Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

Serial ⇌ Ethernet pin module

NT1-B

Contents

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1. Introduction to the product

NT1-B is a module (also known as a "super-gate") that enables the transmission of serial data and Ethernet data. The product comes with an RJ45 connector and a pin package. Can meet all types of TTL level serial devices,MCU networking functions.

Features

- RJ45 Adaptive Ethernet interface;
- Supports a variety of operating modes(TCPServer,TCP Client,UDP Server,UDP Client);
- Support for web page settings, configuration tool settings,AT instruction settings parameters;
- Supports multiple Socket connections;
- Serial Baud Rate supports 1200to230400(default 115200);
- Supports a variety of checks(None,Odd,Even,Mark,Space);
- Support for DHCP functionality;
- Support DNS functions, domain name resolution;
- DNS server address customization;
- Support for Modbus gateway functionality;
- Support for virtual serial port;
- Support time-out restart function, restart time customization;
- Support for short connection function, short connection interval customization;
- Support heartbeat package, registration package function;
- Support for cache cleanup;
- Support access to the external network, local area network;
- Support hardware recovery factory settings;
- Support for online upgrades;
- RJ45 port support, external pin embedded board, flexible embedding.

2. Get started quickly

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

2.1 Use preparation

Before using the Ethernet plug-in module ("Module"), you need to prepare network cable, computer, DuPont cable,USB re-serial converter and other related accessories. Here's how it works:

Table 2- 1 Prepare the list

serial number	Device tools	quantity
1	module	1
2	Cable	1
3	Computer	1
4	DuPont Line	1
5	USB re-serial converter	1

2.2 Module wiring

Test serial-to-network data communication, direct the serial pins of the module through the outside of the USB re-serial converter, and connect to the PC side.

Connect the module's mesh(RJ45)to the network port on the PC side with a network cable.

The connection diagram looks like this:

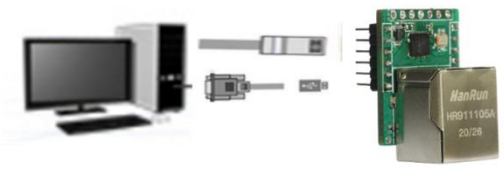


Figure 2- 1 Hardware connection diagram

2.3 Software settings

2.3.1 Network test environment

Avoid problems such as server search failures(pings not working) and the inability to open web pages during real-world applications. Check your computer's settings first.

（1） Turn off your computer's fire walls and antivirus software.

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

（3） For PC directly connected device servers, you need to set up a static network segment on the computer that is the same as the device.

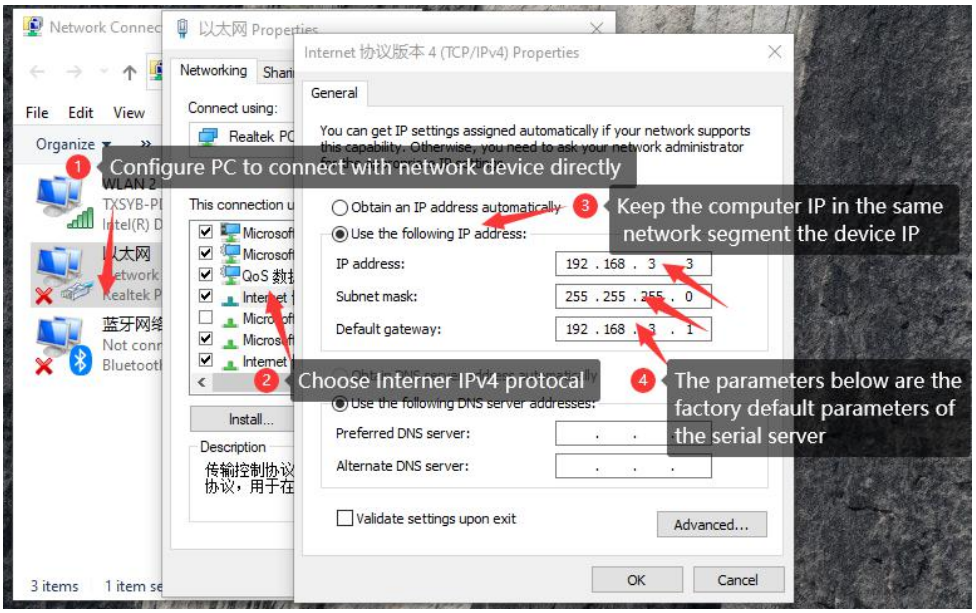


Figure 2- 2 PC local connection settings

2.3.2 The default parameter

Table 2- 2 Default parameters

project	The default parameter
The IP address	192.168.3.7
The default local port	8887
Subnet mask	255.255.255.0
The default gateway	192.168.3.1
The default mode of operation	TCP Server
The default target IP	192.168.3.3
The default destination	8888

port	
Serial Port Rate	115200
Serial parameters	None / 8 / 1

2.3.3 Data transfer test

（1） After the above procedure, follow the factory default parameters of the equipment, perform the following actions, to achieve data transfer testing.

（2） Here are the steps:

（3） Open the test TCP/IP debug assistant software.

（4） The network set-up selects the TCP client mode, corresponding to the server IP address (module default target IP: 192.168.3.3). The server port number sets port 8887(module default port: 8887)for themodule, click Create .

（5） Wait for the computer module, LED2 foot output low after successful connection.

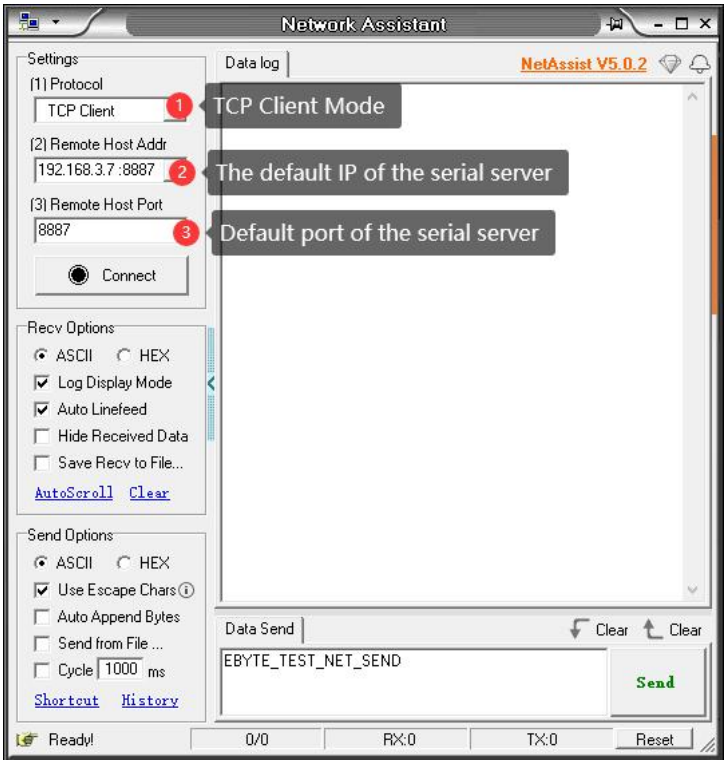


Figure 2- 3 Network Assistant Configuration

（6） Open serial assistant, serial port rate set to 115200, serial port parameter set to None/8/1,click open, open serial port.

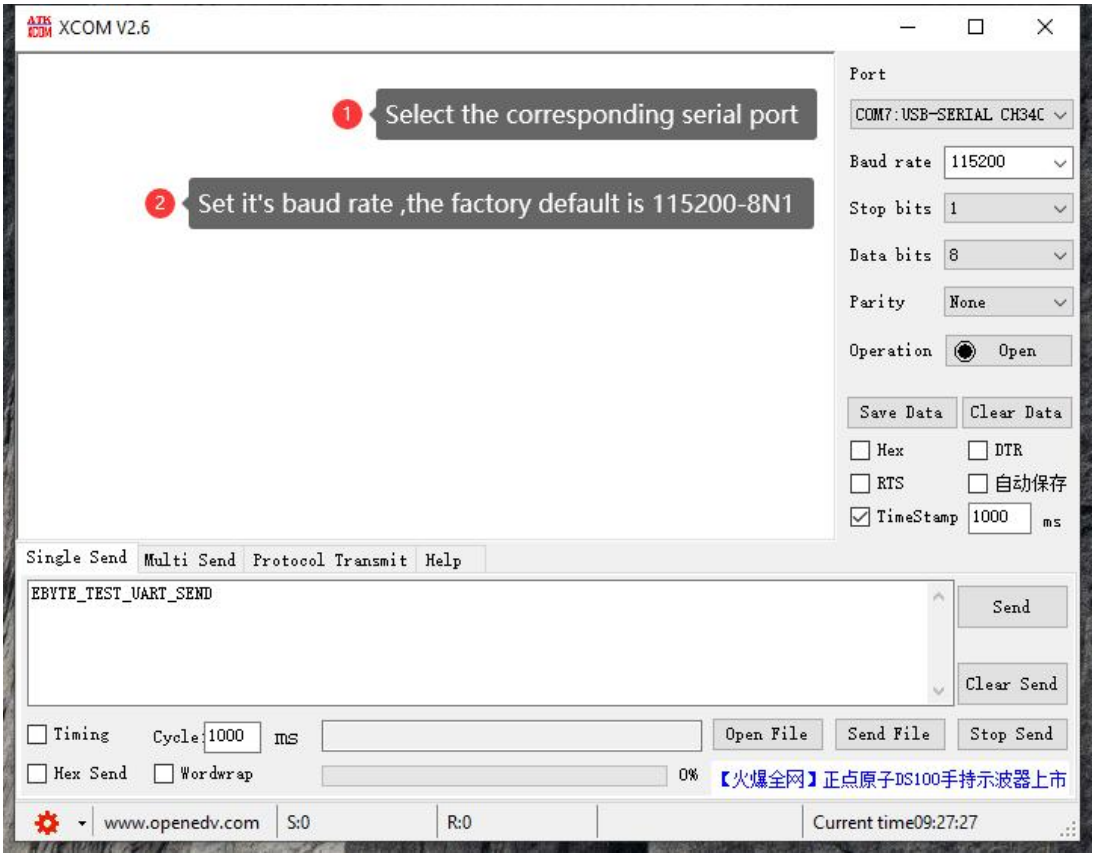


Figure 2- 4 Serial Assistant Configuration

（7） Data transmission test, serial assistant (serial terminal) to send test data, network debugging assistant (network side) received test data. The network debugging assistant (network side) sends test data, and the serial assistant (serial terminal) receives test data. Real two-way communication (i.e. local-to-network two-way data transceiver).

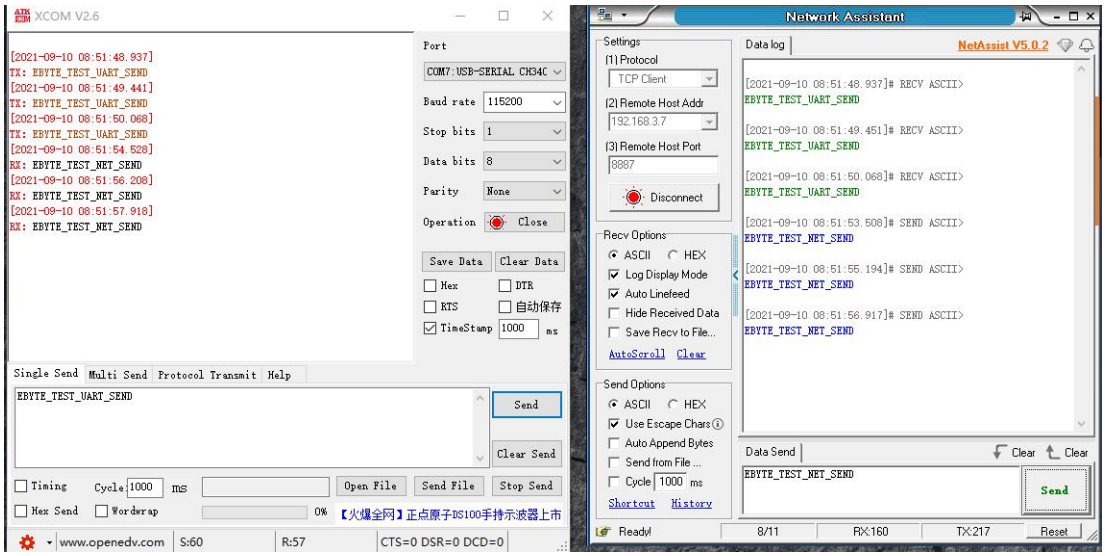


Figure 2- 5 Communication test

3. Product overview

3.1 Product specifications

Table 3- 1 Product Specifications

Product model	The product type	Socket The number of connections	Working mode	Operating voltage	Product size（mm）
NS1	Patch module	6 way	TCP Sever TCP Client UDP Sever UDP Client HTTP	3.0～5.5V(DC)	17 * 19 * 4
NT1	Plug the module in	6 way		3.0～5.5V(DC)	35 * 22 * 30
NT1-B	Plug the module in	6 way		3.0～5.5V(DC)	35 * 22 * 20
NA111	DTU	6 way		8～28V(DC)	92 * 66 * 30
NA111-A				85～265V(AC)	

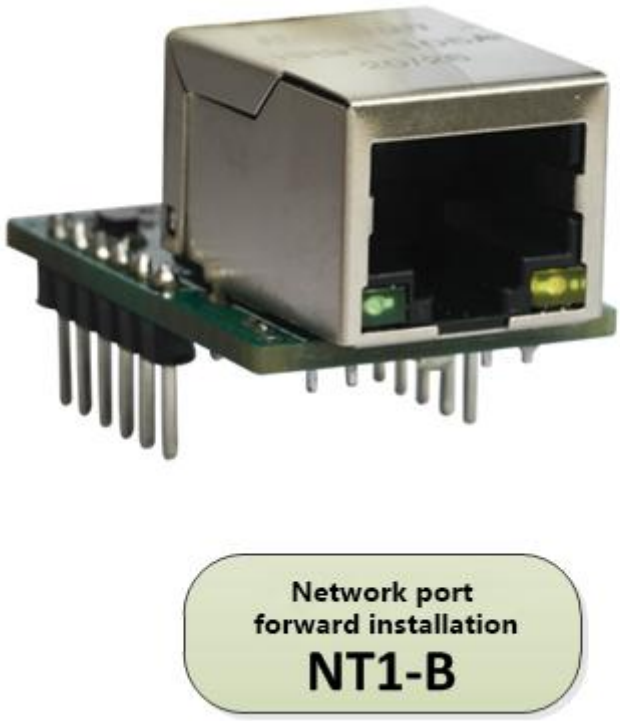


Figure 3- 1 Model Description

3.2 Technical parameters

Table 3- 2 Technical parameters

project	illustrate
Operating voltage	3.0 ～ 5.5V（DC）
Operating current	9mA @ 5V
interface	TTL level serial port (pin), mesh (RJ45)
Serial level	TTL level
Working mode	TCP Server、TCP Client、UDP Server、UDP Client（Default TCP Server）
Socket connection	Supports 6 ways
Network protocol	IP、TCP/UDP、IPv4
How IP is obtained	DHCP, static IP (default static IP)
Domain name resolution	backing
How it's configured	Web, configuration tools, AT instructions
IP address	Customizable (default 192.168.3.7)
The local port	Customizable (default 8887)
Subnet mask	255.255.255.0
gateway	Customizable (default 192.168.3.1)
Target IP	Customizable (default 192.168.3.3)
The destination port	Customizable (default 8888)
Network cache	512 Byte
Serial cache	512 Byte
Packaging mechanism	512 Byte
Serial Port Rate	1200 to 230400 bps (default 115200)
The data bit	5, 6, 7, 8 (default 8)
Stop bit	1, 2 (default 1)
Check bit	None、 Odd、Even、Mark、Space（默认 None）
Flow control	RTS/CTS、DSR/DTR、XON/XOFF、NONE (Default NONE)
Product size	35 mm x 22mm x 30mm (long x width x high)
Product weight	10g ± 1g
Working temperature and humidity	-40 to .85C, 5% to 95%RH (no condensation)
Store temperature and humidity	-40 to 105 degrees C, 5% to 95% RH (no condensation)

3.3 Interface description

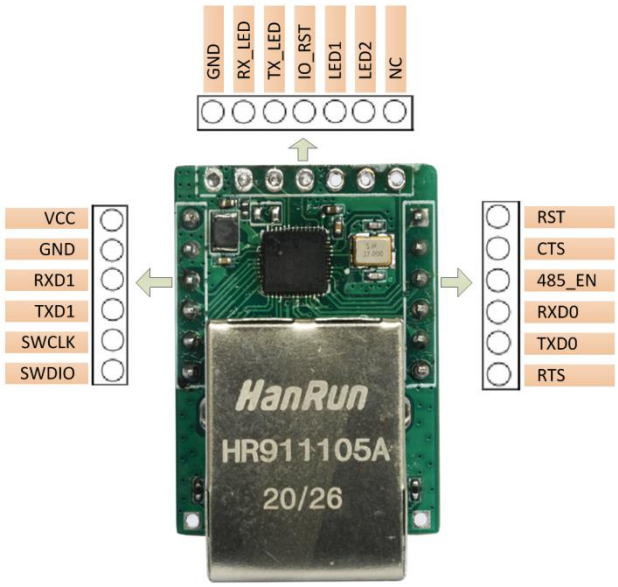


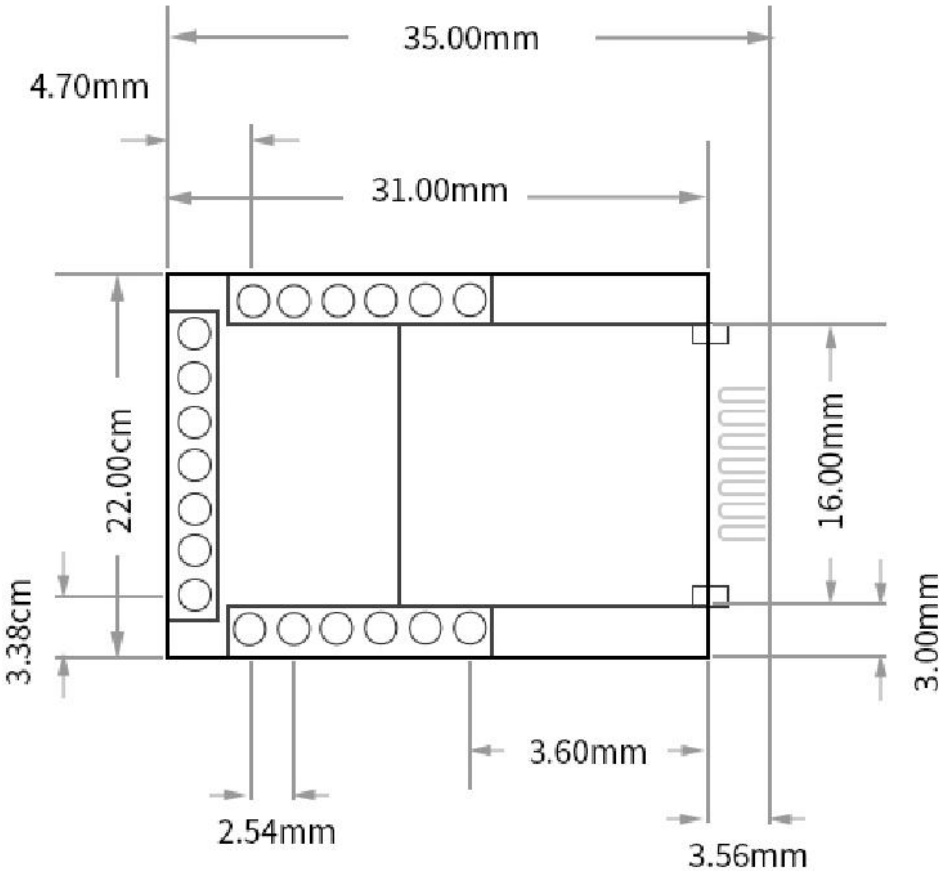
Figure 3-2 Interface Diagram

Table 3- 3 Pin Function Table

serial number	Pins	function
1	RTS	RTS:UART0 MODEM output signal, requested to be sent.
2	TXD0	UART0 serial data output, data communication serial port, can be used for firmware upgrades.
3	RXD0	RXD0:UART0 serial data entry, data communication serial port, Available for firmware upgrades.
4	485_EN	The RS485 software enables the control pin, which is high-level output when the serial port sends data and low output by default.
5	CTS	CTS: MODEM input signal for UART0, clear send.
6	RST	RST: External reset input, low active.
7	NC	Empty pin.
8	LED2	Nethead link indicator output, default output high,TCP protocol after successful connection output low, UDP protocol default output low.
9	LED1	Run the LED, and after the module is initialized, the foot outputs a 5hz square wave.
10	IO_RST	Recover factory pin, need external reset button,

		low level effective.
11	TX_LED	Serial send indicator output, default output high, low output when data output, continuous data output cycle 60ms,low 1 0ms square wave signal.
12	RX_LED	Serial receiver indicator output, default output high, low output when data input, continuous data output cycle 60ms,low 1 0ms square wave signal.
13	GND	Common ground end, power negative input.
14	VDC	Power forward input, support 3to5.5V input.
15	GND	Common ground end, power negative input.
16	RXD1	RXD1:UART1 serial data input, debugging serial port.
17	TXD1	TXD1:UART1 serial data output, debug serial port.
18	SWCLK	The serial clock input for the debug interface.
19	SWDIO	The serial data input and output of the debug interface is built-in pull-up.

3.4 Dimensions



Figures 3- 3 Dimensions

4. Product features

4.1 Introduction to the basic features

4.1.1 Web configuration

The device has a built-in web server, which makes it easy for users to set and query parameters by means of web pages.

The port of the Web server is customizable by default:80

How to do this:

- Open the browser, the address bar enters the IP address of the device, for example 192.168.3.7 (IP address and computer need to maintain the same network segment),forget that native IP can be queried through the AT instructions and configuration software.
- The web page pops up the main interface to query the settings.

You can also open the configuration button by configuring the software's open web page configuration.

Note: If the port number is modified, the address input bar should be added with the port number, for example, if the page access port is 8080,the connection page configuration needs to enter 192.168.3.7:8080in the addressbar.

4.1.2 Subnet mask /IP address

An IP address is the identity of a module in a local area network and is unique in a local area network. Therefore, it cannot be duplicated with other devices on the same LOCAL network. The IP address of the module is available in both static IP and DHCP.

(1) Static IP static IP is a scenario that requires the user to manually set up and pay attention to writing to both ip,subnet mask, and gateway, and static IP is suitable for scenarios where IP and device statistics need to be made and one-to-one correspondence is required.

Advantages: Access to devices that cannot assign IP addresses can be searched through the full network segment broadcast mode, which is convenient for unified management

Cons: Different lanyane segments result in the inability to perform normal TCP/UDP communication.

(2)The main role ofDHCP is to dynamically obtain information such as IP address,Gateway address,DNS server address,etc. from the gateway host, eliminating the tedious steps of setting up IP

addresses. Suitable for scenarios where IP is not required or required to correspond to module one by one.

Pros: Devices with DHCP Server, such as access routers, can communicate directly, reducing the hassle of setting up IP address gateways and subnet masks.

Cons: Access to a network without DHCP Serve, such as directly connected to a computer, the module will not function properly.

Subnet masks are mainly used to determine the network number and host number of IP addresses, indicating the number of subnets, and determining whether the module is a sign within the subnet.

Subnet masks must be set, we commonly use the Class C subnet mask:255.255.255.0,thenetwork number is the first 24 bits, the host number is the last 8 bits, the number of subnets is 255, the module IP is in the 255 range, the module IP is considered in this subnet.

A gateway is the network number of the network on which the module's current IP address is located. If a device such as a router is connected to an off-network connection, the gateway is the route.

4.1.3 DNS server address

DNS servers are primarily used to convert domain names into network-recognized IP addresses. DNS server addresses can be customized to enable domain name resolution in the event of a local domain name server exception. Devices report resolution requests to custom DNS servers when domain name is resolved, having easy and efficient use.

In DHCP mode,DNS server addresses are automatically obtained and cannot be modified.

In static IP mode,DNS server factory address default:114.114.114.114.

4.1.4 Restore factory settings

The RST pin of the module lasts for more than 5 seconds at a low level until the device is restarted and the factory settings can be restored.

Figure 4-1 Reset Pin

The following table parameters are modified to factory default after the factory settings are restored

Table 4- 1 Part Factory parameters

project	The default parameter
The IP address	192.168.3.7
The default local port	8887
Subnet mask	255.255.255.0
The default gateway	192.168.3.1
The default mode of operation	TCP Server
The default target IP	192.168.3.3
The default destination port	8888
Serial Port Rate	115200
Serial parameters	None / 8 / 1
Heartbeat cycle	0
Timed restart	300
Short connection	Shut down
The connection clears the cache	enable
Register the package	Shut down
Modbus Gateway	Shut down

Note: User-defined configurations are formatted, and only some of the parameters are listed in the table above

4.2 The Socket feature

4.2.1 TCP Server mode

TCP Server is the TCP server. In TCP Server mode, the device listens to the native port, accepts the client's connection request, and establishes a connection for data communication. When Modbus is turned off, when the device serial receives serial data, it is sent to all client devices that have a connection to the device at the same time, supporting up to six client connections.

Typically used for intra-local area network communication with TCP clients.

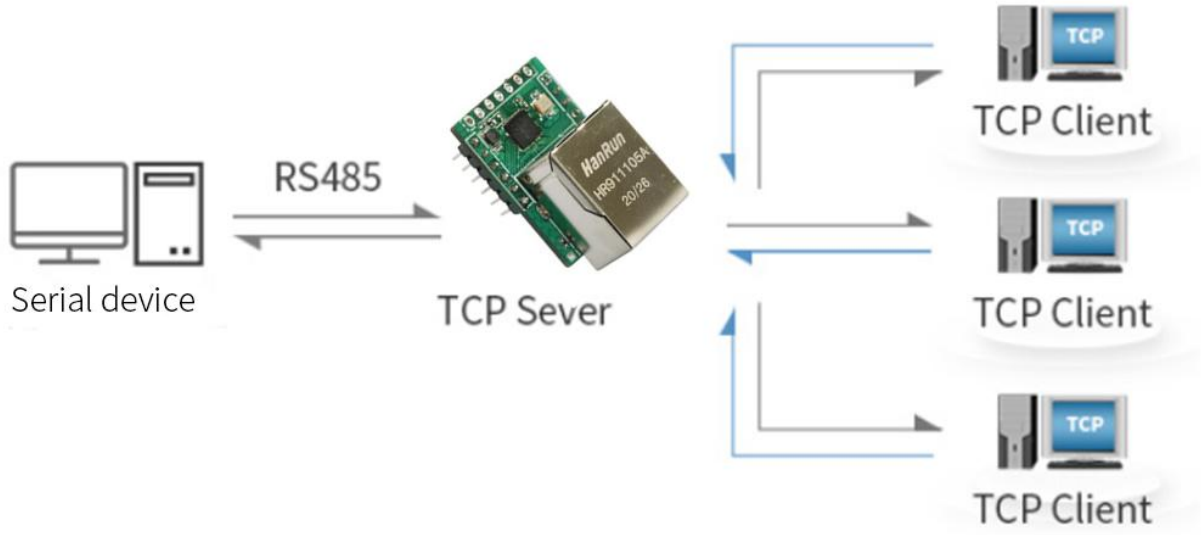


Figure 4-2 Server mode working diagram

4.2.2 TCP Client mode

TCP Client is the TCP client. When the device is working, it proactively initiates a connection request to the server and establishes a connection to enable the interaction between serial and server data. According to the TCP Protocol,TCP Client is a connection and disconnect to ensure reliable exchange of data. Typically used for data interaction between devices and servers, it is the most common form of networked communication.

Setting the service-side mode requires an accurate configuration of the target's IP address/domain name, destination port.

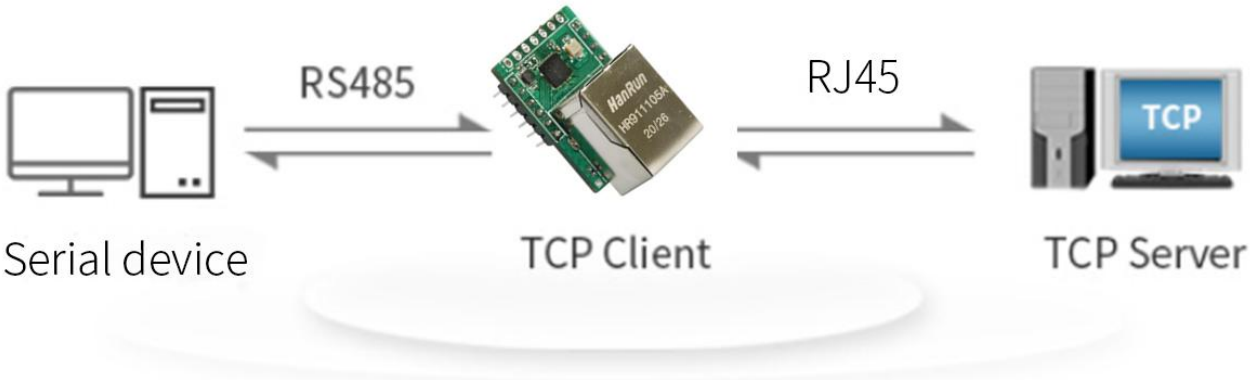


Figure 4- 3 Client mode works schematic

4.2.3 UDP Server mode

UDP Server is when a device makes it unverifiable the data source IP address when

communicating with the UDP protocol, and after each UDP packet is received, the source IP address of the packet is saved and the source port is set to the destination IP and port, so the data sent by the device sends packets only to the source IP address and port where the last device received the data.

This mode is typically used in scenarios where multiple network devices communicate with the device and where the frequency is high and the TCP Server cannot meet the criteria.

Note: InUDP mode, the network should send less than 5 12Bit per package to the device, otherwise data loss will result.

4.2.4 UDP Client mode

UDP Client is a connectionless transport protocol that provides a simple, unreliable information delivery service for transactions, with no connection established and disconnected, and only ips and ports are needed to send data to each other. Typically used for data transfer scenarios where packet drop rates are not required, packets are small and sent more frequently, and data is passed to the specified IP.

In UDP Client mode, the device communicates only with the target port of the target IP, and data from other IPs will not be received by the device.

In this mode, the destination address is set to 255.255.255,and the sending data will be broadcast across the network segment, but the sending and receiving device needs to ensure that the ports are consistent, and the device can also receive broadcast data.

4.3 Serial function

4.3.1 Serial basic parameters

The basic parameters of serial port include: Baud rate, data bit, stop bit, check bit.

Baud rate: Serial communication rate, configurable 1200,2400,4800,9600,14400,19200,38400,57600,1 15200 、230400bps。

Data bits: The length of the data bits, ranges 5,6,7,8.

Stop bit: The range can be set from 1 to 2.

Check bit: The check bit of data communication, support none,Odd,Even,Mark,Space five checks By setting the serial parameters, keeping the serial parameters consistent with the serial connection device serial parameters can ensure that the pass is carried out normally.

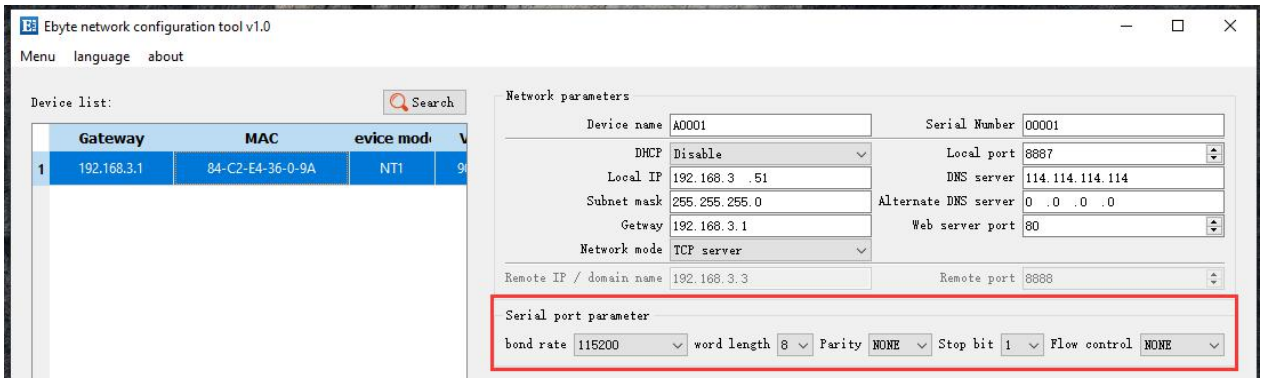


Figure 4- 4 The upper machine is configured with serial parameters

4.3.2 Serial data is sent and received

The serial assistant (serial terminal) sends test data, and the network debugging assistant (network side) receives the test data. The network debugging assistant (network side) sends test data, and the serial assistant (serial terminal) receives test data. Real two-way communication (i.e. local-to-network two-way data transceiver).

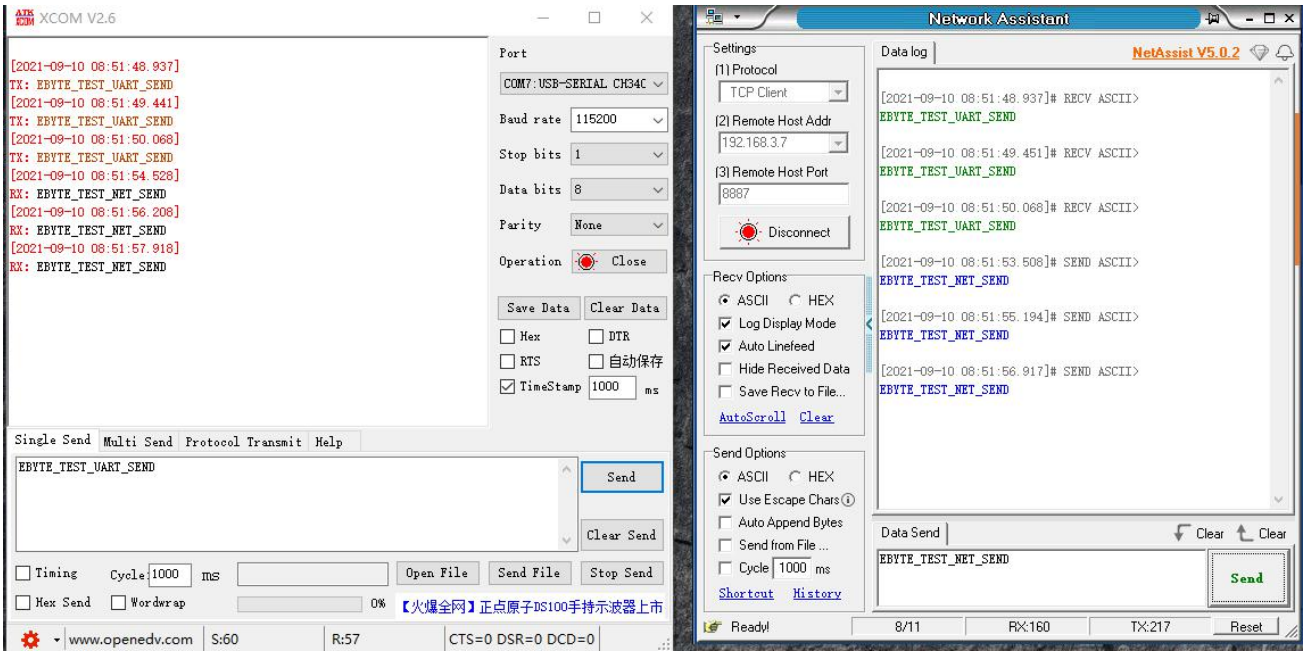


Figure 4- 5 Communication test

4.4 Advanced features

4.4.1 Heartbeat pack function

Under Network Transmission mode, the user can choose to send a heartbeat package and customize the heartbeat package time. Heartbeat Package supports network heartbeat pack, serial heartbeat bag.

Heartbeat package send mode:

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

（2） Serial mode - > The device sends heartbeat content to the serial bus at a set heartbeat interval.

（3） Mesh Mode - > Device sends heartbeat content to the mesh bus at a set heartbeat interval.

Custom heartbeat content (up to 38 bytes (ASCII) data,19 bytes (HEX) data).

Custom heartbeat package send interval, set to 0 when the heartbeat function is turned off, set value greater than zero to open the heartbeat function, open the range: (1-65536)seconds, the default value is 0.

4.4.2 The registration package feature

Under Network Transmission mode, users can choose to send a registration package and customize the registration package time.

The registration package supports the following modes:

（1） Send the MAC address(OLMAC)when the networkestablishes a connection to the device

（2） Sends a custom enrollment package(OLCSTM)when the networkestablishes a connection to the device

（3） Once the network is connected to the device, each packet of data that the device sends to the network is preceded by a MAC address (EMBMAC).

（4） Once the network is connected to the device, each packet of data that the device sends to the network is preceded by custom registration packet data(EMBCSTM).

Custom registration package content (up to 38 bytes (ASCII) data,18 bytes (HEX) data).

Note: Sending MAC using a connection and sending a custom registration package mode using the connection does not work.

4.4.3 Short connection function

Support for network short connections (which are turned off by default),TCP short connections are primarily used to save server resource overhead and are typically used in multipoint (multi-client) to point (server) scenarios.

TCP short connection function is applied to TCP Client mode, after turning on the short connection function, only when sending information request to connect to the server, after the successful connection, in the set time serial port did not receive guide data or network port no data transmission, the device will automatically disconnect. It is important to note that in the case of disconnection, the data sent, the first packet of data will activate the short connection mechanism, and the first frame of data will be lost.

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

Note: Short connections only work in client mode, and server mode does not take effect.

4.4.4 Timed-out restart function

Supports time-out restart (default:300 seconds), which is mainly used to ensure long-term stable operation of the device, no data is sent or received within the set time-out timeout, and the device will restart operations to avoid the impact of abnormal conditions on communication.

Time-out restart time Parameter range(60-65535)seconds, configured to 0 for off timeout restart. The default is 300 seconds.

4.4.5 Cache cleanup

When the TCP connection is not established, the data received by the serial port is placed in the cache, the serial receive cache is 512 bytes, and after the network connection is successful, the serial cache can be selected by configuration to empty the serial cache or to send the cache over the network.

Enabled: The device does not save the data received by the serial port before the connection is

established.

Disabled: The network will receive serial cached data after the connection is established.

4.4.6 Disconnect automatically re-connected

After the network is disconnected, the device attempts to actively connect to the server or waits for the client to connect at a specified time, and if the timeout is timed out and the reconnection is successful, the device will automatically restart, preventing the network from regaining connectivity after the device is disconnected.

Reconnection time: The interval between each attempt by the device to re-establish the network.

Reconnections: The number of times the device attempts to re-establish the network, the cumulative number of reconnections reaches a preset value, and if the connection is not successful, the device will automatically restart.

The actual re-start determination time is off-grid re-connect time multiplied by the number of re-connections.

The recommended network restart time is configured as 5S,with 5 network resets.

4.4.7 Remote upgrade

In order to facilitate later maintenance and upgrade functions as well as replace different firmware,NA,NS,NT is supported online upgrades, through our company to provide upgrades Firmware users can easily upgrade and replace the current firmware via the upper machine.
Firmware upgrade procedure:
The first step: open the upper computer, select the device that needs to be upgraded, open the device upgrade assistant in the menu bar;

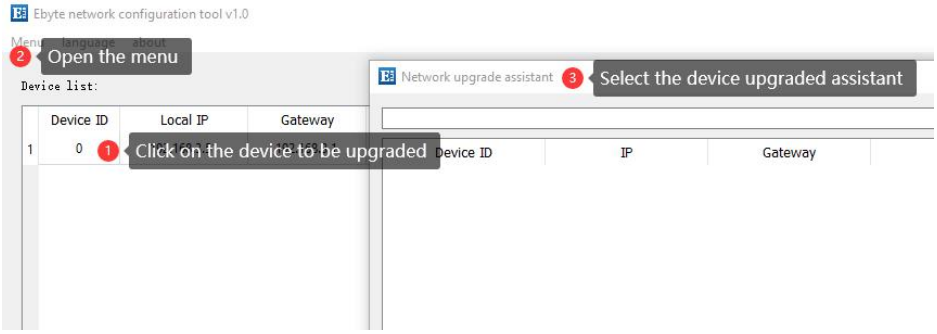


Figure 4- 4 The first step in upgrading the instructions

Step 2: Click to select the firmware, open the corresponding firmware;

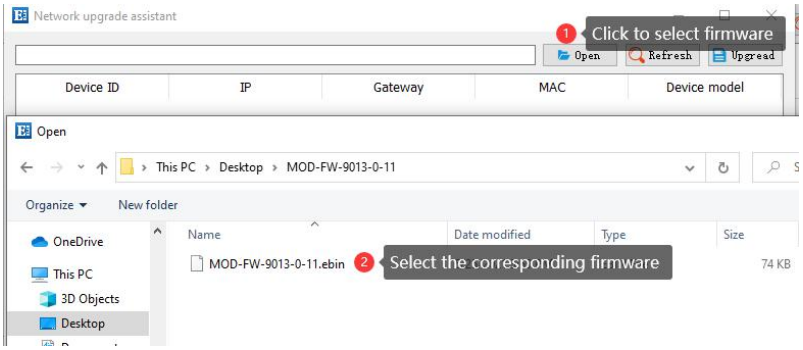


Figure 4- 5 Instructions for the second step of upgrading

Step 3: refresh the device and select the corresponding device that needs to be upgraded;

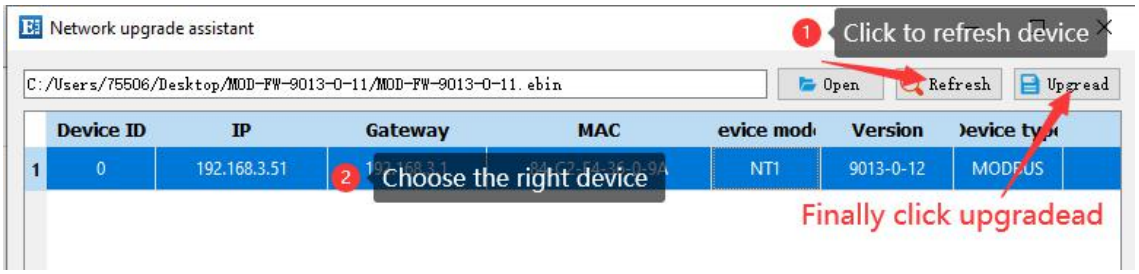


Figure 4- 6 The third step of the upgrade is described

Step 4: Wait for the device upgrade to complete and restart the device.

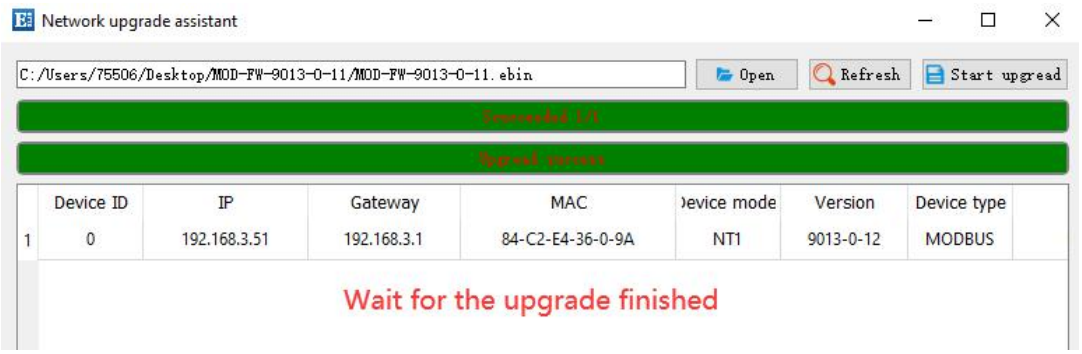


Figure 4- 7 Upgrade the fourth step of the operating instructions

4.5 Modbus gateway functionality

Supports 4 MODBUDS gateway features:

- Simple protocol conversion mode
- Multi-host mode (Modbus firmware support only).
- Storage gateway (Modbus firmware support only).
- Configurable gateway (Modbus firmware support only).

4.5.1 Simple protocol conversion

A simple protocol conversion is the conversion of Modbus RTU data to Modbus TCP data, as well as Modbus TCP data to Modbus RTU data, enabling the interoperability of Ethernet protocol data with serial protocol data.

Simple protocol conversions can work in TCP server mode or in TCP client mode, where only one Modbus primary station can exist, whether working on a TCP server or a TCP client.

The gateway works in TCP server mode:

- When the Ethernet side is the Main Station of Modbus, you can only connect all the way to the Socket(to prevent data conflicts);
- Serial side as Modbus main station, can be connected up to 6 Modbus TCP from the station;

The gateway works in TCP client mode:

- Ethernet side as Modbus main station, serial side theoretically supports up to 128 RTU fromslung;

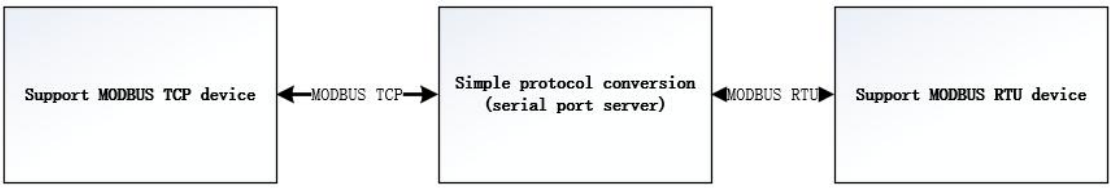


Figure 4- 6 Simple protocol conversion

Simple protocol conversion parameter configuration:

（1） Mode configuration:AT is configured as MOD1,web page, upper machine selection simple protocol conversion.

（2） Modbus Answer TimeOut Configuration: Range:0-65535ms,default:500ms.

4.5.2 Multi-host mode

For simple protocol conversions, only one Modbus master can exist, a functional upgrade is made, and bus occupancy scheduling occurs when multiple hosts are accessing the Modbus gateway at the same time, thus resolving bus conflicts (currently only 6 host connections are supported), only working in TCP server mode.

Because of the bus conflict detection mechanism, every addition to the Modbus master has an

impact on the timeliness of data response.

For example, multiple computers turn on configuration king acquisition data (up to six, too many MODBUS hosts will cause stable variation).

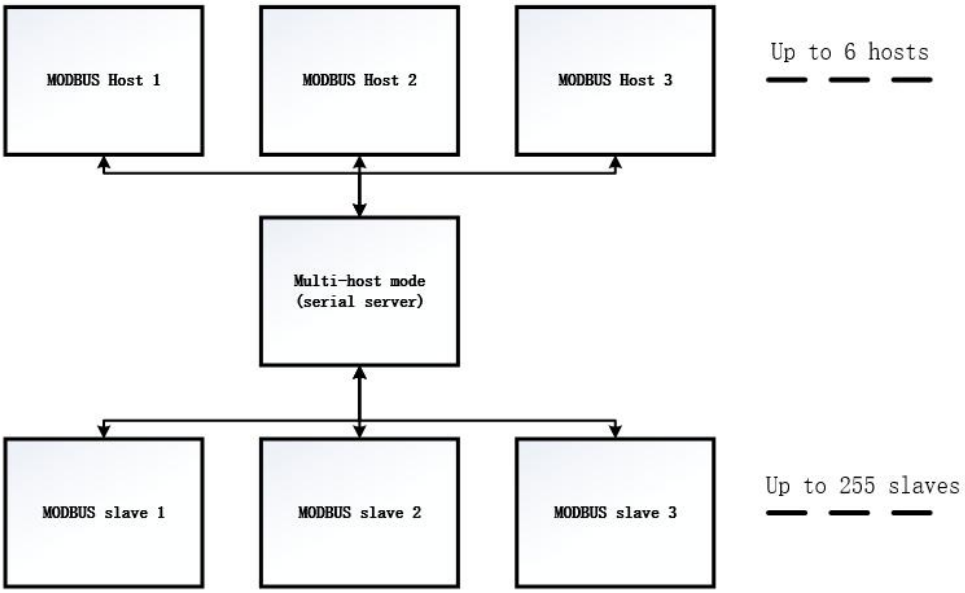


Figure 4- 7 Multi-host gateway

Multi-host mode parameter configuration:

（3） Mode configuration:AT is configured as MOD2,web page, upper machine select multi-host mode.

（4） Modbus Answer TimeOut Configuration: Range:0-65535ms,default:500ms.

4.5.3 Storage gateway

Based on the multi-host development of the optimized network side read speed gateway, the storage network side issued read instructions, when the network side reads the stored instructions, the gateway will replace the RTU device to quickly reply to the MODBUS TCP instruction, serial side automatically poll the RTU device register during the instruction storage time, update the data.

As an upgrade to multi-host mode, the storage gateway also works only in TCP server mode, increasing the responsiveness on the network side.

peculiarity:

（1） The gateway allocates a total of 5K of space for storing instructions and returning results;

（2） RTU responds to timeouts by automatically deleting storage instructions to ensure the authenticity of the data;

（3） The gateway polls the RTU device based on the instruction storage time used for the configuration,theMODBUS host does not query the instruction again during the storage time, and the gateway automatically deletes the storage instruction to free up memory;

（4） The first instruction is transmitted directly to the RTU device;

（5） Only 01,02,0 3,04MODBUS function code storage is only supported;

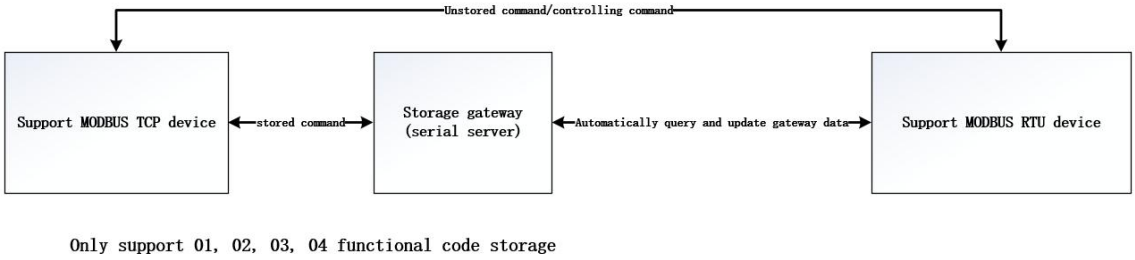


Figure 4- 8 Storage Gateway

Storage gateway parameter configuration:

（1） Mode configuration:AT is configured as MOD3,webpage, upper computer select storage gateway.

（2） Modbus Answer TimeOut Configuration: Range:0-65535ms,default:500ms.

（3） Modbus directive storage time settings: range:0-254s,for instruction storage time settings, default:10s.

4.5.4 Configurable gateway

Serial ports automatically poll the RTU device register (only the configuration of theMODBUS read instruction) based on the configured MODBUS instructions, and the unconfigured instructions and control instructions operate directly on the RTU device. You can store frequently read instructions in the gateway in advance, reducing response time (querying configured instructions). Due to the above characteristics, the serial side of the storage gateway can only be connected to the Modbus from the station.

Use web pages to configure only 14 storage instructions, and upsces and AT instructions to configure 50 storage instructions.

It can improve the response speed of simple protocol conversion but has some effect on stability, and it can be used in scenarios where real-time response is more demanding.

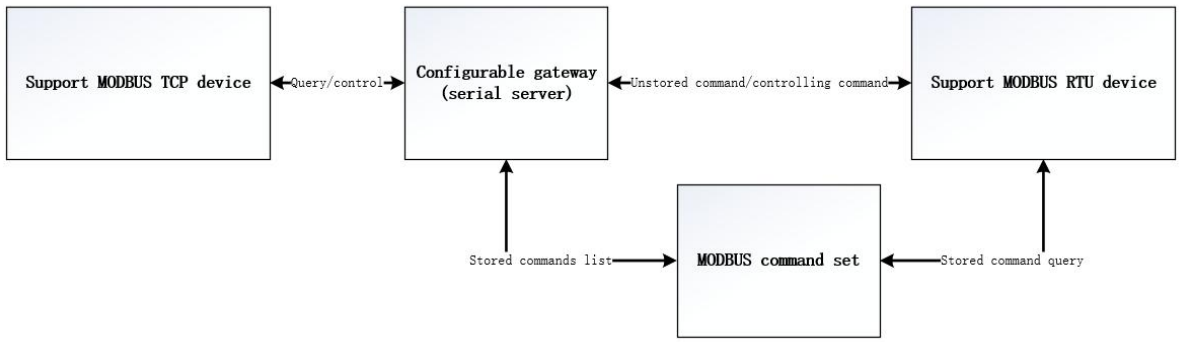


Figure 4- 9 Configurable Gateway

Configurable gateway parameter configuration:

（1） Mode configuration:AT is configured as MOD4,and the web page, the upper machine selects a configurable gateway.

（2） Modbus answer timeout configuration: Range:0-65535ms,default:500ms.

（3） Storage instructions: Web page configuration format (e.g. 0 1,01,00,00,00,08),theupper machine directly enters the MODBUS instruction (e.g. 010100000008).

5. How it's configured

5.1 Web settings

You can customize the settings by means of web settings. Open your browser, enter your device IPin the address bar(default:192.168.3.7),go to thepage, query, set parameters, and finally click on the Submit menu to wait for the page to return a successful prompt for it to take effect.

Note: Devices cannot use Web settings if they are connected to the server as client mode and successfully connected as a server

Note: Web settings cannot be used with domain name resolution on or DHCP on without an IP address.

As shown in the attached image.

5.2 Configure tool software settings

Open the configuration tool software, search for devices, double-click on the recognized devices, pop up the parameter query configuration interface. You can customize the relevant parameters according to the needs, and then save the configuration, restart the device, complete the parameter modification.

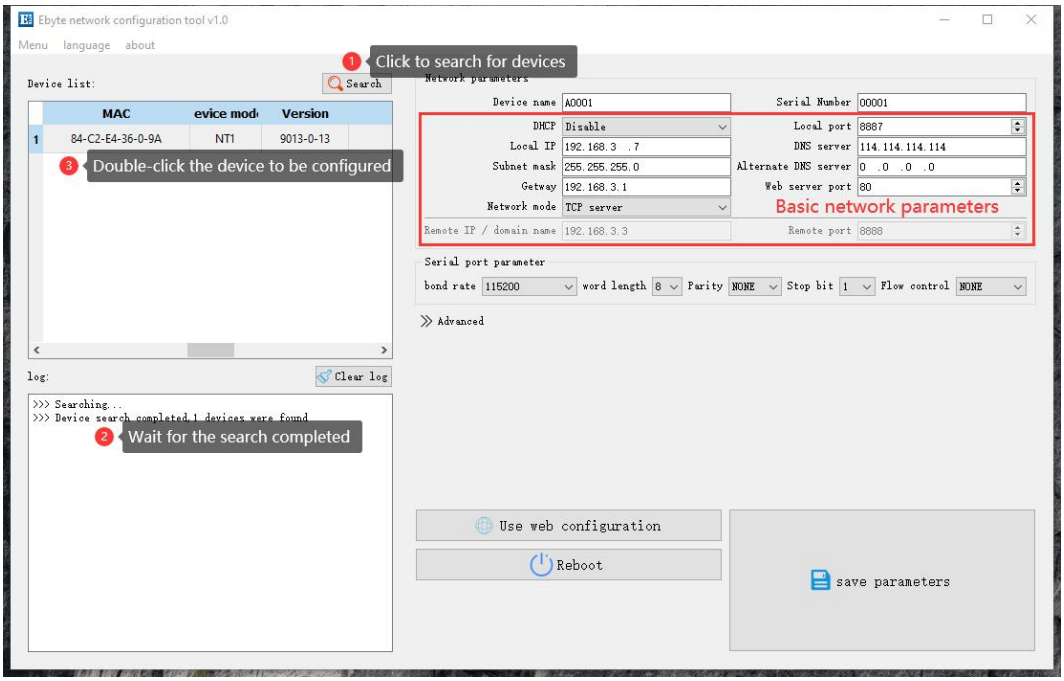


Figure 5- 2 Upper machine configuration

5.3 AT instruction configuration

The relevant parameters of the module are queried and modified, which can be done through the AT instruction configuration. For specific AT instructions, refer to serial server AT instruction sets.

6. Revised history

The final interpretation is owned by Chengdu Yiyit Electronic Technology Co., Ltd.

version	The revision date	Revised description	Maintainer
1.0	2021-06-28	The initial version	LC
1.1	2021-09-13	Content revision	LZX

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