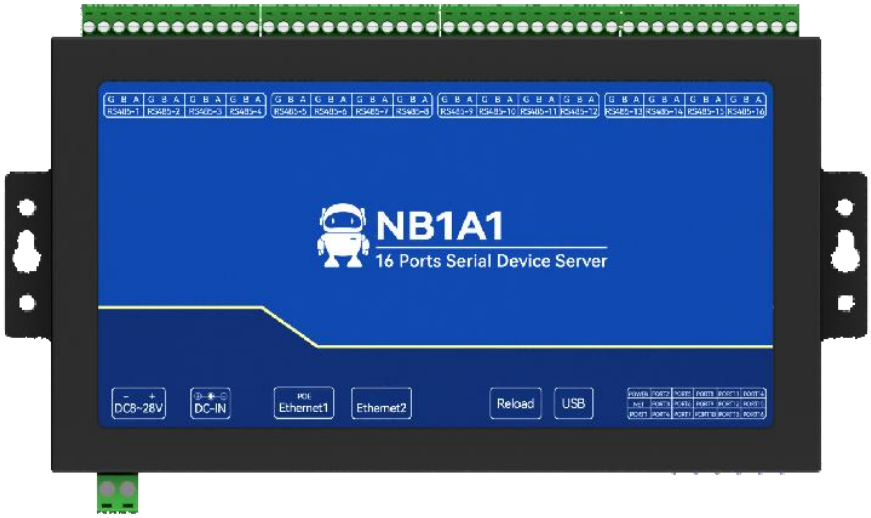


NB1A1

16 Serial Server User Manual

Chengdu Ebyte Electronic Technology Co.,Ltd.

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Catalog

Chapter1 Introduction 1
1.1 Features 1
Chapter 2 Quick Start 2
2.1 Hardware preparation 2
2.2 Sotware preparation 2
2.3 Device Test Procedure 3
2.3.1 Connect hardware 3
2.3.2 Device parameters settings 4
2.3.3 Open the serial debugging assistant 5
2.3.4 Opening the Network Assistant 6
2.3.5 Sending and receiving data test 7
Chapter 3 Product Overview
3.1 Technical parameters 7
3.2 Interface description 9
3.3 Indicator Description 11
3.4 Size 15
Chapter 4 Basic function 16
4.1 Mapping between Channels and serial ports 16
4.2 Local network parameter 16
4.2.1 Local IP address 16
4.2.2 DNS(Domain name resolution) 17
4.2.3 Disconnection and reconnection period 17
4.2.4 Timeout restart (restart without data) 17
4.3 Hardware factory recovery 17
4.4 Device Working Mode 18
4.4.1 TCP Server 18
4.4.2 TCP Client 18
4.4.3 UDP Server 18
4.4.4 UDP Client 19
4.4.5 HTTP client 19
4.4.6 MQTT Client 20
4.4.7 Port Mapping 22
4.5 Channel terminal 22
Chapter 5 Advanced functions 23
5.1 Heartbeat packet and registration packet 23
5.1.1 Heartbeat packet 23
5.1.2 registration packet 23
5.2 Short connection 24
5.3 Serial cache clearing 24
5.4 Modbus Gateway 25
5.4.1 Protocal conversion 25
5.4.2 Simple Protocol Conversion 25
5.4.3 Multi-Host Mode 27

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5.4.4 Storage Gateway 28
5.4.5 Configurable gateway 29
5.4.6 Upload Automatically 30
5.5 Firmware upgrade 31
Revise History 33
About Us 33

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Chapter1 Introduction

NB1A1 is a series of serial port server products independently developed by EBAite, which can realize bi-directional transparent transmission of data from 16 serial ports to Ethernet ports. Support Modbus protocol conversion, multi-host gateway, storage gateway and other data conversion functions. At the same time, it also supports the upload of on-site data to the cloud server to achieve cloud monitoring. The equipment adopts industrial design standards to ensure stability in harsh working environments.

It supports the fast configuration of host computer and AT command, which can realize the fast debugging and installation of equipment.

Widely used in computer room monitoring, environmental monitoring, intelligent traffic, road gate control, intelligent express cabinets and other industries.

1.1 Features

- Industrial design is stable and reliable, port isolation protection design;
- 16 independent RS485 ports are supported.
- Support a variety of Modbus gateway modes, multi-host, storage, configurable gateway;
- Supports active ModBus data reporting.
- Supports two network ports and switch cascading.
- Supports POE power supply；
- Support access standard MQTT, OneNET, Baidu Cloud, Huawei Cloud, Alibaba Cloud;
- Rich LED status indicator, real-time indication of equipment working status;
- Support host computer, AT command configuration and other configuration methods;
- Support terminal or DC head power supply, 8-28V DC wide voltage input, support reverse protection;
- The baud rate ranges from 1200 to 460800bps；
- Supports serial heartbeat packets, network heartbeat packets, and registration packets.
- Each way supports working modes: TCP client, TCP server, UDP client, UDP server, MQTT client, HTTP client;
- 16 servers can be enabled at the same time, and each server supports eight clients.
- supports HTTP client mode;
- Support remote upgrade, easy customization and optimization;
- Supports virtual serial port software.

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Chapter 2 Quick Start

2.1 Hardware preparation

A laptop with RJ45 network port and USB interface;
NB1A1 serial server one;
DC12V 1A power adapter;
A network cable;
One USB to RS485 converter;
The following figure shows the hardware devices to be prepared：

		
Computer	Net cable	NB1A1
		
DC 12V1A	USB to RS45	Conductor cables

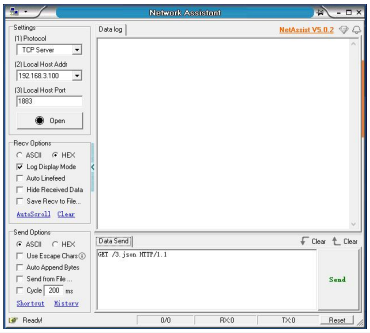
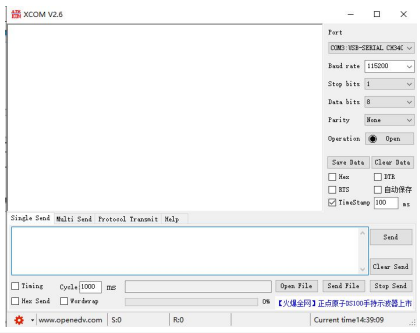
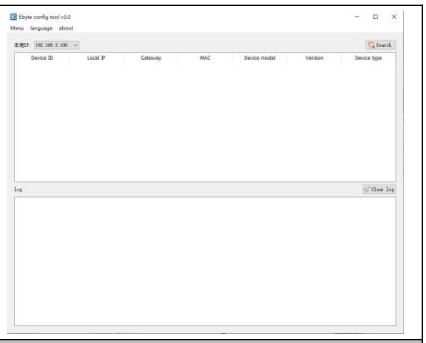
Note: The Quick Start shows only one RS485 port.

2.2 Sotware preparation

Serial Debugging Assistant (XCOM), Network Debugging Assistant (NetAssist), EBAite network configuration tool (configure the host computer), official website address：www.ebyte.com，Product details provides a download interface.

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Network Assistant	XCOM	Ebyte configuration software

[Note] The version of the host computer shown in the manual may be different from that provided by the official website. The host computer provided by the official website shall prevail.

2.3 Device Test Procedure

This quick Start guide uses RS485 channel 1 as an example to describe how to configure other channels.

2.3.1 Connect hardware



1. Connect serial port server network port and computer network port with network cable;
2, use the USB to RS485 converter to connect the USB port of the computer and the RS485 interface of the serial port server (A to A, B to B); (If the serial port cannot be identified, install the corresponding driver.)
3. Use a power adapter (DC 8-28V) to power on the serial port server device. After powering on the device, observe whether the indicator is normal.
4. Confirm that the status is correct and proceed to the next configuration;

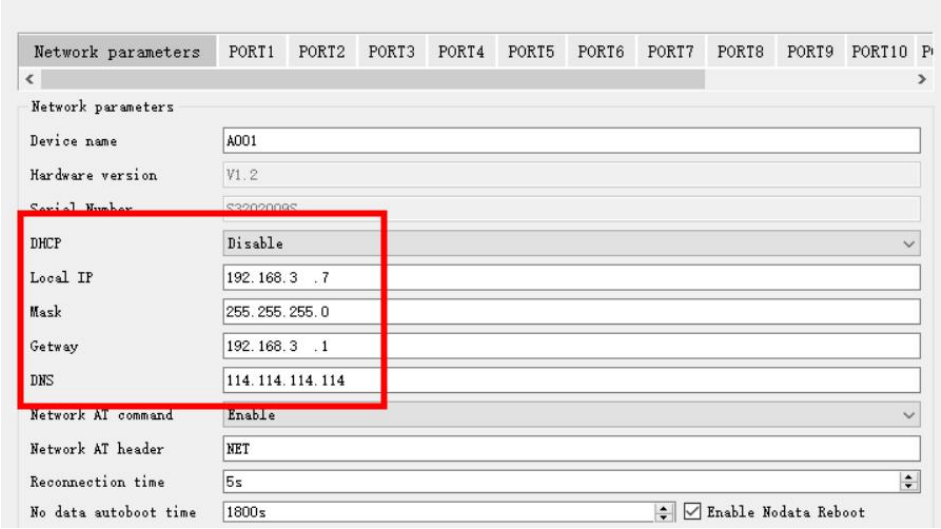
Note: The power-on and power-on process is expected to take about 50 seconds. Wait for the NET indicator to blink quickly, indicating that the device is powered on.

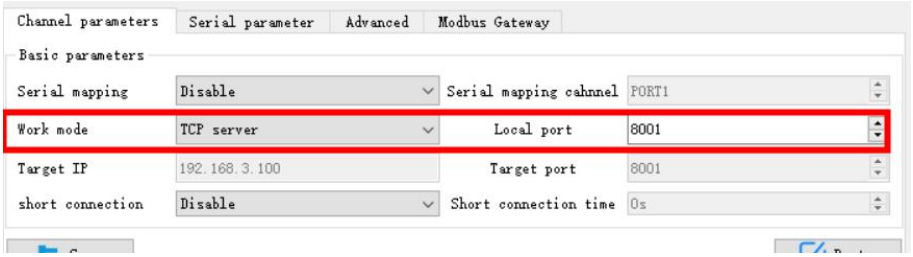
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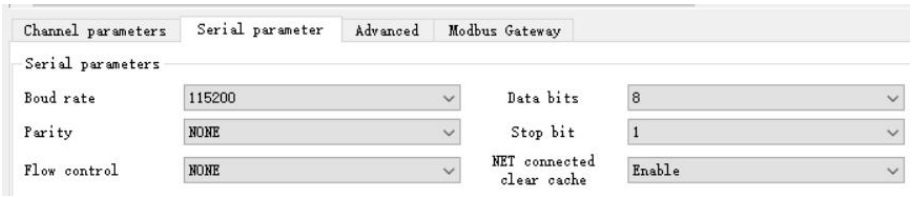
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2.3.2 Device parameters settings

We tested transparent data transfer using the default parameters of the serial server. Open the configuration software, click Search device, select the device, and check the following parameters：





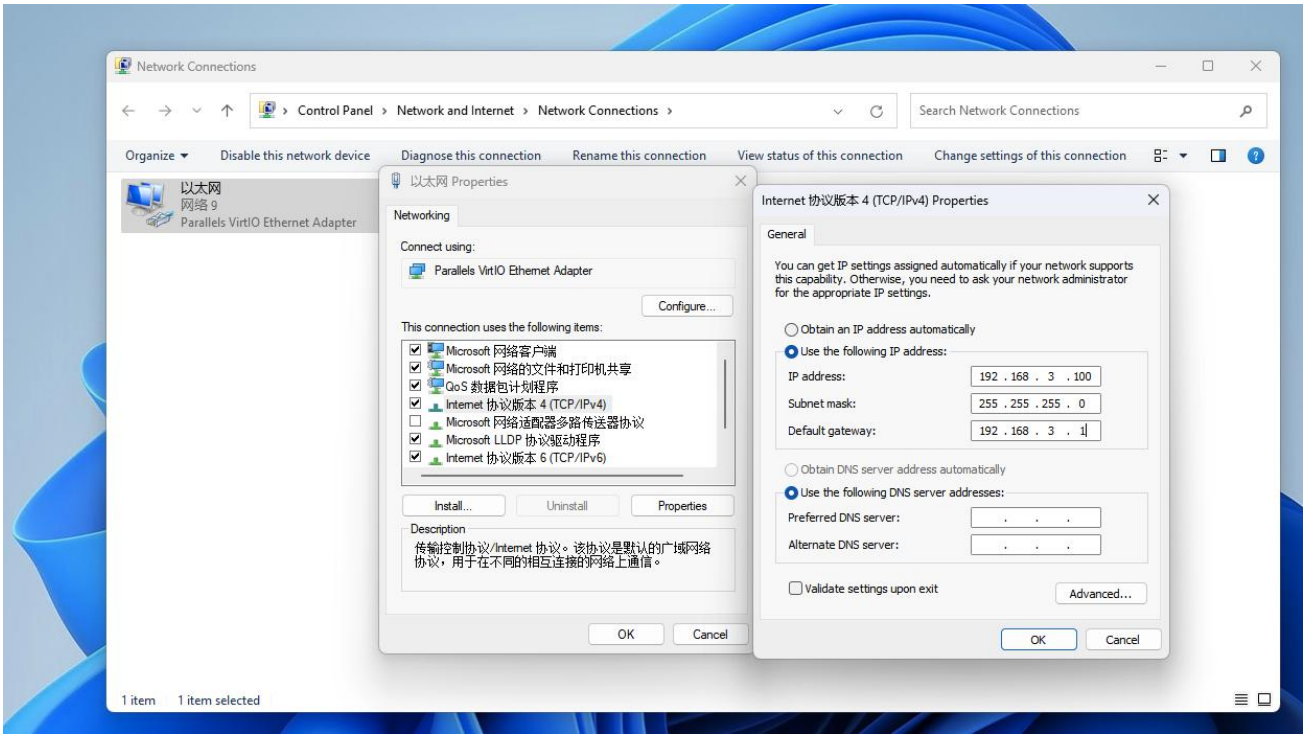


Change the computer IP address as follows: 192.167.3.100.

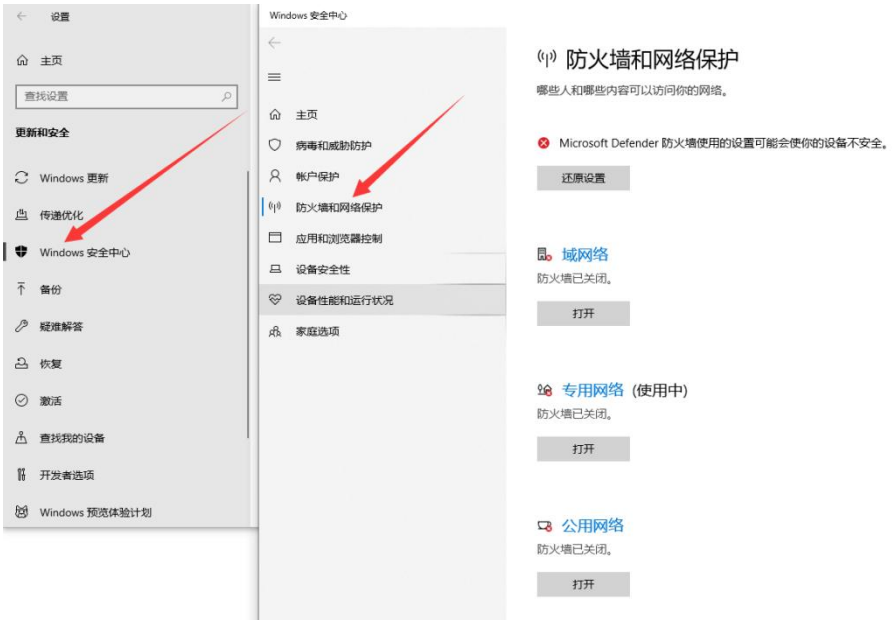
Ensure that the PC IP address and serial port server IP address are in the same network segment, and the IP address must be different. The method is shown in the following figure.

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Note: If the communication is not successful, the user can try to close the firewall of the computer and try again, as shown in the following figure：

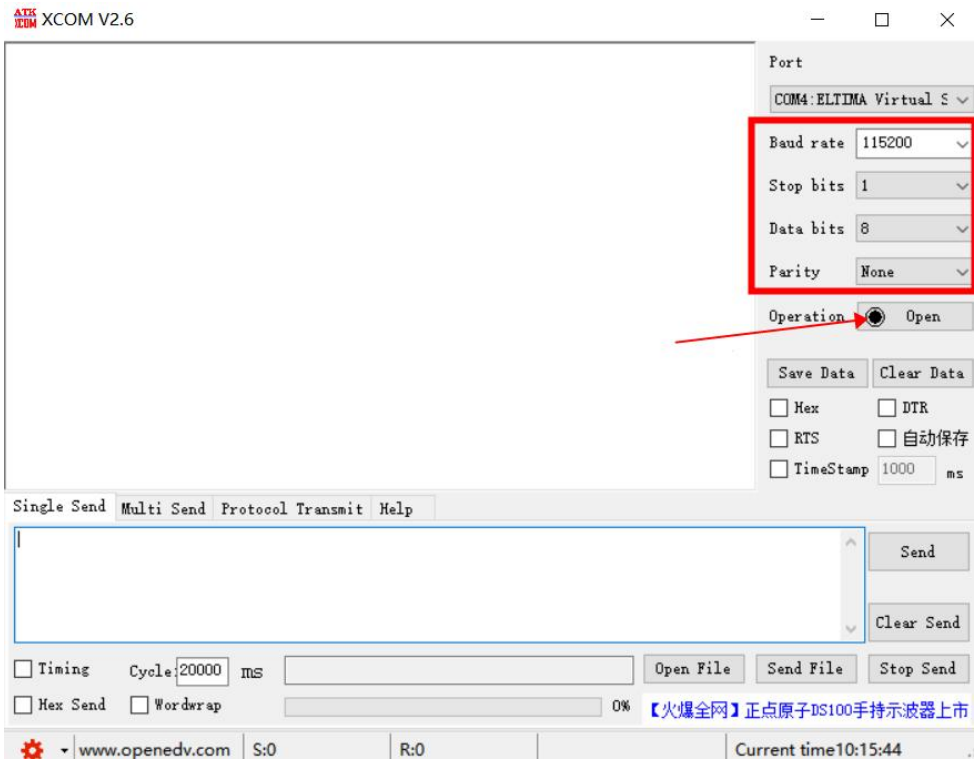


2.3.3 Open the serial debugging assistant

Start the XCOM V2.6 software, select the correct serial port number, set the current serial port parameters of the device (the default value is 115200-8N1), and open the serial port, as shown in the following figure：

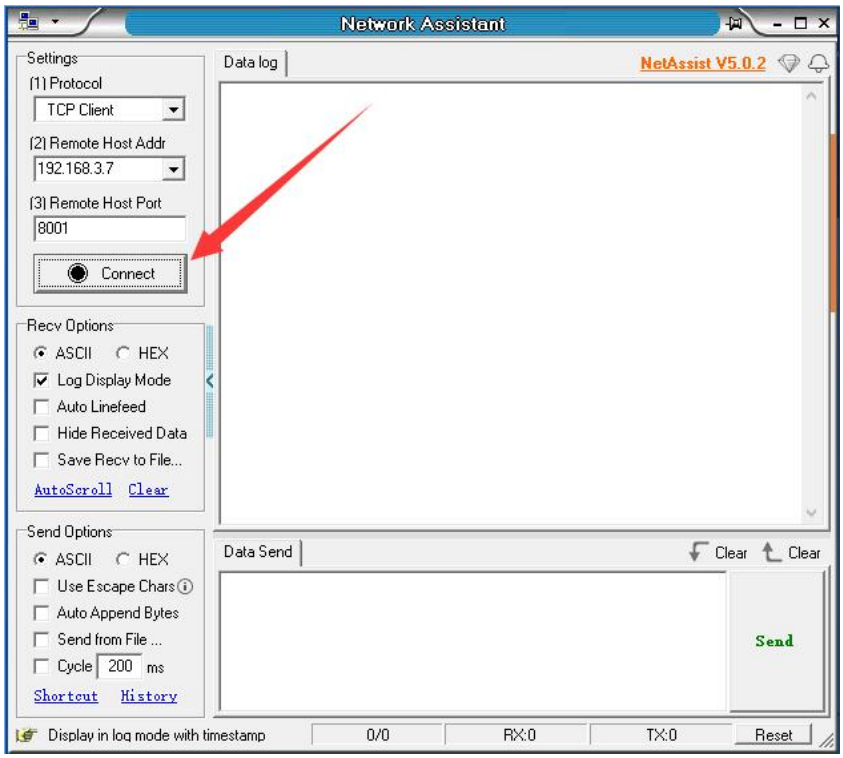
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2.3.4 Opening the Network Assistant

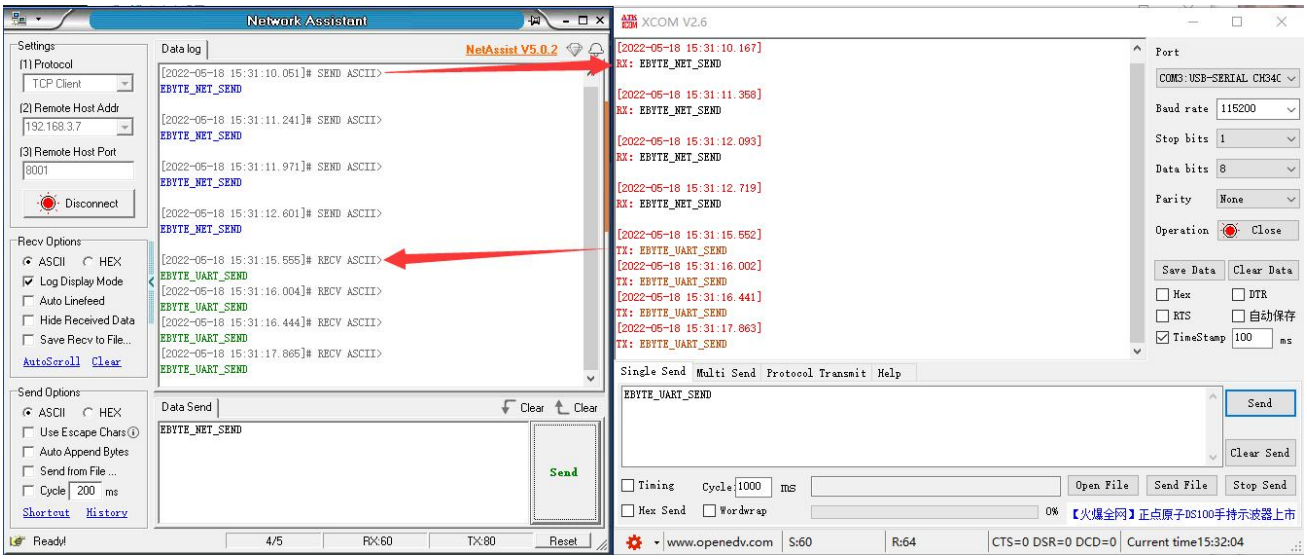
Open the Network assistant software, select the "TCP Client" mode, set the remote IP address to "192.168.3.7" and the remote port to "8001", and click the Connect button, as shown in the following figure：



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2.3.5 Sending and receiving data test

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



Chapter 3 Product Overview

3.1 Technical parameters

Items	Innterface	Description
power	terminal	Dc 8 ~ 28 V, the two interfaces cannot supply power at the same time; Wire terminal: 2pin phoenix terminal; DC seat: straight insert round hole, outer diameter 5.5mm, inner diameter 2.0mm；
	DC block	
Net interface	RJ45	100/10M adaptive network port Support switch function Ethernet 1 supports POE power supply
Serial port	Channel 1 to channel 16	RS485, 3.81mm Phoenix terminal, support isolation
Working mode	TCP Server、TCP Client、UDP Server、UDP Client、HTTP Client、MQTT Client（Default TCP Server）	
Internet protocal	IP、TCP/UDP、IPv4、ICMP、APR、DHCP、DNS、HTTP、MQTT	
IP acquisition	DHCP, Static IP (default static IP)	

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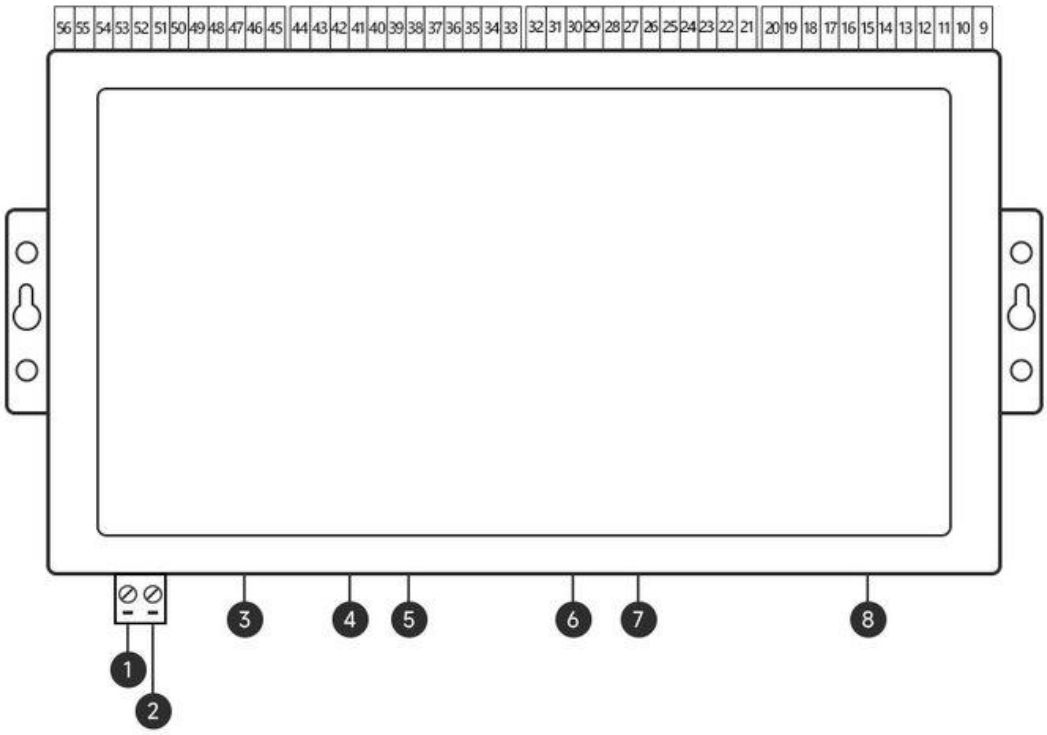
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mode	
Domain name resolution	The value can be a maximum of 128 bytes
Configuration way	Configure tools, AT commands, and network ats
IP address	Customizable (default, 192.168.3.7)
Local port	Customizable (default, channel 1 ~ Channel 16:8001-8016)
Subnet mask	Customizable (default, 255.255.255.0)
Gateway	Customizable (default, 192.168.3.1)
Serial port packaging mechanism	512 Byte
Serial baud rate	1200～460800 bps（default 115200）
Data bit	8
Stop bit	1、2（default 1）
Check bit	None、Odd、Even（default None）
Installation mode	Positioning hole installation
Product size	226mm * 130mm * 28.5mm （L*W*H）
Product weight	720g ± 5g
Operating temperature and humidity	-20 ~ +65℃, 5% ~ 95%RH (no condensation)
Storage temperature and humidity	-30 ~ +75℃, 5% ~ 95%RH (no condensation)

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3.2 Interface description



No.	Name	Function	Description
1	-	DC 8-28 V negative terminal	Dc 8-28 V, 2*5.08mm Phoenix terminal input;Do not supply power at the same time as the socket;
2	+	DC8-28 V Positival terminal	Dc 8-28 V, 2*5.08mm Phoenix terminal input;Do not supply power at the same time as the socket;
3	DC-IN	Dc power input	DC 8-28 V； Straight insert round hole, outer diameter 5.5mm, inner diameter2.0mm； Do not supply power to terminals at the same time；
4	Ethernet 1	Enthernet Interface	Standard RJ45 Ethernet interface, 10/100M adaptive, switch function, cascading

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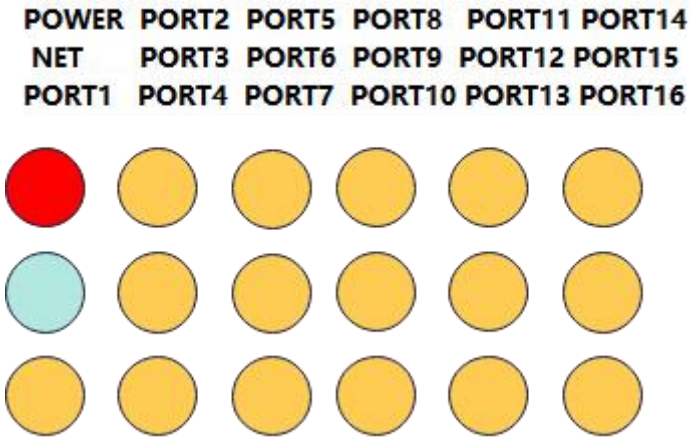
5	Ethernet 2	Enthernet Interface	Standard RJ45 Ethernet port, 10/100M adaptive, POE power supply
6	Reload	Factory reset button	After long press 5-10Ss, all leds except NET will be on for 1s, and the device will be restored to factory
7	USB	Factory burning interface	Micro USB
8	LED	LED indicator light	See indicator description for details
9	RS485-16-A	Channel16-RS485interfaceA	3.81mmPhoenix terminal
10	RS485-16-B	Channel16-RS485interfaceB	3.81mmPhoenix terminal
11	RS485-16-G	Channel16-RS485interfaceG	3.81mmPhoenix terminal
12	RS485-15-A	Channel15-RS485interfaceA	3.81mmPhoenix terminal
13	RS485-15-B	Channel15-RS485interfaceB	3.81mmPhoenix terminal
14	RS485-15-G	Channel15-RS485interfaceG	3.81mmPhoenix terminal
15	RS485-14-A	Channel14-RS485interfaceA	3.81mmPhoenix terminal
16	RS485-14-B	Channel14-RS485interfaceB	3.81mmPhoenix terminal
17	RS485-14-G	Channel14-RS485interfaceG	3.81mmPhoenix terminal
18	RS485-13-A	Channel13-RS485interfaceA	3.81mmPhoenix terminal
19	RS485-13-B	Channel13-RS485interfaceB	3.81mmPhoenix terminal
20	RS485-13-G	Channel13-RS485interfaceG	3.81mmPhoenix terminal
21	RS485-12-A	Channel12-RS485interfaceA	3.81mmPhoenix terminal
22	RS485-12-B	Channel12-RS485interfaceB	3.81mmPhoenix terminal
23	RS485-12-G	Channel12-RS485interfaceG	3.81mmPhoenix terminal
24	RS485-11-A	Channel11-RS485interfaceA	3.81mmPhoenix terminal
25	RS485-11-B	Channel11-RS485interfaceB	3.81mmPhoenix terminal
26	RS485-11-G	Channel11-RS485interfaceG	3.81mmPhoenix terminal
27	RS485-10-A	Channel10-RS485interfaceA	3.81mmPhoenix terminal
28	RS485-10-B	Channel10-RS485interfaceB	3.81mmPhoenix terminal
29	RS485-10-G	Channel10-RS485interfaceG	3.81mmPhoenix terminal
30	RS485-9-A	Channel9-RS485interfaceA	3.81mmPhoenix terminal
31	RS485-9-B	Channel9-RS485interfaceB	3.81mmPhoenix terminal
32	RS485-9-G	Channel9-RS485interfaceG	3.81mmPhoenix terminal
33	RS485-8-A	Channel8-RS485interfaceA	3.81mmPhoenix terminal
34	RS485-8-B	Channel8-RS485interfaceB	3.81mmPhoenix terminal
35	RS485-8-G	Channel8-RS485interfaceG	3.81mmPhoenix terminal
36	RS485-7-A	Channel7-RS485interfaceA	3.81mmPhoenix terminal
37	RS485-7-B	Channel7-RS485interfaceB	3.81mmPhoenix terminal
38	RS485-7-G	Channel7-RS485interfaceG	3.81mmPhoenix terminal
39	RS485-6-A	Channel6-RS485interfaceA	3.81mmPhoenix terminal
40	RS485-6-B	Channel6-RS485interfaceB	3.81mmPhoenix terminal
41	RS485-6-G	Channel6-RS485interfaceG	3.81mmPhoenix terminal
42	RS485-5-A	Channel5-RS485interfaceA	3.81mmPhoenix terminal
43	RS485-5-B	Channel5-RS485interfaceB	3.81mmPhoenix terminal
44	RS485-5-G	Channel5-RS485interfaceG	3.81mmPhoenix terminal

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45	RS485-4-A	Channel4-RS485interfaceA	3.81mmPhoenix terminal
46	RS485-4-B	Channel4-RS485interfaceB	3.81mmPhoenix terminal
47	RS485-4-G	Channel4-RS485interfaceG	3.81mmPhoenix terminal
48	RS485-3-A	Channel3-RS485interfaceA	3.81mmPhoenix terminal
49	RS485-3-B	Channel3-RS485interfaceB	3.81mmPhoenix terminal
50	RS485-2-G	Channel3-RS485interfaceG	3.81mmPhoenix terminal
51	RS485-2-A	Channel2-RS485interfaceA	3.81mmPhoenix terminal
52	RS485-2-B	Channel2-RS485interfaceB	3.81mmPhoenix terminal
53	RS485-2-G	Channel2-RS485interfaceG	3.81mmPhoenix terminal
54	RS485-1-A	Channel1-RS485interfaceA	3.81mmPhoenix terminal
55	RS485-1-B	Channel1-RS485interfaceB	3.81mmPhoenix terminal
56	RS485-1-G	Channel1-RS485interfaceG	3.81mmPhoenix terminal

3.3 Indicator Description



Lable	Function	Description
POWER	Power indicator light	DC 8-28V power supply lights up after input
NET	Running light	The indicator blinks rapidly: it is working normally.; Indicator Blinking slowly: The device is not connected. Network cable: Other status: The device is not working properly;
PORT1	Channel1 Status indicator	If the indicator is off, the link is downBlinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client

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		message(3) UDP client mode
PORT2	Channel2 Status indicator	If the indicator is off, the link is down.Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected. (2) UDP server mode and after receiving the client message; (3) UDP client mode.
PORT3	Channel3 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT4	Channel4 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT5	Channel5 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT6	Channel6 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT7	Channel7 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on:

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		(1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT8	Channel8 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT9	Channel9 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT10	Channel10 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT11	Channel11 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT12	Channel12 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode

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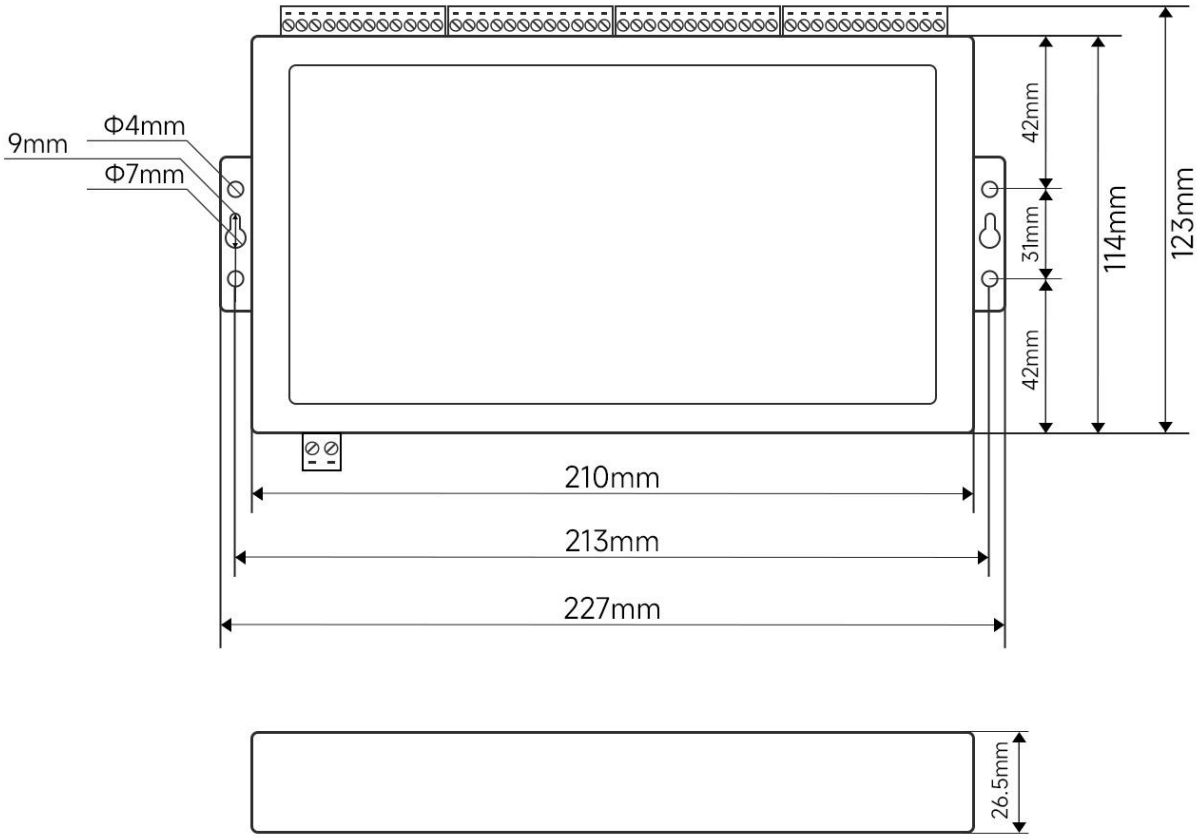
PORT13	Channel13 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT14	Channel14 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT15	Channel15 Status indicator	If the indicator is off, the link is down Blinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode
PORT16	Channel16 Status indicator	If the indicator is off, the link is downBlinking: The indicator blinks when the network or serial port is sending or receiving data. Indicator light is on: (1) The link is successfully connected (2) UDP server mode and after receiving the client message (3) UDP client mode

[Note] Some special working mode indicator status:
Restore the factory, except for NET, the remaining LED is on for 1s, and then the other indicators except the power supply are turned off;

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3.4 Size



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Chapter 4 Basic function

4.1 Mapping between Channels and serial ports

Baud rate：1200、2400、4800、9600、14400、19200、38400、57600、76800、115200、230400、460800bps；
Data bit：8 bits；
Check bit: NONE, ODD, and EVEN are supported.
Stop bits: 1, 2 bits;
Hardware flow control: Not supported；

Channel	Serial Port	Indicator light	protol of serial port	Factory mode, port
Channel1	COM1	PORT1	RS485	TCPS、8001
Channel2	COM2	PORT2	RS485	TCPS、8002
Channel3	COM3	PORT3	RS485	TCPS、8003
Channel4	COM4	PORT4	RS485	TCPS、8004
Channel5	COM5	PORT5	RS485	TCPS、8005
Channel6	COM6	PORT6	RS485	TCPS、8006
Channel7	COM7	PORT7	RS485	TCPS、8007
Channel8	COM8	PORT8	RS485	TCPS、8008
Channel9	COM9	PORT9	RS485	TCPS、8009
Channel10	COM10	PORT10	RS485	TCPS、8010
Channel11	COM11	PORT11	RS485	TCPS、8011
Channel12	COM12	PORT12	RS485	TCPS、8012
Channel13	COM13	PORT13	RS485	TCPS、8013
Channel14	COM14	PORT14	RS485	TCPS、8014
Channel15	COM15	PORT15	RS485	TCPS、8015
Channel16	COM16	PORT16	RS485	TCPS、8016

4.2 Local network parameter

4.2.1 Local IP address

STATIC: You can define the configuration IP address, subnet mask, default gateway, and DNS server；

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DHCP (Dynamic IP address 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.;

4.2.2 DNS(Domain name resolution)

When a user enters a domain name, the system automatically queries the DNS server, which searches the database and obtains the corresponding IP address. In static IP mode, the user can customize the domain name resolution server to resolve the data of the private domain name server. In dynamic IP mode, the device automatically follows the domain name resolution server configured by the routing device, and the user only needs to modify the routing device You do not need to configure this device.

How to configure DNS parameters:

4.2.3 Disconnection and reconnection period

The device periodically sends a reconnection request when it detects that it is disconnected from the server. Therefore, disconnection Reconnection Time does not affect the normal connection establishment time. You can set the request period to 5s by default.

4.2.4 Timeout restart (restart without data)

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

By default, the restart interval is 30 minutes. You can customize the restart interval without data.

4.3 Hardware factory recovery

The Reload pin of the device will be continuously pressed for 5-10s and released. All the leds except NET will light up and the device will restart. After the restart, the device will be restored to factory.

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4.4 Device Working Mode

4.4.1 TCP Server

TCP Server Indicates the TCP server. In TCP Server mode, the device listens to the local port, accepts the connection request of the client and establishes the connection for data communication. When the Modbus gateway function is disabled, the device sends the data received from the serial port to all the client devices that are connected to the device.

Each serial port server supports eight clients. If the number of clients exceeds the maximum, the serial port server refuses to connect.

4.4.2 TCP Client

TCP Client Indicates the TCP client. When the device is working, it initiates a connection request to the server and establishes a connection to realize the interaction between serial port data and server data.

The IP address, domain name, and port of the target must be correctly configured when the client is used.

When serving as a TCP client, you are advised to set the local port to 0, that is, the dynamic port.

4.4.3 UDP Server

In UDP Server mode, the device does not verify the source IP address of data when it uses the UDP protocol for communication. After receiving a UDP packet, the device saves the source IP address and source port of the packet and sets them as the destination IP address and port. After receiving data from other ports, the device updates the source IP address and source port of the packet. Therefore, the data sent by the device only sends data packets to the source IP address and port of the last data received by the device.

This mode is usually used when multiple network devices communicate with the local device at a high frequency, and the TCP Server cannot meet the requirements。

If the UDP Server is used, the remote UDP device must send data first. Otherwise, data cannot be sent properly. After receiving any packet of data, the PORT indicator lights up。

Note: In UDP mode, the data sent by the network to the device must be smaller than 1472 bits per packet; otherwise, data loss may occur.

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4.4.4 UDP Client

The UDP Client is a connectionless transport protocol that provides simple and unreliable transaction-oriented information transmission services. No connection is established or disconnected. Data can be sent to each other only by configuring the destination IP address and destination port. It is usually used in the data transmission scenario where the packet loss rate is not required, the packet size is small, the transmission frequency is fast, and the data needs to be transmitted to the specified IP address.
In UDP Client mode, the device communicates only with the remote UDP device configured with the destination IP address and destination port.
In this mode, when the target address is set to 255.255.255.255, the sending and receiving devices need to ensure that the ports are the same and that the devices can receive broadcast data.

Note: In UDP mode, the data sent by the network to the device must be smaller than 1472 bits per packet; otherwise, data loss may occur.

4.4.5 HTTP client

This mode can realize the HTTP automatic packet grouping function, providing two ways of GET and POST. Customers can configure the URL, Header and other parameters by themselves, and send the packet grouping by the device to realize the rapid communication between serial data and the HTTP server. The maximum value of URL and Header data is 128 bytes. The 16 channels can enable the HTTP client mode independently without affecting each other.

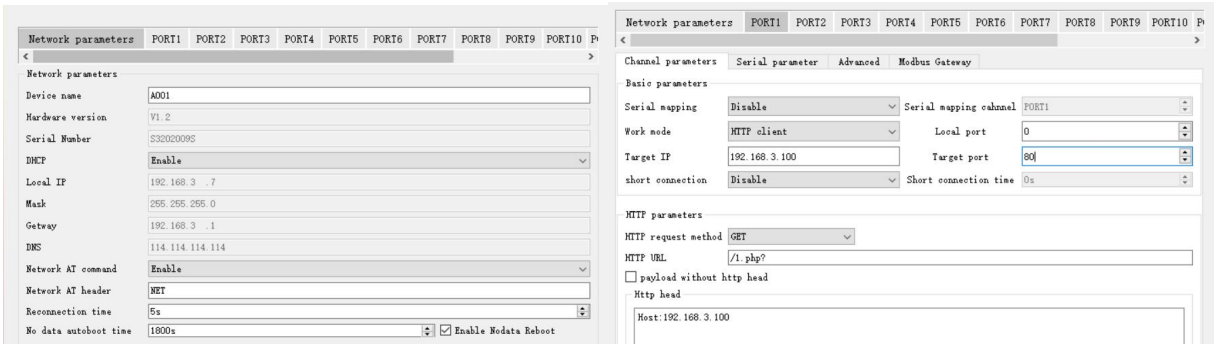
The HTTP request data should be smaller than the package length (512 bytes); otherwise, the device will divide the request data into multiple packets for request, resulting in request exceptions.

You can configure whether to return the HTTP packet header. The returned data is shown in the following figure：

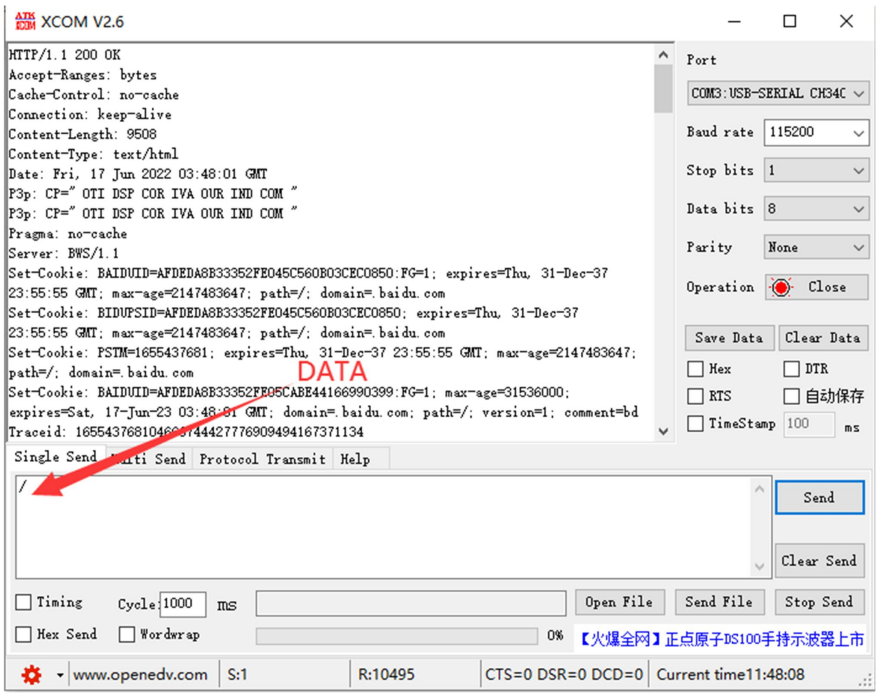
Start the host computer, search for devices, and enter the device configuration page. Set Network Parameters first. DHCP is recommended to avoid device IP anomalies (network segment errors, IP conflict, etc.) caused by incorrect configurations. Configure the HTTP client mode on 16 channels that require HTTP. This section uses GET to request the Baidu web page as an example. (URL: empty, HEADER: Host:www.baidu.com, target domain name :www.baidu.com, target port: 80, random port is recommended for the local port.) The configuration is as shown in the following figure：

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Request data is "/", use the serial assistant to get the web page：



In the POST request mode, the device automatically calculates the data length of the packet header (for example, Content-length:2729) that does not need to be configured separately, and sends the packet. Other packet headers need to be manually configured. A maximum of 128 bytes of data can be configured。

4.4.6 MQTT Client

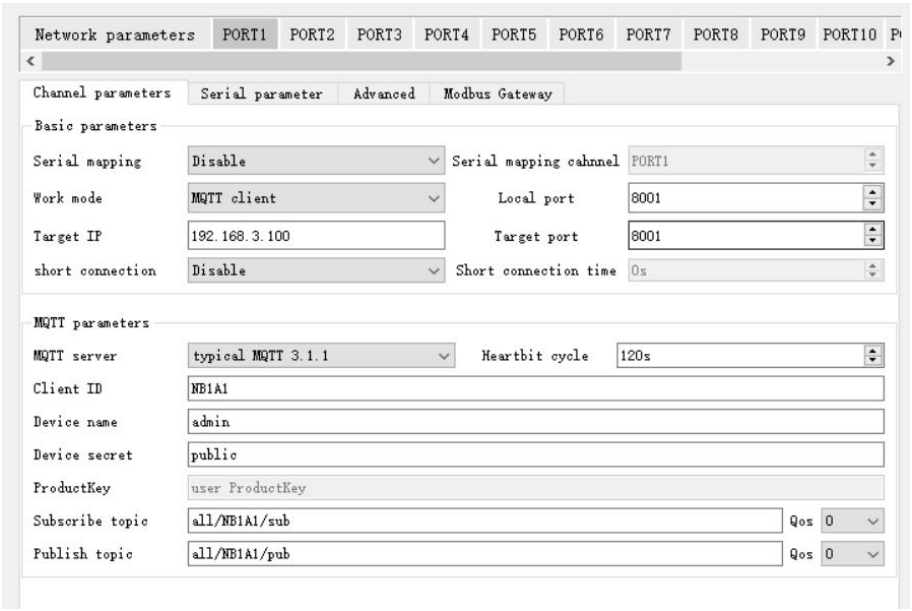
Support fast access to standard MQTT3.1.1 protocol servers (OneNET, Baidu Cloud, Huawei Cloud, user-built server types, etc.) and Alibaba Cloud servers, support quality of service level configuration (Qos 0, Qos 1), support long text configuration, Convenient and better access to network service operators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

When using MQTT function, short links should be turned off, otherwise the device will repeatedly connect to the server, it is recommended to use random ports, as shown in the following

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figure：



（1）、 Select standard MQTT3.1.1, Baidu Cloud, OneNET, Huawei Cloud configuration can refer to the following table to fill in the parameters：

Parameters	Standard MQTT3.3.1	Baidu Cloud	OneNET
Device name（Client ID）	Client ID	DeviceKey	Device ID
User name（Device name）	User Name	IoTCoreId/Device Key	Product ID
password（Device secret）	Password	DeviceSecret	Device name/User Password
PrductKey	Ali cloud parameters, do not fill		
Release topic	MQTT publishing topic address (OneNET dynamic generation)		
Subscribe to topics	MQTT subscription subject address (OneNET dynamically generated)		

[Note]

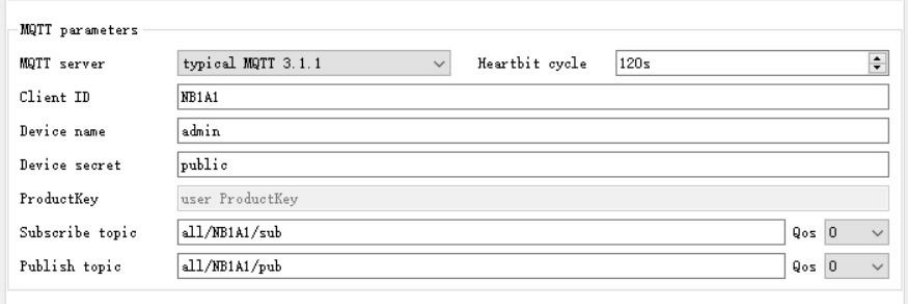
You can use the same parameters to dynamically generate a topic address to achieve the effect of data uploading. For example, OneNET can publish and subscribe to the same topic address: 123456 to achieve data uploading.

The MQTT platform (Baidu Cloud, Huawei Cloud, and OneNET) cannot be connected due to adjustments. After parameters are set, the platform rules prevail.

Take standard MQTT3.1.1 parameter filling as an example, as shown in the following figure：

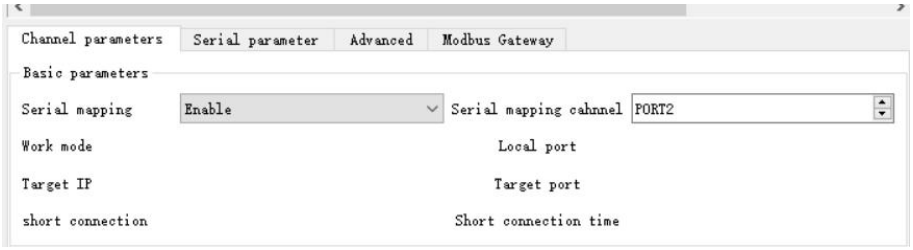
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4.4.7 Port Mapping

The port mapping function maps any serial port to implement data exchange between serial ports. It is usually used when the parameters of the serial ports on both ends of the system are inconsistent. After port mapping is enabled, other functions are unavailable.



4.5 Channel terminal

Random port：

TCP clients, UDP clients, HTTP clients, MQTT clients can configure the local port to 0 (using random local ports), server mode cannot use random ports, otherwise the client cannot establish a connection correctly (the device is not listening to the port properly).

Random port connection can be quickly reestablished when the device disconnects the server unexpectedly, preventing the server from rejecting the connection due to four incomplete waves. You are advised to use random port in client mode.

The device automatically configures random ports when the TCP client, HTTP client, and MQTT client modes are configured AT. You can cancel the configuration.

Static port：

Device fixed port (factory default: 8001-8016), TCP server mode device listens to the configuration port, receives the connection request from the client and establishes the connection for data communication, TCP client mode device fixed port initiates the connection request.

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Chapter 5 Advanced functions

5.1 Heartbeat packet and registration packet

5.1.1 Heartbeat packet

In the client mode, you can send heartbeat packets and set the heartbeat packet time. The heartbeat packet can be sent in hexadecimal and ASCII codes. This heartbeat packet is not MQTT heartbeat, and the MQTT client mode needs to be disabled. The MQTT heartbeat packet can only be configured with "Heartbeat Period" in the column of "MQTT Parameter Configuration". It is recommended that the value be less than 60 seconds, for example, the recommended value is 120s in the Alibaba Cloud manual.

Heartbeat packet sending mode:

1. The heartbeat packet mode is disabled by default.

2. Serial port Mode -> The device sends heartbeat messages to the serial port bus at the specified heartbeat interval.

3. Network Port Mode -> The device sends heartbeat messages to the network port bus at the specified heartbeat interval.

User-defined heartbeat packet content (maximum 128 bytes (ASCII) data, 64 bytes (HEX) data)

If the interval for sending heartbeat packets is set to 0, the heartbeat packet function is disabled. If the interval is greater than 0, the heartbeat packet function is enabled. When enabled, the interval can be set to (1 to 65536) seconds.

5.1.2 registration packet

1. In client mode, the user can send the registration package and set the registration package time.
2. The registration package supports the following modes:
3. 1. Send the MAC address (OLMAC) when the network is connected to the device.
4. 2. Send the data of the customized registration package (OLCSTM) when the network is connected to the device.
5. 3. After the network is connected to the device, each packet sent by the device to the network is preceded by an EMBMAC address.

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6. After the network is connected to the device, each packet sent by the device to the network is preceded by the Custom Registration Packet data (EMBCSTM).。

Custom registration package content (maximum 128 bytes (ASCII) data, 64 bytes (HEX) data)

Note: Do not use special characters (such as '', '', "\", and "/") when configuring the registration package. The hexadecimal configuration is recommended。

5.2 Short connection

In client mode, the TCP short connection function is supported (this function is disabled by default). The TCP short connection is mainly used to save server resource overhead, and is generally applied to the multi-point (multi-client) to one-point (server) scenario.

The TCP short connection function applies to the TCP Client mode. After the short connection function is enabled, the device requests to connect to the server only when sending messages. If the connection is successful, the device automatically disconnects if the serial port does not receive data or the network port does not send or receive data within a specified period.

When the short link hold time is set to 0, the short link function is disabled. When the setting range is (2-255) seconds, the short link function is enabled, and the default hold time is 0 seconds (close the short link).

After the short connection is enabled, use port 0; otherwise, the device cannot be reconnected within 60 seconds after being disconnected .

5.3 Serial cache clearing

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

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

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

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5.4 Modbus Gateway

5.4.1 Protocal conversion



Enable: Verifies Modbus data. Non-modbus data (RTU/TCP) is discarded and not transmitted. Modbus RTU and Modbus TCP are transferred to each other.

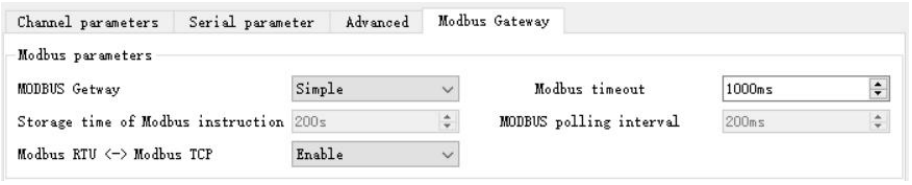
Disable: Protocol conversion is not performed but Modbus data is verified. Non-modbus data (RTU/TCP) is discarded and not transmitted.

5.4.2 Simple Protocol Conversion

Modbus RTU data is converted to Modbus TCP data, or Modbus TCP data is converted to Modbus RTU data, and Ethernet Modbus data and serial Modbus data are exchanged.

Simple protocol conversion can work in any mode (TCP client, TCP server, UDP client, UDP server, MQTT client), the gateway mode does not support multi-host operation, need multi-host please use "storage gateway" and "multi-host mode"。

Simple protocol translation configuration：

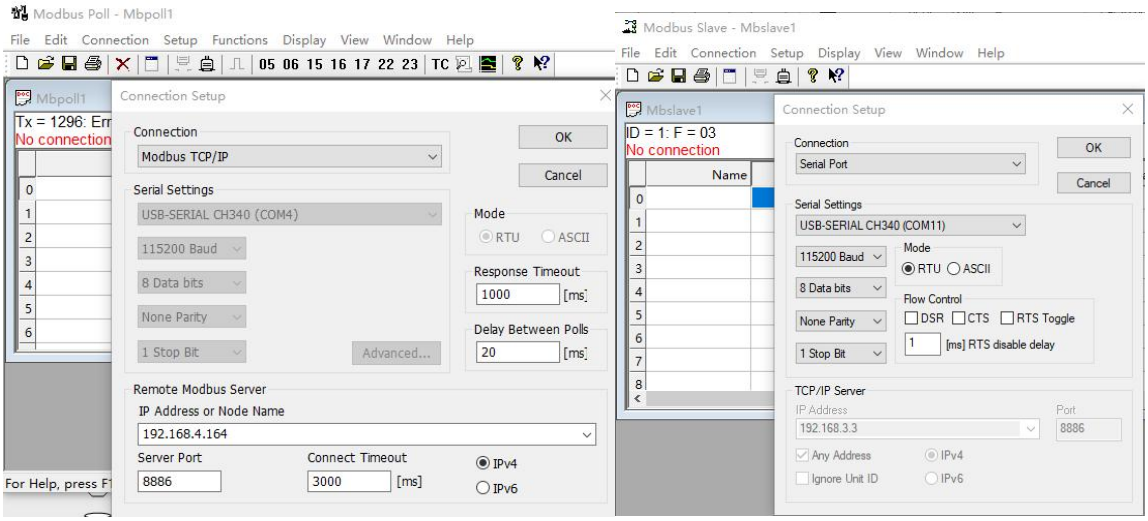


Modbus Poll and Modbus Slave software debugging:

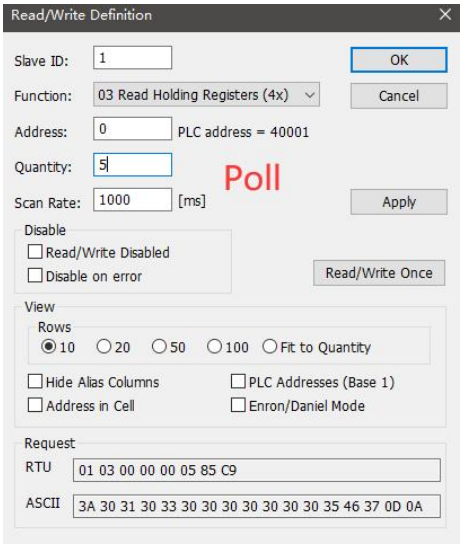
Software connection setup：

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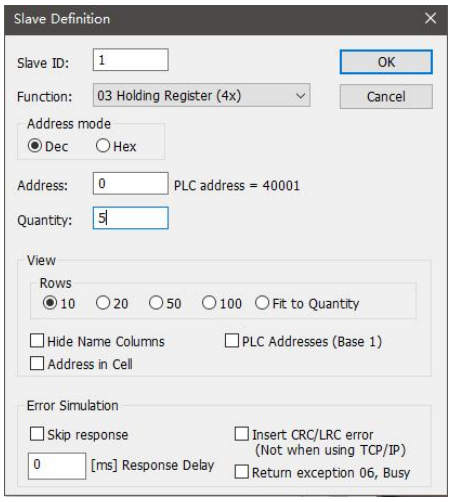
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Software register reading and simulation configuration:
Poll menu select SetupRead/Write Definition



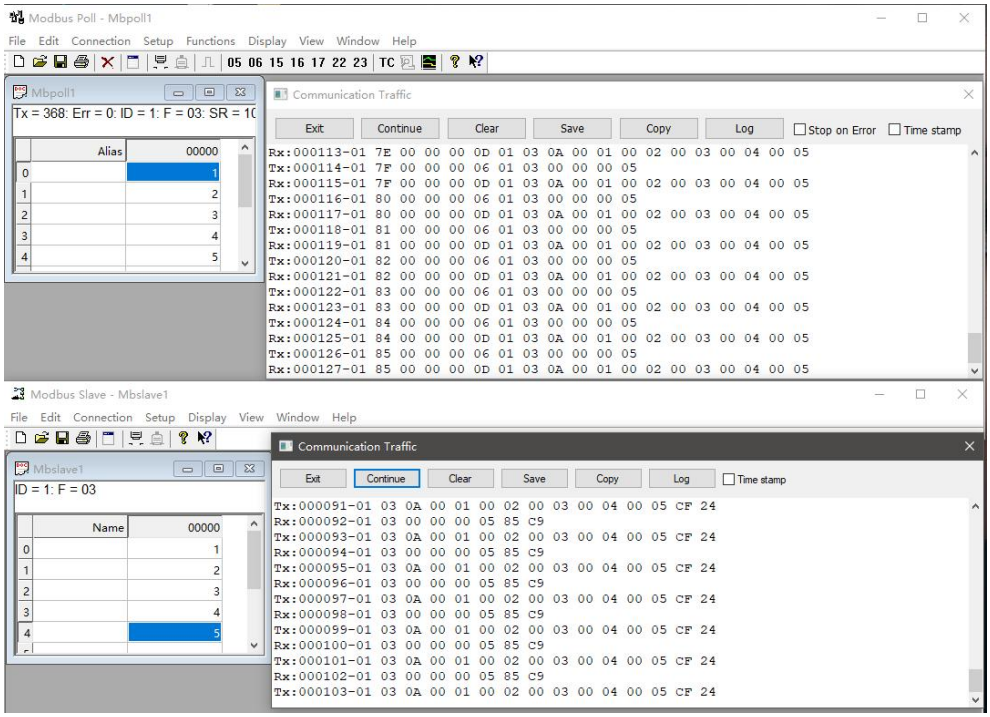
Slave Menu selection Setup→Slave Definition



Communication demonstration：

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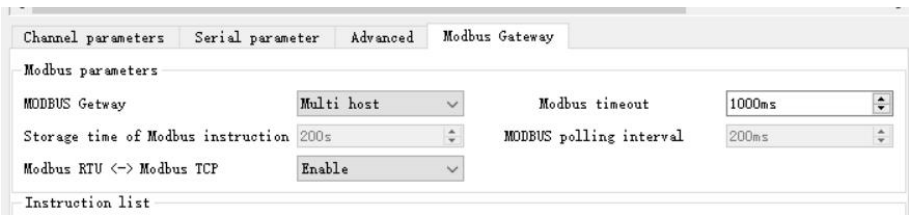
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5.4.3 Multi-Host Mode

Relatively simple protocol conversion can only have one Modbus master station, while 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 perform bus occupation scheduling (RS-485 bus can only process one request at a time, and the Modbus can only handle one request at a time). The multi-host mode will sort and process according to the TCP request successively, and the other links will wait), so as to solve the bus conflict problem (currently, in the server mode, a maximum of 16 Modbus TCP host connections are supported, and the simultaneous access of multiple hosts should pay attention 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 you need a fast response, you are advised to use the storage gateway.) The server can work only in TCP server mode, and the slave can work only over a serial port.

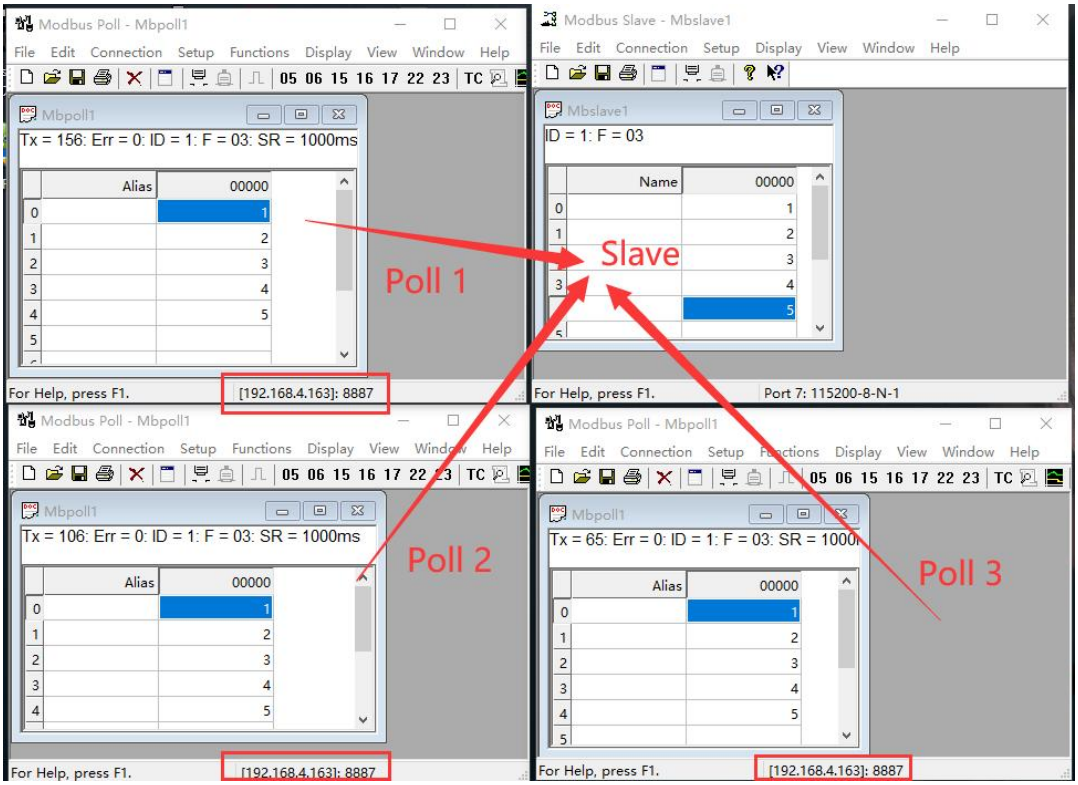
As the number of hosts increases, the Modbus timeout period should be increased accordingly. If multiple hosts need to make continuous high-speed requests, it is recommended to use "storage gateway", and it is recommended to configure "Simple protocol conversion" when no multiple hosts are used.



For software configuration and register configuration, refer to "Simple Protocol Conversion" and enable multiple Modbus Poll software at the same time (3 channels are used as an example, a maximum of 8 channels can be supported in the server model).。

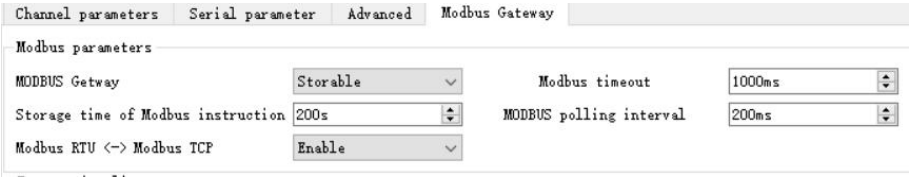
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5.4.4 Storage Gateway

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 ask the RTU device register status 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 whole request process. Users can customize the polling interval and instruction storage time of the storage area according to requirements.



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

（2） Features:

（3） (1) The gateway has a cache for storing instructions and returning results (125 registers in 03/04 code and 2000 registers in 01/02 code);

（4） (2) RTU response time out automatically empty the cache, to ensure the real-time and authenticity of data;

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

（6） (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 within the storage time, the gateway will automatically delete the stored instruction and release the

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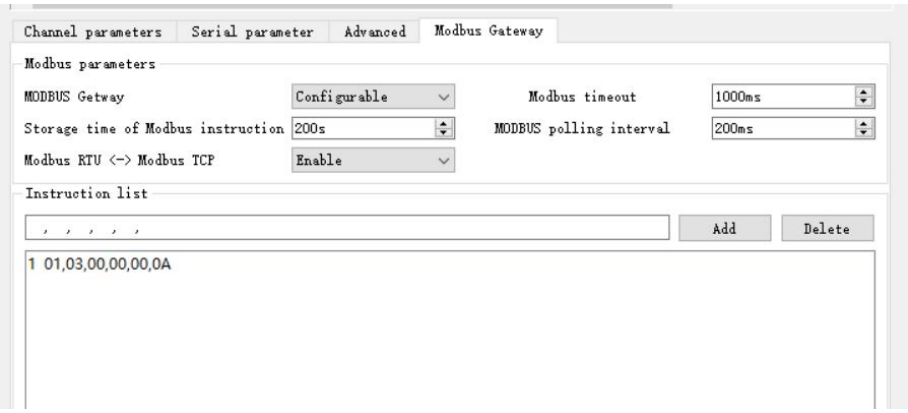
cache;

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

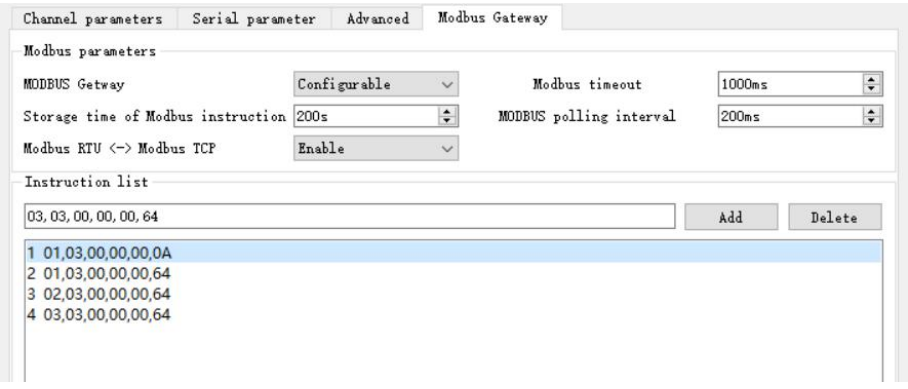
（8） Only 01, 02, 03, and 04 function codes can be stored after Modbus query results；

5.4.5 Configurable gateway

According to the pre-configured MODBUS instruction, the gateway automatically polls the RTU device register (only the configuration of MODBUS read instructions is supported), and the non-stored instructions will directly operate the RTU device. The frequently read instructions can be stored in the gateway in advance, which can shorten the response time (query the configured instructions). Data will not be sent directly to the server and will be returned only after the Modbus host requests, similar to the method of "Simple Protocol conversion", if you want to upload data to the server automatically, select "Automatic upload". Due to the above characteristics, only the Modbus slave station can be connected to the serial port side of the configurable gateway.



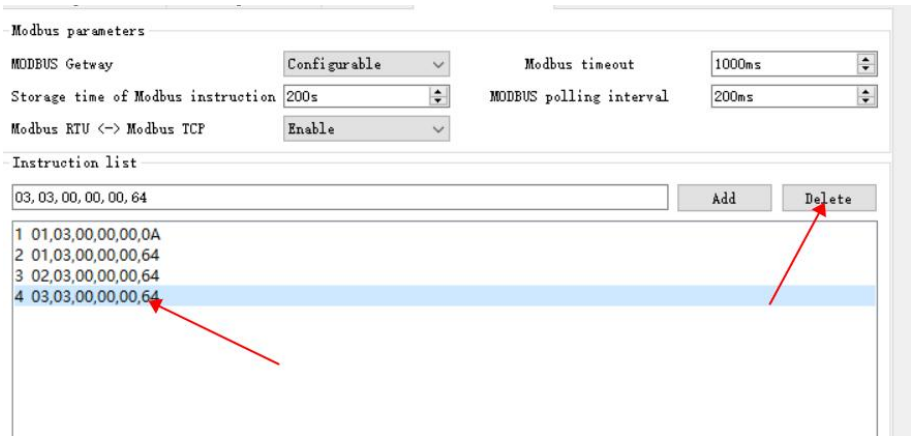
Instruction storage instructions (added, instruction errors and formatting errors cannot be added, no need to add CRC check bits)：



Instruction store description (delete)：

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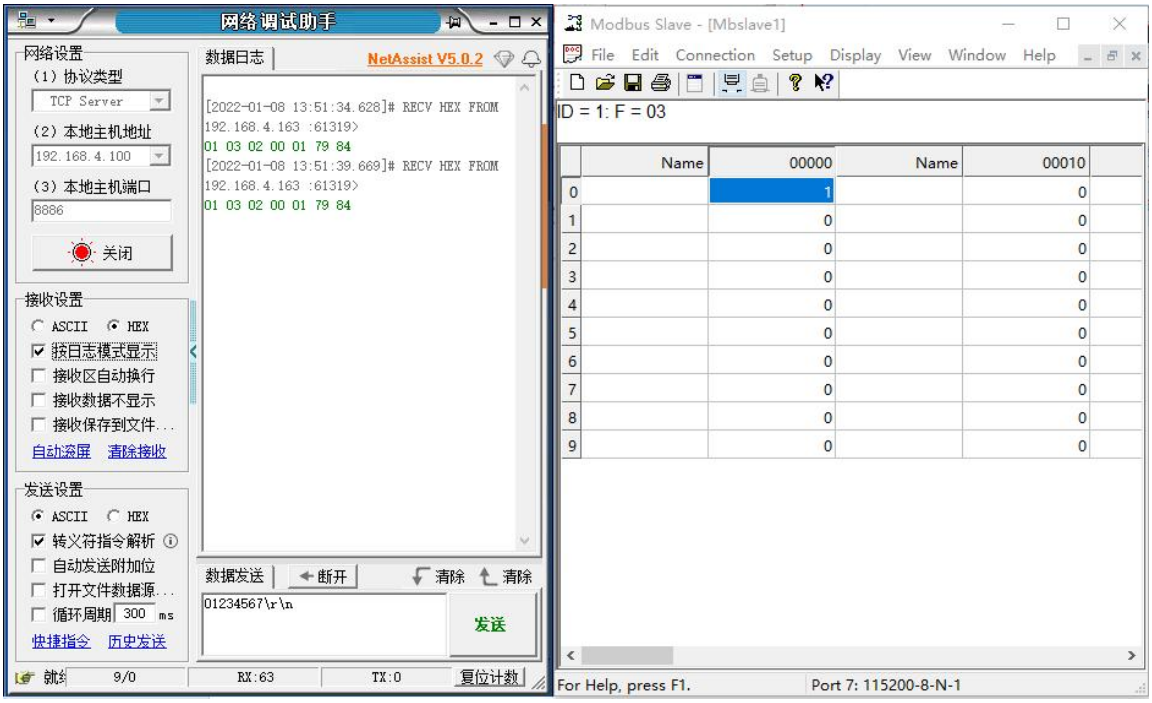
5.4.6 Upload Automatically

In the client mode (TCP client, UDP client, MQTT client, HTTP client), the gateway will automatically poll the instructions stored in the 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 requirements.

Instruction prestorage Refer to "Configurable Gateway - Instruction Storage Instructions".

If Modbus TCP is used, you need to enable RTU = TCP conversion.

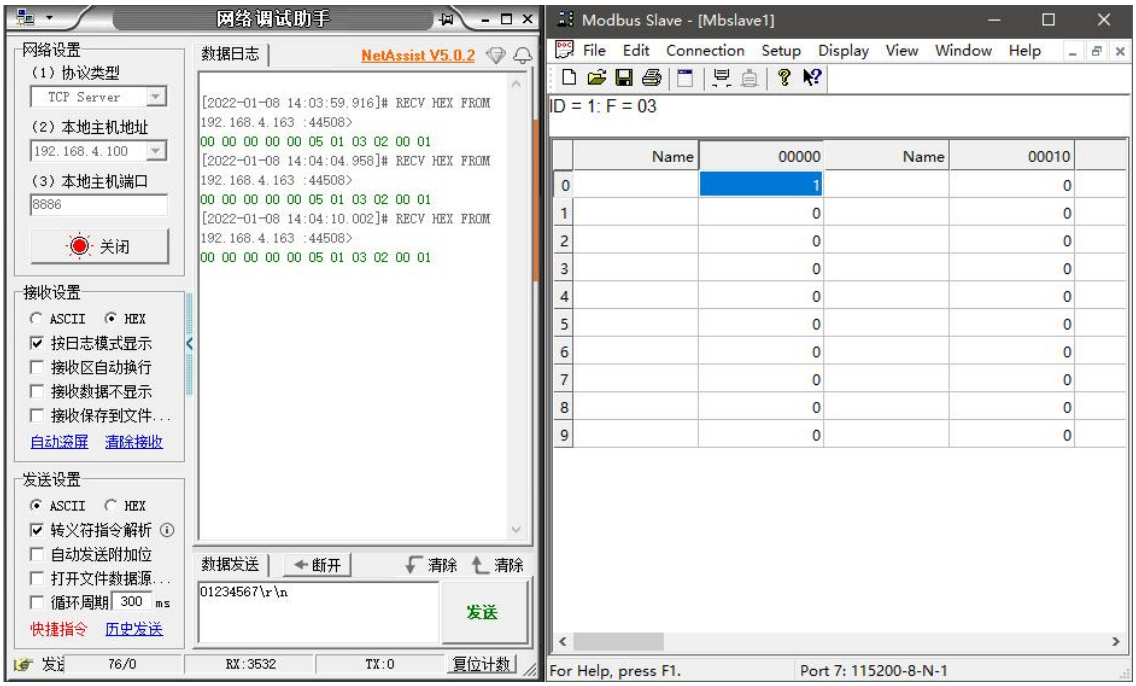
TCP Client Demo (Modbus RTU format)：



TCP Client Demo (Modbus TCP format)：

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5.5 Firmware upgrade

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Users can upgrade the firmware of the device through network cables. For details about how to upgrade the firmware, see the upgrade package. (If the new firmware is available, you can download it from the official website.)

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Revise History

Version	Revise date	Revise description	maintainer
1.0	2023-9-18	Initial version	LYL

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