地址
分配 PROFINET 设备名称
复位为出厂设置
功能
分配 IP 地址
为该设备分配 IP 地址
连接到企业网络或直接连接到 internet 的设备必须采取合适的保护措施以防止未经授权的访问。
例如通过使用防火墙或网络分段。
有关工业安全性的更多信息，请访问
http://www.siemens.com/industrialsecurity
MAC 地址：
00 -FF -FF -FF -FF -21
可访问设备
IP 地址：
192 . 168 . 0 . 22
子网掩码：
255 . 255 . 255 . 0
使用路由器
路由器地址：
192 . 168 . 0 . 22
分配 IP 地址
分配 PROFINET 设备名称
组态的 PROFINET 设备
PROFINET 设备名称：
amx-io-22
设备类型：
AMX-PN-IO8R-A



ÿ Click Edit to modify the station name. After modification, click Settings to download the station name.

ÿ After the download is complete, set the corresponding IP address of the module during configuration. After the program is downloaded, the corresponding IP address of the module will be modified. When setting the configuration

See Section 4.3 for IP details.

Five, STEP 7 connection using this module

5.1. Preparation before connection

Prepare the required XML files as follows:

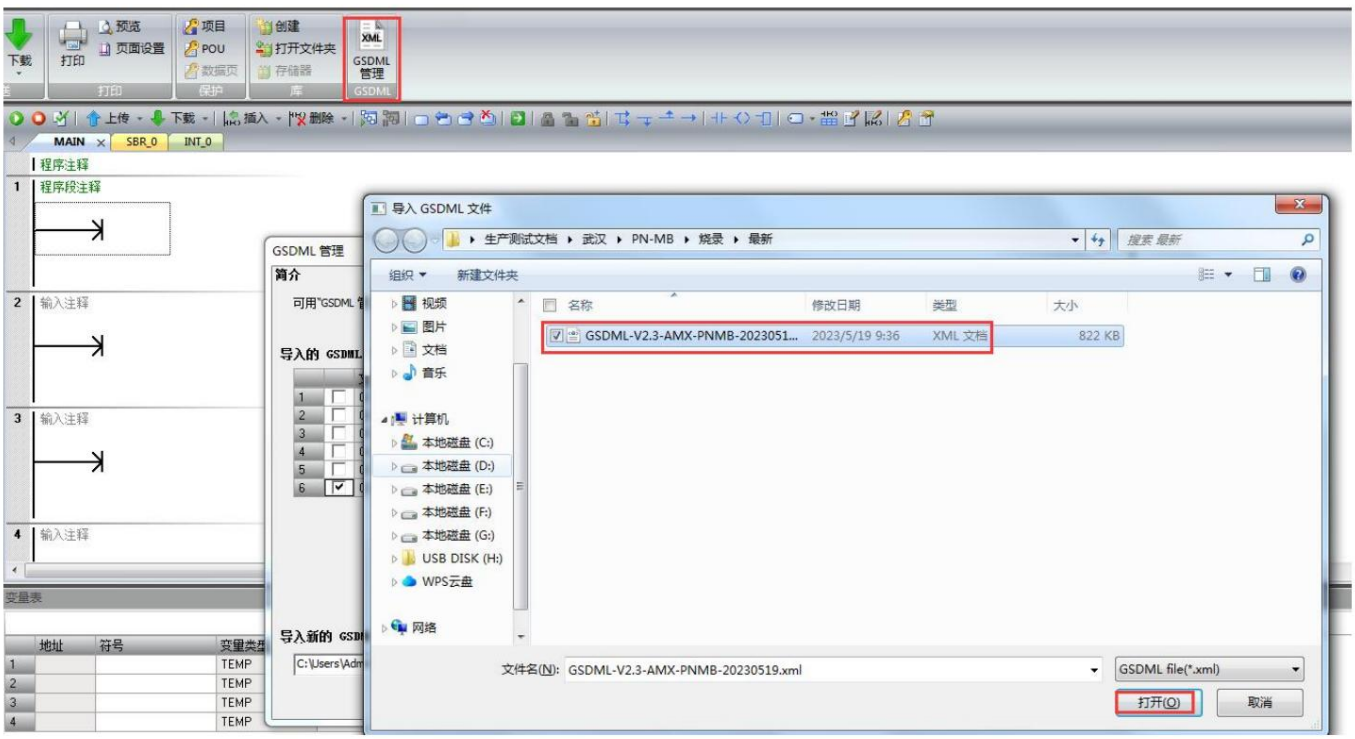
Connect the DC 24V external power supply to the module and power it on. Before powering on, please check whether the positive and negative poles of the power supply are connected correctly.

Use a network cable to connect the module to the Profinet interface of the PLC controller.

5.2. Add GSDML file

Open the step 7-microWIN SMART software, click GSDML management, find "import new

GSDML", click Browse, select the prepared GSDML folder, click to select the file, and click Open.



Click OK to complete the installation.

5.3. Add PROFINET devices to the project

Select the PROFINET command under the Tools menu.

Select the PLC role as the PLC controller, and set the corresponding parameters such as the IP of the PLC controller. Click Next when finished.

Select AMX-PMMBV1.0.0 under PROFINET-IO>Gateway>AMS Gateway> in the right column, click to select,

Then hold down the left button and drag it into the table on the left.

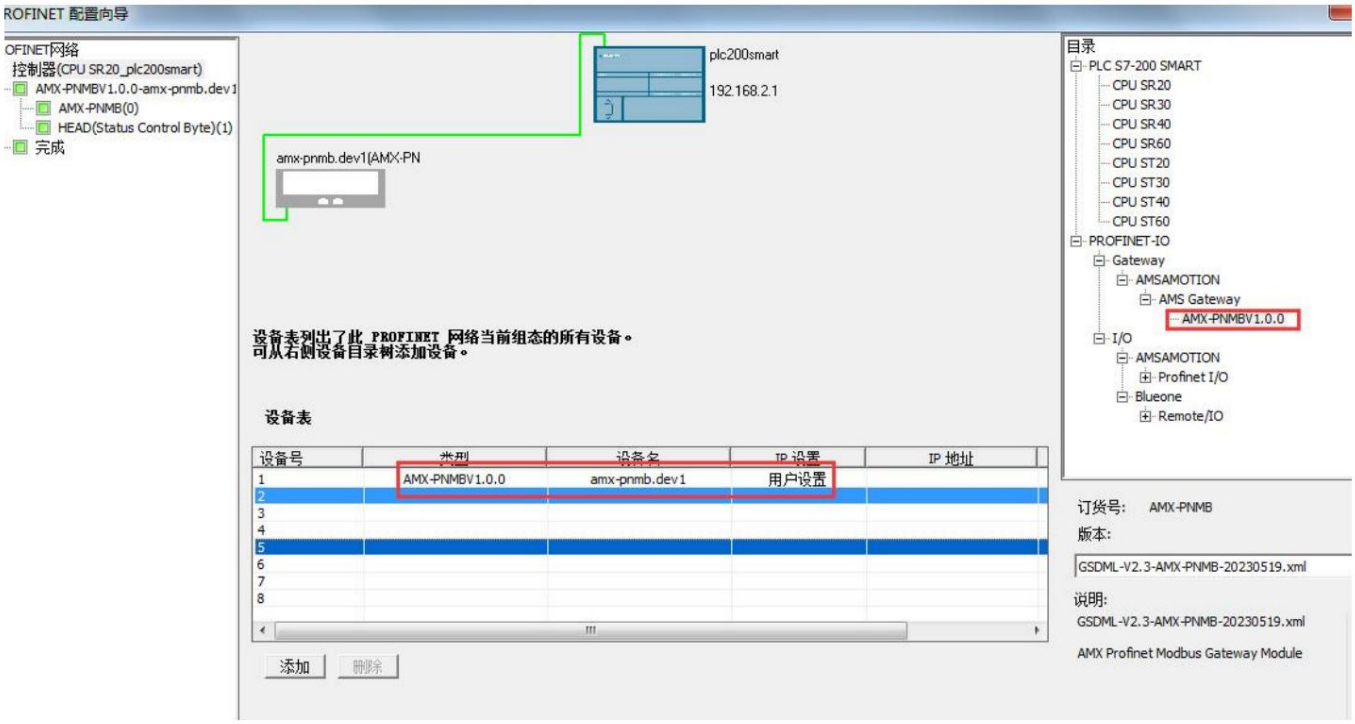
Double-click the device name column and fill in the corresponding device name. The same device name cannot exist in the same project, and the same IP address should be set.

It must be in the same network segment as the PLC controller.

Note: The device name set at this time needs to be consistent with the device. If you do not know the device name, you can set it at will first, and then set the module

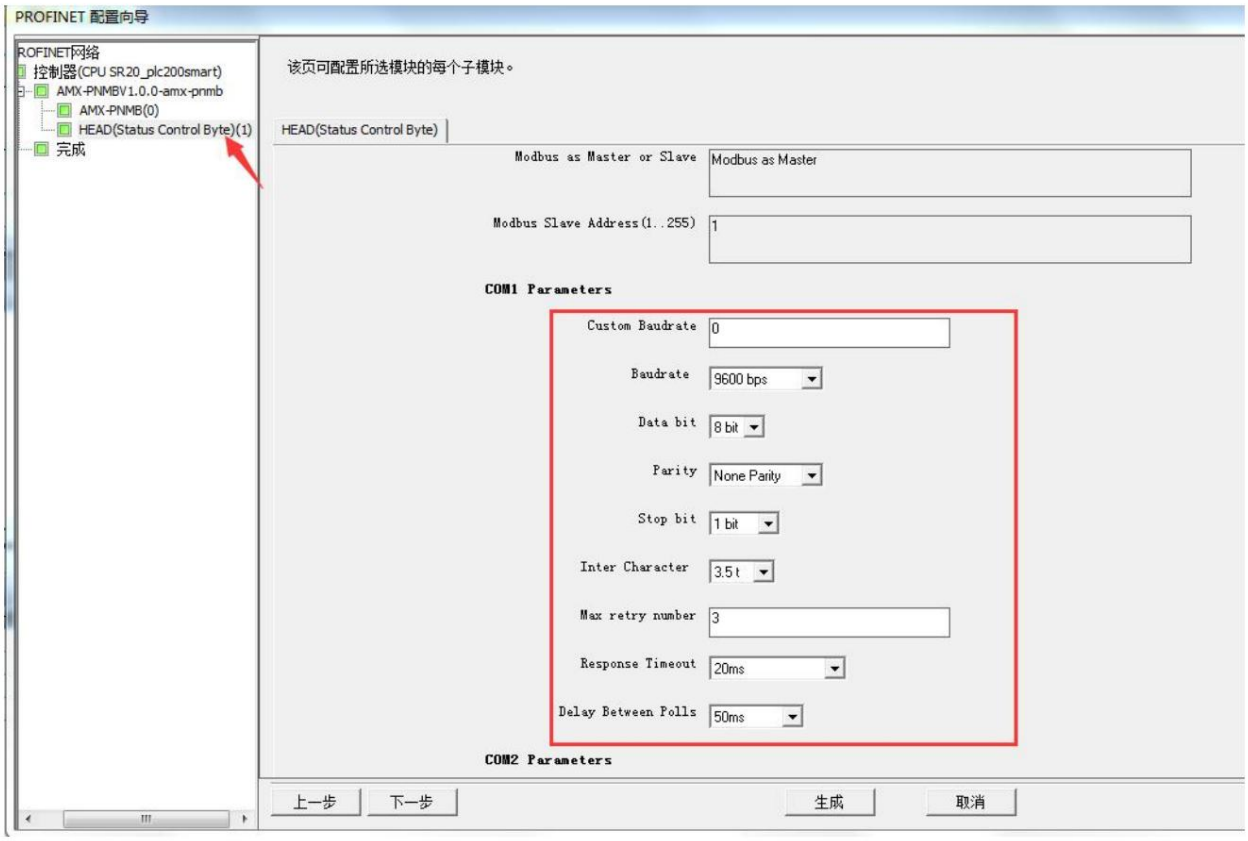
It is enough to change the device name to be the same. The IP address set at this time will be set as the IP address of the module with the same device name during configuration.

set value. Please refer to Section 5.5 "Modification of Module Name and Module IP Address in STEP 7-MicroWIN SMART" for device name modification.



5.4. Configure modus communication parameters

Click "HEAD" to configure modbus communication parameters, com1 is 485 parameters, com2 is 422 parameters



PN-MB equipment module Modbus communication interface description:

--Modbus as Master Or Slave : This module only supports master station mode temporarily, this option is gray and cannot be selected.

--Modbus Slave Address: set in Modbus slave mode, not in master mode.

--Custom Baudrate: Customer non-standard baudrate setting, when this option is 0, the following option baudrates are available.

--Baudrate: Standard baud rate. Supported baud rate range: 2400-115.2k, the default is 9600, available when the Custom Baudrate option is 0.

--Data bit: set the data bit, 8 bits and 7 bits can be selected. The default is 8 bits.

--Parity: Set data parity, you can choose no parity, odd/even parity. The default is no checksum.

--Stop bit: Set the data stop bit, you can choose 1 stop bit or 2 stop bits. The default is 1 bit.

--Inter Character: Set the data interval character. After receiving the first frame of data, the master station will confirm how long it will wait before receiving the message. 3.5t-49t can be selected. The default is 7t.

--Max retry number: Set the number of error retries, 0-255, 0 does not resend, 255 infinite resends, 1-254 resends by the number of times.

--Response Timeout: After the module sends a Modbus message, it waits for the response time of the Modbus device. If the MODBUS device still does not respond within the set waiting time, the module stops waiting and continues to send the next MODBUS message. Select the range of 10ms-1000ms and wait for an answer indefinitely (Keep waiting...).

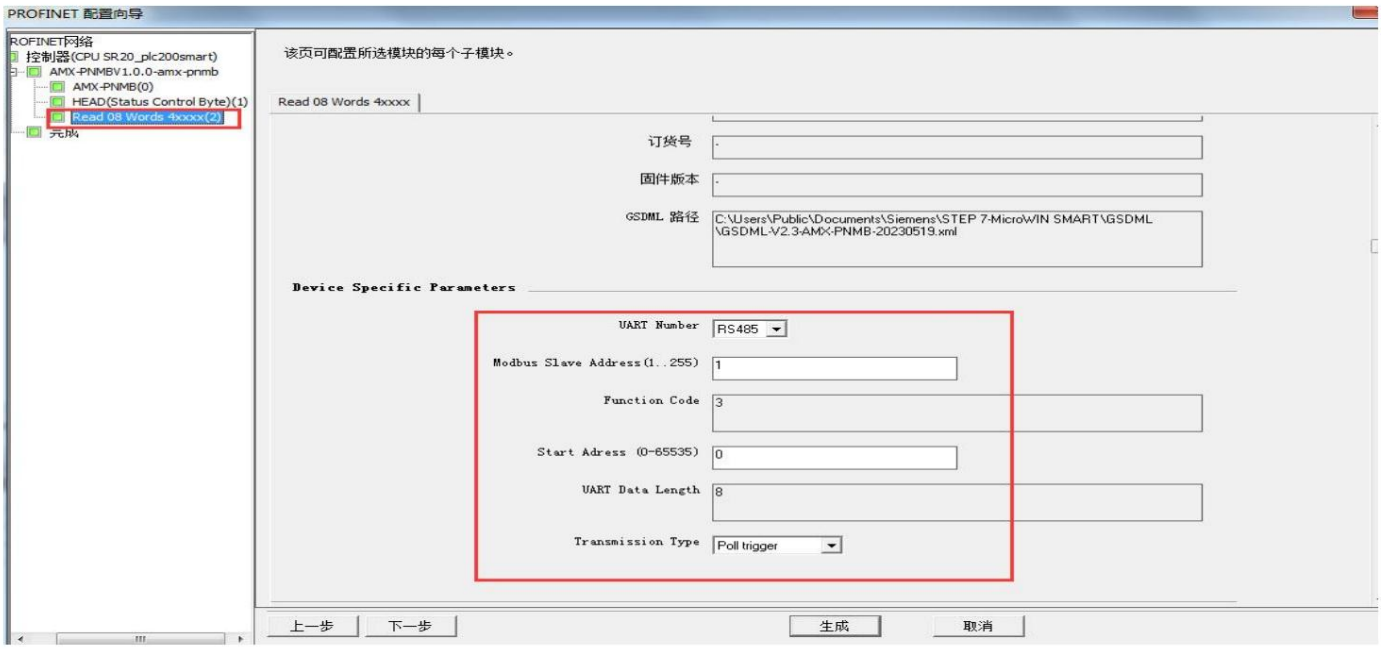
--Delay Between Polls: After the bus conversion module receives the correct message from the MODBUS slave station, it will delay sending the MODBUS master station message. If the MODBUS slave device responds slowly to the master station message, if the bus conversion module sends the MODBUS message too fast, then there will be a communication failure, and the interval between sending messages can be appropriately increased. The selection range is 10ms-1500ms or no waiting (No Delay). The default value is 50 ms.

--COM2 interface parameters are the same as COM1 interface parameters, please refer to COM1 interface description for details.

5.6. Configure Modbus message

Add corresponding MODBUS messages according to equipment requirements

Set the sending port, station number, starting address, and sending mode. For parameter descriptions, refer to Chapter 4.6



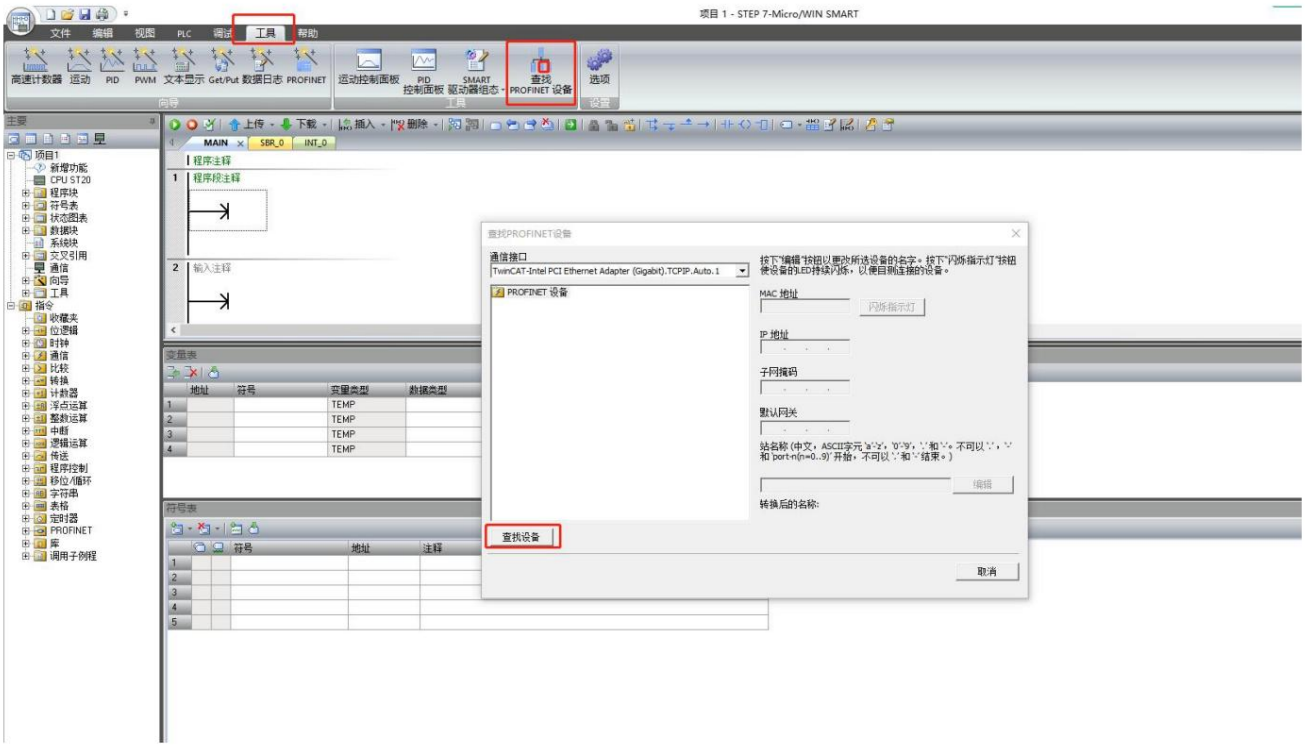
After filling in the parameters, click Generate. Refer to Chapter 4.5 for the status word and control word

5.7, STEP 7 modify the module name and module IP address

When using Step7 micro to set the module name and IP address, the smart 200 will automatically set the

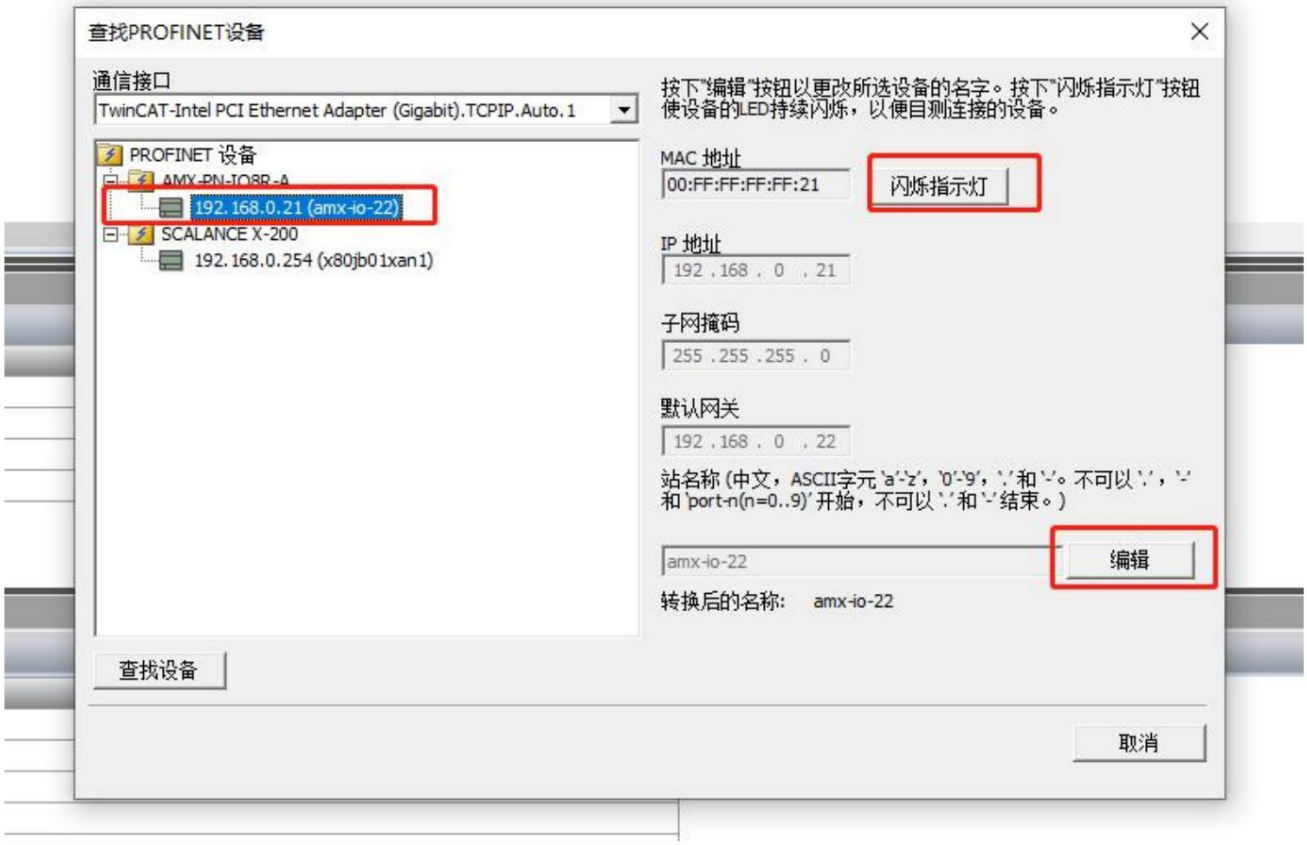
The IP address is sent to the module corresponding to the station name, so only the station name needs to be modified.

Open the step7 micro/WIN smart software, and open the search PROFINET device under the tool bar.



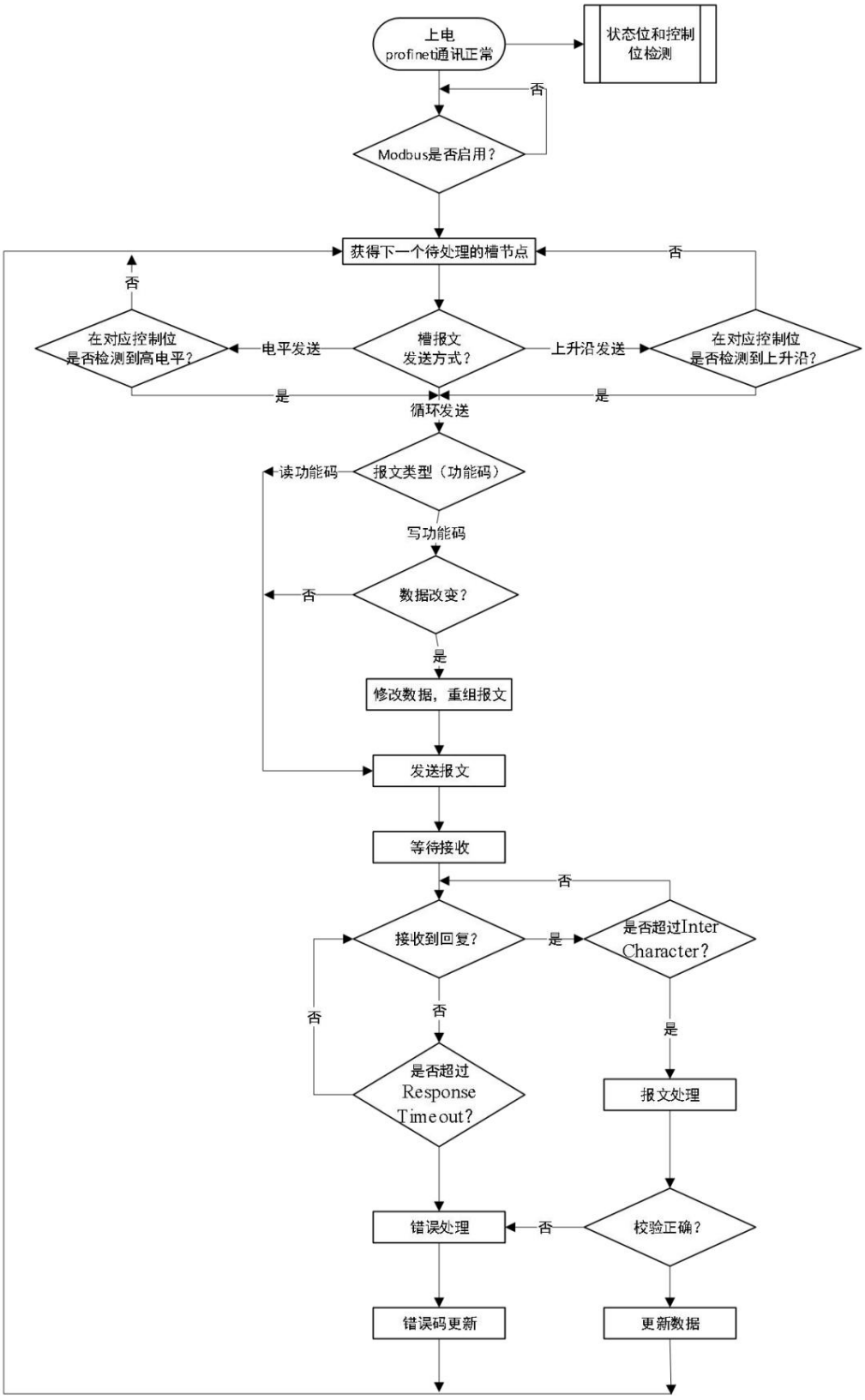
Click to find the device, and after finding it, click to select the module whose station name needs to be modified. If there are multiple modules, you can click the flashing indicator

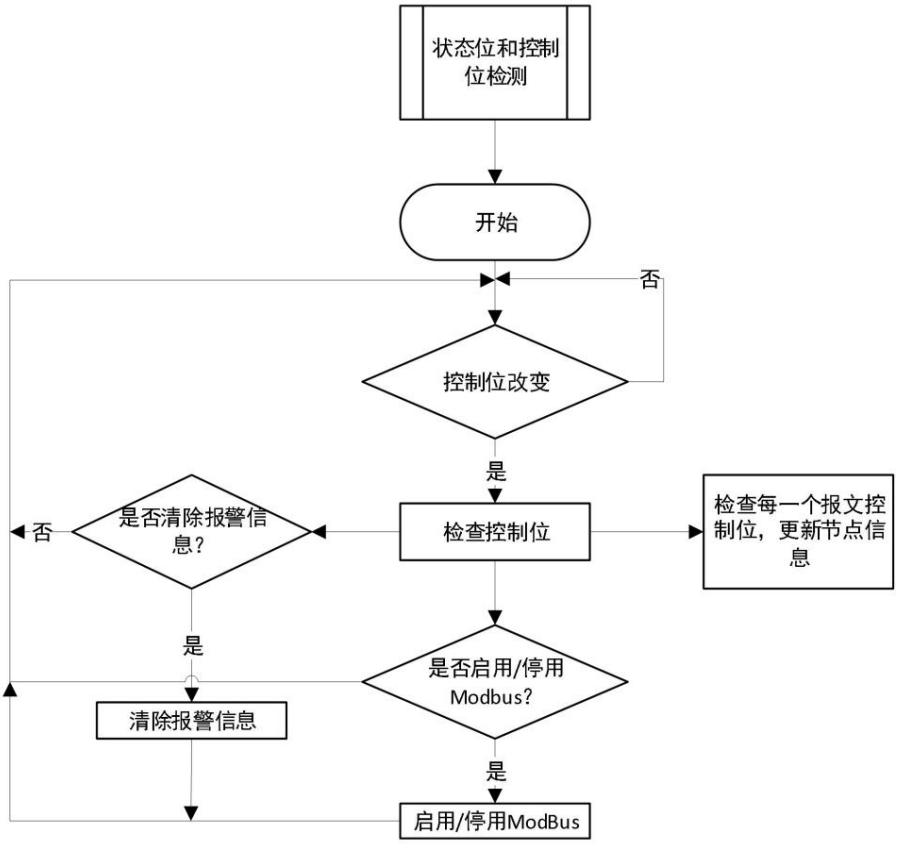
light, the red light on the module will flash.



Click Edit to modify the station name. After modification, click Settings to download the station name.

6. Send message process




状态位和控制位检测
开始
否
控制位改变
是
是否清除报警信息?
否
检查控制位
检查每一个报文控制位，更新节点信息
是
是否启用/停用Modbus?
清除报警信息
是
启用/停用ModBus