Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



Serial port ⇌ Ethernet SMD Module

NS2-V2/NS4-V2/NS8-V2

NS2-V2-TB/NS4-V2-TB/NS8-V2-TB

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Instructions for use

This manual is applicable to the NSx-v2 series second-generation multi-serial port to Ethernet SMD modules. The software functions of the entire series are exactly the same, only the number of serial ports is different . Please note the specific differences as shown in the table below.

Parameter comparison table

Product Model	Serial port number	Remark
NS2-V2	2	2 serial port SMD module
NS4-V2	4	4 serial port SMD module
NS8-V2	8	8 serial port SMD module
NS2-V2-TB	2	Test board (quick debugging board), built-in NS2-V2, but USB only leads to one serial port, which can be switched by jumper cap
NS4-V2-TB	4	Test board (quick debugging board), built-in NS4-V2, but USB only leads to one serial port, which can be switched by jumper cap
NS8-V2-TB	8	Test board (quick debugging board), built-in NS8-V2, but USB only leads to one serial port, which can be switched by jumper cap

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Chapter 1 Product Introduction

NSx-v2 /NSx-v2 -TB is an Ethernet serial server module that realizes 2/4/8 serial port data ⇌ Ethernet data conversion ; it has multiple Modbus gateway modes and TCP/DUP/MQTT/HTTP IoT gateway modes, which can meet the networking functions of various serial port devices/PLC . The module adopts LCC packaging, which is convenient for user equipment to be integrated on the PCB board.

NSx-TB test kit comes with a USB to TTL circuit (only one channel is built-in, which can be switched through a jumper cap), which allows quick debugging without an external converter . It also brings out the reset and factory reset pins for external buttons for easy operation, and brings out all the module's functional pins for user-friendly external debugging .

Features

- Support 10 /100M Ethernet interface;
- Support two configuration methods: configuration tool and AT command ;
- In server mode, each serial port supports 5 socket connections ;
- The baud rate supports 2400~115200bps and supports multiple verification methods;
- Support DNS domain name resolution , DHCP dynamic IP ;
- Supports timeout restart function, short connection and other functions, and the time can be customized;
- Support serial port cache clearing function ;
- Support online upgrade to facilitate user function customization;
- Support multiple registration package and heartbeat package modes ;
- Support TCP, UDP, MQTT, HTTP client and TCP, UDP server modes ;
- Support Modbus gateway, can realize active reporting of RTU devices, support conversion between Modbus TCP and Modbus RTU protocols, can be configured as storage mode to automatically collect device data, or use multi-host mode with one question and one answer;
- Support MQTT, quickly connect to Alibaba Cloud and standard MQTT3.1.1 servers (OneNET, Baidu Cloud, Huawei Cloud, etc.);
- Support Modbus data active reporting to TCP transparent transmission server, MQTT server, etc.;
- Support HTTP client mode, use HTTP/1.1 protocol, and can be configured as GET and POST request methods ;

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- Support virtual serial port .

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Chapter 2 Quick Start

If you have any problems during use, please click the official website link: www.cdebyte.com

The quick start guide is used to quickly verify the device functions. This chapter uses the test board as an introduction, hereinafter referred to as the device.

2.1 Hardware Preparation

A laptop with RJ45 network port;
NS8-V2-TB one set;
One network cable;
The specific hardware equipment is shown in the figure below:

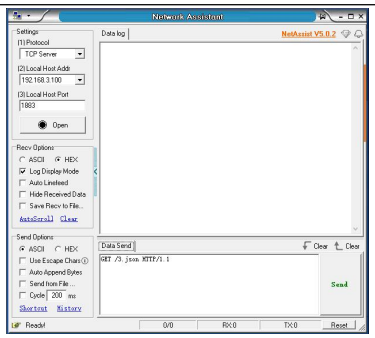
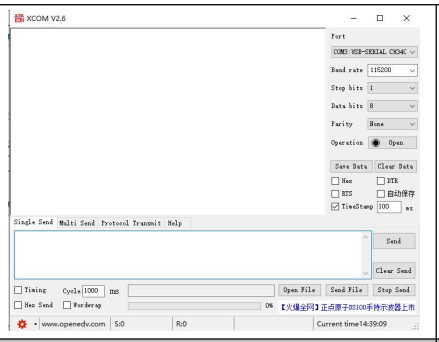
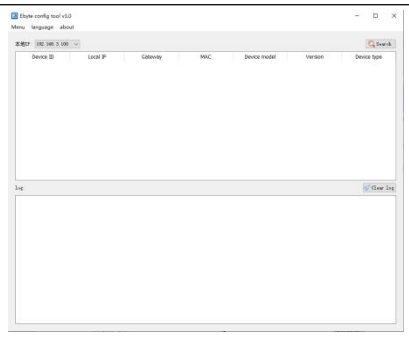
		
computer	Network cable	NS8-V2-TB

2.2 Software Preparation

Serial port debugging assistant (X COM), network debugging assistant (T CP/IP debugging assistant), Ebyte network configuration tool (configure configuration software tool), official website address:www.cdebyte.com, for downloading.

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Network Assistant	X -COM	Ebyte Network Configuration Tool

[Note] The configuration software tool's version displayed in the manual may be different from that provided by the official website. The version provided by the official website shall prevail.

2.3 Device default parameter test steps

Different channels use the same IP but different local ports. For example, the factory-configured channel 1 corresponds to port 8001 , which increases sequentially to channel 8 corresponding to port 8008. For detailed introduction, see the "Correspondence between channels and serial ports " section.

2.3.1 Connecting the Hardware



1. Use an Ethernet cable to connect the device network port and the computer network port ;
2. Equipment USB interface: Connect to computer ;
3. After confirming that there is no problem with the status, proceed to the next step of configuration;

Note: The test board is used to test the first serial port by default. If you need to verify other serial ports, you need to switch the jumper caps.

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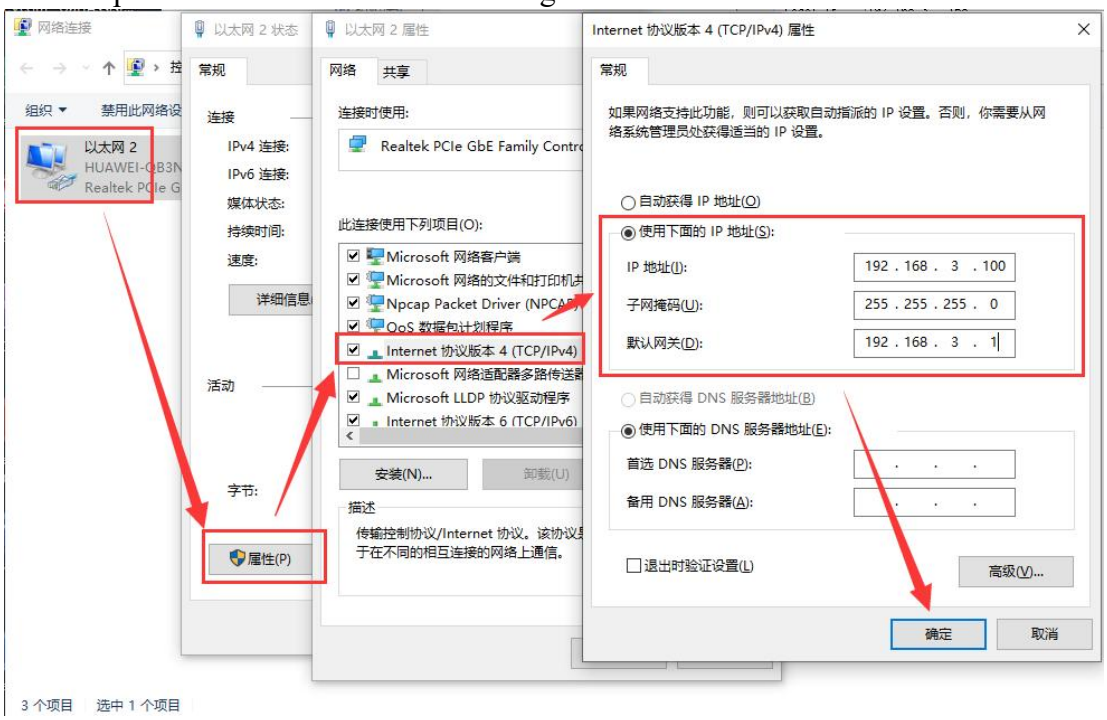
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2.3.2 Device parameter configuration

In order to enable users to quickly have a simple understanding of the device , we use the default parameters to test data transparent transmission . The default parameters of the NS8-V2 module are shown in the following table.

Item	Default Parameters
IP address	192.168.3.7
Subnet Mask	255.255.255.0
Gateway	192.168.3.1
Channel 1 working mode	TCP_SERVER
Local port for channel 1	8 001
Serial port baud rate	1 15200
Serial port parameters	NONE/8/1/NONE

Make sure the computer IP and the serial server IP are in the same network segment and do not conflict. The inspection method is shown in the figure below.

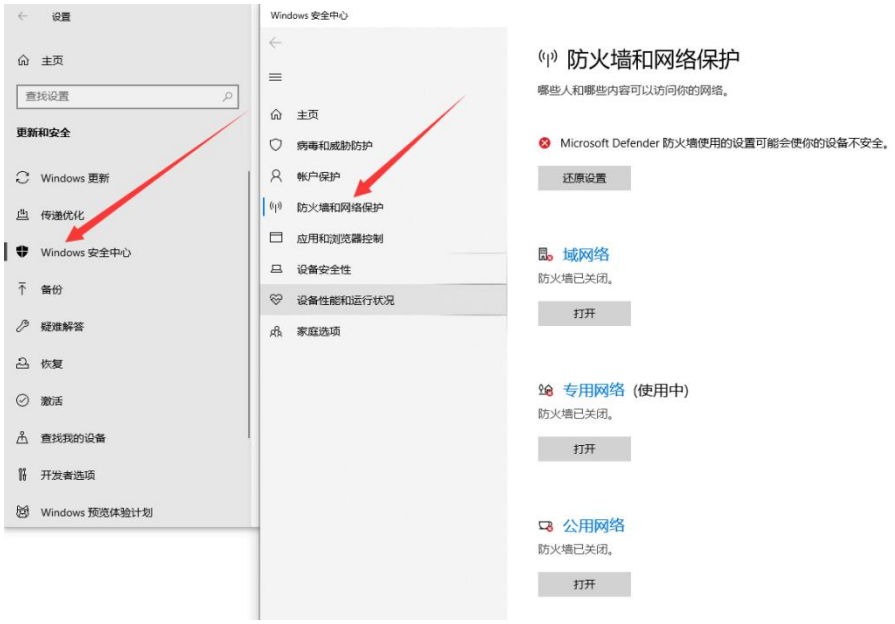


2.3.3 Turn off your computer's firewall

If the communication is unsuccessful, user can try to turn off the firewall on the computer and try again.

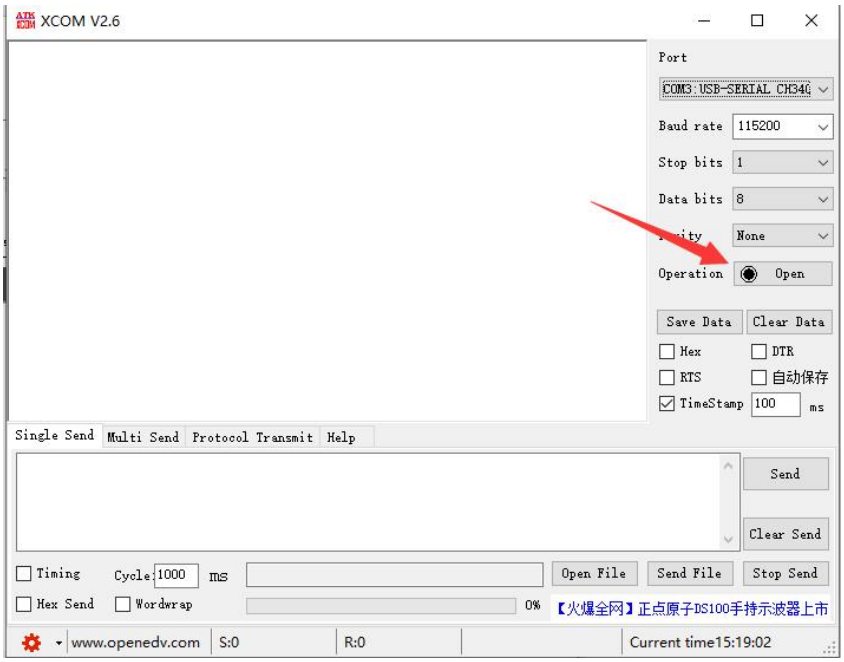
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2.3.4 Open the "Serial Port Debug Assistant"

Select the correct serial port number, configure the correct serial port parameters (115200-8N1), and open the serial port, as shown below:

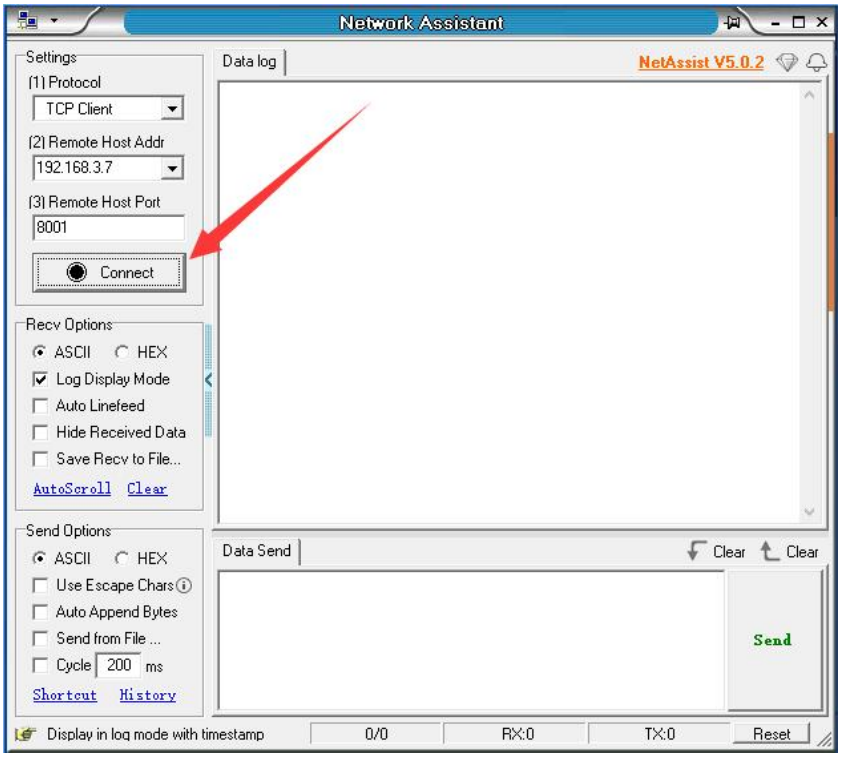


2.3.5 Open Network Assistant

Select the “TCP Client ” mode, configure the remote IP address to “ 192.168.3.7 ”, and configure the remote port address to “8001 ” as shown below:

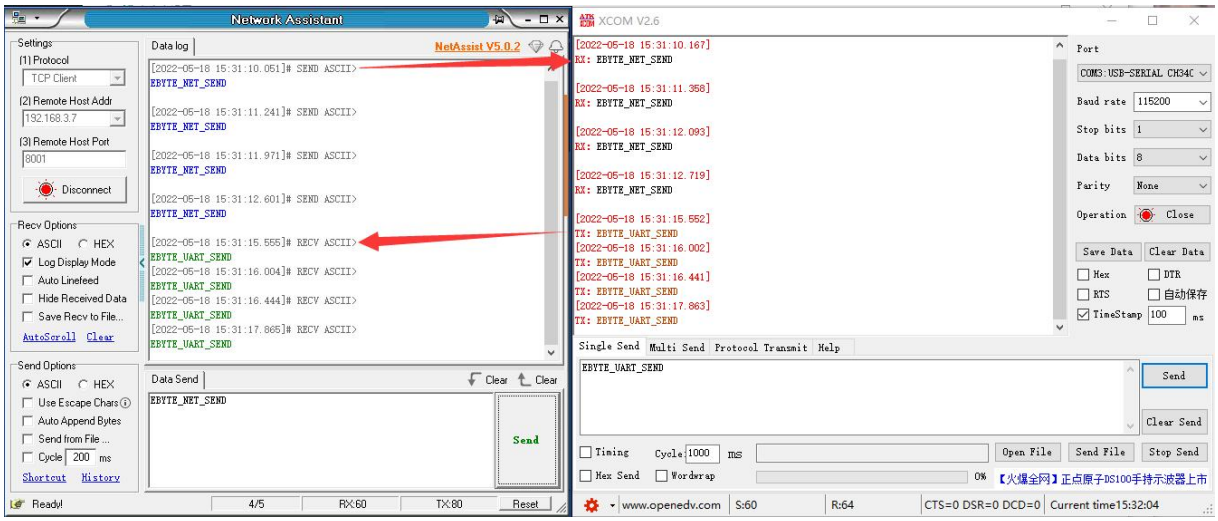
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2.3.6 Send and receive data test

Click the [Send] button on the " Network Debugging Assistant " and " Serial Port Debugging Assistant " respectively to realize transparent transmission of network and serial port data, as shown in the figure below.



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Chapter 3 Product Overview

3.1 Product Specifications

Product Model	Product Type	Working Mode	Operating voltage (V)	Product size (mm)
NS2-V2	Dual serial ports	TCP/ UDP/ MQTT/HTTP	DC 3.0～5.5	27 × 27
NS4-V2	Four serial ports		DC 3.0～5.5	27 × 27
NS8-V2	Eight serial ports		DC 3.0～5.5	27 × 27
NS2-V2-TB	Dual serial port test board		DC 4.5 ～5.5	89 × 49 × 13
NS4-V2-TB	Four serial port test board		DC 4.5 ～5.5	89 × 49 × 13
NS8-V2-TB	Eight serial port test board		DC 4.5 ～5.5	89 × 49 × 13
NB124-V2	Dual serial port isolation board		DC 8～28	173 × 95 × 26.5
NB124E-V2	Dual serial port isolation + POE version		DC 8～28 /POE	173 × 95 × 26.5
NB124S-V2	Dual serial port non-isolated version		DC 8～28	173 × 95 × 26.5
NB124ES-V2	Dual serial port non-isolated + POE version		DC 8～28 /POE	173 × 95 × 26.5
NB144-V2	Four serial port isolation board		DC 8～28	198 × 109 × 26.5
NB144E-V2	Four serial ports isolation + POE version		DC 8～28 /POE	198 × 109 × 26.5
NB144S-V2	Four serial ports non-isolated version		DC 8～28	198 × 109 × 26.5
NB144ES-V2	Four serial ports non-isolated + POE version		DC 8～28 /POE	198 × 109 × 26.5
NB183-V2	Eight serial ports isolation board		DC 8～28	198 × 109 × 26.5
NB183E-V2	Eight serial ports isolation + POE version		DC 8～28 /POE	198 × 109 × 26.5
NB183S-V2	Eight serial ports		DC 8～28	198 × 109 × 26.5

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	non-isolated version			
NB183ES-V2	Eight serial ports non-isolated + POE version		DC 8～28 /POE	198× 109 × 26.5

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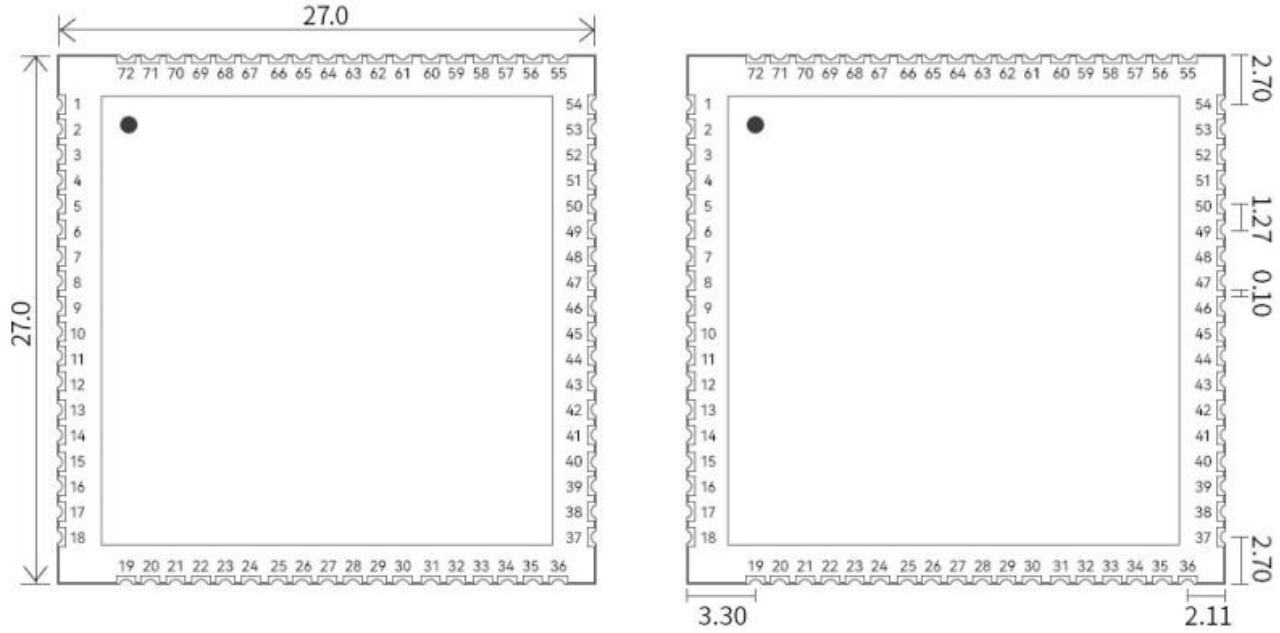
3.2 Technical Parameters

Item	Description
Operating voltage	3.0 ～ 5.5V (D C)
Working current	Peak: 130mA @ 5V Standby: 80mA@5V Peak: 150mA @ 3.3V Standby: 100mA@3.3V
Serial port level	TTL level (3.3V)
Working Mode	TCP Server (default), TCP Client, UDP Server, UDP Client, H TTP Client, M QTT Client
Socket connection	A single-link TCP server supports up to 5 client connections
Network Protocol	IP, TCP/UDP, IPv4 , APR , D HCP , D NS , HTTP , M QTT
IP address	Customizable (default, 192.168.3.7)
Domain name resolution	support
DNS domain name resolution server	Customizable (default 1 14.114.114.114)
Configuration	Configuration tools, AT commands
Local Port	Customizable (default, channel 1 to channel 8: 8001-8008)
Subnet Mask	255.255.255.0 (default, customizable)
Gateway	192.168.3.1 (default, customizable)
Serial port buffer	n×3k Byte
Packaging mechanism	1024 Byte
Serial port baud rate	2400 to 115200 bps (115200 by default)
Data bits	8
Stop bits	1 (default), 2
Check digit	None (default), Odd, Even
Product size	27 × 27 × 3 mm (L × W × H)
Product Weight	3.5 g
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	Function Description
1	GND	Common ground terminal, negative input terminal of power supply;
2	NC	The default setting is left floating.
3	NC	The default setting is left unconnected.
4	NC	The default setting is left unconnected.
5	NC	The default setting is left floating.
6	NC	The default setting is left unconnected.
7	GND	Common ground terminal, negative input terminal of power supply;
8	GND	Common ground terminal, negative input terminal of power supply;
9	GND	Common ground terminal, negative input terminal of power supply;
10	GND	Common ground terminal, negative input terminal of power supply;

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11	TXD6	The serial port sends data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
12	RXD6	The serial port receives data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
13	TXD7	The serial port sends data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
14	RXD7	The serial port receives data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
15	TXD2	The serial port sends data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
16	RXD2	The serial port receives data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
17	TXD8	The serial port sends data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
18	RXD8	The serial port receives data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
19	GND	Common ground terminal, negative input of power supply;
20	GND	Common ground terminal, negative input of power supply;
21	VCC	Power positive input, supports 3-5.5V input , can be used simultaneously with pin 22;
22	VCC	Power positive input, supports 3-5.5V input; can be used simultaneously with pin 21;
23	DATA8	Serial port 8 data indicator pin, outputs 50ms square wave when there is data interaction;
24	LINK8	Serial port 8 data link indicator, output low level in U DP mode ; Other modes output low level if the connection is successful , and high level if there is no connection ;
25	DATA7	Serial port 7 data indicator pin, outputs 50ms square wave when there is data interaction;
26	LINK7	Serial port 7 data link indicator, output low level in U DP mode ; Other modes output low level if the connection is successful , and high level if there is no connection ;
27	DATA6	Serial port 6 data indicator pin, outputs 50ms square wave when there is data interaction;
28	LINK6	Serial port 6 data link indicator, output low level in U DP mode ; Other modes output low level if the connection is successful , and high level if there is no connection ;
29	DATA5	Serial port 5 data indicator pin, outputs 50ms square wave when there is data interaction;
30	LINK5	Serial port 5 data link indicator, output low level in U DP mode ;

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		Other modes output low level if the connection is successful , and high level if there is no connection ;
31	TXD3	The serial port sends data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
32	RXD3	The serial port receives data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
33	485EN-2	Serial port 2 RS485 enable pin, normally low, pulled high when sending data
34	485EN-3	Serial port 3 RS485 enable pin, normally low, pulled high when sending data
35	485EN-4	Serial port 4 RS485 enable pin, normally low , pulled high when sending data
36	485EN-1	Serial port 1 RS485 enable pin, normally low, pulled high when sending data
37	485EN-8	Serial port 8 RS485 enable pin, normally low, pulled high when sending data
38	485EN-7	Serial port 8 RS485 enable pin, normally low, pulled high when sending data
39	485EN-6	Serial port 6 RS485 enable pin, normally low, pulled high when sending data
40	485EN-5	Serial port 5 R S48 5 enable pin, normally low, pulled high when sending data
41	SPDLED	Network port data indicator
42	LINKLED	Network port connection indicator
43	RX+	Ethernet receives RX+ signal ;
44	RX-	Ethernet receives RX-signal ;
45	TX+	Ethernet sends TX+ signal ;
46	TX-	Ethernet sends TX-signal ;
47	RESTORE	Reset pin, pull low for more than 5 seconds to take effect
48	TXD1	The serial port sends data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
49	RXD1	The serial port receives data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
50	NC	The default setting is left floating.
51	NC	The default setting is left unconnected.
52	NC	The default setting is left floating.
53	3.3V	Output voltage 3.3V ;
54	GND	Common ground terminal, negative input of power supply;
55	NC	The default setting is left unconnected.
56	NC	The default setting is left unconnected.
57	NC	The default setting is left unconnected.

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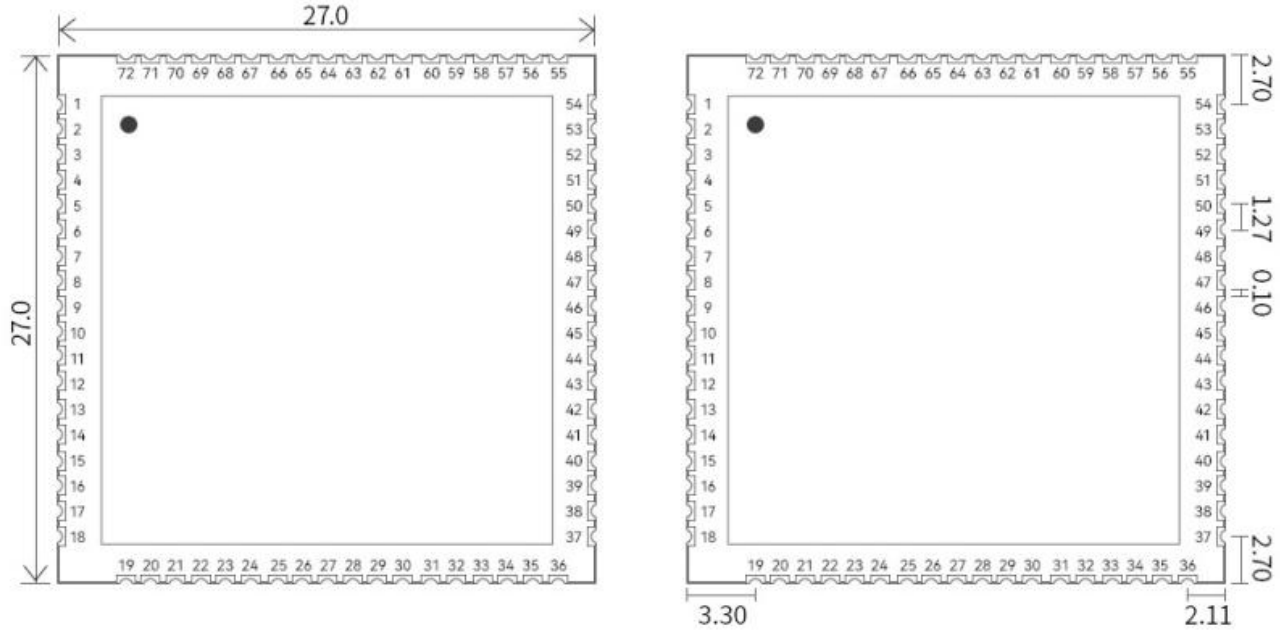
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58	NC	The default setting is left unconnected.
59	NRST	Module reset, pull down for more than 1ms to take effect
60	NET	Network cable connection indicator light, low output when the network cable is inserted Unable to detect network cable output high
61	TXD4	The serial port sends data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
62	RXD4	The serial port receives data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
63	TXD5	The serial port sends data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
64	RXD5	The serial port receives data and only supports 3.3V T TL , if connected to 5 V , level conversion is required;
65	LINK1	Serial port 1 data link indicator, output low level in U DP mode ; Other modes output low level if the connection is successful , and high level if there is no connection ;
66	DATA1	Serial port 1 data indicator pin, outputs 50ms square wave when there is data interaction;
67	LINK2	Serial port 2 data link indicator, output low level in U DP mode ; Other modes output low level if the connection is successful , and high level if there is no connection ;
68	DATA2	Serial port 2 data indicator pin, outputs 50ms square wave when there is data interaction;
69	LINK3	Serial port 3 data link indicator, output low level in U DP mode ; Other modes output low level if the connection is successful , and high level if there is no connection ;
70	DATA3	Serial port 3 data indicator pin, outputs 50ms square wave when there is data interaction;
71	LINK4	Serial port 4 data link indicator, output low level in U DP mode ; Other modes output low level if the connection is successful , and high level if there is no connection ;
72	DATA4	Serial port 4 data indicator pin, outputs 50ms square wave when there is data interaction;

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3.4 Dimensional drawing



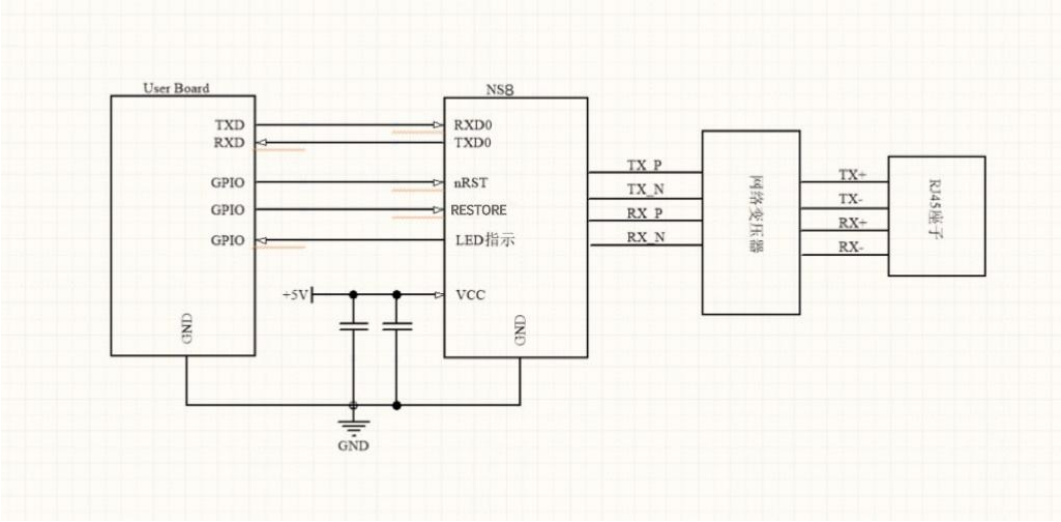
Unit : mm
pad quantity : 72
Tolerance value : X.X±0.1mm
X.XX±0.01mm

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3.5 Hardware Reference Design

3.5.1 Typical application hardware connection

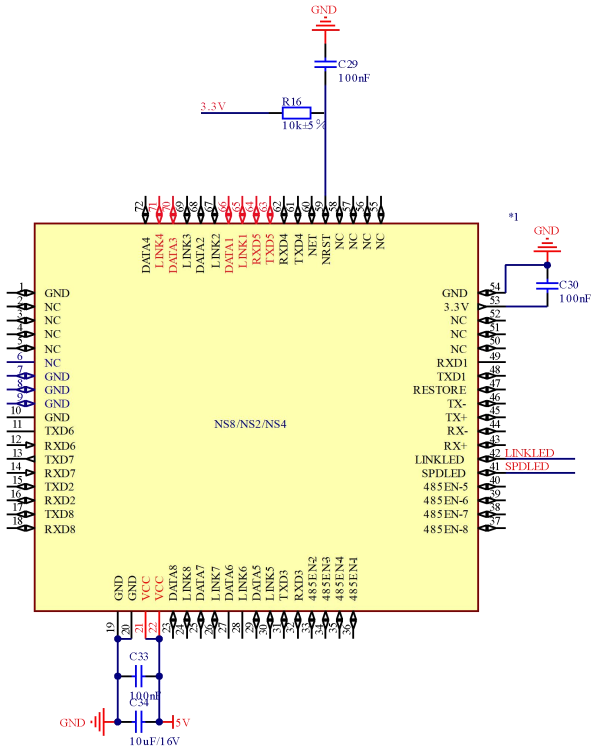


3.5.2 Power interface

The module uses a typical DC 5 V. The V CC voltage range is 3.0~ 5.5 V, the normal operating current is 200 mA @5V , and the peak current is about 300 mA @5V . Please note that if the power supply is less than 3.3V , the 3.3V output of pin 53 will change according to the input. V CC can be connected to 10UF/ 16V /10% and 100nF/50V/10% bypass chip capacitors to stabilize the module operation , and the NRST reset pin needs to be pulled up . As shown in the figure below.

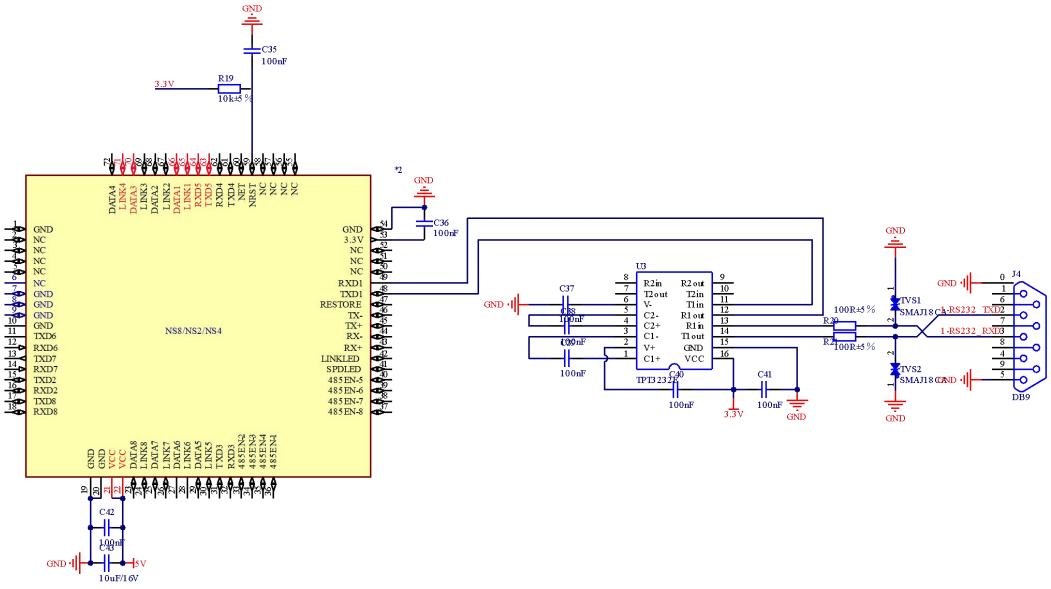
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3.5.3 UART interface

UART is a serial data interface that only supports TTL-3.3V communication level. It can be connected to RS-232 chip to convert to RS-232 level and connect to external devices. The UART interface of this module includes TXD/RXD signal lines. Taking RS-232 level as an example, the reference circuit is as follows:

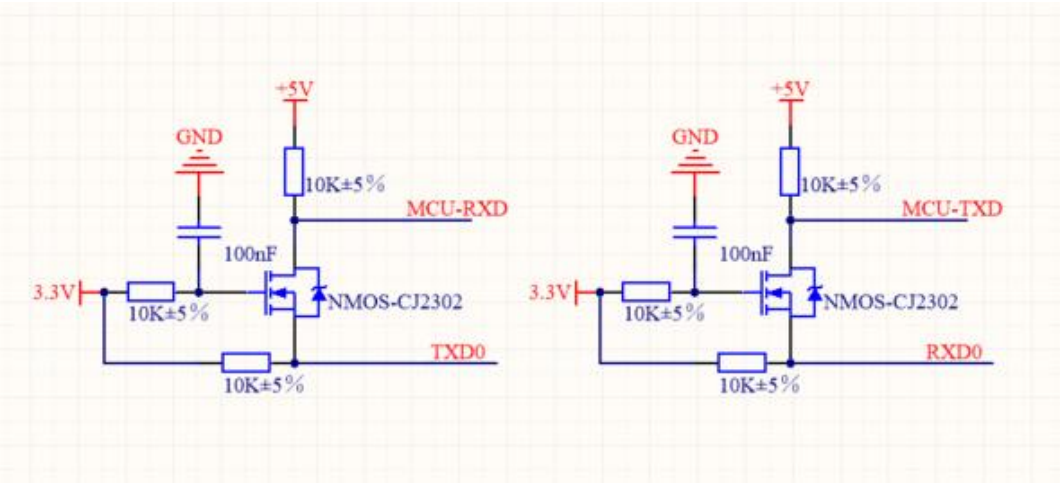


If it is communicating directly with MCU (3.3V level), you only need to add the module's TXD

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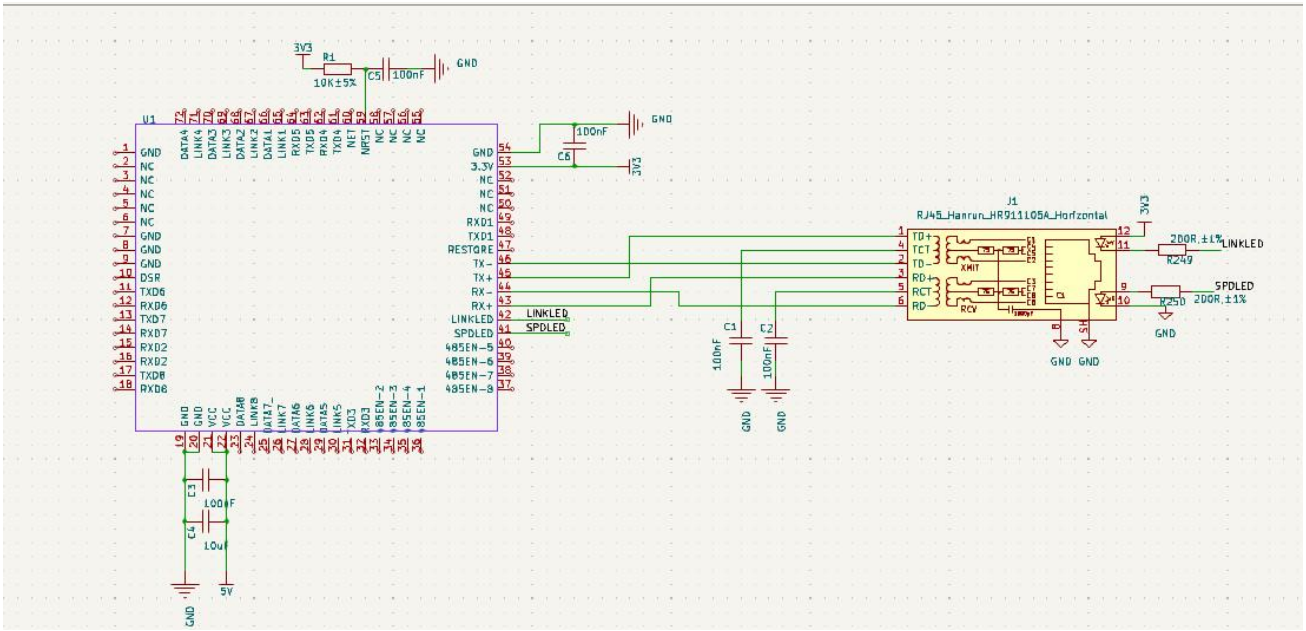
to the MCU's RXD, and connect the module's RXD to the MCU's TXD. If the MCU is 5V level, a conversion circuit needs to be added in the middle, as shown in the figure below:



3.5.4 Application of external network transformer for Ethernet interface

The module can be connected to an external 10 /100M Ethernet physical interface and supports the design method of interconnecting the RJ45 connector and the network transformer.

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



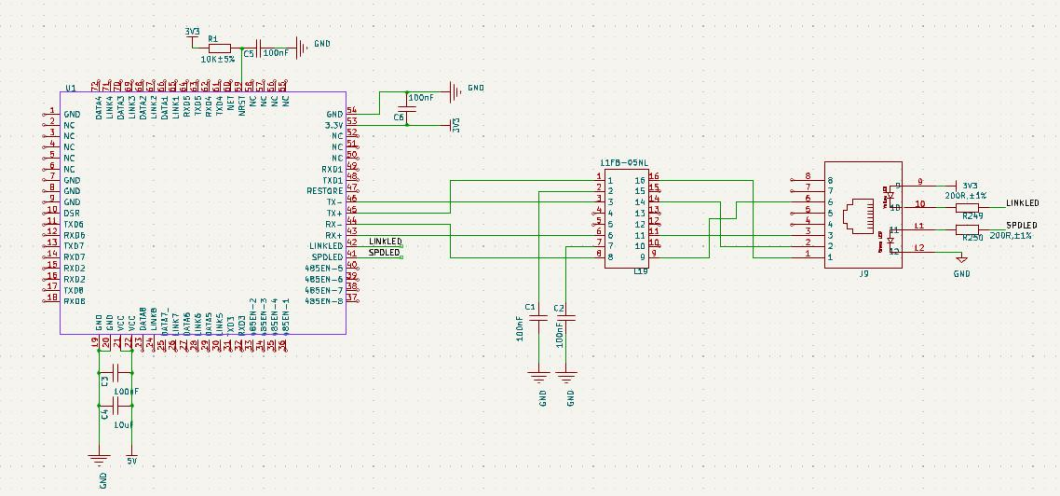
3.5.5 Application of Ethernet interface with built-in network transformer

RJ45 has a built-in 2KV electromagnetic isolation network transformer. The corresponding

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network data receiving pin of the module is directly connected to the data receiving pin of the Ethernet physical interface through AC coupling to serve as the data transmission channel within the system. RX+ and RX- are differential lines with 100 ohm differential impedance matching, and TX+ and TX- are differential lines with 100 ohm differential impedance matching. The reference circuit diagram of the hardware design is as follows.



3.5.6 Reference Packaging

Ebyte has made a corresponding PCB package library. Please download the specific files on the official website

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Chapter 4 Basic Functions

4.1 Correspondence between channels and serial ports

Baud rate: 2 400 , 4 800 , 9 600 , 1 4 400 , 1 9 200 , 3 8 400 , 5 7 600 , 7 6 800 , 1 15 200 bps ;
Data bits: only 8 bits are supported;
Parity bit: supports none (NONE), odd (ODD), even (EVEN);
Hardware flow control: not supported;

Channel	Default working mode	Default Port
Channel 1	TCPS	8001
Channel 2	TCPS	8002
Channel 3	TCPS	8003
Channel 4	TCPS	8004
Channel 5	TCPS	8005
Channel 6	TCPS	8006
Channel 7	TCPS	8007
Channel 8	TCPS	8008

4.2 Local network parameters

4.2.1 Local IP

STATIC (Static IP) : Users can define and configure IP , subnet mask , default gateway, and domain name resolution server (DNS server);

DHCP (Dynamic IP Acquisition): The device logs in to the server and automatically obtains the IP address, subnet mask, gateway address, and DNS server address parameters assigned by the server and configures them for use;

4.2.2 DNS (Domain Name Resolution)

When the user enters a domain name, the DNS server will be automatically queried, and the DNS server will retrieve the database to obtain the corresponding IP address. In static IP mode , the user can customize the domain name resolution server to resolve private domain name server data. In

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dynamic IP mode , the device automatically follows the domain name resolution server configured on the routing device. The user only needs to modify the DNS server of the routing device without configuring this device.

4.2.3 Network disconnection and reconnection cycle

When the device detects that it is disconnected from the server, it periodically initiates a reconnection request. Therefore, the "disconnection reconnection time" does not affect the connection establishment time under normal circumstances. Users can customize the request period, which is 5s by default.

4.2.4 Timeout restart (restart without data)

The device monitors the data transmission and reception. If the device does not transmit or receive data for a long time, the device automatically restarts to ensure long-term working stability.

The default activation period of this function is 30 minutes. Users can customize the timeout restart on or off and can also customize the period of restart without data.

4.3 Hardware factory reset

RESTORE pin of the device is pulled low for 5-10 seconds and then pulled high to complete the factory reset of the device.

4.4 Device working mode

4.4.1 T CP Server

TCP Server is TCP server. In TCP Server mode, the device listens to the local port, accepts the client's connection request and establishes a connection for data communication. When the Modbus gateway function is turned off, the device sends the data received by the serial port to all client devices that have established a connection with the device.

server mode, each link can connect to 5 clients . If the number of client devices exceeds the limit, the device will refuse the connection.

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4.4.2 TCP Client

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

The client needs to accurately configure the target IP address /domain name and target port .

Eight channels can independently open eight TCP clients . (Specific number is subject to the number of serial ports)

4.4.3 UDP Server

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

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

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

[Note] In U DP mode, the data sent from the network to the device should be less than 1024 Bytes per packet , otherwise data loss will occur .

4.4.4 UDP Client

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

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

In this mode, the destination address is set to 255.255.255.255, and the sent data will be broadcast in the entire network segment, but the sending and receiving devices need to ensure that

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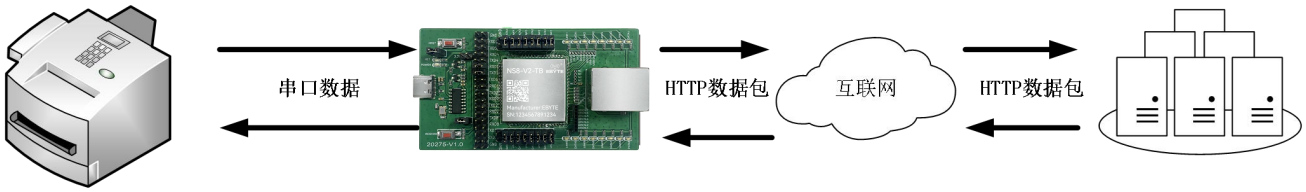
the ports are consistent. At the same time, the devices can also receive broadcast data .

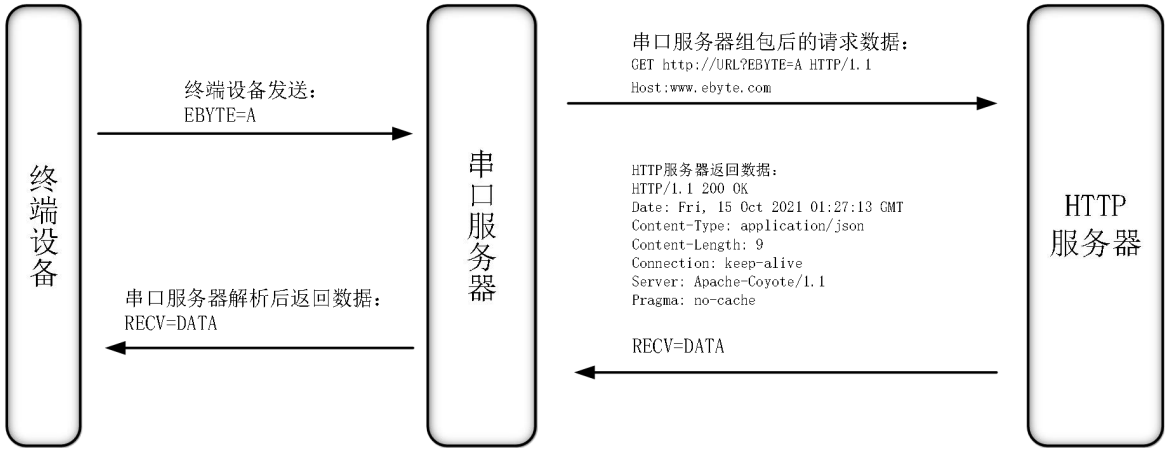
[Note] In U DP mode, the data sent from the network to the device should be less than 1024 Bytes per packet , otherwise data loss will occur.

4.4.5 HTTP Client

This mode can realize HTTP automatic packet assembly function, and provides two methods: GET and POST. Customers can configure URL, Header and other parameters by themselves, and the device will assemble and send the packets to realize fast communication between serial port data and HTTP server. URL and Header support up to 128 bytes of data. 8 channels can independently open HTTP client mode without affecting each other.

HTTP request data should be smaller than the packet length (1024 bytes), otherwise the device will divide the request data into multiple packets for request, resulting in request abnormality.

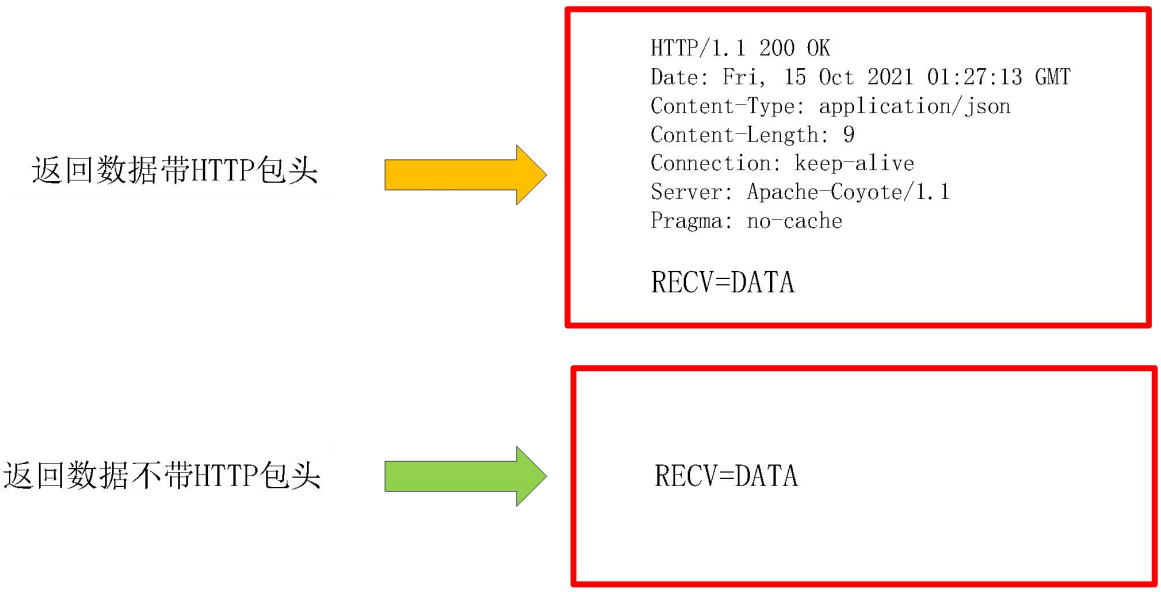




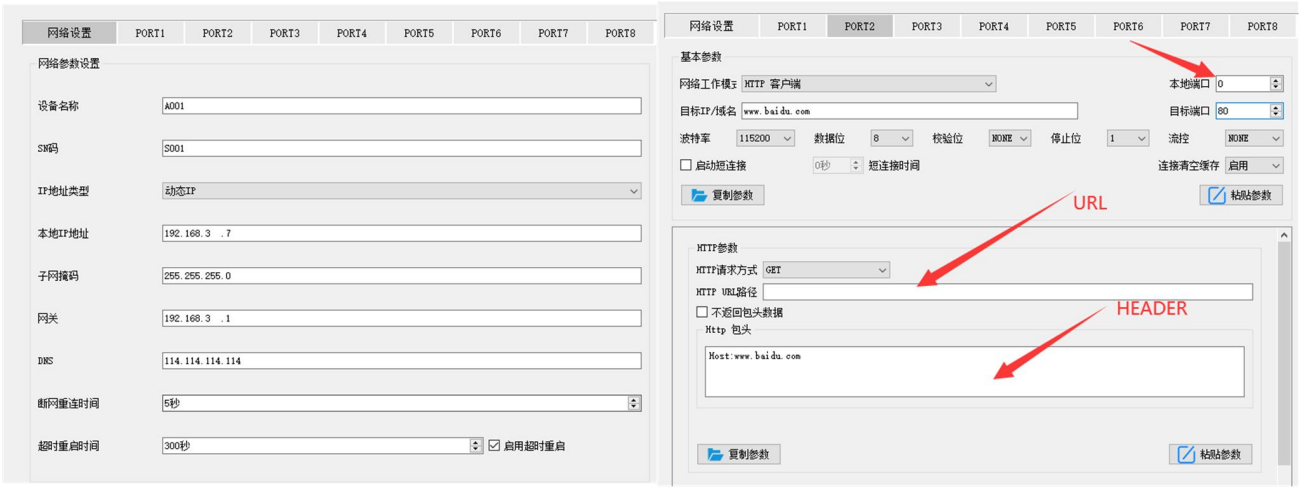
Supports configuration of whether to return HTTP protocol header. The returned data is shown in the figure below:

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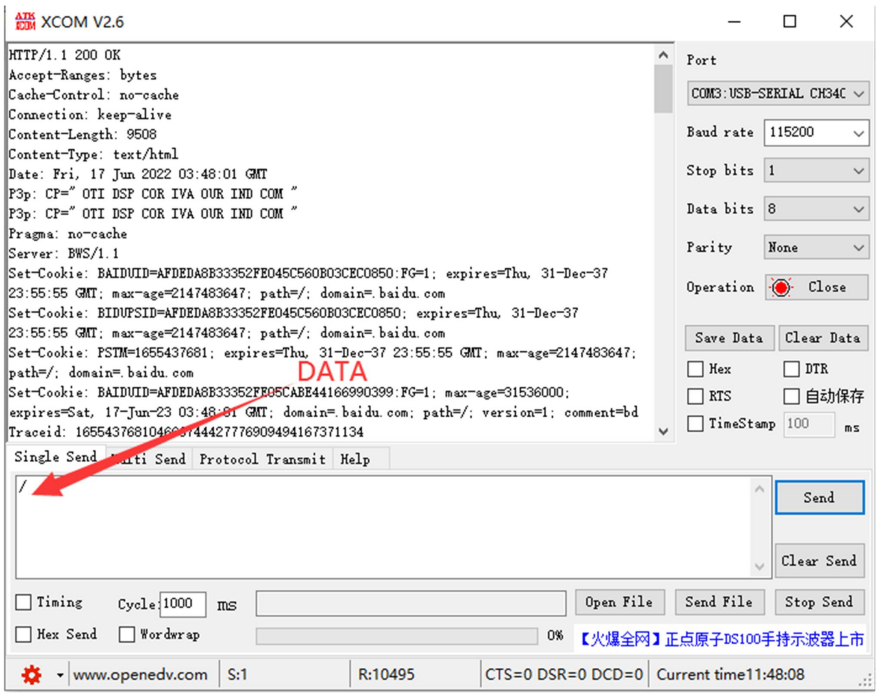
Configuration instructions, open the configuration software tool, search for the device and enter the device configuration interface, first configure the "network parameters", it is recommended to use the DHCP function to avoid incorrect configuration leading to device IP abnormalities (network segment errors, IP conflicts, etc.), when configuring the channel that needs to use the HTTP function, support 8 channels to configure the HTTP client mode at the same time, here through GET request "Baidu" web page as an example (URL : empty, HEADER : Host : www.baidu.com , target domain name: www.baidu.com , target port: 80 , the local port is recommended to use a random port), the specific configuration is shown in the figure below:



The request data is "/", use the serial port assistant to get the web page:

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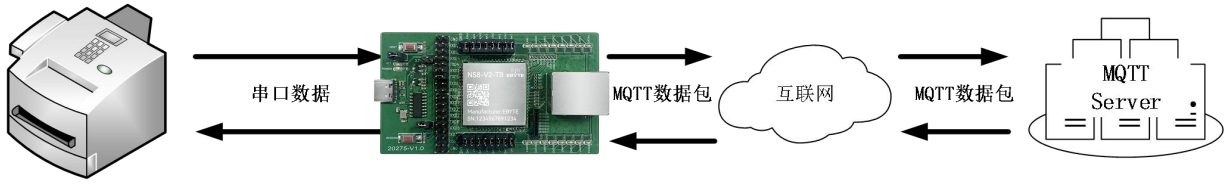
POST description: When configured as P OST request mode, the packet header data does not need to be individually configured with data length (for example: Content-length: 2729). The device automatically calculates the data length and sends it in packets. Other packet header data needs to be manually configured, and a maximum of 1 28 bytes of data configuration is supported.

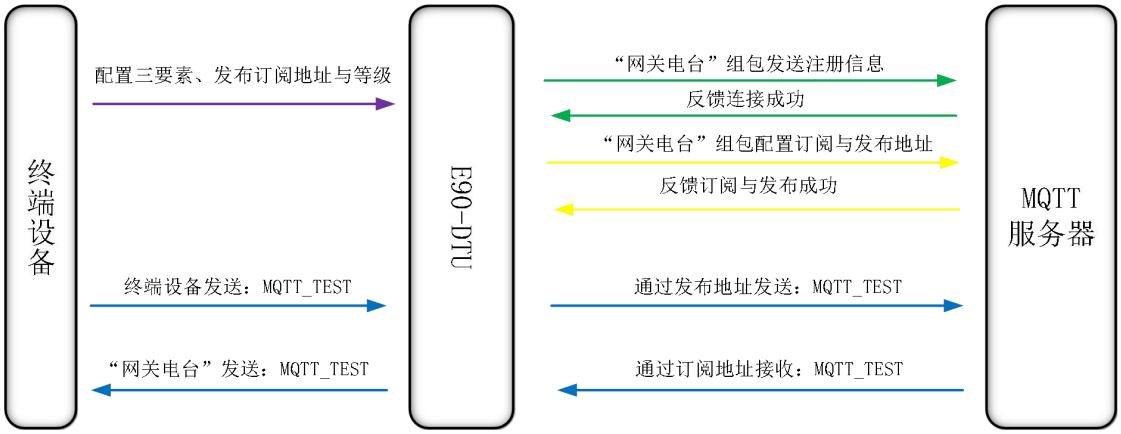
4.4.6 M QTT Client

Support to access standard MQTT3.1.1 protocol servers (OneNET, Baidu Cloud, Huawei Cloud, user-built servers, etc.) and Alibaba Cloud servers, supports service quality level configuration (Qos 0, Qos 1), supports ultra-long text configuration, and facilitates better access to network service operators (server address, three elements, subscription and publishing addresses support up to 128 characters, Alibaba Cloud product key 64 characters).

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When using the M QTT function, the short link should be turned off, otherwise the device will repeatedly connect to the server. It is recommended to use a random port, as shown in the following figure:



1) For standard MQTT3.1.1, Baidu Cloud, OneNET, or Huawei Cloud configuration, please refer to the following table to fill in the parameters:

Parameter	Standard M QTT3.3.1	Baidu Cloud	One NET
Device Name （Client ID ）	Client ID	DeviceKey	Device ID
username （ Device name ）	User Name	IoTCoreId/Device Key	Product ID
password （ Device secret ）	Password	DeviceSecret	Device Name/ User Password
PrductKey	Alibaba Cloud parameters, optional		
Publish a topic	M QTT publish topic address (dynamically generated by		

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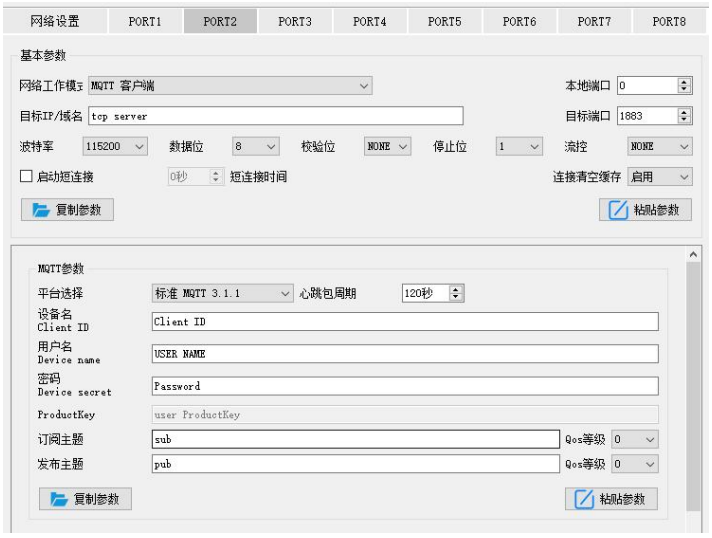
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	One NET)
Subscribe to a topic	M QTT subscription topic address (dynamically generated by One NET)

【Note】

- Dynamically generated topic addresses can use the same parameters to achieve the effect of data return. For example, OneNET publishes and subscribes to the same topic address: 1 23456 to achieve data return.
- Due to adjustments to the M QTT platform (Baidu Cloud, Huawei Cloud, OneNET), the connection cannot be made after the parameters are filled in. Please refer to the platform rules;

Take the standard MQTT3.1.1 parameter filling as an example, as shown below:



2) Alibaba Cloud

Supports using Alibaba Cloud's "three elements" to directly connect to the server. Obtain the "three elements" required to connect to Alibaba Cloud, as shown in the figure (only used for demonstration cases, users need to use self-built parameters to connect):



Configure Topic for communication testing:

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Configuration theme description:

Select the corresponding product, in "Custom To pic " under the To pic class list (please refer to the Alibaba Cloud documentation for detailed instructions), click "Define To pic class", configure the name to 1 234 and grant publish and subscribe permissions (for data transmission).

Configure the device connection parameters as shown in the following figure (the left figure is the configuration software tool, and the right figure is the web page configuration) :

{

"ProductKey": "a1GlhuTU1yN",

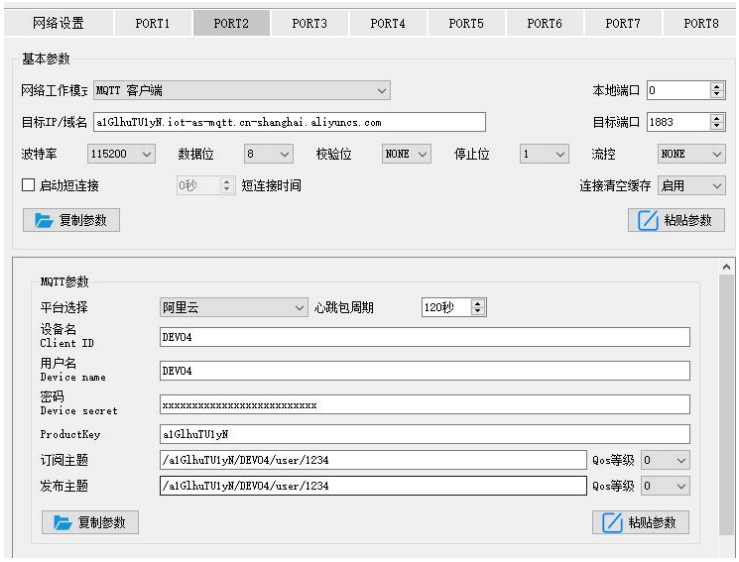
"DeviceName": "DEV04",

"DeviceSecret": "xxxxxxxxxxxxxxxxxxxxxxxxxx"

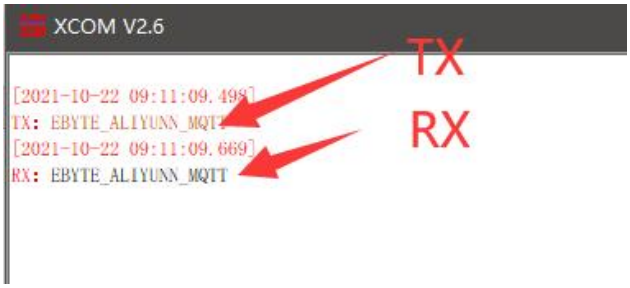
}

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

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



Alibaba Cloud M QTT platform communication test:



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4.5 Channel Port

Random Port:

TCP client, UDP client, HTTP client, and MQTT client can configure the local port to 0 (using a random local port). Random ports cannot be used in server mode, otherwise the client cannot establish a connection correctly (the device does not monitor the port correctly).

Using a random port connection can quickly reestablish the connection when the device accidentally disconnects from the server, preventing the server from rejecting the connection due to incomplete four waves. It is recommended to use a random port in client mode.

the device is configured in TCP client, HTTP client, or MQTT client mode in AT, a random port will be automatically configured, which can be canceled by customization .

Static Ports:

Device fixed port (factory default: 8001-8008), TCP server mode device listens to the configured port, accepts the client's connection request and establishes a connection for data communication, TCP client mode device fixed port initiates connection request.

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Chapter 5 Advanced Features

5.1Heartbeat packet and registration packet

5.1.1 Heartbeat Packet

In client mode, users can choose to send heartbeat packets and customize the heartbeat packet time. The heartbeat packet can be selected in two modes: network heartbeat packet and serial port heartbeat packet. It supports hexadecimal and ASCII code sending. This heartbeat packet is not an MQTT heartbeat. It needs to be turned off when using the MQTT client mode. The MQTT heartbeat can only be configured in the "Heartbeat Period" under the "MQTT Parameter Configuration" column. The content of the MQTT heartbeat packet is not open for configuration due to protocol constraints. It is recommended not to configure it for less than 60s. For example, the Alibaba Cloud manual recommends using 120s.

Heartbeat packet sending mode:

1. The heartbeat packet mode is disabled by default.
2. Serial port mode->The device sends heartbeat content to the serial port bus according to the set heartbeat time interval.
3. Network port mode->The device sends heartbeat content to the network port bus according to the set heartbeat time interval.

Customize the heartbeat packet content (maximum support 128 bytes (ASCII) data, 64 bytes (HEX) data)

Customize the heartbeat packet sending time interval. When set to 0, the heartbeat packet function is turned off. When the setting value is greater than zero, the heartbeat packet function is turned on. When turned on, the setting range is: (1-65536) seconds. The default value is 0.

5.1.2 Registration Package

In client mode, users can choose to send a registration package and customize the registration package time.

The registration package supports the following modes:

1. The network sends the MAC address (OLMAC) when establishing a connection with the device.

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2. The data of the custom registration packet (OLCSTM) is sent when the network establishes a connection with the device.
3. After the network establishes a connection with the device, the MAC address (EMBMAC) is added to the front of each data packet sent by the device to the network.
4. After the network and the device are connected, each data packet sent by the device to the network is preceded by custom registration packet data (EMBCSTM).

Customize the registration package content (maximum support 128 bytes (ASCII) data, 64 bytes (HEX) data)

[Note] It is recommended not to use special characters (such as "," "\" "/", etc.) when configuring the registration package. If you want to use it, it is recommended to use hexadecimal configuration .

5.2 Short connection

In client mode, network short connections are supported (this function is disabled by default). TCP short connections are mainly used to save server resource overhead and are generally used in multi-point (multi-client) to one-point (server) scenarios.

The TCP short connection function is applied in TCP Client mode. After the short connection function is turned on, the device will automatically disconnect if the serial port does not receive data or the network port does not send or receive data within the set time after the connection is successfully established.

When the short link hold time is set to 0, the short link function is turned off. When the setting range is (2-255) seconds, the short link function is turned on, and the default hold time is 0 seconds (short link is turned off).

5.3 Serial port cache clearing

When the TCP connection is not established, the data received by the serial port will be placed in the buffer area. The serial port receiving buffer is 1024 bytes. After the network connection is successful, you can choose to clear the serial port buffer or send the buffer through the network through configuration.

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

Disable: The network will receive data from the serial port buffer after the connection is

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established .

5.4 Modbus Gateway

5.4.1 Protocol conversion



Enable: Verify Modbus data, discard non-Modbus data (R TU/TCP) and do not transmit, and convert Modbus RTU protocol to Modbus TCP protocol.

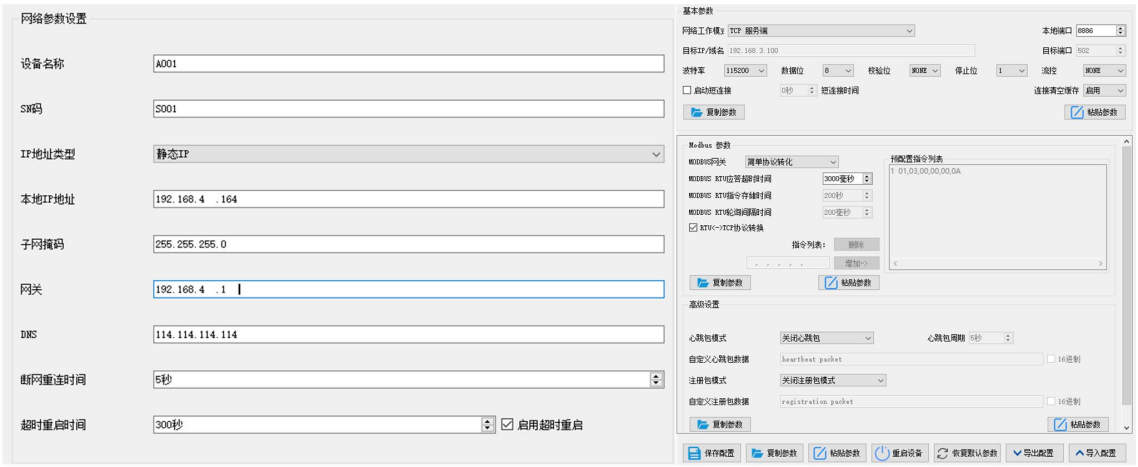
Disable: No protocol conversion is performed but the Modbus data is verified, and non-Modbus data (RTU /TCP) is discarded and not transmitted.

5.4.2 Simple Protocol Conversion

Modbus RTU data to Modbus TCP data, or convert Modbus TCP data to Modbus RTU data, and realize the conversion between Ethernet Modbus data and serial port Modbus data.

Simple protocol conversion can work in any mode (TCP client, TCP server, U DP client, U DP server, MQTT client). This gateway mode does not support multi-host operation. If you need multiple hosts, please use "storage gateway" and "multi-host mode".

Simple protocol conversion configuration:

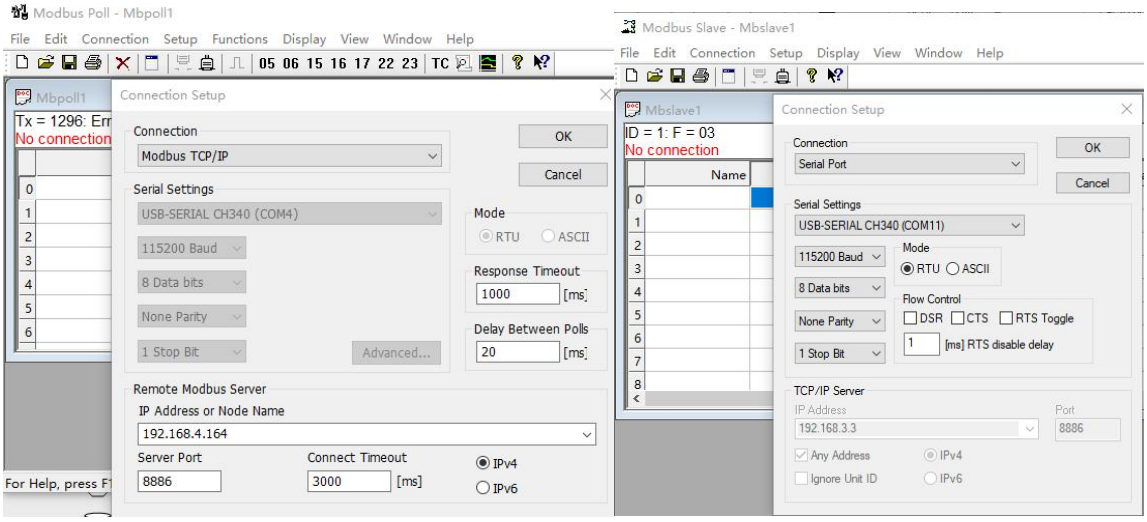


Modbus Poll and Modbus Slave software debugging:

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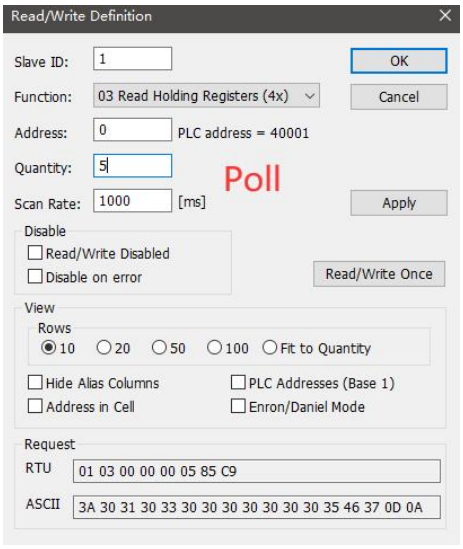
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Software connection settings:

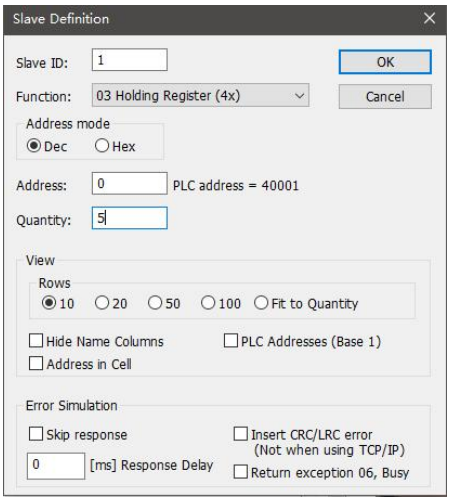


Software register reading and simulation configuration:

Select Set up →Read/Write Definition from the Poll menu



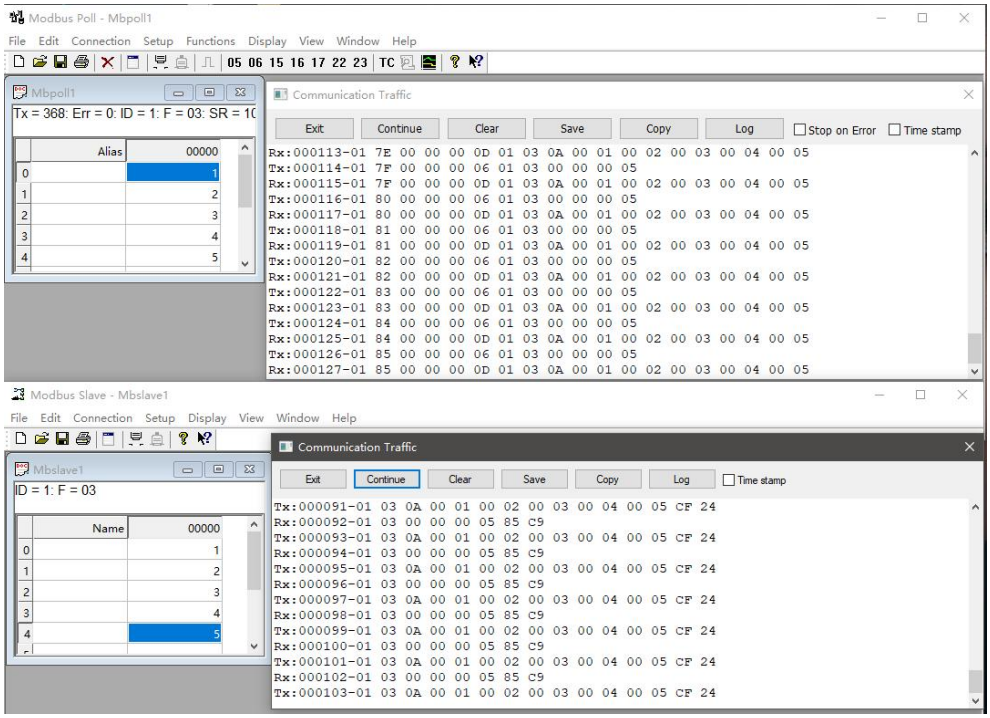
Select Set up →Slave Definition from the Slave menu



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Communication Demo:



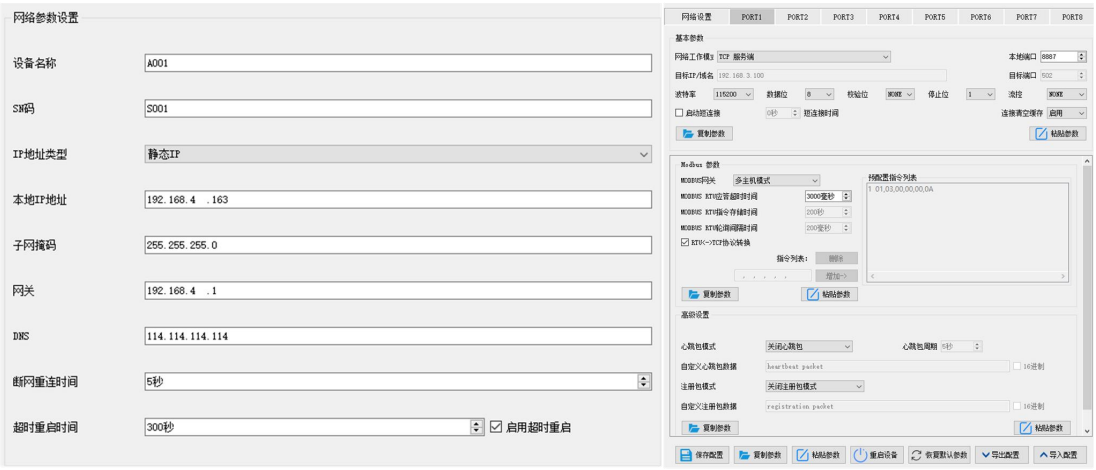
5.4.3 Multi-host mode

Relatively simple protocol conversion can only have one Modbus master station, while the multi-host mode can access multiple Modbus TCP hosts at the same time. When multiple Modbus hosts access at the same time, the Modbus gateway will schedule the bus occupancy (RS -485 bus can only process one request at a time, while the multi-host mode will sort and process according to the TCP request , and other links will wait), thereby solving the bus conflict problem (currently supports up to 9 Modbus in single server mode). T CP host connection, when multiple hosts are connected at the same time, attention should be paid to the matching of request interval and timeout time, otherwise the serial port transmission rate is much lower than the Ethernet transmission rate, resulting in packet loss. If fast response is required, it is recommended to use "storage gateway"), which only supports working in T CP server mode, and the slave can only be connected at the serial port, otherwise it will not work properly.

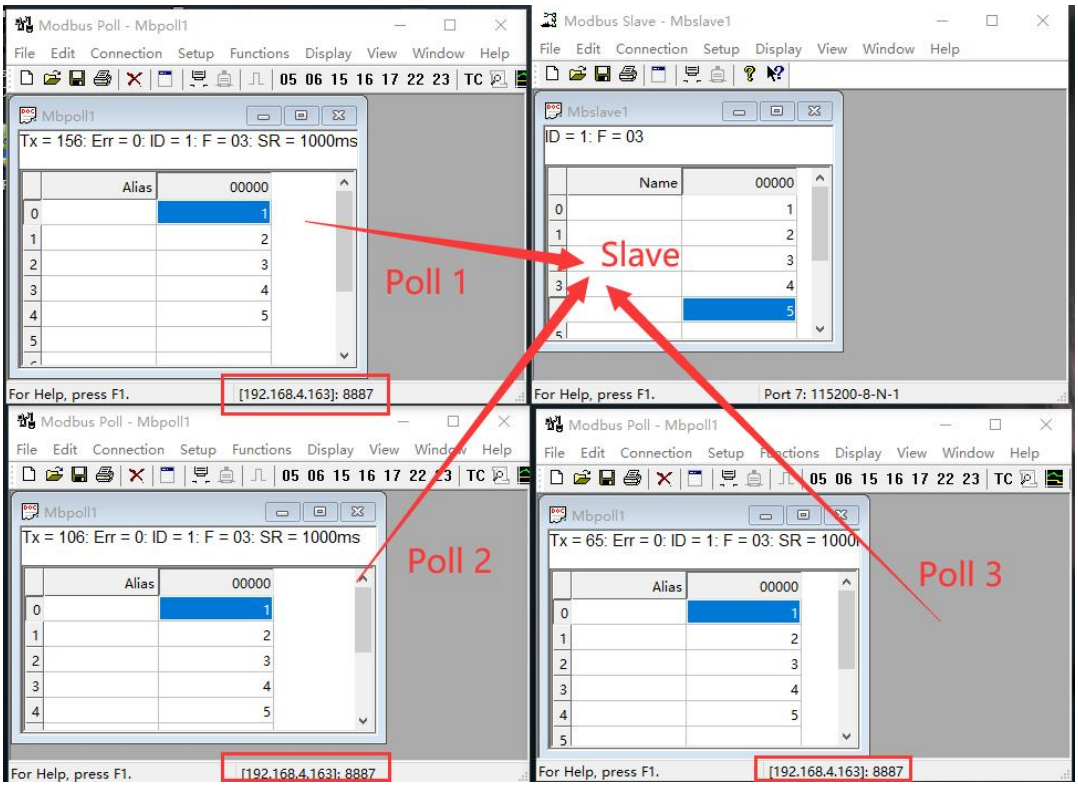
As the number of hosts increases, the Modbus timeout should be increased accordingly. If multiple hosts are required to make continuous high-speed requests, it is recommended to use a "storage gateway". It is recommended to configure it as "simple protocol conversion" when there are no multiple hosts.

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For software configuration and register configuration, refer to "Simple Protocol Conversion" and enable multiple Modbus Poll software at the same time (taking 3 channels as an example, a single server model can support up to 9 channels).

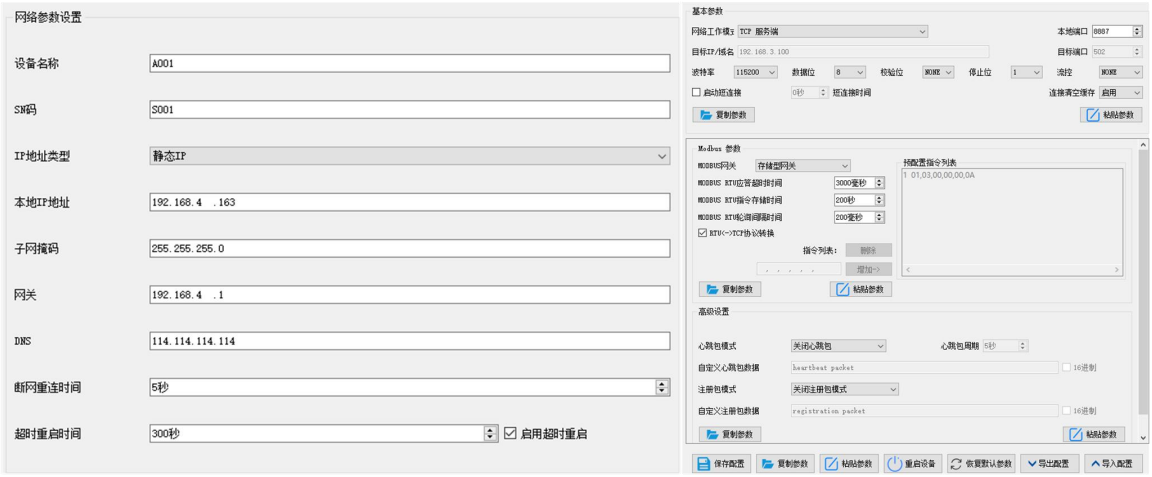


5.4.4 Storage Gateway

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

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

Features:

（1） The gateway has a 3K cache for storing instructions and return results (taking 10 holding registers as an example, it can store about 67 instructions and return results);

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

（3） The polling interval can be customized, 0 -65535 ms (default: 200ms) ;

（4） TU device according to the storage time of the command used for configuration . If the MODBUS host does not query the command again within the storage time, the gateway will automatically delete the stored command to release the cache;

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

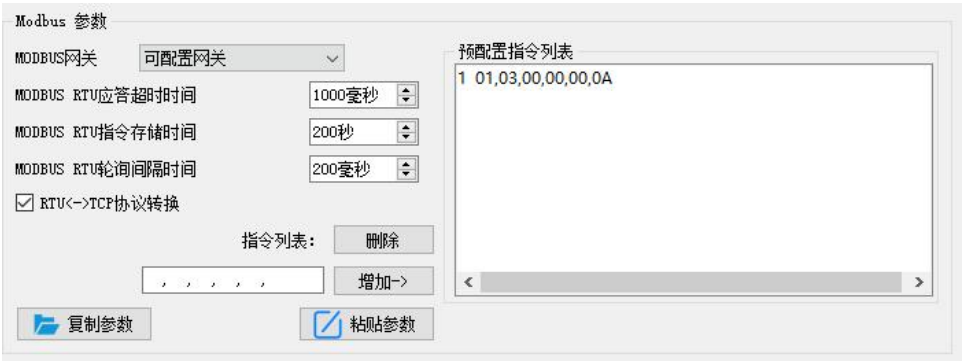
（6） Only supports 01 , 02 , 03 , 04 Mode bus function code query result storage;

5.4.5 Configurable Gateway

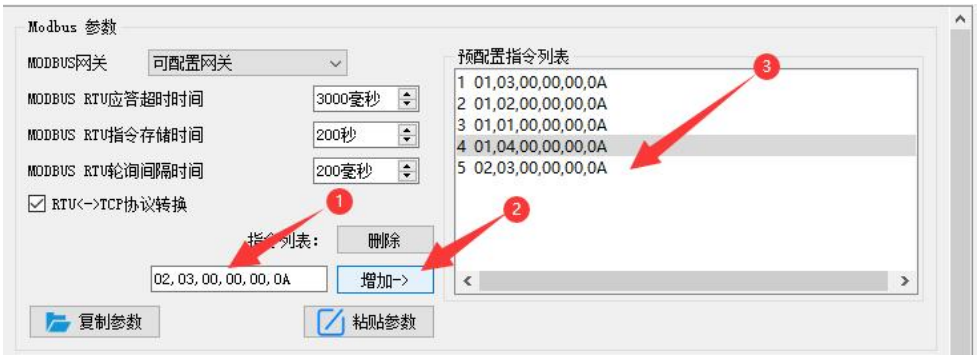
The gateway automatically polls the RTU device register according to the pre-configured MODBUS instructions (only supports the configuration of MODBUS read instructions). Instructions not in the storage table will directly operate the RTU device. Frequently read instructions can be stored in the gateway in advance, which can shorten the response time (query configuration instructions). Data will not be sent directly to the server and will only be returned after a Modbus host request. Similar to the use of "simple protocol conversion", if you need to automatically upload data to the server, please select "automatic upload". Due to the above characteristics, the serial port side of the configurable gateway can only connect to the Modbus slave station.

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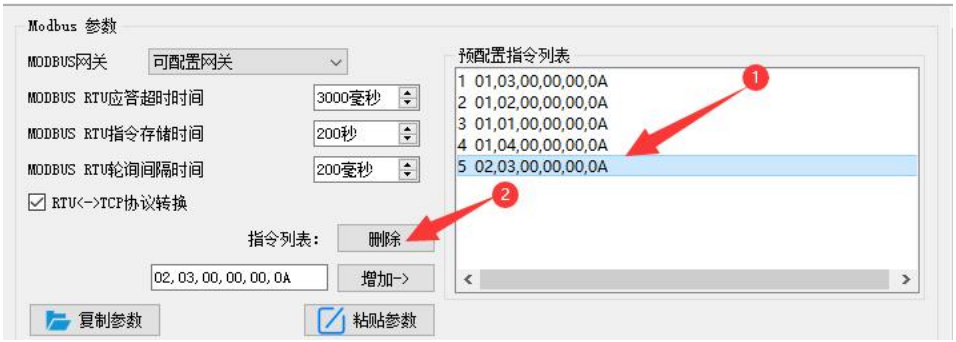
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Instruction storage description (added, instruction errors and format errors cannot be added):



Instruction storage description (deleted):



5.4.6 Automatic upload

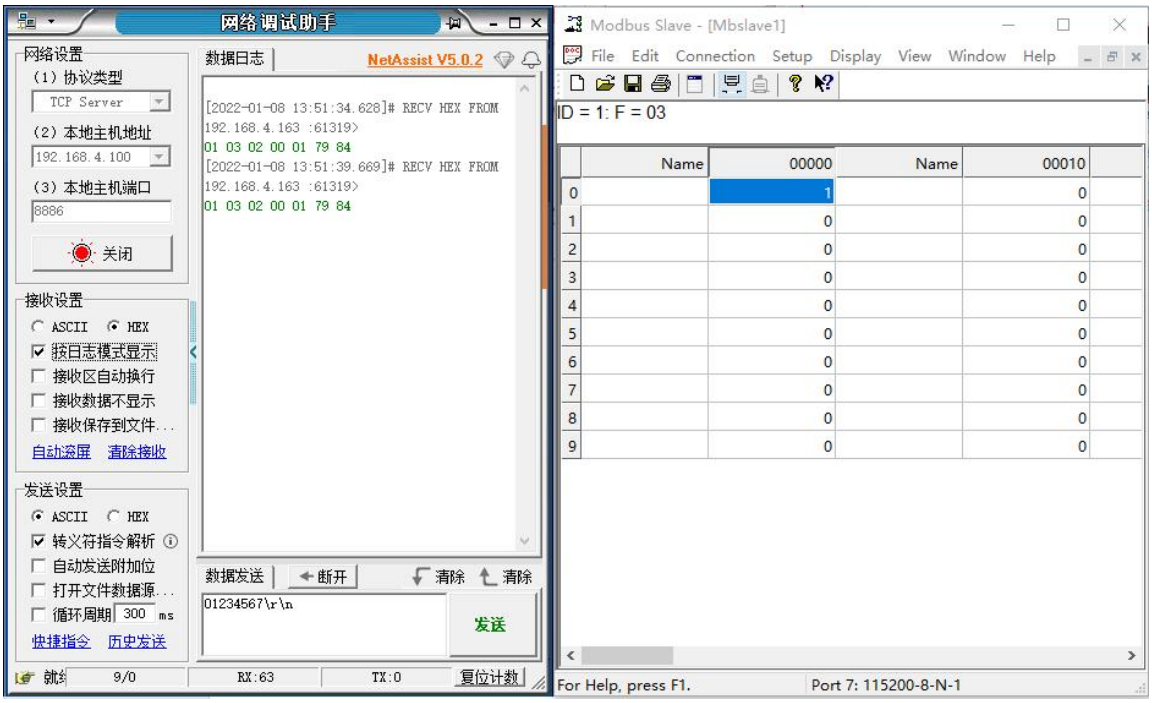
In client mode (TCP client, UDP client, MQTT client, HTTP client), the gateway will automatically poll the instructions in the stored instruction table and upload them to the server. You can select the feedback format (Modbus RTU format or Modbus TCP format) and the instruction polling interval (0-65535ms) according to your needs.

For pre-storage of instructions, refer to "Configurable Gateway - Instruction Storage Instructions" and automatically upload the configuration to the configuration software tool/web page:

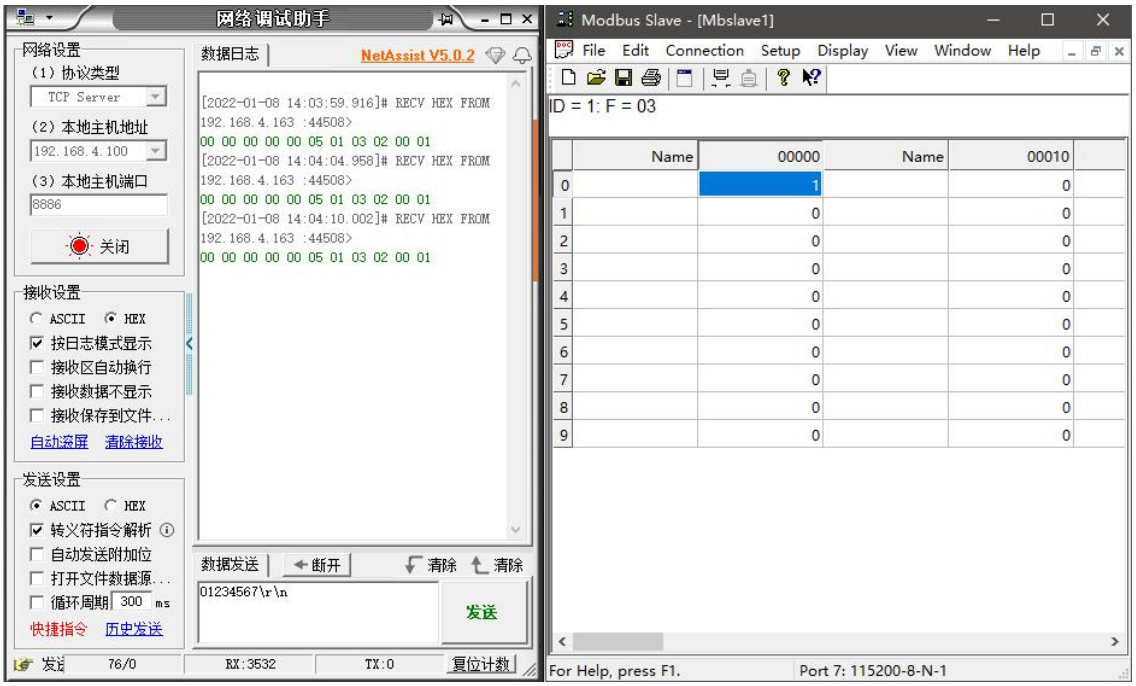
TCP client demonstration (Modbus RTU format):

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TCP client demonstration (Modbus TCP format):



5.5 Firmware Upgrade

Users can upgrade the device firmware through the "Ebyte Network Configuration Tool" .

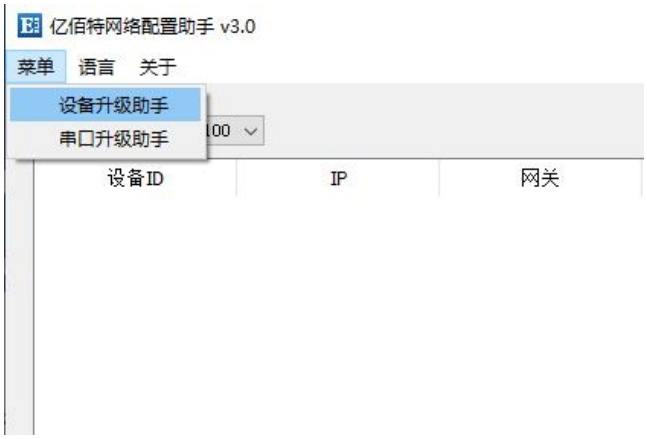
5.5.1UDP Upgrade

Step 1: Open the "Ebyte Network Configuration Tool" and select "Device Upgrade Assistant" under

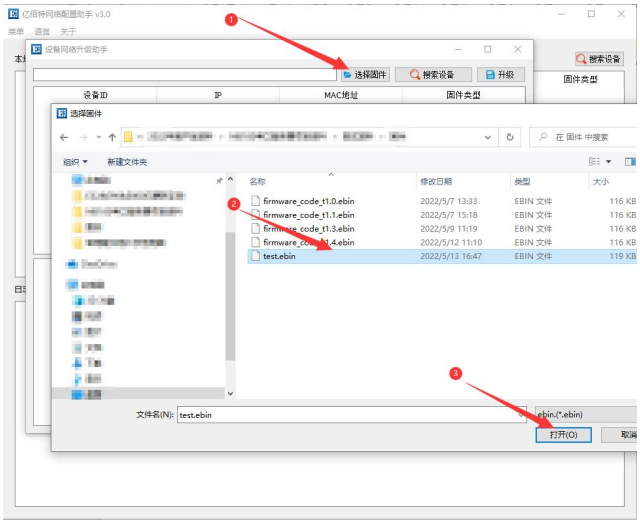
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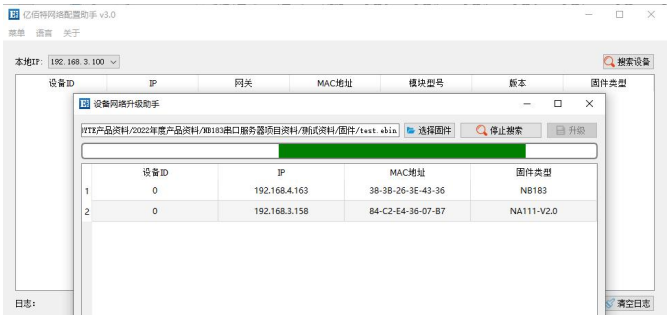
the "Menu" option;



Step 2: Select the firmware you want to use. You need to obtain it from the "Related Downloads" of the corresponding product details on the official website (www.ebyte.com) . The firmware used for demonstration is not provided on the official website.



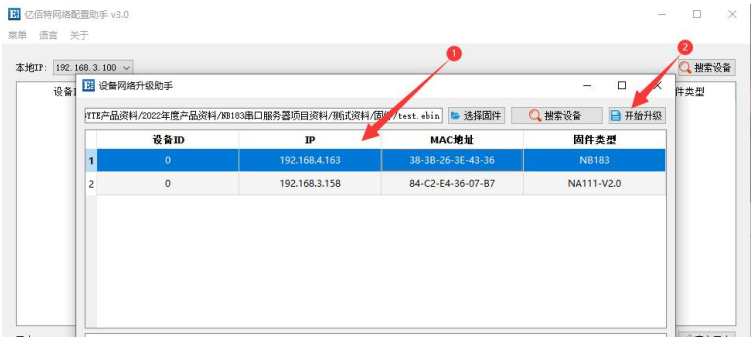
Step 3: Click "Search Device", the device list will show the currently found devices, click "Stop Search" again.

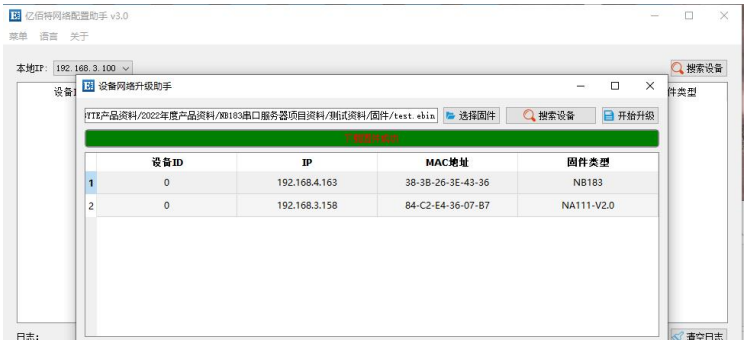


Select the device to be upgraded and click Start Upgrade. Wait for the configuration software tool to display the upgrade completion.

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5.5.2 Serial port upgrade

Only channel 1 (i.e. serial port 1, which can use RS232 interface/ RS485 interface) supports upgrading via serial port. When network upgrading fails or the network environment is complex, it is recommended to use serial port for upgrading ;

Step 1: Make sure the device is powered off and connect serial port 1 correctly;

Step 2: Open the "Ebyte Network Configuration Tool", select "Serial Port Upgrade Assistant" under the "Menu" option, select the corresponding serial port and click "Open Serial Port";

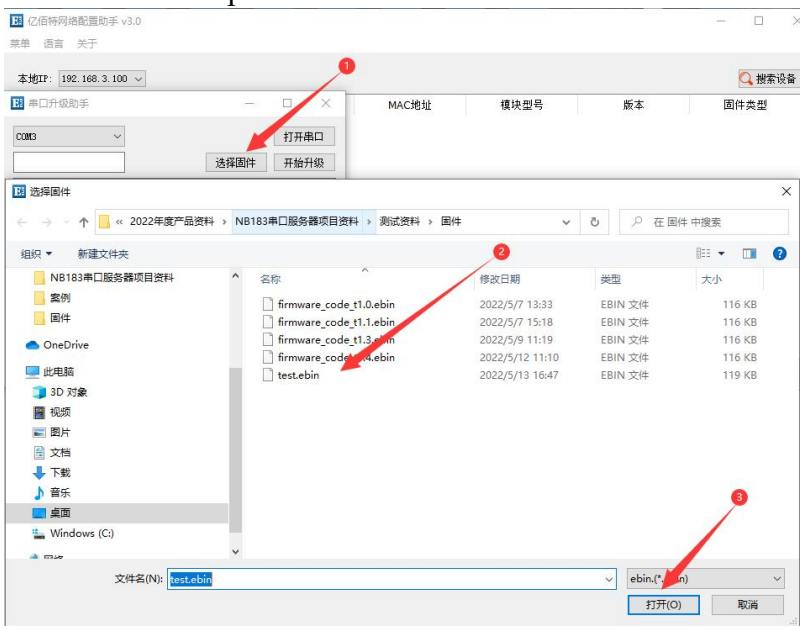


Step 3: Select the firmware you want to use. You need to obtain it from the "Related Downloads" of the corresponding product details on the official website (www.ebyte.com) . The

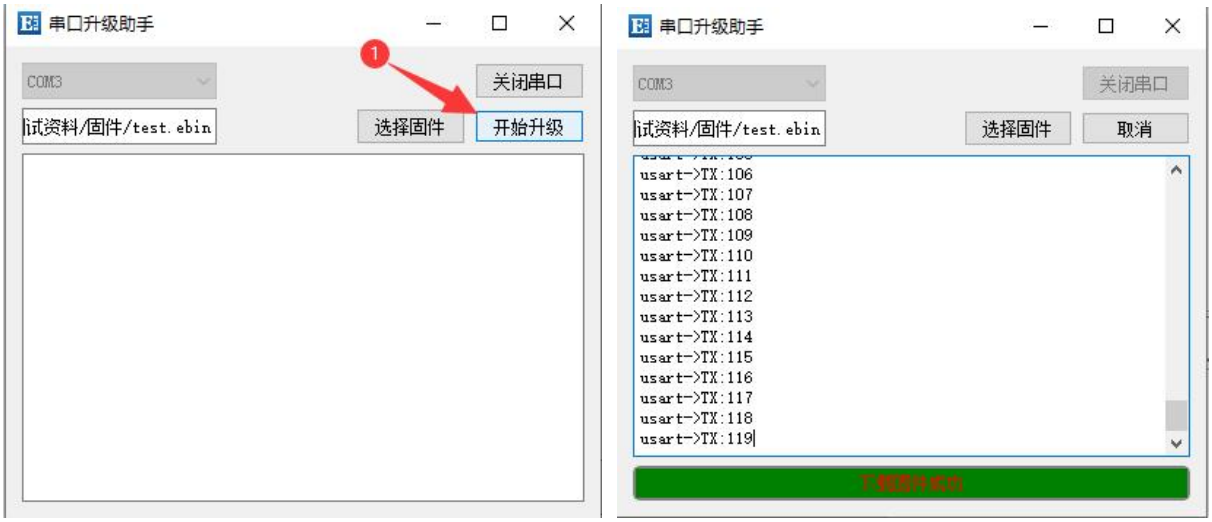
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firmware used for demonstration is not provided on the official website.



Step 4: Click "Start Upgrade", pull down the Re load pin of NS8-V2 and then turn on the device power. After waiting for the firmware upgrade to complete, click "Cancel" to end the serial port upgrade.



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Revision History

Version	Revision Date	Revision Notes	Maintainer
1.0	2025-5-26	Initial release	LYL
1.1	2025-7-29	Update the hardware reference design circuit	ZYD
1.2	2025-12-24	Update the dimension drawing	ZYD

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