Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



Serial port ⇌ Ethernet module

NS1/NS1-TB

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1. Product Introduction



NS1 is a serial port server module that realizes serial port data ⇌ Ethernet data conversion; It has multiple Modbus gateway modes and MQTTC/HTTPC Internet of Things gateway modes, which can meet the networking functions of various serial port devices/PLCs.

The NS1-TB test kit is equipped with a USB to TTL circuit, which does not require the user to connect the external converter, and the reset and restart pins are connected with external keys for easy operation. At the same time, the operation status indicator pins are connected with external LEDs for the user to observe the status.

Features

- RJ45 supports 10M Ethernet interface;
- Support multiple working modes (TCP Server, TCP Client, UDP Server, UDP Client, HTTPC, MQTTC);
- Support configuration tools, web pages and AT commands;
- The server mode supports multiple socket connections;
- Support multiple baud rates;
- Support DHCP function;
- Support DNS (domain name resolution) and customizable domain name resolution server;
- Support multiple Modbus gateways (simple protocol conversion, multi-host mode, storage gateway, configurable gateway);
- Support fast access to Alibaba Cloud, Baidu Cloud, OneNET, Huawei Cloud, and version 3.1 standard MQTT servers;
- Support HTTP protocol (GET/POST request);
- Support virtual serial port;
- Support timeout restart function and customize the restart time;
- Support the short connection function and customize the short connection interval;
- Support heartbeat package and registration package functions;
- Support serial port cache cleaning function;
- Support access to the Internet and LAN;
- Support hardware restoration to factory settings;
- Support online upgrade function.

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2. Quick get start

If there is a problem in the use process, click the official website link:https://www.ebyte.com/product-class.aspx

2.1. Preparation for use

Before using the serial server (hereinafter referred to as the "device"), it is necessary to prepare the network cable, computer, USB to serial converter and other relevant auxiliary materials. The details are as follows:

		
NS1-TB	Network cable	computer

[Note] This case uses test suite (NS1-TB) equipment;

2.2. Software settings

2.2.1. Network test environment

To avoid the server search failure and the inability to open the web page and other related problems in the actual application process, it is recommended to check the relevant settings of the computer first.

（1） Turn off the firewall and antivirus software of the computer;

（2） Configure the network card connected to the device;

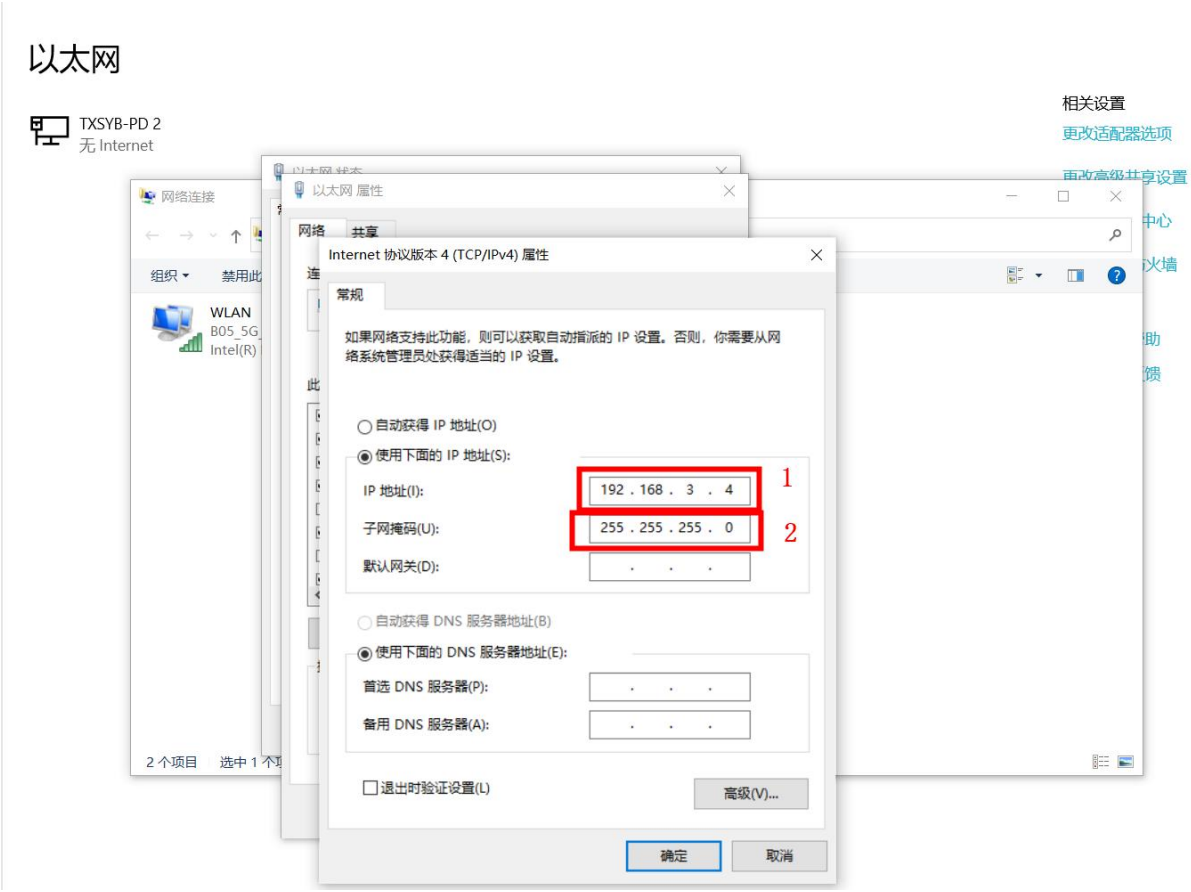
（3） This case is for the test of direct connection of the equipment to the computer. The computer needs to be configured as static IP (the computer is directly connected to the serial port server, there is no router to assign, and the computer cannot obtain the IP address). The use of a switch or router needs to ensure that the equipment and the computer are on the same network end (for example, 192.168.3. xxx);

（4） The static IP of the computer is 192.168.3.4 (the same network segment as the serial port

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server), the subnet mask is 255.255.255.0, and the default gateway is 192.168.3.1.



2.2.2. Default parameters

project	Default parameters
IP address	192.168.3.7
Default local port	8887
Subnet mask	255.255.255.0
Default gateway	192.168.3.1
Default working mode	TCP Server
Serial baud rate	115200
Serial port parameters	8 / None / 1

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2.2.3. Data transmission test

After the above operation steps, follow the factory default parameters of the equipment and perform the following operations to realize the transparent data transmission test.

The operation steps are as follows:

（1） Open the test TCP/IP debugging assistant software;

（2） In the "Network Settings" area, select the TCP Client mode. The remote host address corresponds to the device's default local IP: 192.168.3.7. The remote host port corresponds to the device's factory local port 8887. Click Connect;

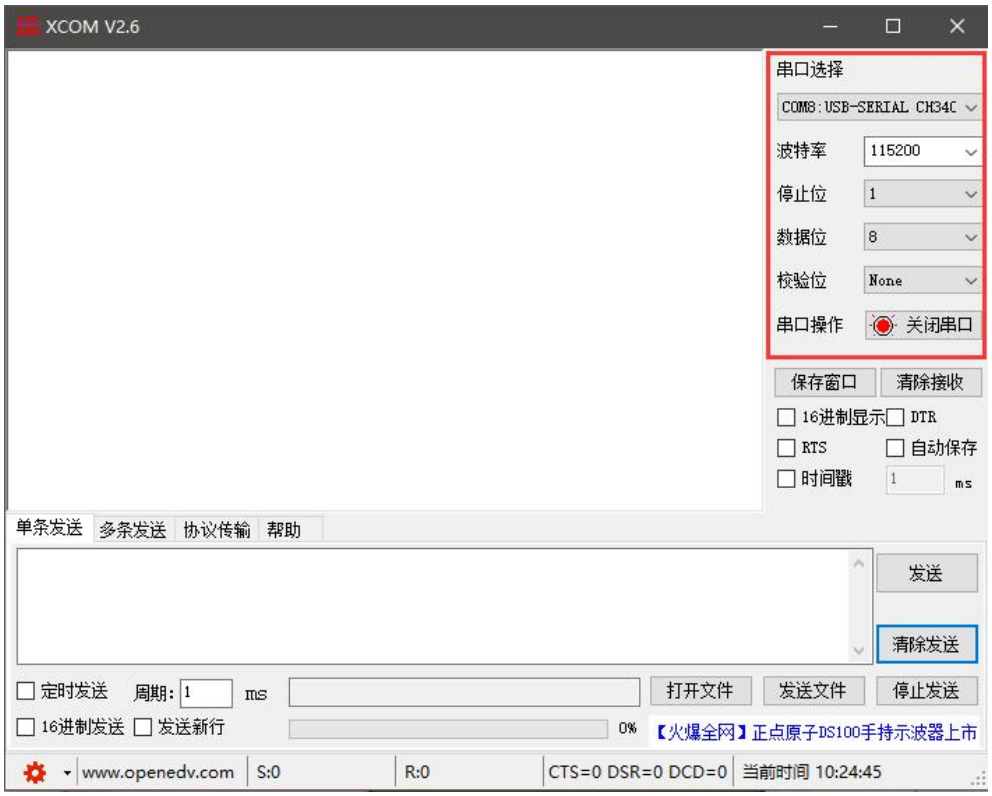
（3） Wait for the computer to connect to the serial port server. After the connection is completed, the LED2 pin of the module outputs low level;



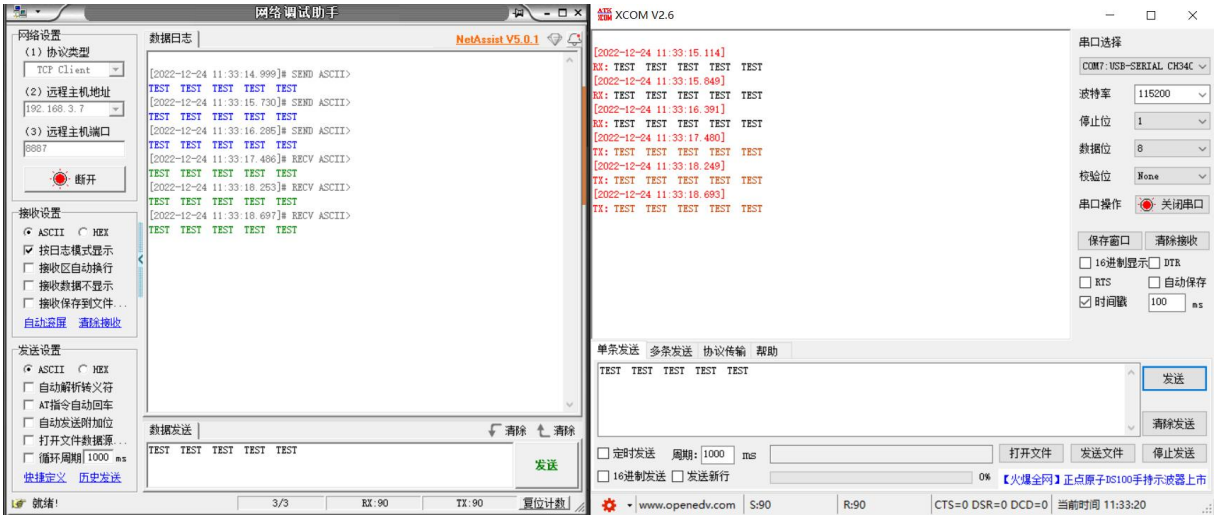
（4） Open the serial port assistant, set the serial port baud rate to 115200, set the serial port parameter to 1/8/None, and click to open the serial port;

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（5） For data transmission test, the serial port assistant (serial port end) sends the test data, and the network debugging assistant (network end) receives the test data. The network debugging assistant (network side) sends the test data, and the serial port assistant (serial port side) receives the test data. Realize duplex communication (i.e. local to network two-way data transmission and receiving);



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3. Product Overview

3.1. Product specification

Product model	product type	Socket Number of connections	Working mode	working voltage	Product size（mm）
NS1	Chip module	6-way	TCP Server TCP Client UDP Server UDP Client MQTT Client HTTP Client	DC 3.3～5.5V	17×19×4
NT1	In-line module	6-way		DC 3.3～5.5V	35×22×30
NT1-B					
NA111	DTU	6-way		DC 8～28V	110×66×30
NA111-A				AC 85～265V	
NB114	DTU	6-way		DC 8～28V	102×84×25

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3.2. technical parameter

project	explain
working voltage	DC 3.0～5V
Working current	Standby: 30mA @ 3.3V Peak: 300mA@3.3V Standby: 25mA @ 5V Peak: 250mA@5V
Serial port level	3.3V TTL level, if 5V is required, external conversion circuit is required
Working mode	TCP Server (default), TCP Client, UDP Server, UDP Client, HTTP Client, MQTT Client
Socket connection	TCP server supports 6-way client connections
Network protocol	TCP/UDP、MQTT、HTTP、IPv4、DHCP、DNS
IP acquisition method	Static IP (default), DHCP
DNS domain name resolution	support
Domain name resolution server	114.114.114.114 (customizable)
collocation method	Web page, parameter configuration tool, AT command
IP address	192.168.3.7 (customizable)
user name	Admin (customizable)
password	Admin (customizable)
Local Port	8887 (customizable)
Subnet mask	255.255.255.0 (customizable)
gateway	192.168.3.1 (customizable)
Serial port cache	1024 Byte
Packaging mechanism	512 Byte
Serial baud rate	1200~230400 bps (115200 by default)
Data bits	5. 6, 7, 8 (default)
Stop bit	1 (default), 2
Check bit	None (default), Odd, Even, Mark, Space
Flow control	NONE (default), RTS/CTS, DSR/DTR, XON/XOFF
Product size	seventeen × nineteen × 4mm （L × W × H）
Product weight	1.6g ± 0.1g
Working temperature and humidity	-40~+85 ℃, 5%~95% RH (no condensation)
Storage temperature and humidity	-40~+105 ℃, 5%~95% RH (no condensation)

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3.3. Pin description



Serial number	Pin screen printing	Pin function	describe
1	RX_ P	RX_ P	Ethernet receives RX+signals;
2	RX_ N	RX_ N	Ethernet receives RX-signal;
3	TX_ P	TX_ P	Ethernet sends TX+signal;
4	TX_ N	TX_ N	Ethernet sends TX signal;
5	D+	NC	Default hanging;
6	D-	NC	Default hanging;
7	TXD0	TXD0	Serial port sends data, TTL level communication voltage only supports 3.3V, if connected to 5V, level conversion is required;
8	PB6	RTS	Modem output signal of serial data, requesting transmission;
9	PB5	NC	Default hanging;
10	RXD0	RXD0	Serial port receives data, TTL level communication voltage only supports; 3.3V, if connected to 5V, level conversion is required;
11	PB3	485_ EN	RS485 enable control pin, set high when the serial port sends data, and set low in normal state;
12	PB2	NC	Default hanging;
13	PB1	NC	Default hanging;
14	PB0	CTS	Modem input signal of serial data, clear transmission;
15	RST	RST	External reset input, low level more than 100 nanoseconds active, internal weak pull-up;

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16	PB22	NC	Default hanging;
17	PB21	LED2	4hz square wave output within 3 seconds after power-on Network not connected: output high level Network connected: output low level
18	PB20	LED1	4hz square wave output within 3 seconds after power-on The network cable is not connected: output 5hz square wave Network cable connected: but not connected: output 1hz square wave Network connection succeeded: output 0.33hz square wave When the serial port has data receiving and sending, output 60ms pulse low level
19	ANT	NC	Default hanging;
20	PA4	IO_ RST	Restore factory pin, internal weak pull-up, can be connected to the reset button, low level lasts for about 5 seconds effective;
21	PA5	NC	Default hanging;
22	PA15	TX_ LED	Serial port sending indicator output, 4hz square wave output within 3 seconds after power-on The default output is high level. When there is data output, the output is low level. When there is data continuously, the output period is 80ms, and the low level is 20ms square wave signal;
23	GND	GND	Common grounding terminal, power supply negative terminal input;
24	VCC	VCC	Positive power input, supporting 3-5.5V input;
25	GND	GND	Common grounding terminal, power supply negative terminal input;
26	PA14	RX_ LED	Serial port receiving indicator output, Output 4hz square wave within 3 seconds after power-on, The default output is high level. When there is data input, the output is low level. When there is continuous data, the output period is 80ms, and the low level is 20ms square wave signal;
27	PA13	NC	Default hanging;
28	PA12	NC	Default hanging;
29	NC	NC	Default hanging;
30	NC	NC	Default hanging;
31	PB9	LINKLED	After inserting the network cable, output low

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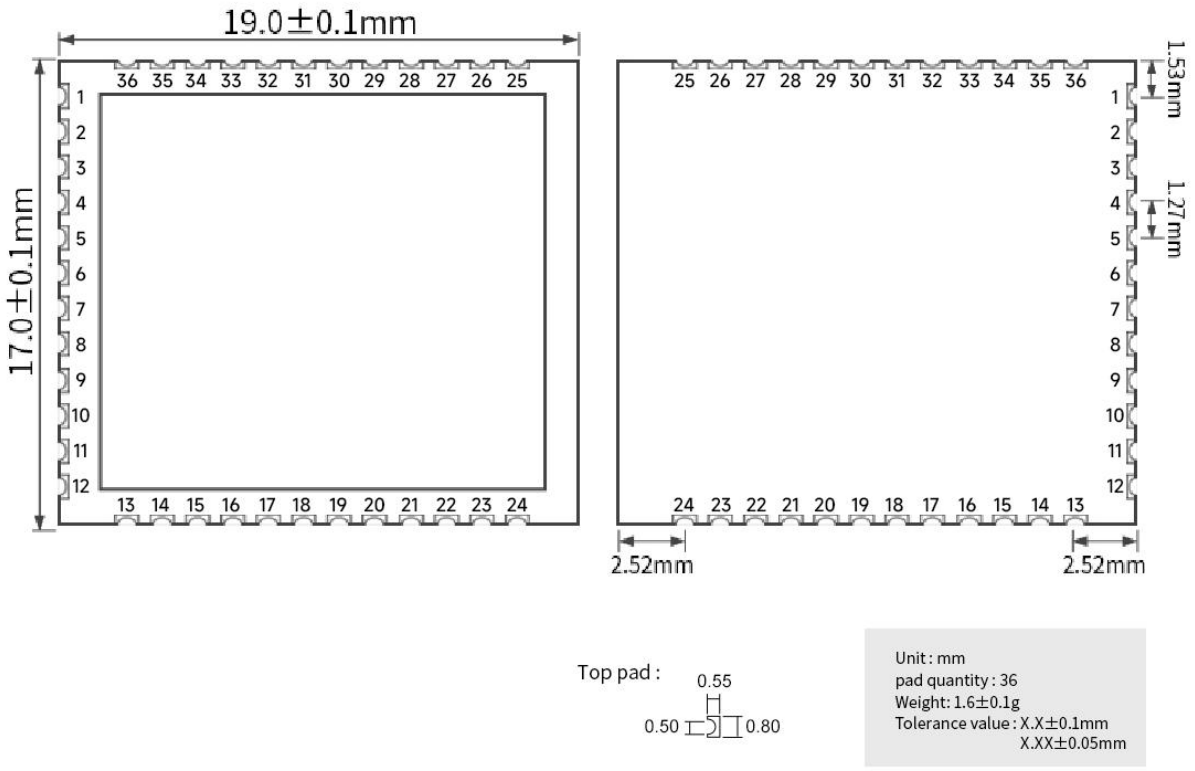
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			level, and output high level when the network cable is not connected;
32	PB8	SPDLED	SPD indicator;
33	TCK	NC	Default hanging;
34	TIO	NC	Default hanging;
35	3.3V	3.3V output	Can output 3.3V, do not connect to heavy load;
36	GND	GND	Common grounding terminal, power supply negative terminal input;

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3.4. Dimensional drawing

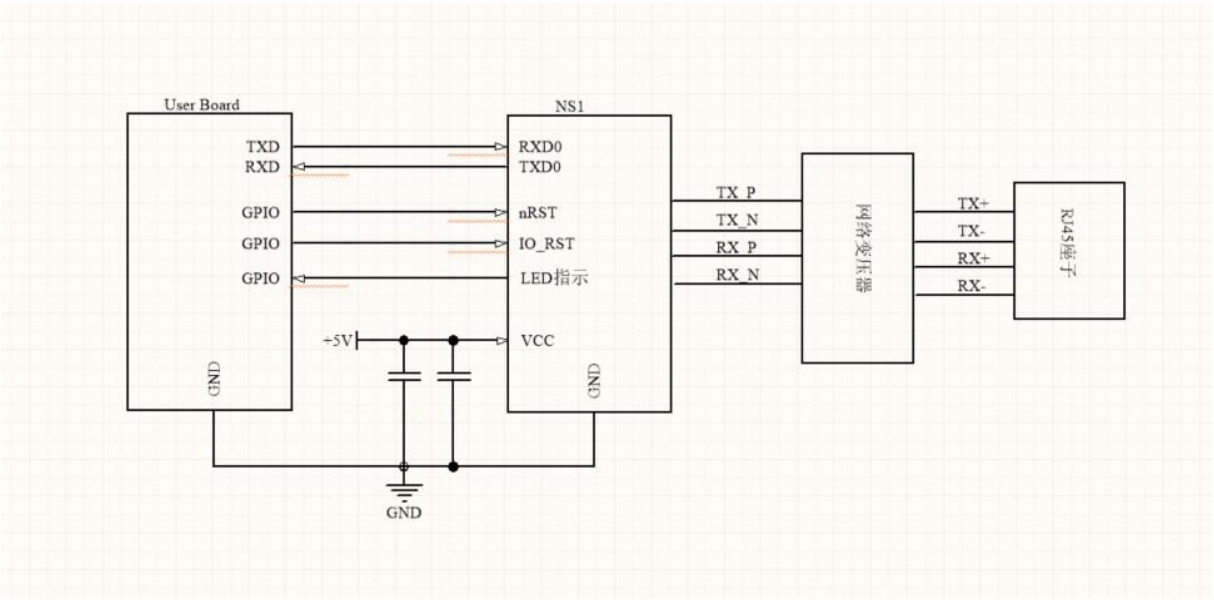


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3.5. Hardware reference design

3.5.1. Typical application hardware connection

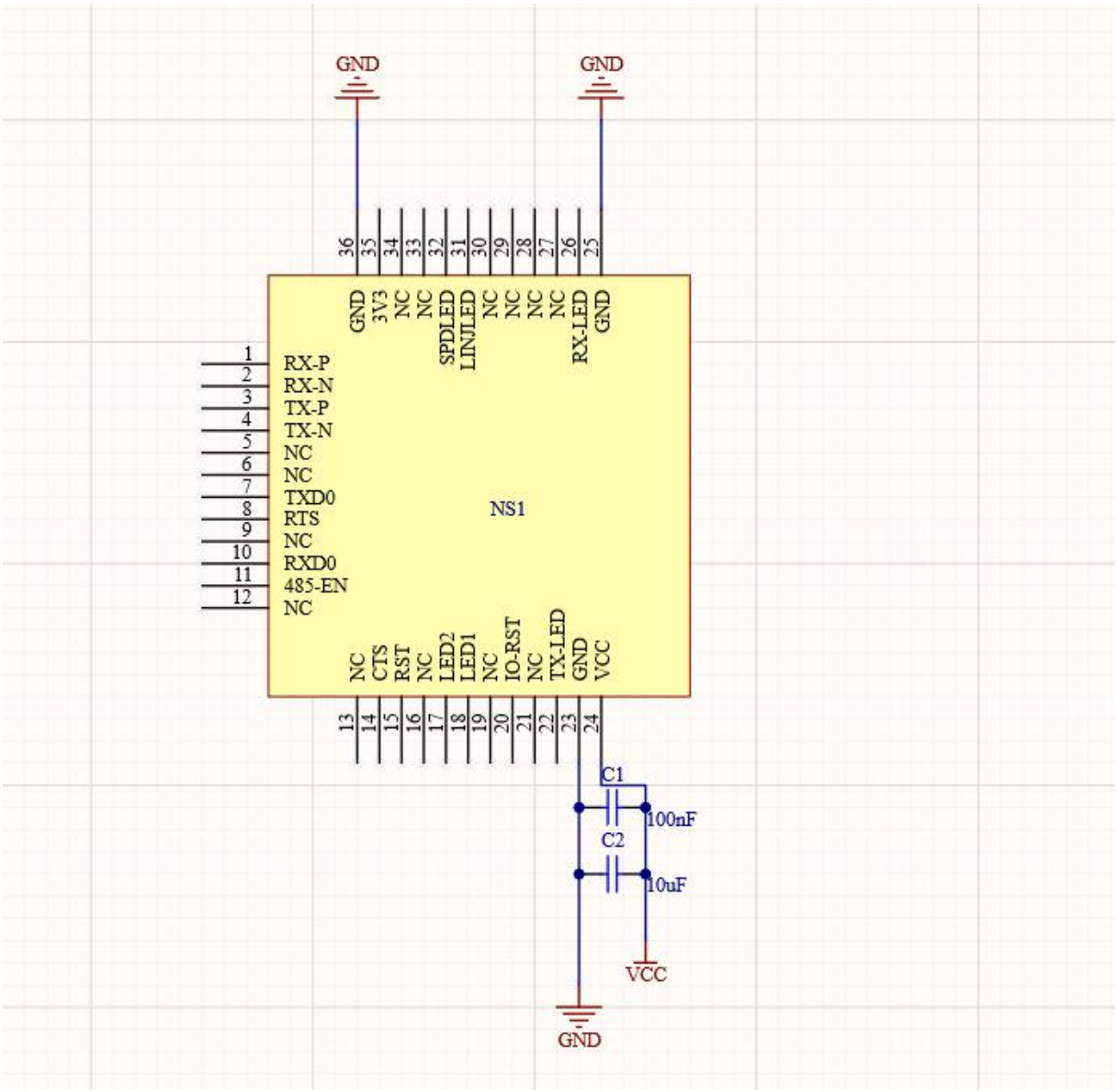


3.5.2. Power interface

NS1 adopts DC typical 5V. VCC voltage range: 3.0~5.5V, positive normal working current: 15mA@5V , peak current is about 58mA@5V 。 Note that if the power supply is less than 3.3V, the 3.3V output of pin 35 will change according to the input. VCC can work with 10UF/16V/10% and 100nF/50V/10% bypass patch capacitor stabilization modules. As shown in the figure below.

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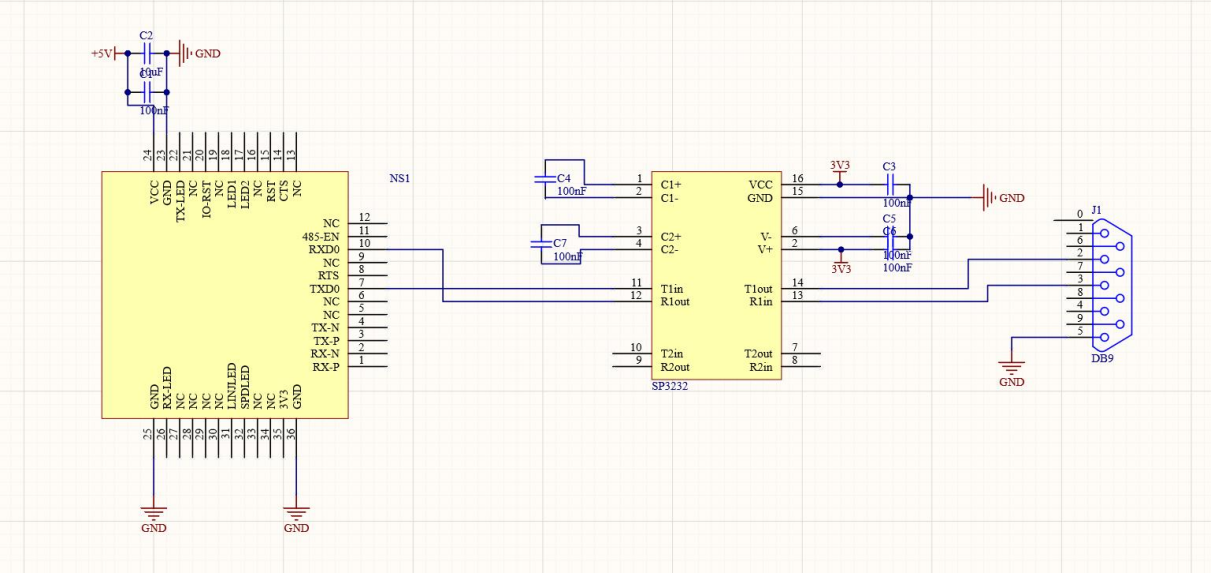


3.5.3. UART interface

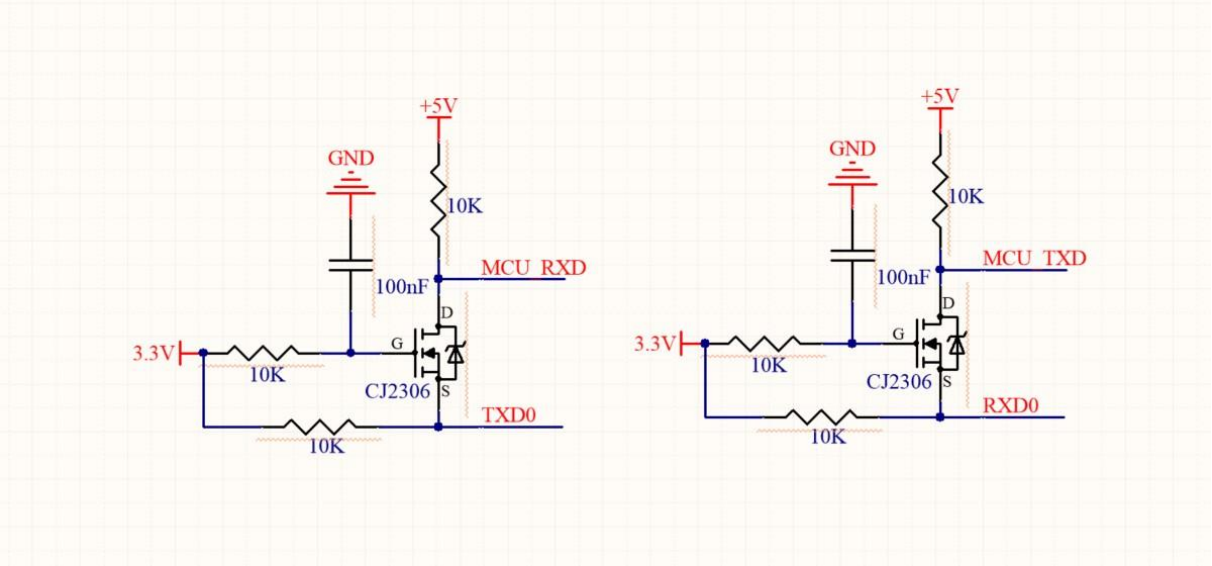
UART is a serial data interface and only supports TTL-3.3V communication level. You can connect RS-232 chips to RS-232 level and connect with external devices. The UART interface of this module includes TXD/RXD signal line. Taking RS-232 level as an example, the reference circuit is as follows:

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In case of direct communication with MCU (3.3V level), it is only necessary to add the TXD of the module to the RXD of MCU, and connect the RXD of the module to the TXD of MCU. If the MCU is 5V level, the conversion circuit needs to be added in the middle, as shown in the following figure:



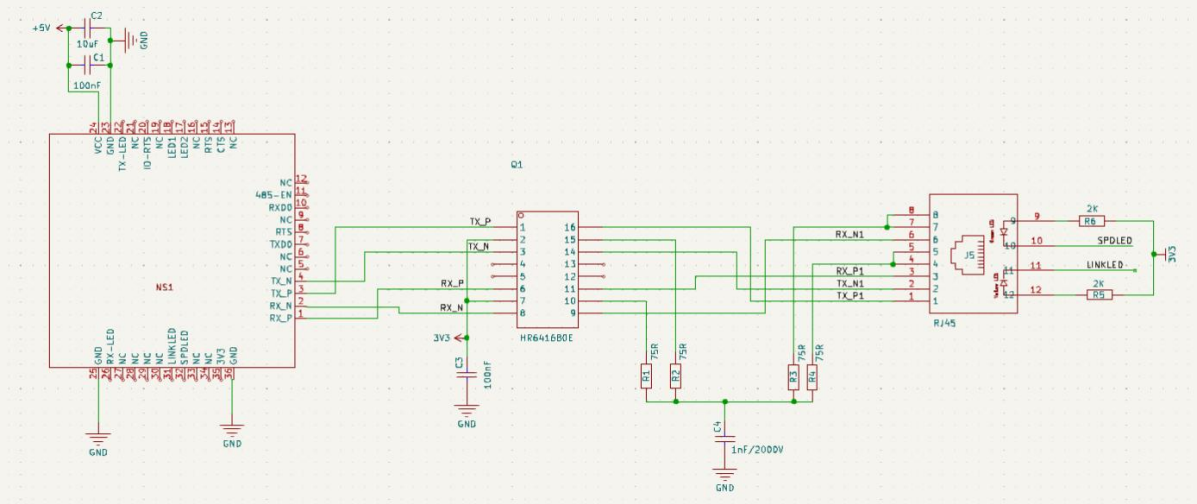
3.5.4. Application of 10M Ethernet interface external network transformer

NS1 module can be externally connected with 10M Ethernet physical interface, and supports RJ45 connector and network transformer interconnection design method.

The network transformer and RJ45 connector are combined into a standard 10M Ethernet physical interface, and then connected with the NS1 module. RX+and RX - run differential lines, 100 ohm differential impedance matching, TX+and TX - run differential lines, 100 ohm differential impedance matching. The hardware design reference circuit diagram is as follows:

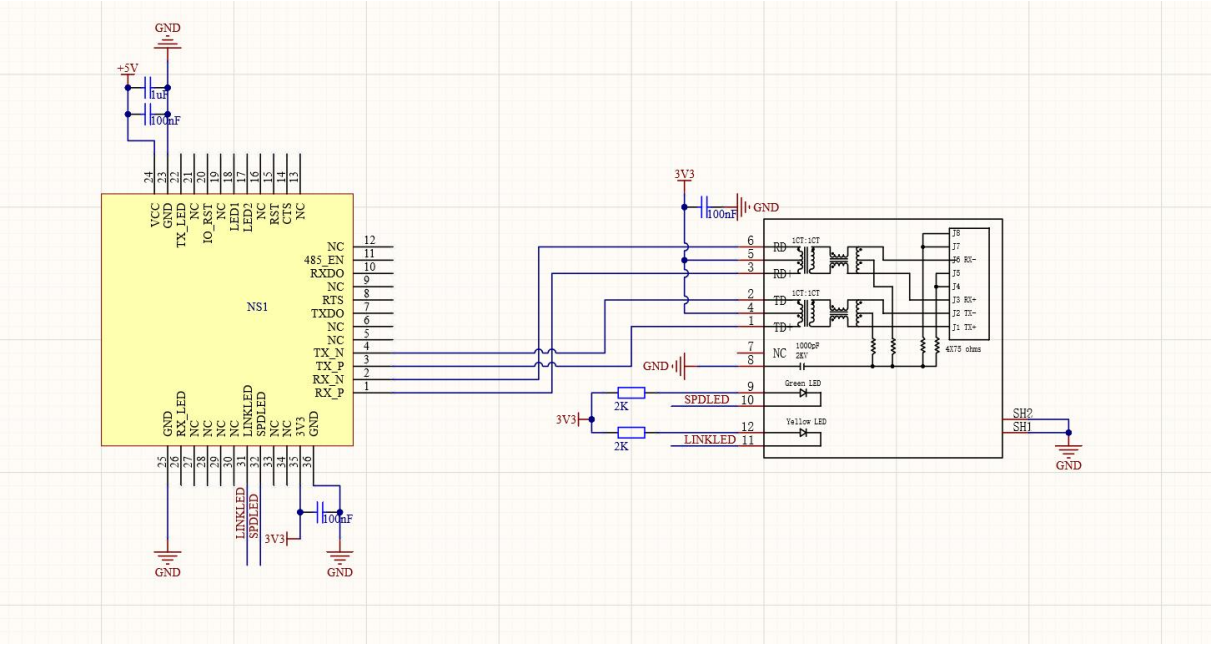
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3.5.5. Application of 10M Ethernet interface built-in network transformer

RJ45 has a built-in 2KV electromagnetic isolation network transformer. The corresponding network data receiving pin of the NS1 module and the data receiving pin of the Ethernet physical interface are directly connected by AC coupling to act as the data transmission channel in the system. RX+and RX - run differential lines, 100 ohm differential impedance matching, TX+and TX - run differential lines, 100 ohm differential impedance matching. Refer to the circuit diagram for hardware design.



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3.5.6. Reference package

In order to facilitate the hardware layout of customers, EBT has made the corresponding PCB packaging library. Please download the specific files on the official website **https://www.cdebyte.com**

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4. Product function

4.1. Network parameters

4.1.1. IP address type

The IP address is the identification of the module in the LAN, which is unique in the LAN. Therefore, it cannot be duplicated with other devices in the same LAN. The IP address of the module can be obtained by static IP and DHCP.

（1） Static IP: The static IP needs to be set manually by the user. In the process of setting, pay attention to writing the IP, subnet mask and gateway at the same time. The static IP is suitable for the scenario where the IP and device need to be counted and corresponding one by one.

Advantages: access to devices that cannot be assigned IP addresses can be searched through the full-segment broadcast mode, which is convenient for unified management;

Disadvantages: Different intranet segments in different LANs lead to the failure of normal TCP/UDP communication.

（2） Dynamic DHCP: DHCP is mainly used to dynamically obtain IP address, gateway address, DNS server address and other information from the gateway host, thus eliminating the tedious steps of setting IP address. It is applicable to scenarios where there is no requirement for IP and no requirement for one-to-one correspondence between IP and modules.

Advantages: The access router and other devices with DHCP server can communicate directly, reducing the trouble of setting IP address gateway and subnet mask.

Disadvantages: If the module is connected to a network without a DHCP server, for example, if it is directly connected to a computer, the module will not work properly.

The subnet mask is mainly used to determine the network number and host number of the IP address, indicate the number of subnets, and determine whether the module is in the subnet.

The subnet mask must be set. Our commonly used Class C subnet mask is 255.255.255.0, the network number is the first 24 digits, the host number is the last 8 digits, the number of subnets is 255, and the module IP is within the range of 255, then the module IP is considered to be in the subnet.

Gateway refers to the network number of the network where the module's current IP address is

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located. If the router and other devices are accessed when connecting to the external network, the gateway is the router.

4.1.2. Domain name resolution (DNS)

Domain name resolution converts the domain name into an IP address recognized by the network through the domain name resolution (DNS) server. The domain name resolution (DNS) server address of the serial port server supports user customization. It can achieve domain name resolution through the customized domain name resolution server in case of domain name server exception. The device will report the resolution request to the customized domain name resolution (DNS) server during domain name resolution, and return the device connection parameters (generally IP address) after the resolution is completed.

In DHCP mode, the domain name resolution (DNS) server address is automatically obtained (synchronous router domain name resolution address) and cannot be modified.

In the static IP mode, the default address of the domain name resolution (DNS) server is 114.114.114.114.

4.1.3. Intranet access port

The default intranet access port is 80.

[Note] If the port number is modified, the port number should be added in the address input column. For example, to modify the web page access port to 8080, you need to enter 192.168.3.7:8080 in the address column to connect to the web page configuration.



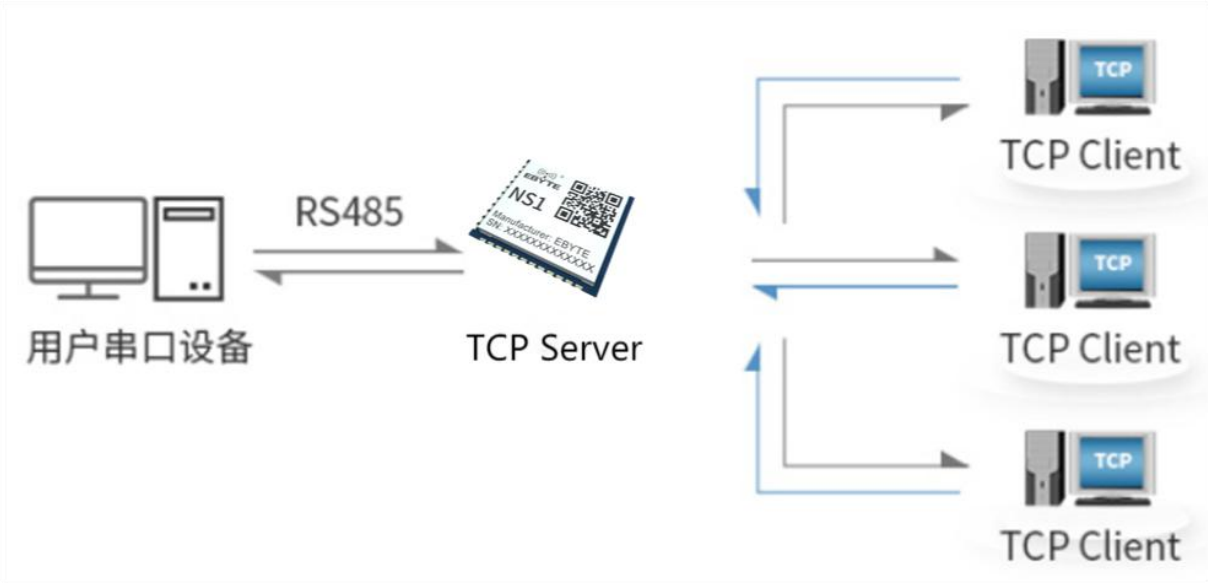
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4.2. Network operation mode

4.2.1. TCP server mode

TCP Server is a TCP server. In the TCP Server mode, the device listens to the local port, accepts the connection request of the client and establishes a connection for data communication, which is usually used for communication with TCP clients in the LAN.

When the Modbus gateway function is turned off, the device will send the data received by the serial port to all the client devices that have established a connection with the device. At most, it can connect 6 clients. After the Modbus gateway function is enabled, the non-Modbus data will be cleared and will not be forwarded.



4.2.2. TCP client mode

TCP Client is the TCP client. When the device works, it will actively send a connection request to the server and establish a connection to realize the interaction between serial port data and server data.

To use the client, you need to configure the IP address/domain name and target port of the target accurately.

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4.2.3. UDP server mode

UDP Server means that the device does not verify the data source IP address when communicating with UDP protocol. After receiving a UDP packet, it saves the source IP address and source port of the packet and sets it as the target IP address and port. Therefore, the data sent by the device only sends the data packet to the source IP address and port of the last time the device received the data.

This mode is usually used in scenarios where multiple network devices communicate with this device, and the frequency is high, and TCP Server cannot meet the conditions.

Using UDP Server requires remote UDP devices to send data first, otherwise data cannot be sent normally.

[Note] In UDP mode, the data sent by the network to the device should be less than 512Bit per packet, otherwise it will cause data loss.

4.2.4. UDP client mode

UDP Client is a connectionless transport protocol that provides simple and unreliable transaction-oriented information transmission services. There is no connection establishment and disconnection. You only need to configure the destination IP and destination port to send data to each other. Usually used in data transmission scenarios where there is no requirement for packet loss rate, the data packet is small and the transmission frequency is fast, and the data is to be transmitted to the specified IP.

In UDP Client mode, the device will only communicate with the configured (target IP and target port) remote UDP device.

In this mode, the target address is set to 255.255.255.255, and the transmitted data will be broadcast in the whole network segment, but the receiving and transmitting equipment needs to ensure the port consistency, and the equipment can also receive the broadcast data.

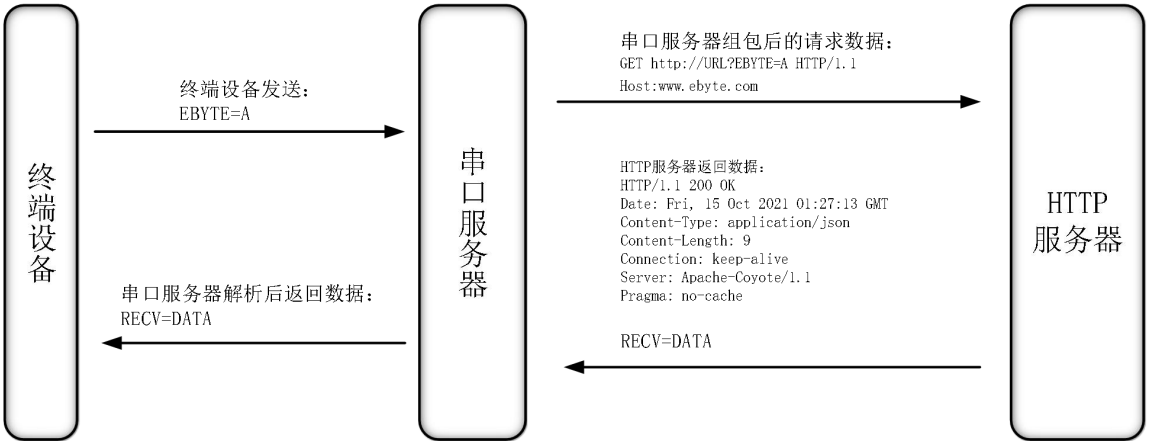
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4.2.5. HTTP client mode

This mode can realize the HTTP packet grouping function, and provides two modes: GET and POST. The customer can configure parameters such as URL, Header, and send packets by the device (serial port server) to realize the fast communication between the serial port device and the HTTP server. The HTTP client mode is recommended to use the random port and open a short connection to save the HTTP server resources.





1. GET

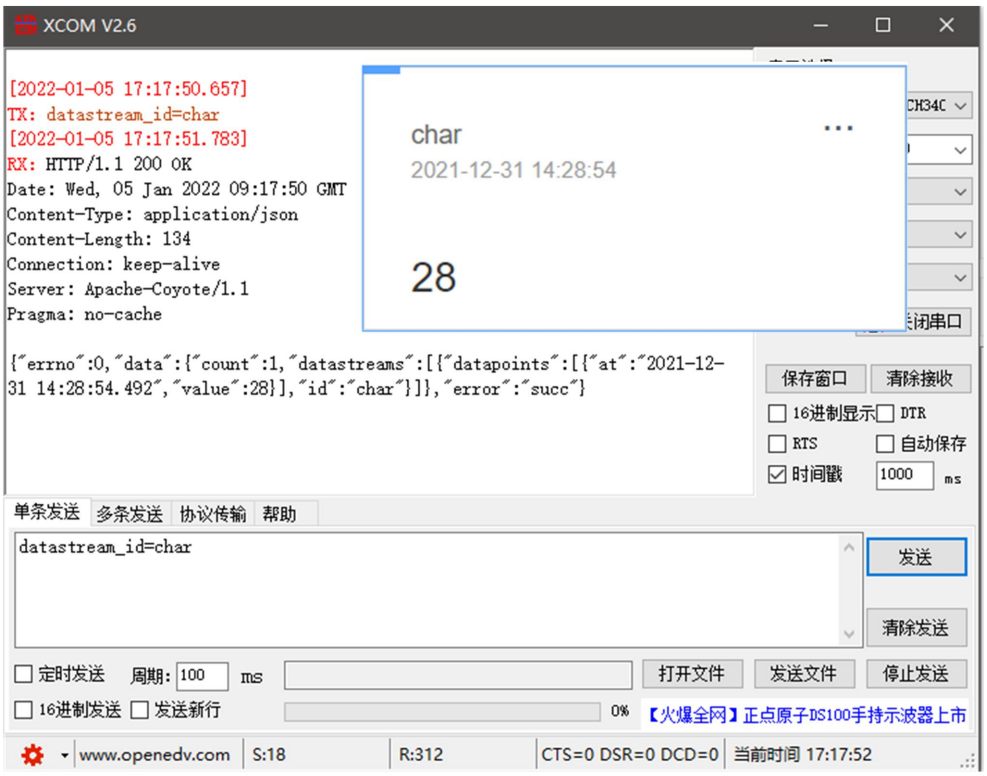
Use the HTTP mode of OneNET multi-protocol access to test the HTTP-GET request of the device, as shown in the following figure.

(1) Return data configuration with header:



Data return test:

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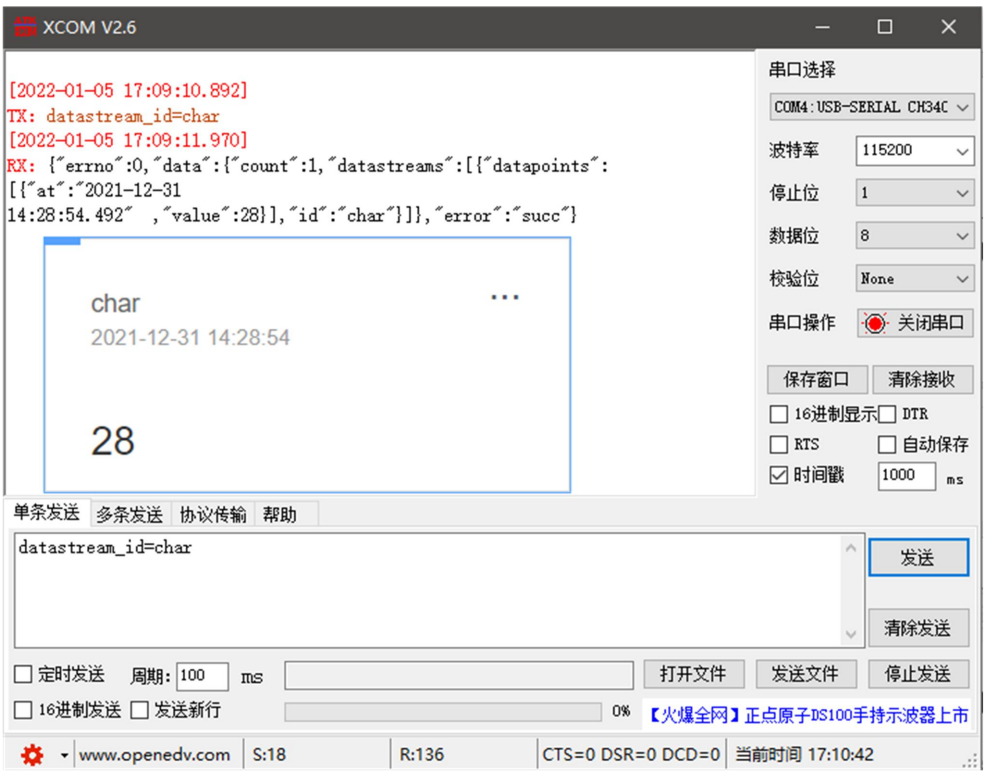
(2) Return data configuration without header:



Data return test:

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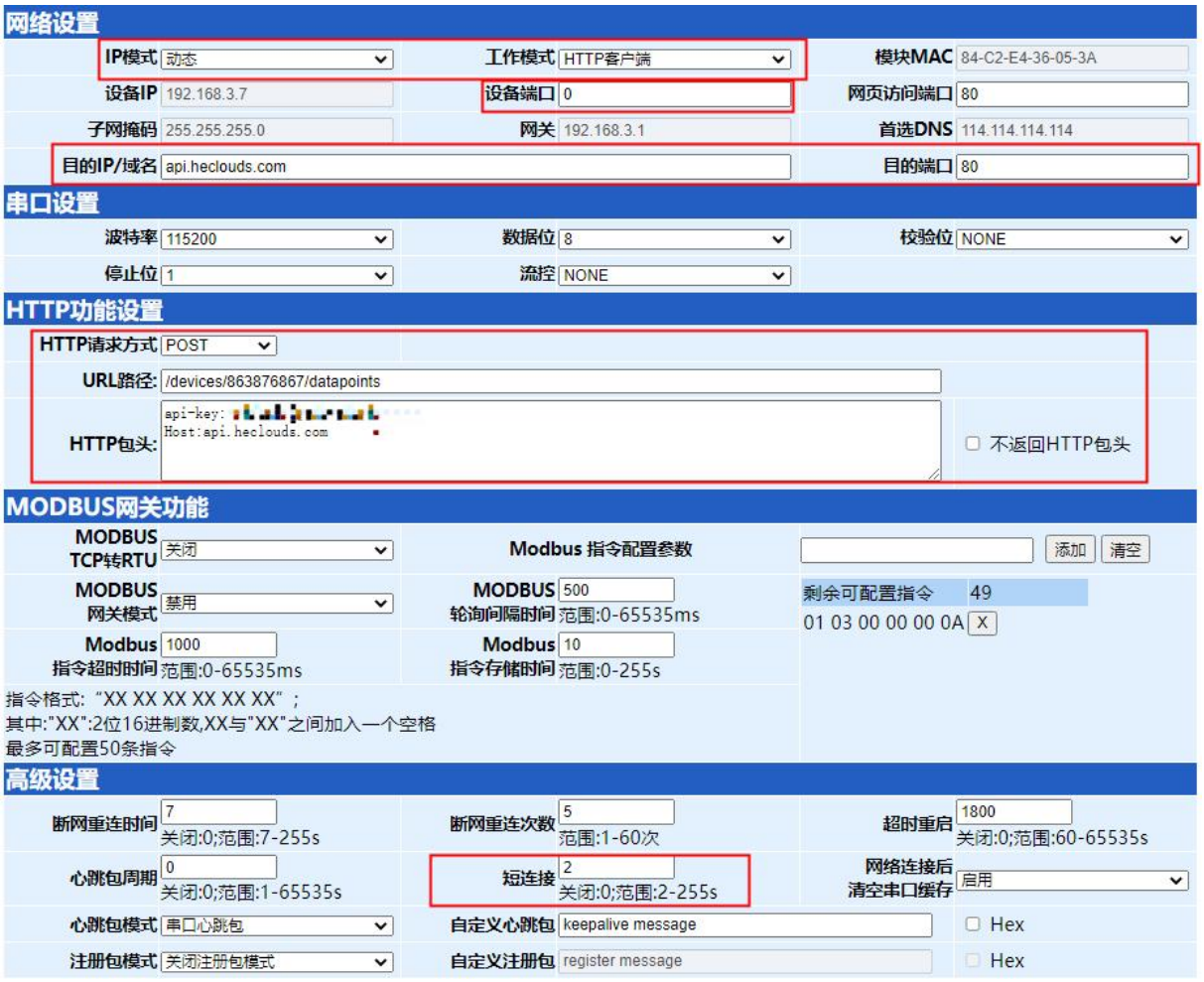
2. POST

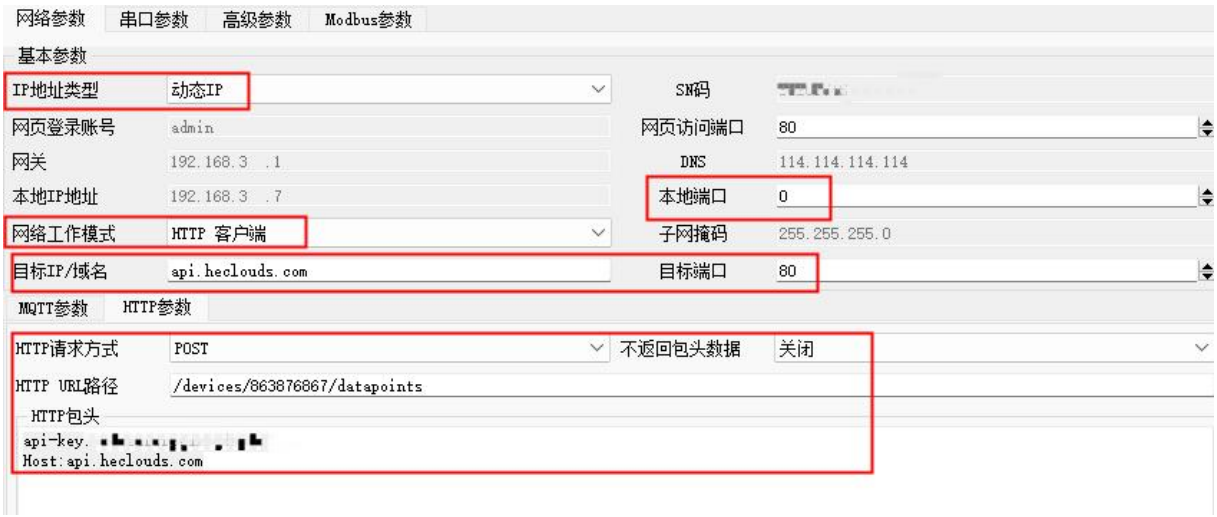
Use the HTTP mode of OneNET multi-protocol access to test the HTTP-POST request of the device, as shown in the following figure.

(1) Return data configuration with header:

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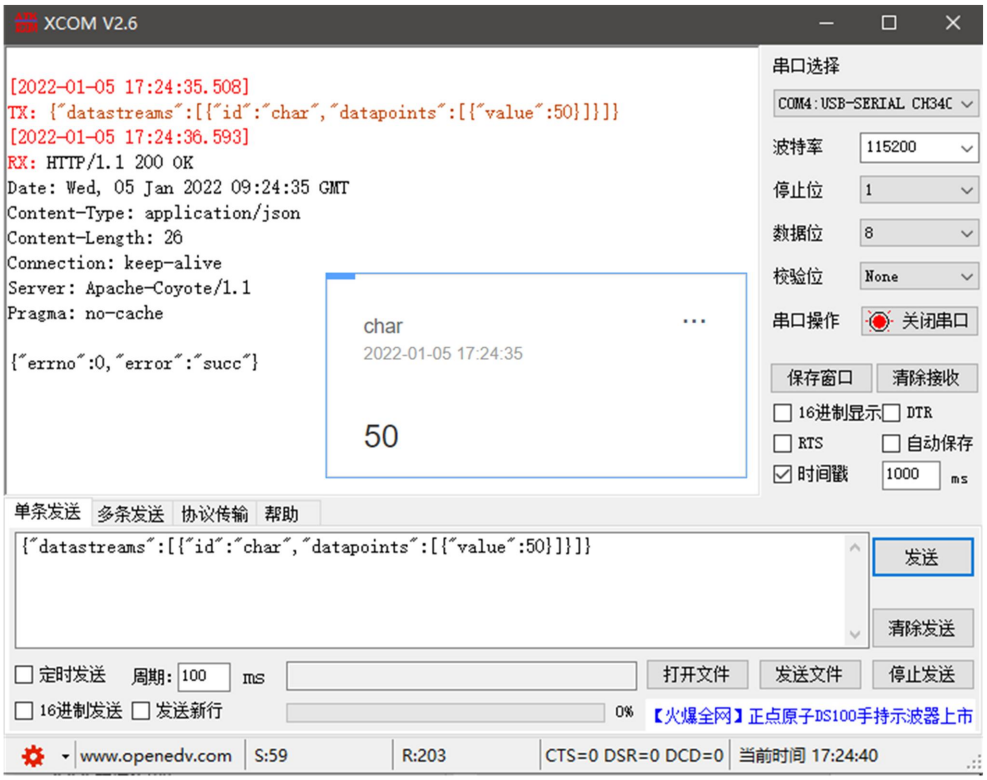




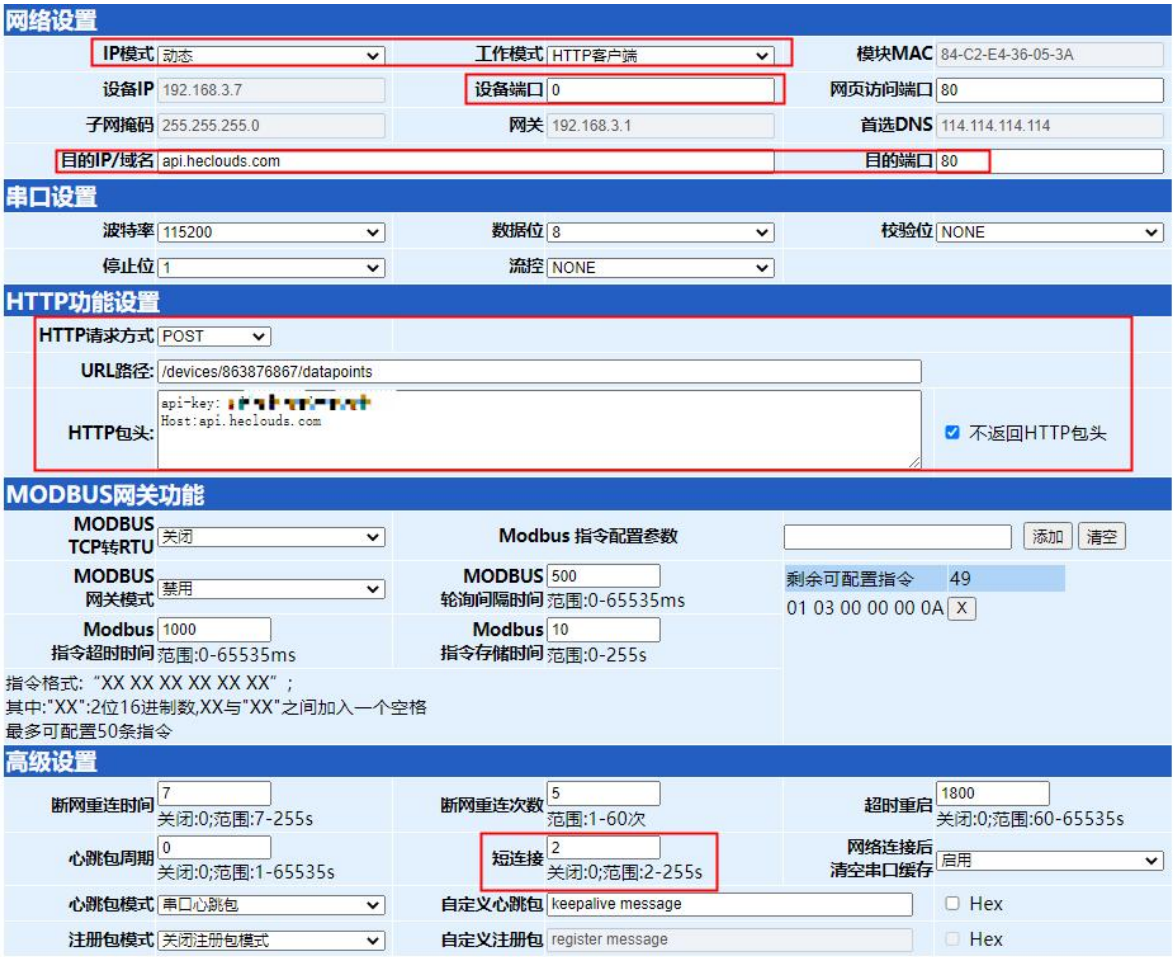
Data return test:

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(2) Return data configuration without header:

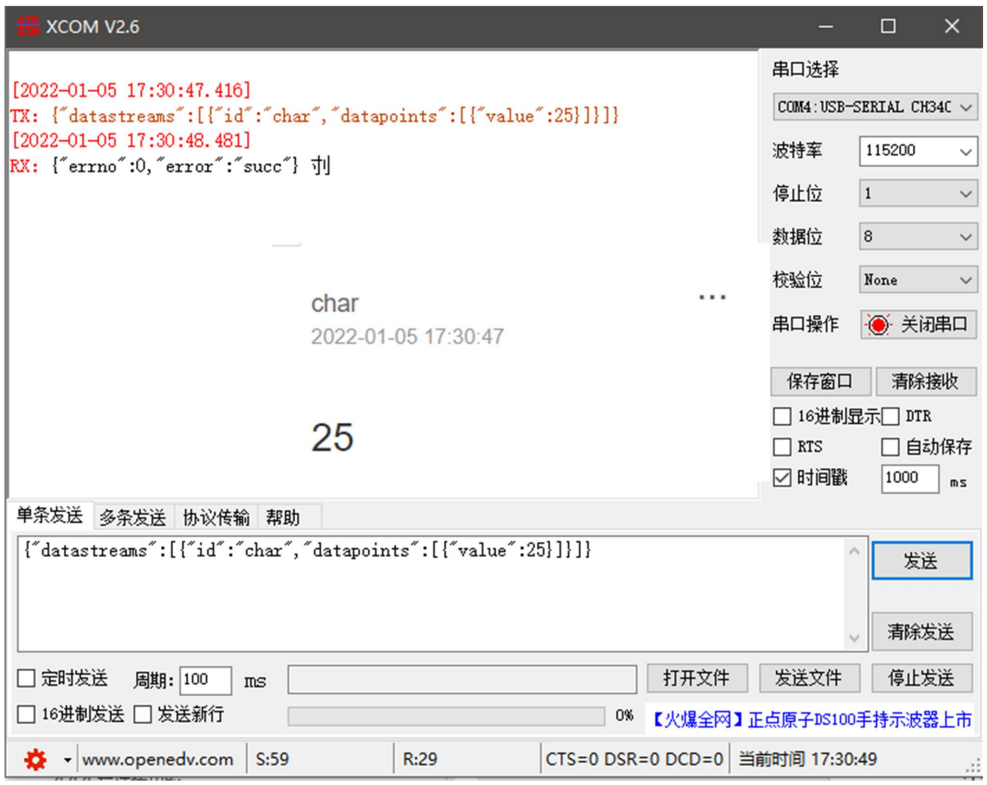


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Data return test:

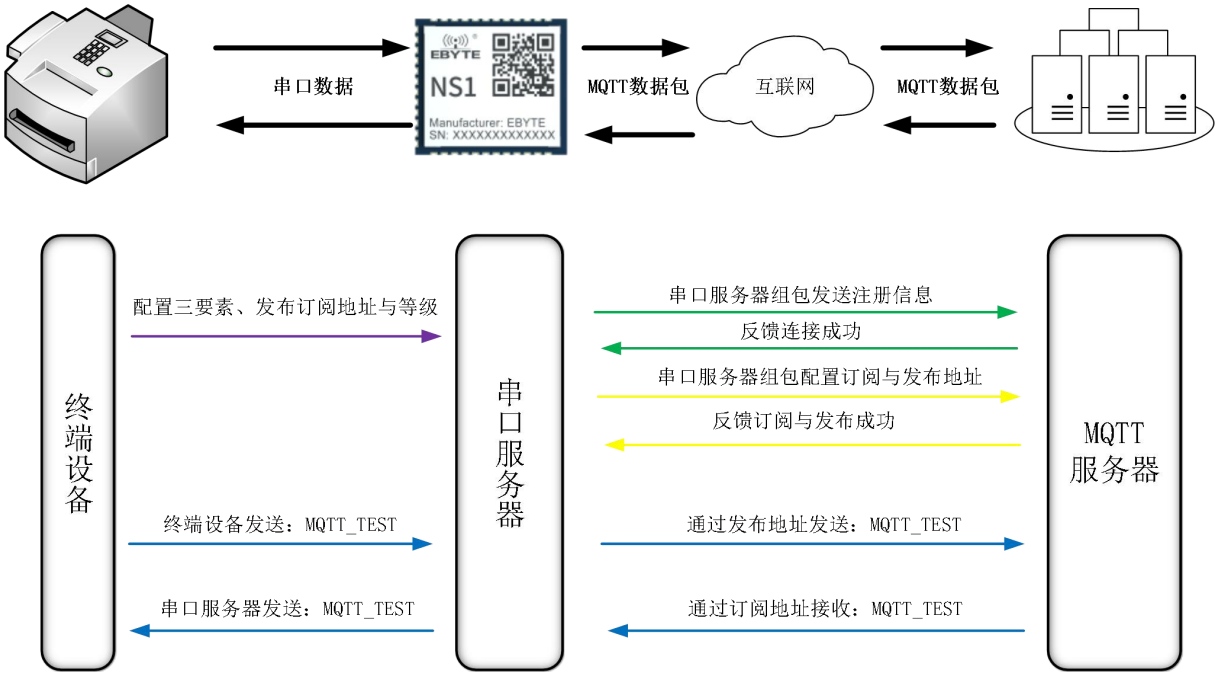


4.2.6. MQTT client mode

The serial server supports the fast access standard MQTT3.1 protocol server (OneNET, Baidu Cloud, Huawei Cloud, user-built and other server types) and Alibaba Cloud server, supports the quality of service level configuration (Qos 0, Qos 1), supports the ultra-long text configuration, and facilitates better access to network service operators (server address, three elements, subscription and publishing address support the configuration of up to 128 characters).

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【注】根据平台配置的规则引擎进行数据转发，此处以回传为例说明

1. Standard MQTT3.1.1

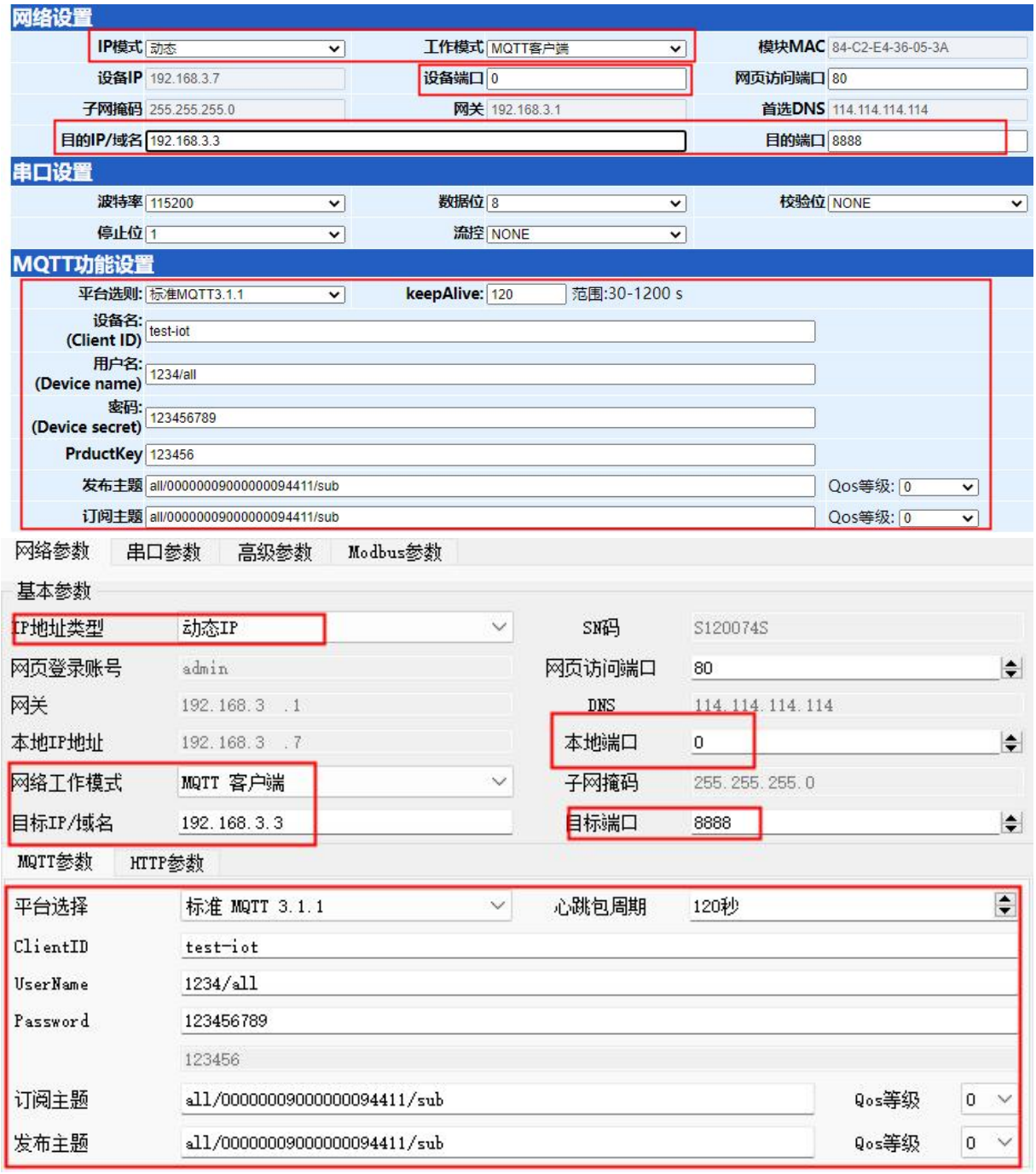
Here, the standard MQTT3.1.1 connection takes Tencent's standard MQTT3.1.1 server as an example. The "three elements" described in the standard can be obtained from Tencent server as shown in the following figure:



Parameter configuration (upper computer and web page) is described as follows:

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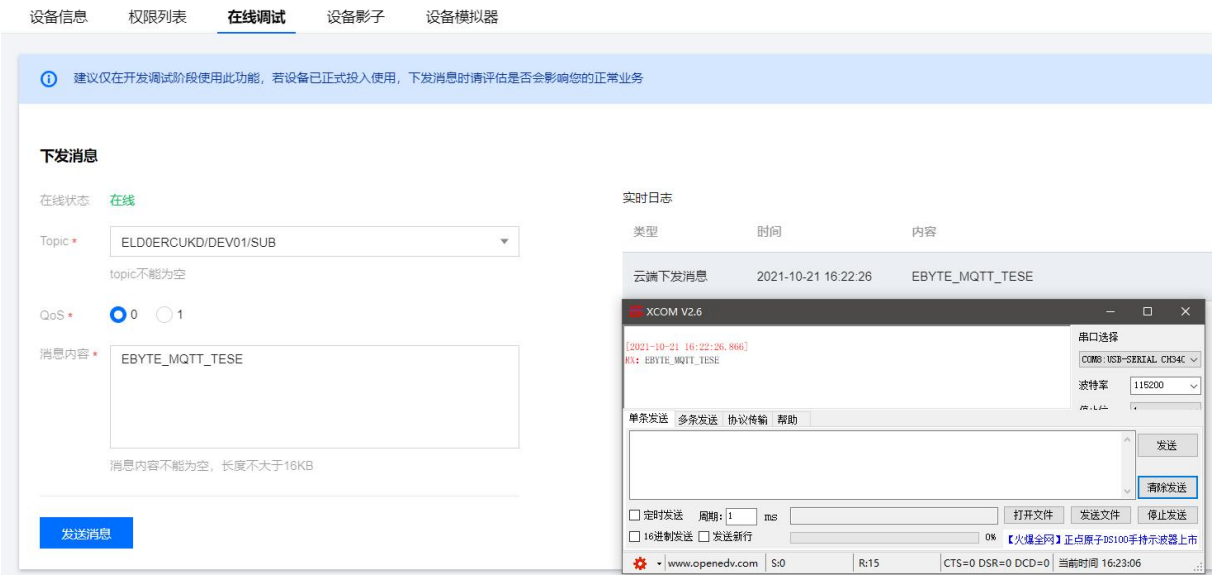
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Configure the corresponding subscription publishing address, and use the platform online debugging to send data for communication test:

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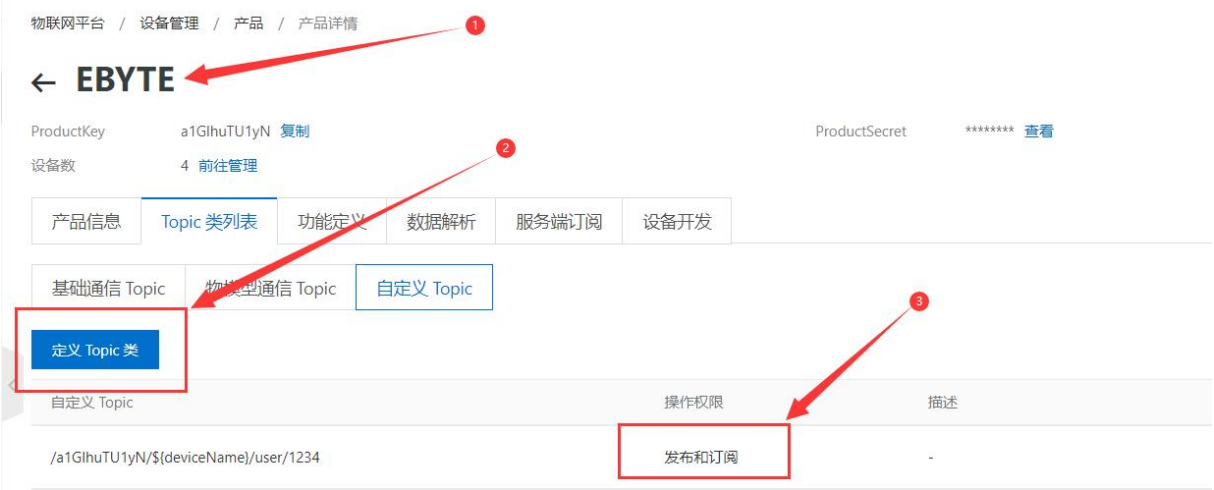


2. Alibaba Cloud

Support the use of Alibaba Cloud's "three elements" to directly connect to the server and obtain the "three elements" required to connect to Alibaba Cloud, as shown in the figure:



Configure Topic for communication test:



Select the corresponding product, select the customized topic under the topic class list (see Alibaba Cloud Document Description for details), click to define the topic class, configure the name 1234, and grant publish and subscribe permissions (for data retrieval).

Configure the device connection parameters, as shown in the following figure:

{

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"ProductKey": "a1GlhuTU1yN",

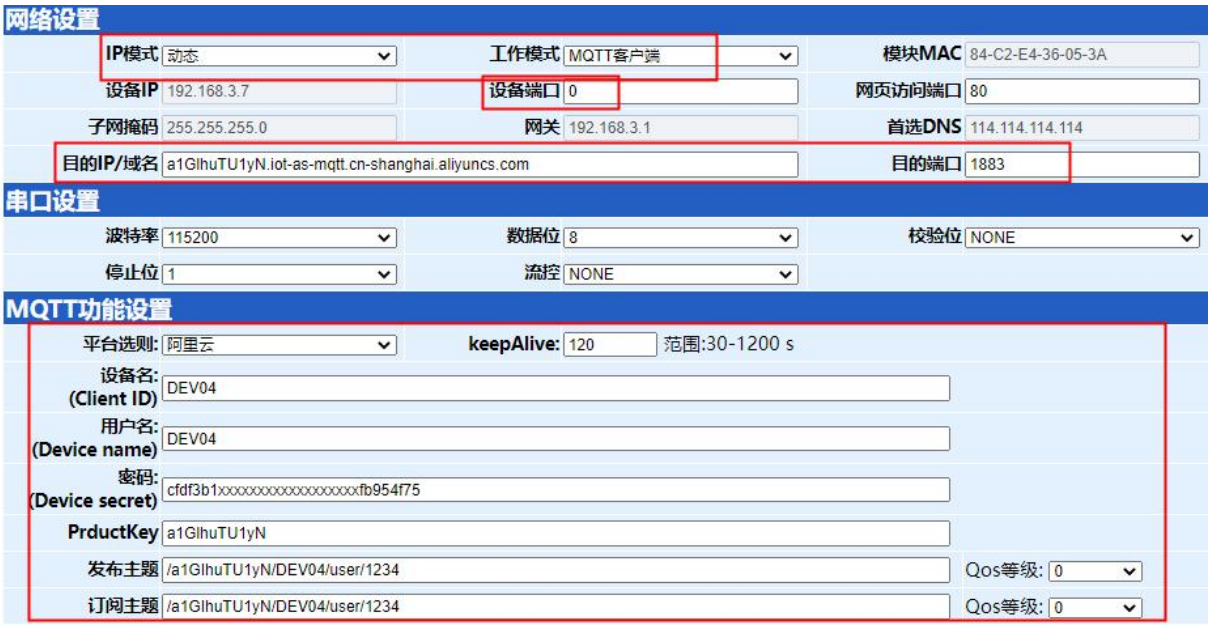
"DeviceName": "DEV04",

"DeviceSecret": "xxxxxxxxxxxxxxxxxxxxxxxxxxx"

}

Alibaba Cloud server address: ProductKey. iot-as-mqtt.cn-shanghai. aliyuncs. com: 1883

Topic of subscription and publication:/a1GlhuTU1yN/DEV04/user/1234

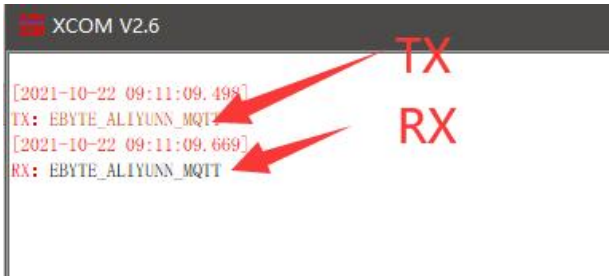




Alibaba Cloud MQTT platform communication test:

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3. Baidu Cloud

Support the use of Baidu Cloud's "three elements" to directly connect to the server and obtain the "three elements" needed to connect to Baidu Cloud, as shown in the figure:

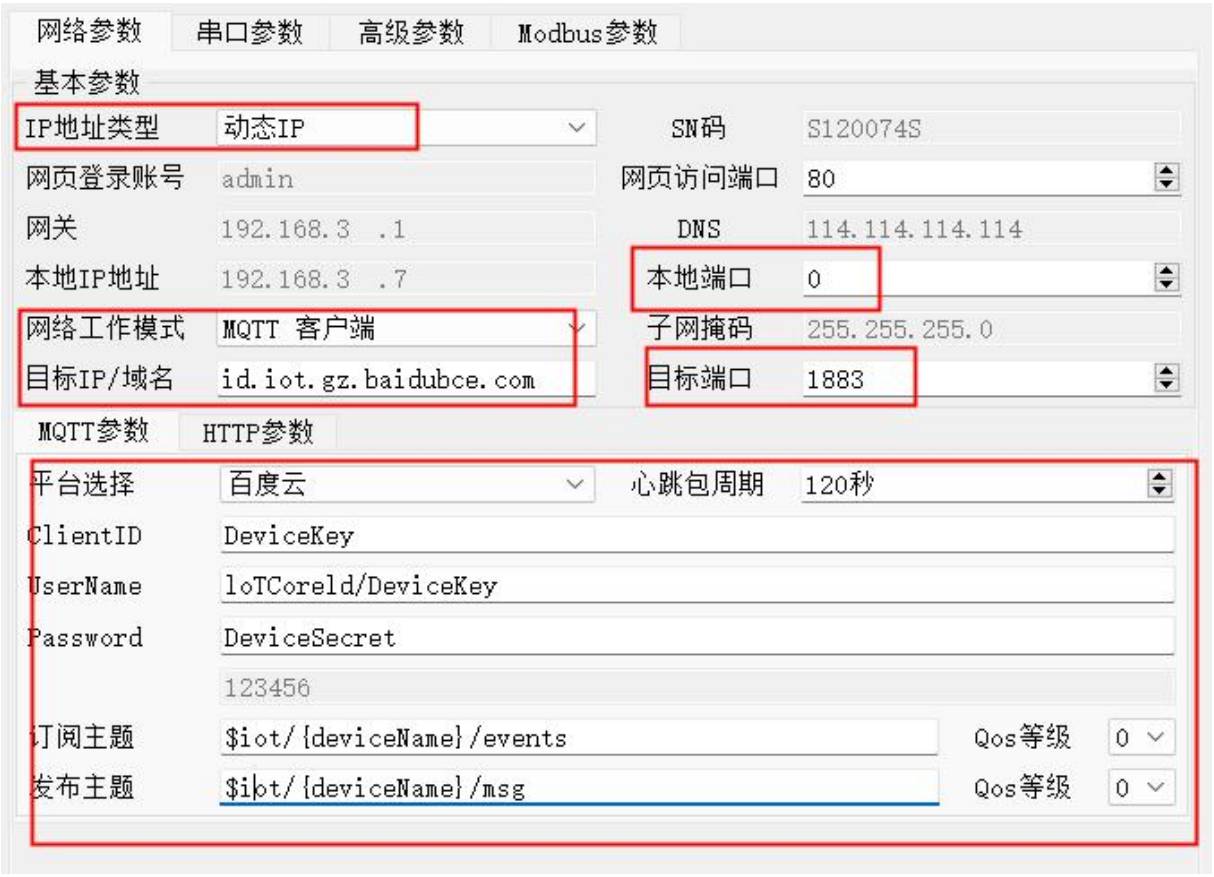


Configure the device connection parameters, as shown in the following figure:



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Subscription and publishing require the establishment of a rule engine to achieve data retrieval. First, a message template needs to be established, as shown in the following figure:



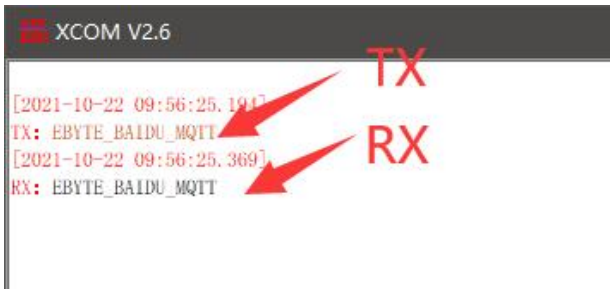
Create a rule engine for data retrieval, as shown in the following figure:

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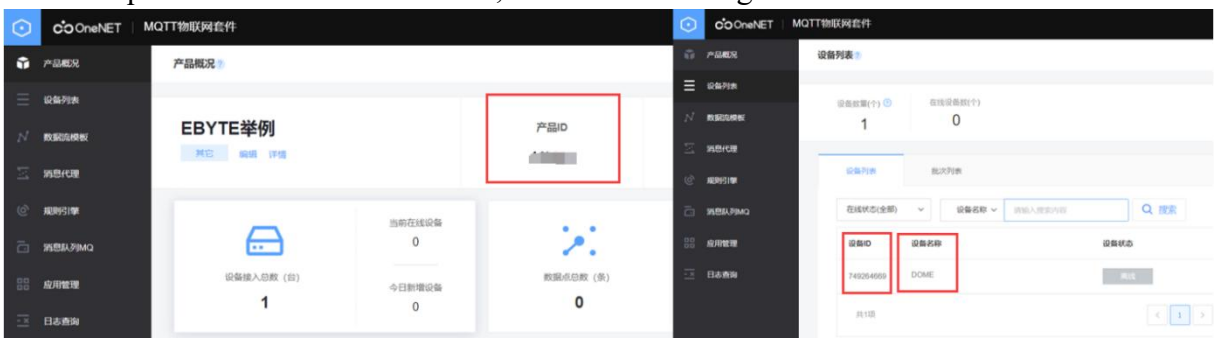


Enable the rule engine, restart the device (re-subscribe and publish), and the communication test is as follows:



4. OneNET

Support the use of OneNET "three elements" to directly connect to the server and obtain the "three elements" required to connect to OneNET, as shown in the figure:



Configure the device connection parameters, as shown in the following figure:

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Server address: 183.230.40.39:6002

Device name: fill in the device ID of OneNET;

User name: fill in the product ID of OneNET;

Password: fill in the device name (MQTTS) and the user-defined key (MQTT for multi-protocol access);

OneNET supports automatic generation of topics with subscription and publication attributes. Only the same address of subscription and publication is needed to realize data transmission.

Communication test:

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4.3. Serial port parameters

Serial port parameters include baud rate, data bit, check bit and stop bit.

Baud rate: serial communication rate, 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200, 230400bps can be configured.

Data bit: length of data bit, range 5, 6, 7, 8.

Check bit: the check bit of data communication. It supports five verification methods: None, Odd, Even, Mark and Space. By setting the serial port parameters, keeping the serial port parameters consistent with the serial port parameters of the equipment connected to the serial port, the normal operation of the communication can be guaranteed.

Stop bit: range 1 and 2 can be set.

Flow control: only NS1 and NT1 can be used.



4.4. Advanced parameters

4.4.1. Disconnection and reconnection function

In the client mode, after the device is disconnected from the network, it tries to actively connect to the server at the specified time. If the request times out and the set number of reconnections has not been successfully reconnected, the device will restart to prevent the network from being unable to recover after the device is disconnected.

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Disconnection and reconnection time: the time interval between each attempt of the device to reestablish the network.

Reconnect times: the number of times the device attempts to reestablish the network. The cumulative number of requests reaches the preset value. If the connection is not successful, the device will automatically restart.

The actual time to restart is the period of disconnection and reconnection times. It is recommended to use the factory default parameters if there is no special requirement.

4.4.2. Timeout restart function

The timeout restart function (default: 300 seconds) is supported. This function is mainly used to ensure the long-term stable operation of the equipment. If data transmission and reception are not performed within the set timeout restart time, the equipment will restart to avoid the impact of abnormal conditions on communication.

When the timeout restart function is turned on, the timeout restart time setting parameter range is (60-65535) seconds.

4.4.3. Short connection function

In the client mode, the network short connection is supported (the function is turned off by default). TCP short connection is mainly used to save server resource costs, and is generally used in multi-point (multi-client) to one-point (server) scenarios.

The TCP short connection function is applied in the TCP Client mode. After the short connection function is enabled, the device will only request to connect with the server when sending information. After the connection is successful, the serial port does not receive data or the network port does not receive data within the set time, and the device will automatically disconnect.

When the short connection function is turned on, the short connection time setting parameter range is (2-255) seconds.

4.4.4. Connection emptying cache function

The device is in the client mode. When the TCP connection is not established, the data received by the serial port will be placed in the cache area. The serial port receive cache is 1024 bytes, and the data received earlier will be overwritten by more than 1024 bytes. After the network connection is successful, you can choose to clear the serial port cache or send the cache through the network

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through configuration.

Enable: The device does not save the data received by the serial port before the connection is established.

Disable: After the connection is established, the network will receive the data cached by the serial port.

4.4.5. Heartbeat packet function

In the client mode, users can choose to send heartbeat packets and customize the heartbeat packet time. The heartbeat packet can be selected from two modes: network heartbeat packet and serial heartbeat packet. It supports sending in hexadecimal and ASCII code. This heartbeat packet is not MQTT heartbeat. It needs to be turned off in MQTT client mode. MQTT heartbeat only needs to be configured in "MQTT mode". It is recommended not to configure the heartbeat packet cycle time less than 60s. For example, 120s is recommended in Alibaba Cloud manual.

Heartbeat packet sending mode:

（1） The default is to turn off heartbeat packet mode.

（2） Serial heartbeat packet ->The device sends heartbeat content to the serial bus according to the set heartbeat interval.

（3） Network interface heartbeat packet ->The device sends heartbeat content to the network interface bus according to the set heartbeat time interval.

Custom heartbeat packet content (up to 40 bytes (ASCII) data, 20 bytes (HEX) data).

Customize the heartbeat packet sending interval. If the setting value is greater than zero, the heartbeat packet function will be turned on. When it is turned on, the range can be set: (1-65536) seconds, and when it is turned off, it is 0.

4.4.6. Registration package function

In the client mode, users can choose to send the registration package, customize the time of the registration package, and customize the content of the registration package (up to 40 bytes (ASCII) data, 20 bytes (HEX) data).

The registration package supports the following modes:

（1） Send MAC address when the network establishes a connection with the device

（2） Send the data of the custom registration package when the network establishes a connection with the device

（3） After the connection between the network and the device is established, each packet of

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data sent by the device to the network is preceded by a MAC address

（4） After the connection between the network and the device is established, each packet of data sent by the device to the network is preceded by the user-defined registration packet data

4.5. Modbus gateway

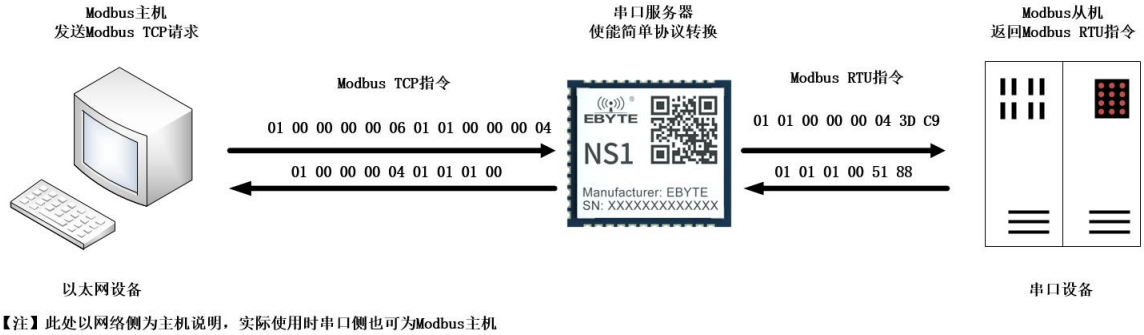
4.5.1. Simple protocol conversion mode



On: the Modbus RTU protocol and Modbus TCP protocol are converted to each other, and non-Modbus data (RTU/TCP) is discarded without conversion.

Off: Modbus data is verified without protocol conversion, and non-Modbus data (RTU/TCP) is discarded.

Simple protocol conversion can work in any mode (TCP client, TCP server, UDP client, UDP server, MQTT client, HTTP client). No matter what mode it works in, there can only be one Modbus master station.



Upper computer/web page configuration:

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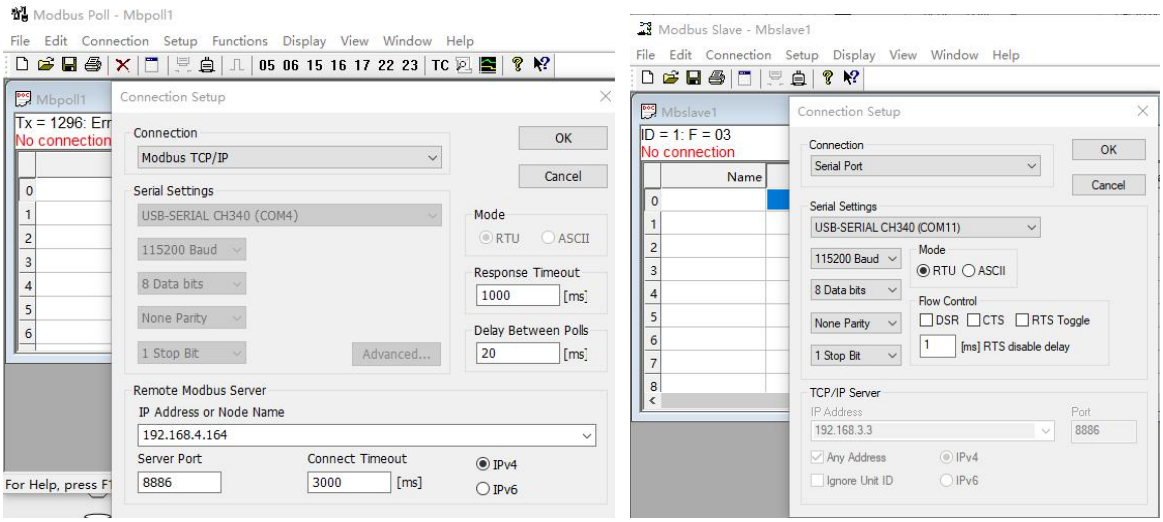


Modbus Poll and Modbus Slave software debugging:

Software connection settings:

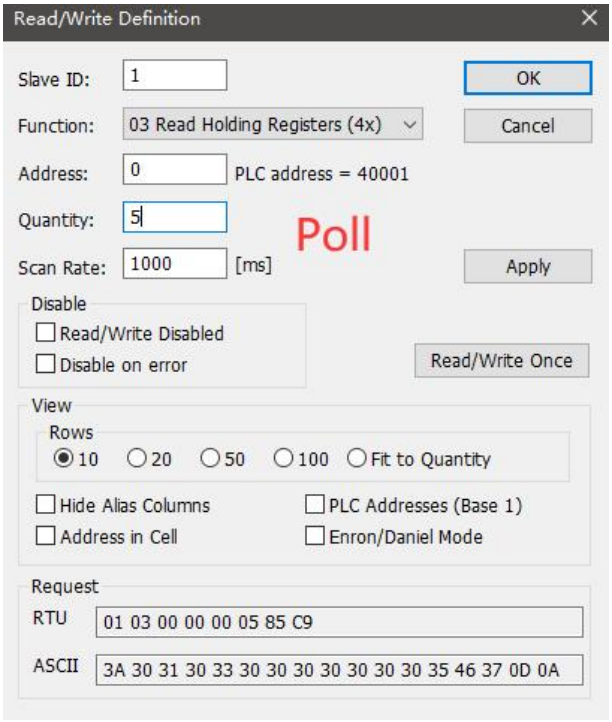
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Software register reading and simulation configuration:

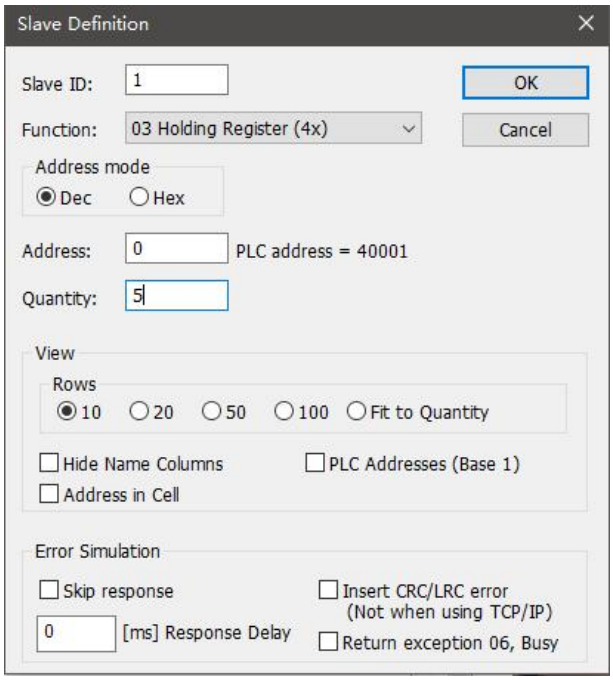
Poll menu, select →SetupRead/Write Definition



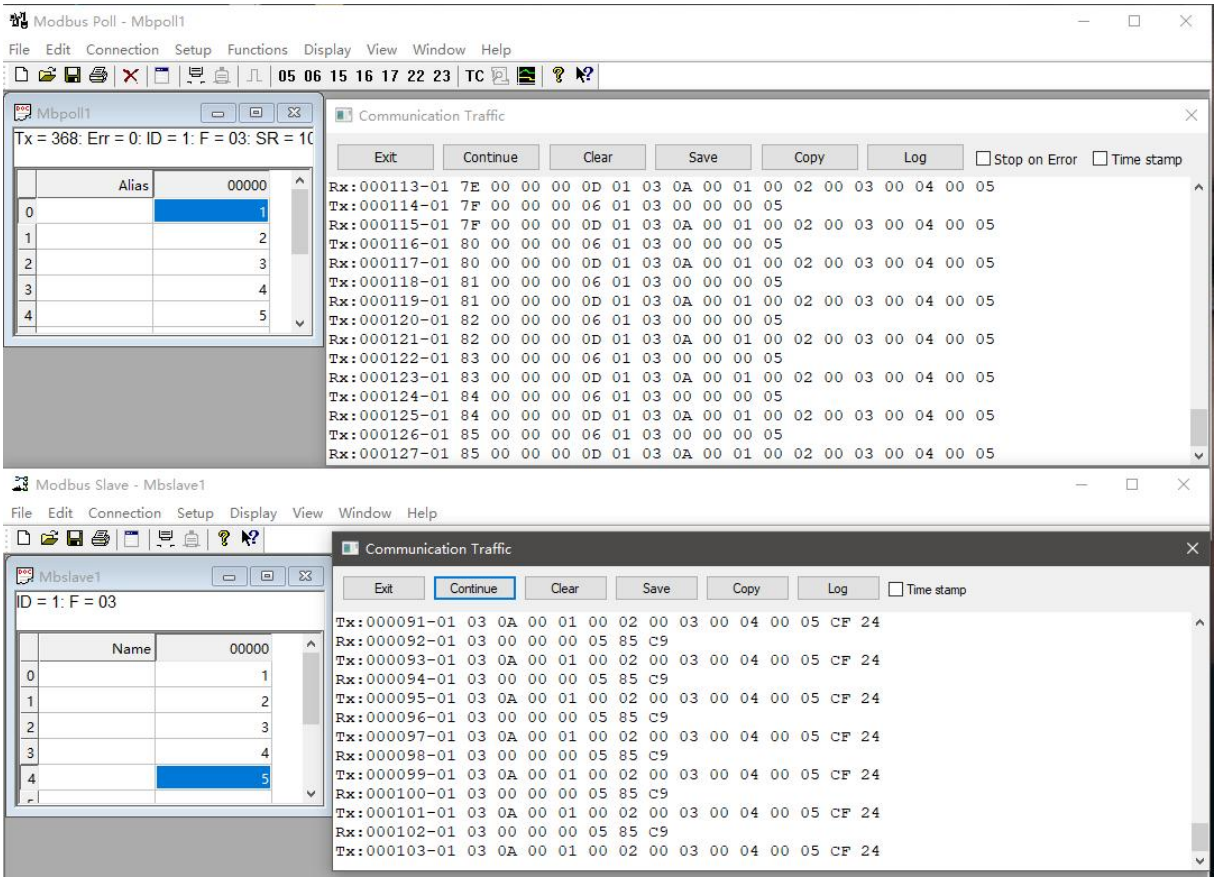
Select SetupSlave Definition from the →Slave menu

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Communication demonstration:



4.5.2. Multi-host mode

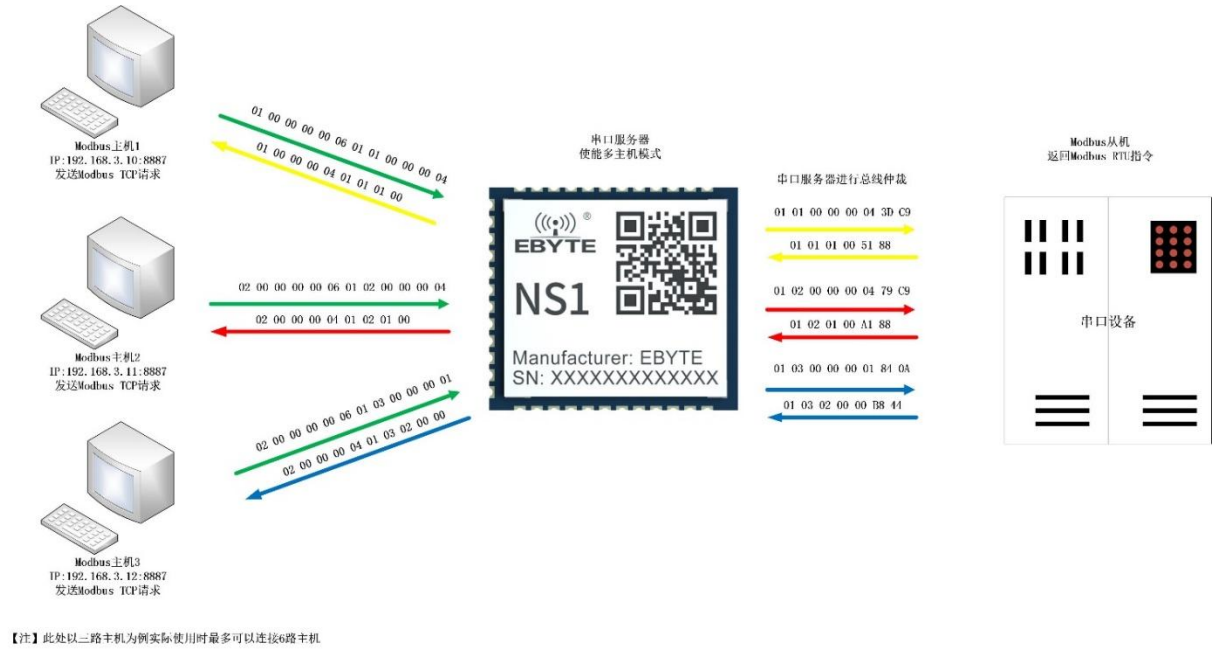
The multi-host mode can handle up to 6 Modbus TCP hosts. When multiple Modbus hosts

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access the Modbus gateway at the same time, the bus occupation scheduling will be carried out (TTL can only process one request at a time, while the multi-host mode will sort and process according to the TCP request sequence, and other links will wait), so as to solve the bus conflict problem (currently only supports 6-host connection), and only supports working in the TCP server mode, The slave can only be on the serial port, otherwise it cannot work normally.

It is recommended to configure it as "simple protocol conversion" when there is no multi-channel host.



【注】此处以三路主机为例实际使用时最多可以连接6路主机

Upper computer/web page configuration:





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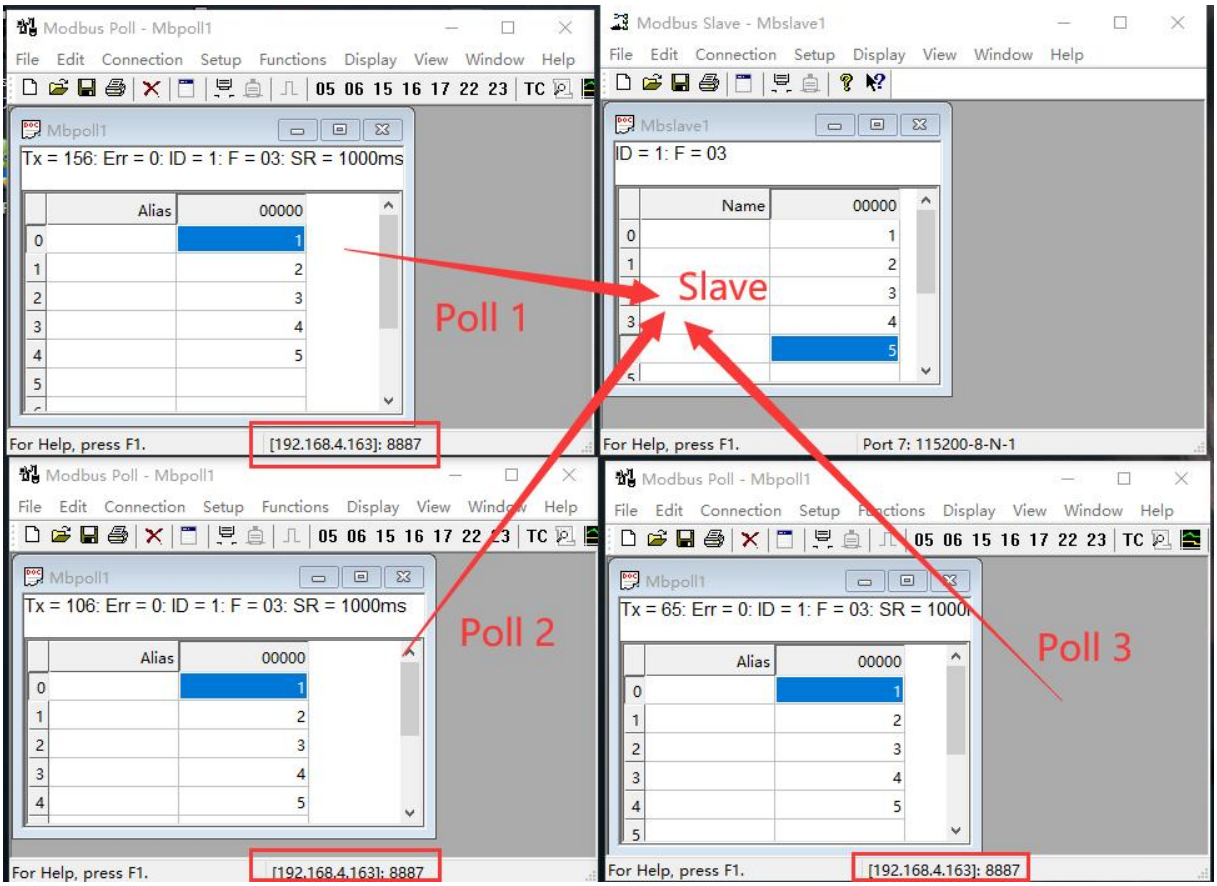


Modbus Poll and Modbus Slave software debugging:

Refer to "Simple Protocol Conversion" for software configuration and register configuration. Start multiple Modbus Poll software at the same time (for example, 3 channels can be supported up to 6 channels).

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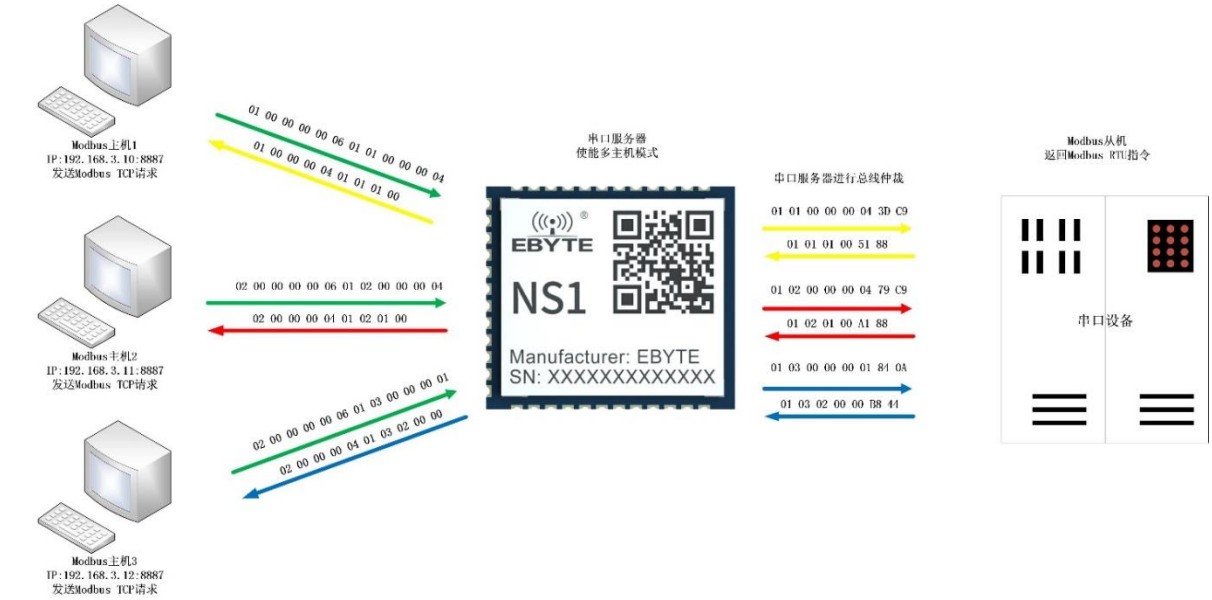


4.5.3. Storage gateway

The storage gateway not only arbitrates the bus data, but also stores the repeated read instructions. When different hosts request the same data, the gateway does not need to query the register status of RTU device many times, but directly returns the cached data in the storage area, which greatly improves the multi-host request processing capability of the gateway, and also reduces the time consumed by the entire request process. Users can customize the instruction polling interval and instruction storage time of the storage area according to their needs.

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【注】此处以三路主机为例实际使用时最多可以连接6路主机

As the optimization of multi-host request performance, the storage gateway can only work in the TCP server mode, which improves the response speed on the network side.

characteristic:

（1） The gateway has a 5K cache for storing instructions and returned results (taking reading 10 holding registers as an example, 189 instructions and returned results can be stored);

（2） RTU response timeout automatically clears the cache to ensure the real-time and authenticity of data;

（3） The polling interval can be customized, 0-65535ms;

（4） The gateway will poll the RTU device according to the instruction storage time used for configuration. If the MODBUS host does not query the instruction again during the storage time, the gateway will automatically delete the storage instruction and release the cache;

（5） The first command and control command (05, 06, 0F, 10 function code) will directly access RTU equipment;

（6） Only 01, 02, 03 and 04 Modbus function code query results can be stored;

Storage gateway host computer and web page configuration:



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4.5.4. Configurable gateway

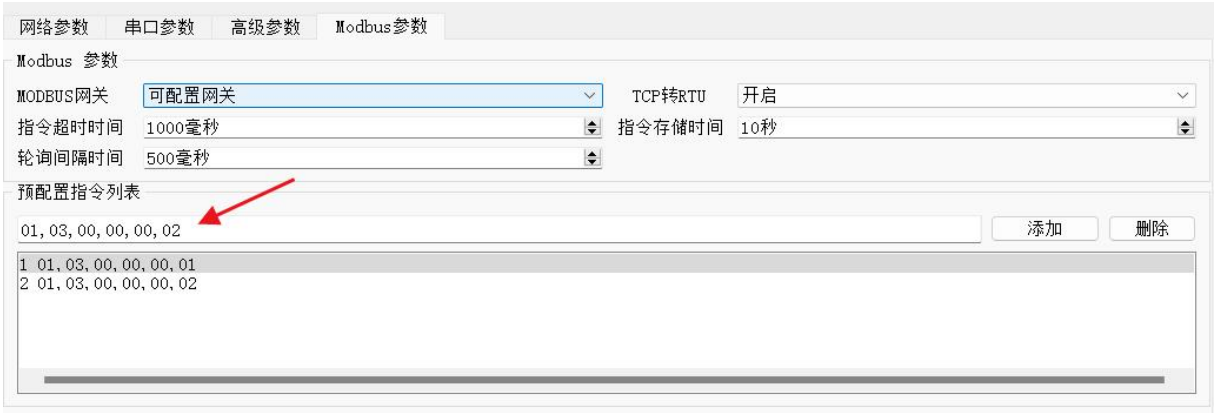
The gateway automatically polls the RTU device register according to the preconfigured MODBUS instruction (only supports the configuration of MODBUS read instruction), and the instruction in the non-storage table will directly operate the RTU device. The frequently read instructions can be stored in the gateway in advance to shorten the response time (query the configured instructions). Because of the above characteristics, the serial port side of the configurable gateway can only connect to the Modbus slave station.

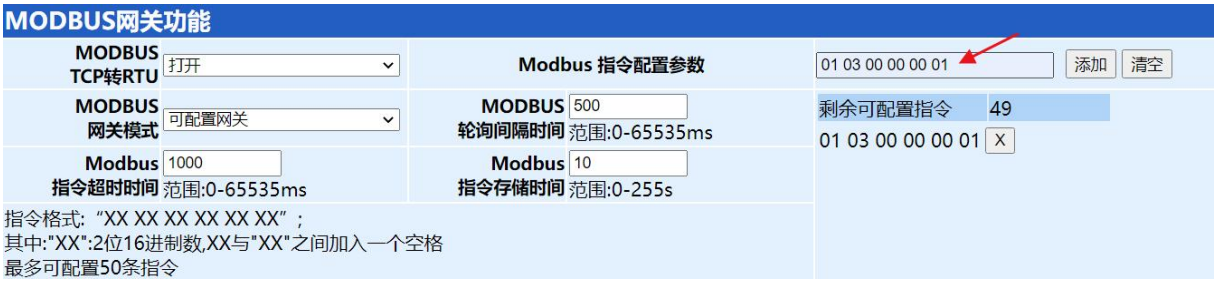
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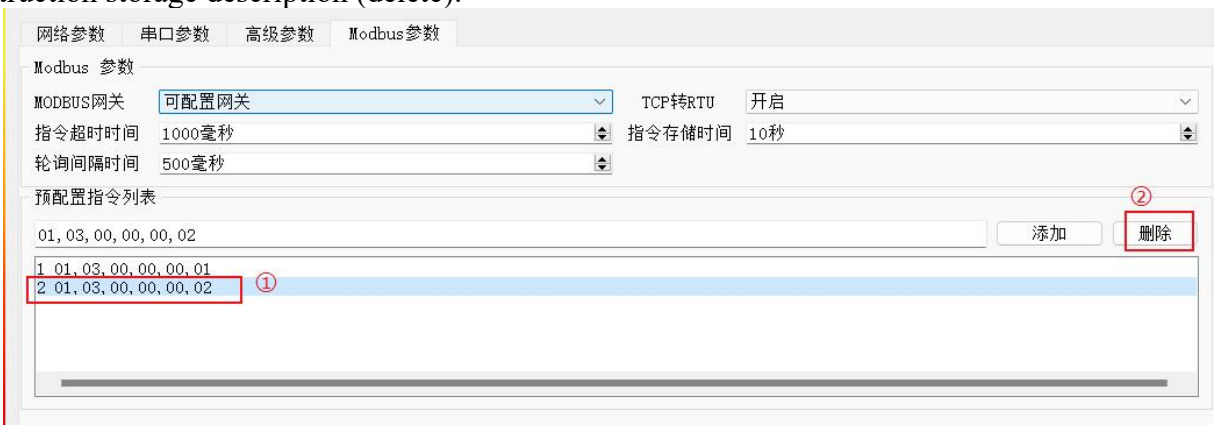


Instruction storage description (add, instruction error and format error cannot be added):



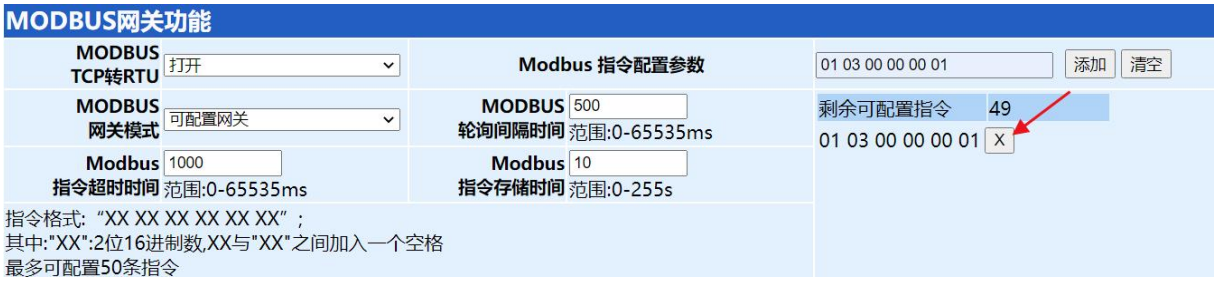


Instruction storage description (delete):

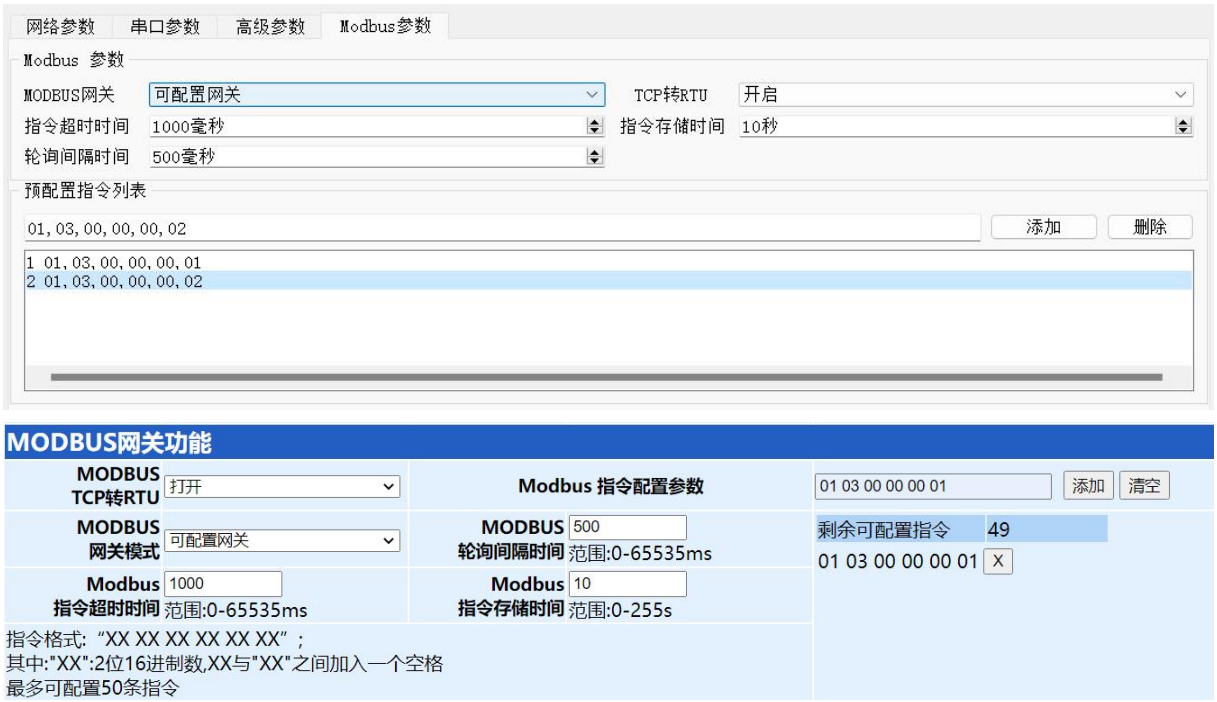


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Upper computer/web page configuration:



4.5.5. Automatic upload

In the client mode (TCP client, UDP client, MQTT client, HTTP client), the gateway will automatically poll the instructions in the storage instruction table and upload them to the server. The feedback format (Modbus RTU format or Modbus TCP format) and the instruction polling interval (0-65535ms) can be selected according to the demand.

Refer to "Configurable Gateway - Instruction Storage Description" for instruction pre-storage, and automatically upload the upper computer/web page configuration:

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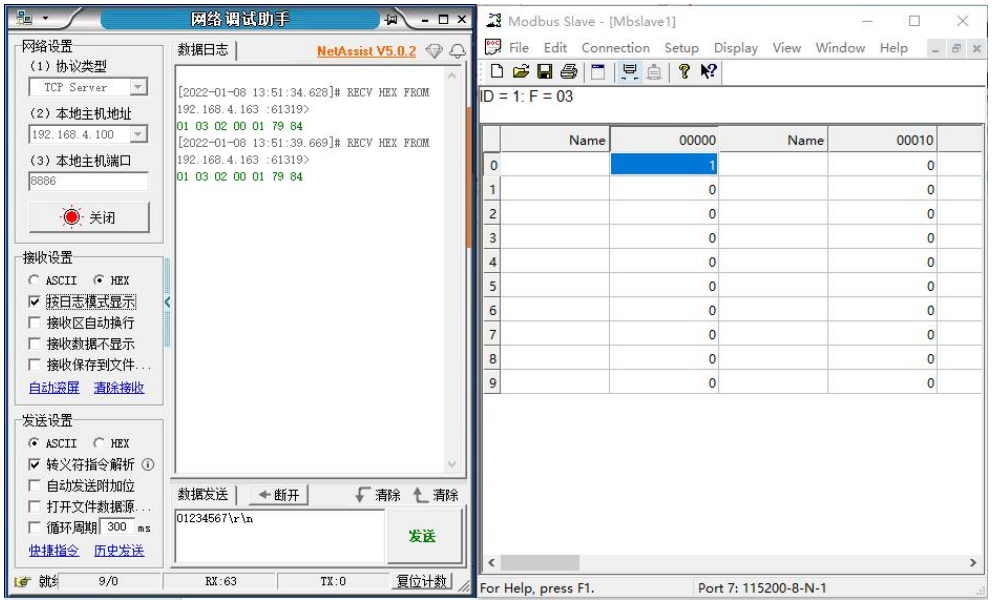




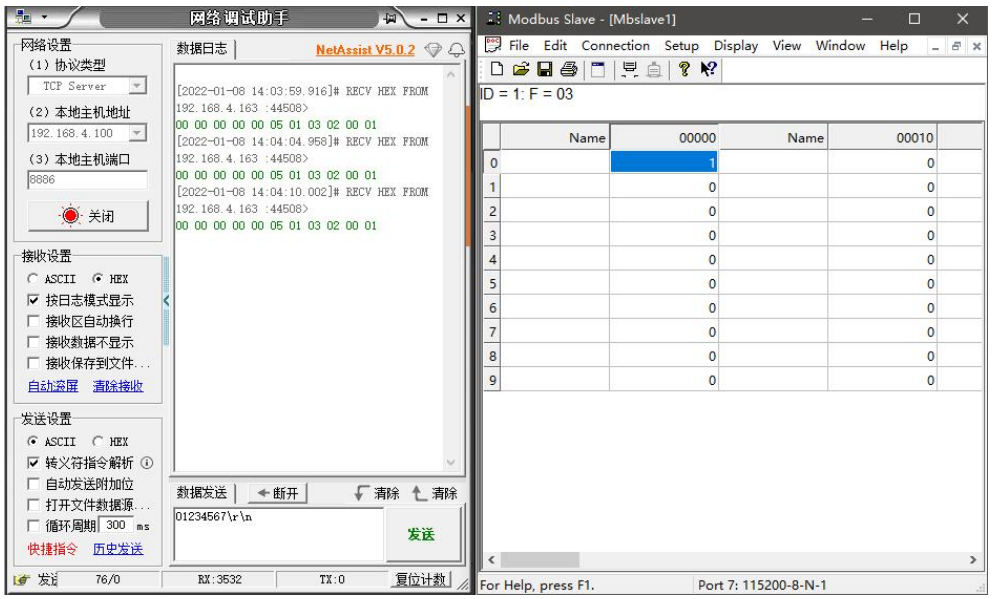
TCP client presentation (Modbus RTU format):

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TCP client presentation (Modbus TCP format):



4.6. Introduction to basic functions

4.6.1. Web page configuration

The device has a built-in web server, which is convenient for users to set and query parameters through web pages.

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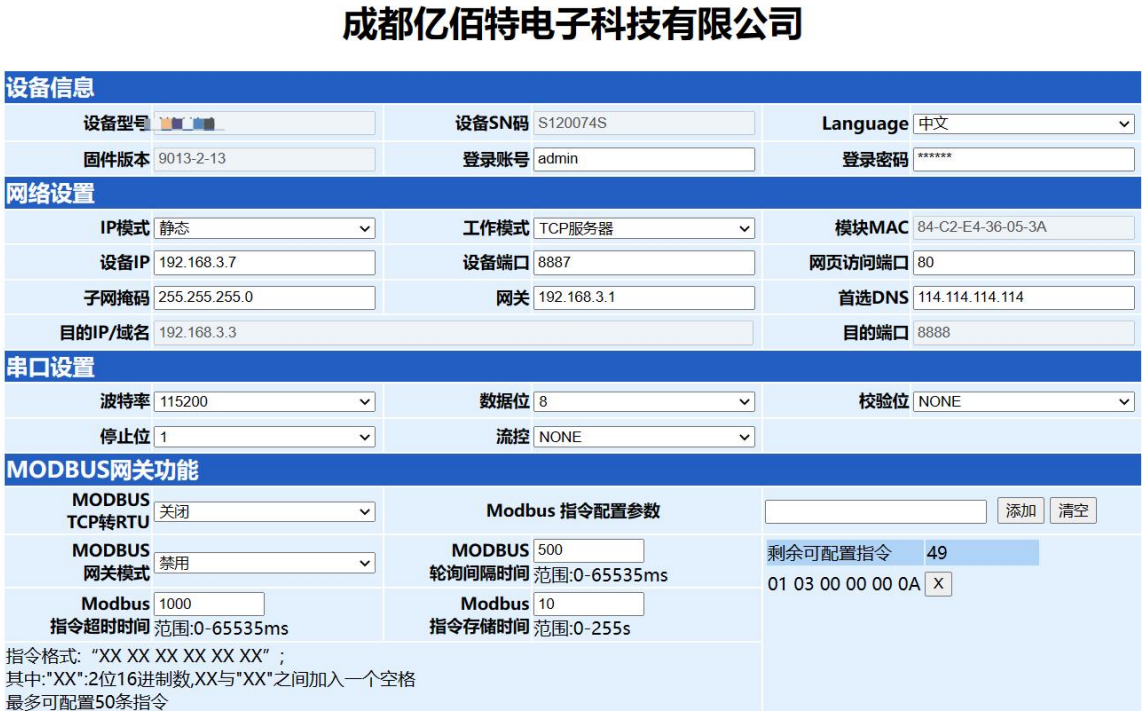
The port of the Web server can be customized (2-65535). The default is 80.

Operation mode (Microsoft Edge version 94.0.992.50 as an example, Google Kernel Browser is recommended, IE Kernel Browser is not supported):

- Open the browser and enter the IP address of the device in the address bar. The default is 192.168.3.7 (the IP address and the computer need to be kept in the same network segment). Forget that the local IP address can be queried through the AT command and configuration software;



- Click Login, the default account is admin, and the default password is admin (entered by default, you can click Login directly);



- The main interface pops up on the webpage, where you can query and set relevant parameters;
- Click Submit to save the configuration parameters;
- The progress bar prompts the configuration progress;

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- The main thing to note is that the device needs stable power supply when using web configuration (> 200Ma@5V ） Otherwise, the firmware will be damaged.



4.6.2. Restore factory settings

IO of device_ RST pin can be pulled down for 5s and then released to restore the factory configuration.

4.6.3. AT instruction configuration

The query and modification of the relevant parameters of the equipment can be completed through the AT command configuration. For specific AT instructions, please refer to "NA11x&NB114&NS1&NT1-AT Instruction Set".

4.6.4. Configuration tool software settings

Open the configuration tool software, search for the device, double-click the identified device, and the parameter query configuration interface will pop up. Relevant parameters can be customized and modified as required, and then the configuration can be saved, and the equipment can be restarted to complete the parameter modification.

[Note]:

Do not use multiple upper computers in the same LAN environment. The industrial control computer with multiple network cards should be temporarily disabled without using network cards, otherwise the upper computer will be abnormal (the same device will display multiple times, and the device cannot be found)

The upper computer shields the wireless network card, so the upper computer must be connected to the network cable. The wireless network card can be configured through the web page.

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4.6.5. Random native port

TCP client, UDP client, HTTP client and MQTT client can configure the local port to 0 (use random local port). The server mode cannot use random port, otherwise the client cannot establish a connection correctly.

Using random port connection can quickly re-establish the connection when the device accidentally disconnects the server, to prevent the server from refusing the connection due to four incomplete waves. It is recommended to use random port in client mode.

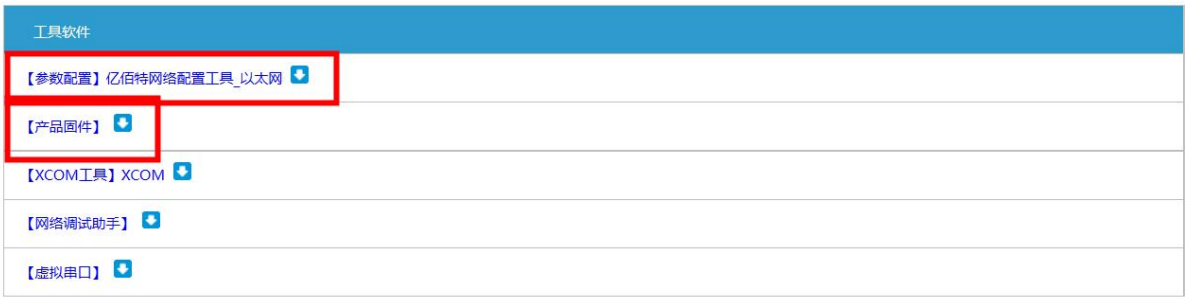
The device will automatically enable random ports when configuring TCP client, HTTP client and MQTT client modes.

4.6.6. Remote upgrade

In order to facilitate later maintenance and upgrade functions and replace different firmware, serial servers (NA11x series, NB114, NS1, NT1, etc.) support online upgrade. Users can upgrade or replace the current firmware through the upper computer through the upgrade firmware provided by our company.

Network upgrade firmware operation steps:

Step 1: download the upper computer and "product firmware" at the corresponding location on the official website;



Step 2: Open the upper computer, click "Menu", and select "Device Upgrade Assistant";

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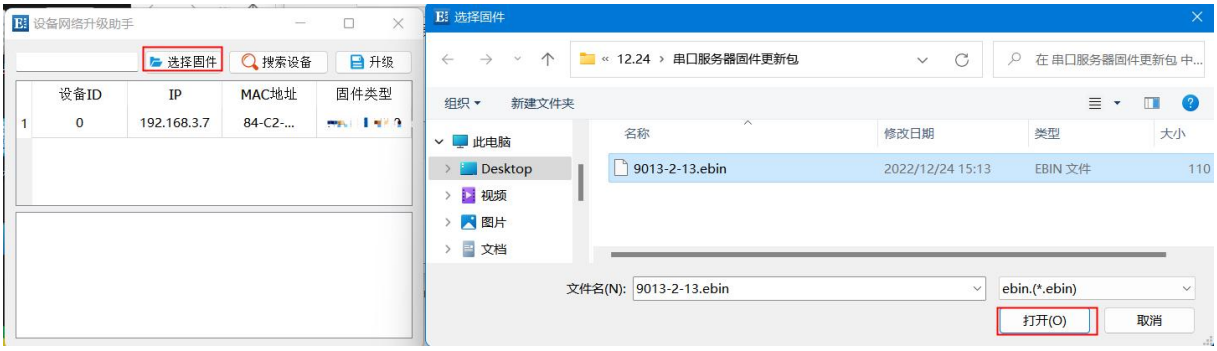
Step 3: In the pop-up "Device Network Upgrade Assistant" dialog box, click "Search Device" (the computer and device should be in the same network segment), and click "Stop Search" after finding the device;



Step 4: Click "Select Firmware", select the corresponding firmware, and then click "Open";

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Step 5: Select the equipment to be upgraded, click "Upgrade", the progress bar will start to change, and wait for the upgrade to complete.

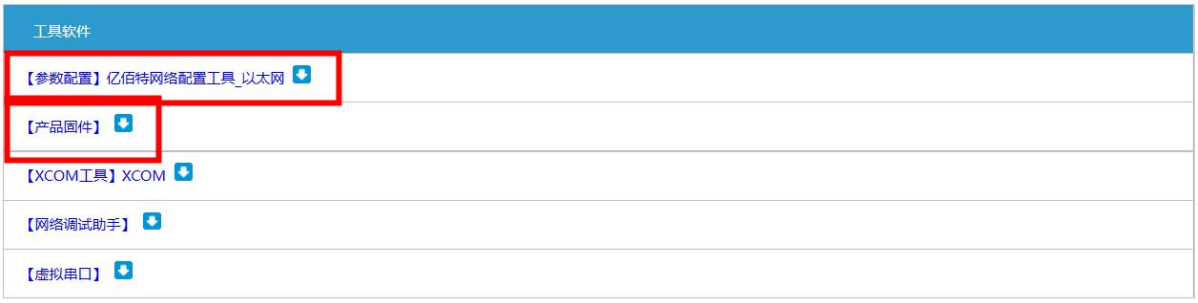


Operating steps for serial port firmware upgrade:

Step 1: download the upper computer and "product firmware" at the corresponding location on the official website;

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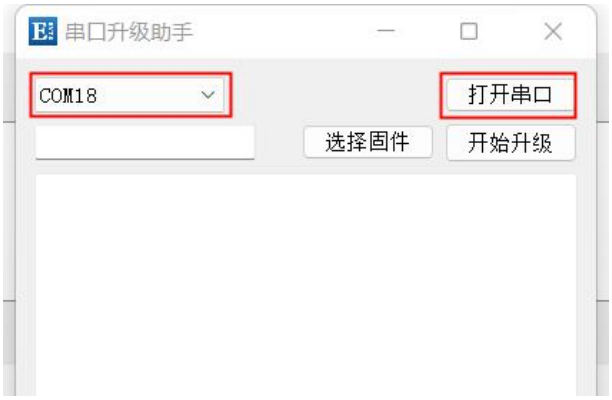
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Step 2: Open the upper computer, click "Menu", and select "Serial port upgrade assistant";



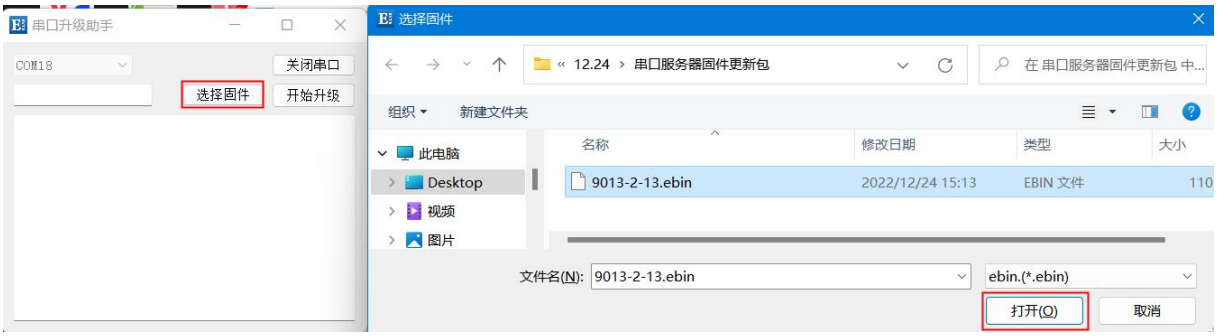
Step 3: First connect the USB port of the computer, select the corresponding port number in the pop-up "Serial Port Upgrade Assistant" dialog box, and click "Open Serial Port";



Step 4: Click "Select Firmware", select the corresponding firmware, and then click "Open";

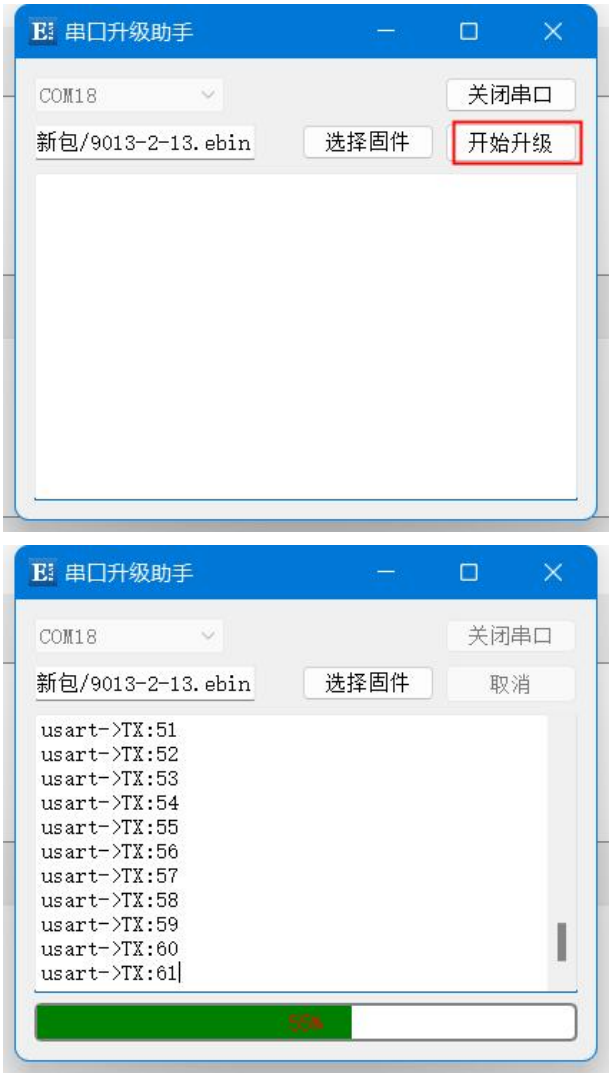
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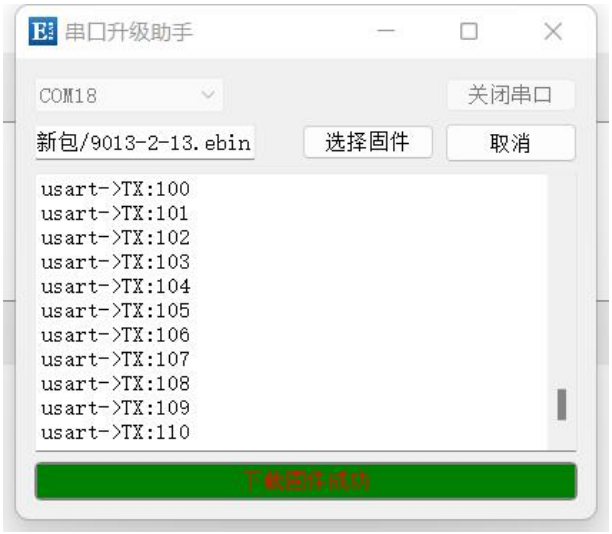
Step 5: Click "Start upgrading", the progress bar will start to change, and wait for the upgrade to complete.

[Note] Power on again to trigger the upgrade.



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Revision History

edition	Revision date	Revision description	Maintainer
1.0	2021-06-28	Initial version	LC
1.1	2021-08-28	Content revision	LC
1.2	2021-09-25	Content revision	LC
1.3	2021-10-22	Product upgrade and content revision	LC
1.4	2021-11-05	Add hardware reference design	LC
1.5	2022-01-08	Adapt "9013-2-xx" firmware	LC
1.6	2022-12-26	Match "9013-2-13" firmware	LL
1.7	2023-03-08	Content revision	LL
1.9	2023-10-18	Added IO interface description	LY
2.0	2023-12-8	Added power consumption description	LYL
2.1	2025-10-23	Update the hardware reference design	ZYD

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