



Chengdu Ebyte Electronic Technology Co.,Ltd

# Wireless Modem

## User Manual



**Serial  $\rightleftharpoons$  Ethernet**

**Serial server**

**NA111**

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## 1. Introduction to the product

NA111 is a serial-port server that implements serial data ⇌ Ethernet data conversion. The product comes with an RJ45 interface and is rail mounted. With a variety of Modbus gateway modes, it can meet the networking functions of various serial devices/PLC.



### Features

- RJ45 Adaptive Ethernet Interface;
- Support for multiple modes of operation (TCP Server, TCP Client, UDP Server, UDP Client);
- Support web settings, configuration tool settings, AT instruction settings parameters;
- Support for multiple Socket connections;
- Serial port rate support 1200 to 230400 (default 115200);
- Support for multiple checks (None, Odd, Even, Mark, Space);
- Support DHCP function;
- Support DNS function, domain name resolution;
- DNS server address customization;
- Support for a variety of Modbus gateways (simple protocol conversion, multi-host mode, storage gateway, configurable gateway);
- Support for virtual serial port;
- Support time-out restart function, restart time customization;
- Supports short connection function, short connection interval customization;
- Support heartbeat package, registration package function;
- Support cache cleanup function;
- Support access to the extranet, local area network;
- Supports hardware recovery factory settings;
- Support for online upgrades.

## 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 serial port server (hereinafter referred to as "device"), it is necessary to prepare network cable, computer, USB serial port converter and other related accessories. Here's how:

Table 2 - 1 Material sheet

serial number	Device tools	quantity
1	equipment	1
2	Cable	1
3	Computer	1
4	USB serial converter	1

### 2.2 The device is wired

Test serial-to-network data communication and connect the RS485 pin of the device to the PC end via a USB serial converter.

Use a network cable to connect the device's gateway (RJ45) to the PC's gate.

The connection diagram looks like this:



Figure 2- 1 PC connection diagram

## 2.3 Software settings

### 2.3.1 The network test environment

Avoid server search failures (pings don't work) and problems with customers not being able to open web pages during real-world applications. Check the computer for the relevant settings first.

- (1) Turn off your computer's firewall and antivirus software.
- (2) Configure the network card that is connected to the device.
- (3) For PC direct serial port servers, you need to set up a static computer and maintain the same network segment as the device.

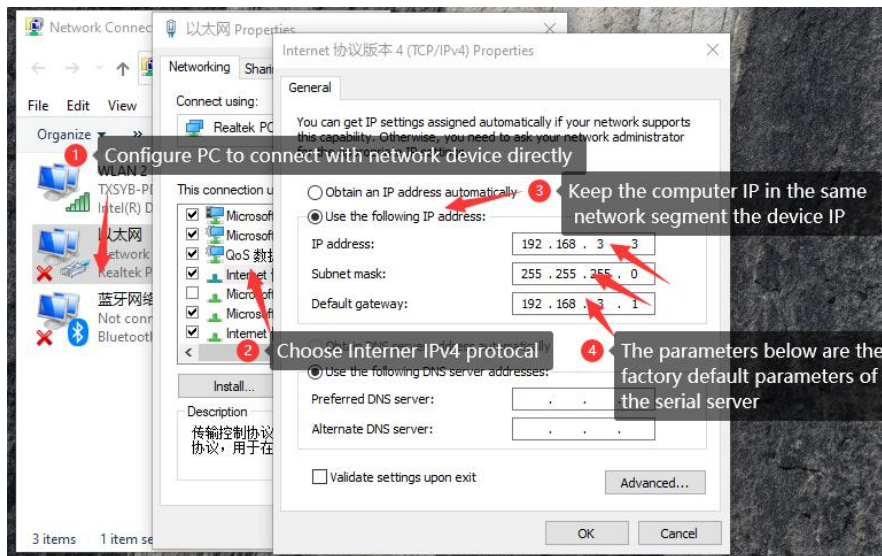


Figure 2 - 2 PC local connection settings

### 2.3.2 The default parameter

Table 2 - 2 default parameters

project	The default parameter
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

### 2.3.3 Data transfer test

After the above steps, follow the device factory default parameters, do the following, to achieve data transmission testing.

Here's how:

- (1) Open the test TCP/IP debugging assistant software.
- (2) The network settings area selects the TCP client mode, which corresponds to the server IP address (module default target IP: 192.168.3.3). The server port number corresponds to the module setting port 8887 (module default port: 8887), click Create.
- (3) Wait for the computer to connect to the serial server, the connection is complete after the serial server M0 (green LED lit).

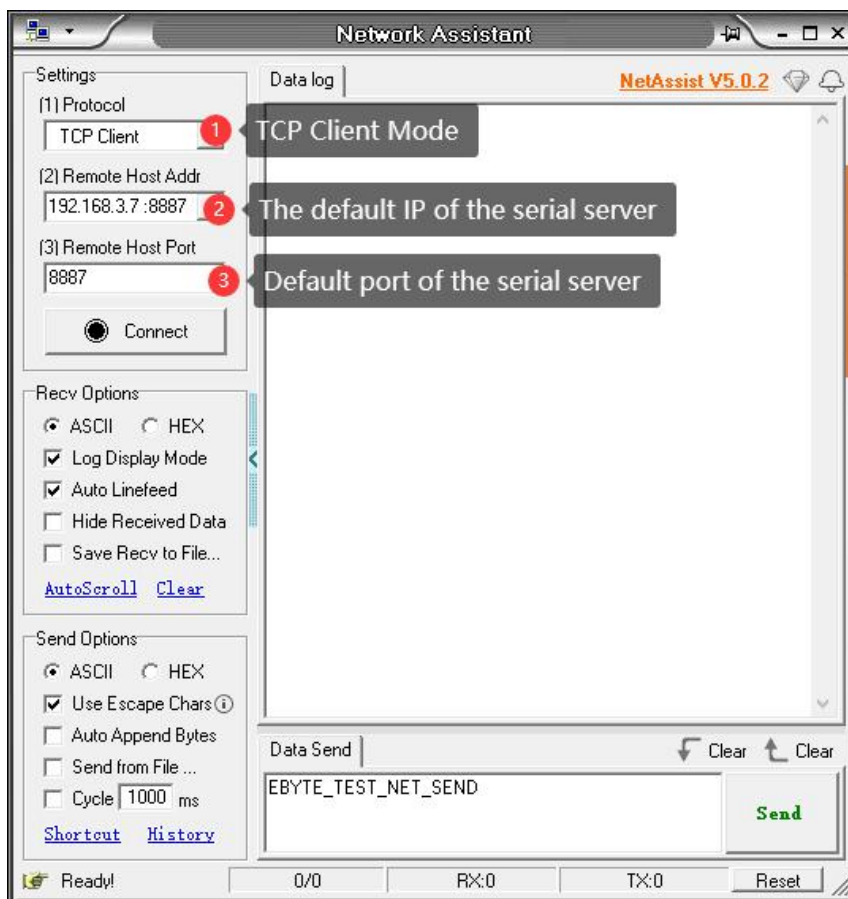


Figure 2- 3 Gate parameter configuration

- (4) Open serial assistant, serial port rate is set to 115200, serial parameters are set to None/8/1, click on open, open serial port.

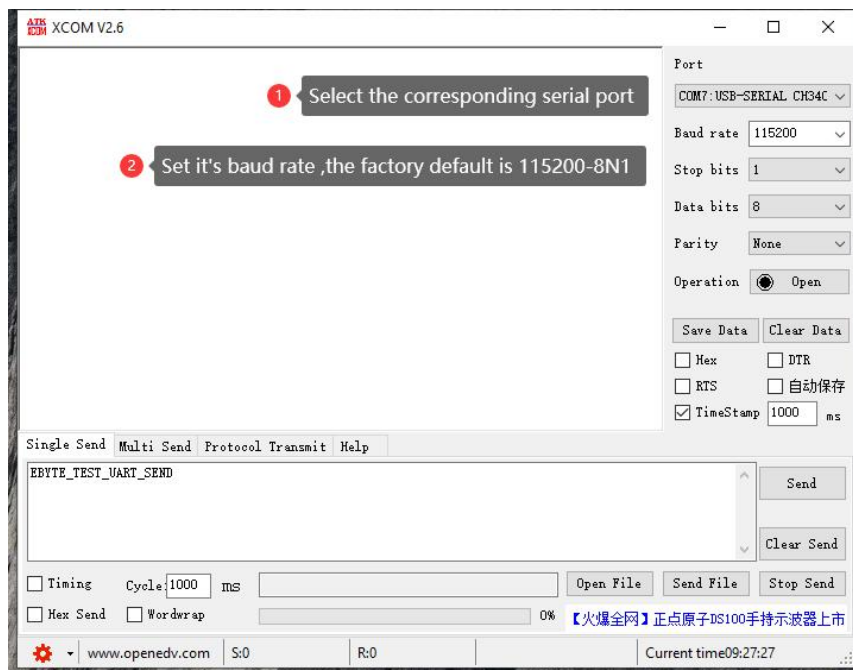


Figure 2- 4 Serial parameter configuration

(5) Data transmission testing, serial assistant (serial port side) 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 port side) receives the test data. Duplex communication (i.e. local-to-network two-way data transceivers).

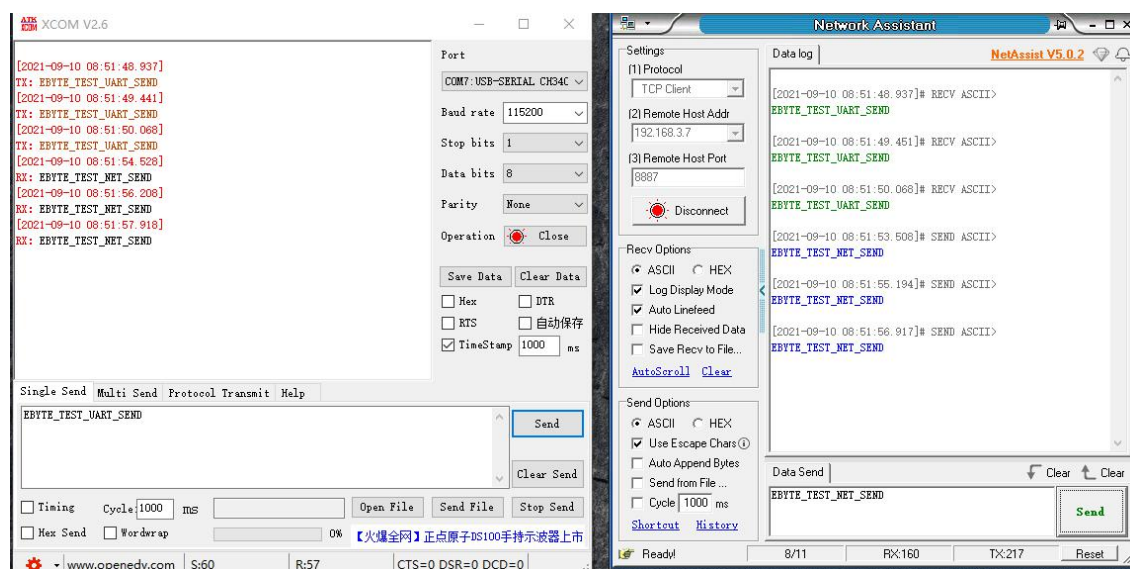


Figure 2- 5 Send tests

### 3. Product overview

#### 3.1 Product specifications

Table 3 - 1 Specification Table

Product model	The type of product	Socket The number of connections	The working mode	Operating voltage	Product size (mm)
NS1	Patch module	6 way	TCP Sever TCP Client UDP Sever UDP Client	3.0~5.5V(DC)	17 * 19 * 4
NT1	Plug in the module directly	6 way		3.0~5.5V(DC)	35 * 22 * 30
NT1-B	Plug in the module directly	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)	

## 3.2 Technical parameters

Table 3 - 2 Device parameters

project	illustrate
Operating voltage	DC 8 to 28V
interface	Serial (RS485), Netport (RJ45)
The working mode	TCP Server、TCP Client、UDP Server、UDP Client（默认 TCP Server）
Socket connection	Supports 6 ways
Network protocols	IP、TCP/UDP、IPv4
How IP is obtained	DHCP, static IP (default static IP)
Domain name resolution	backing
How it is 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
The 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 bits	None、Odd、Even、Mark、Space（default None）
Flow control	RTS/CTS、DSR/DTR、XON/XOFF、NONE (Default NOW)
Product size	92 mm x 66mm x 30mm (long x wide x high)
The weight of the product	81g ± 5g
Operating temperature and humidity	-40 to .85 degrees C, 5% to 95% RH (no condensation)
Store temperature and humidity	-40 to .105 degrees C, 5% to 95% RH (no condensation)

### 3.3 THE LED DESCRIPTION

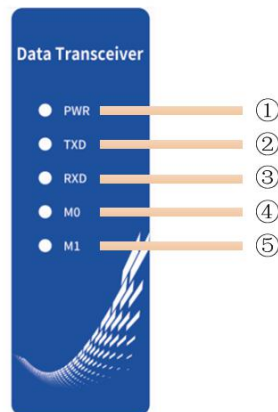


Figure 3- 1 LED

Table 3- 3 LED function table

serial number	name	function	illustrate
1	PWR	Power LED	Power on: The light is always on. Power off: The light goes out.
2	TXD	Serial send light	Data sent: Light on. No data sent: Lights off.
3	RXD	Serial reception indicator	Data sent: Light on. No data sent: Lights off.
4	M0	Link light	TCP mode: network connection, light on. The network is down and the lights are off. UDP mode: The LIGHT is always on.
5	M1	STATE indicator	The network cable is connected and the light is always on. The network cable is disconnected and the light goes out.

Note: PWR, TXD, RXD, M0 all light up when the network cable is not connected, M1 off.

### 3.4 Dimensions

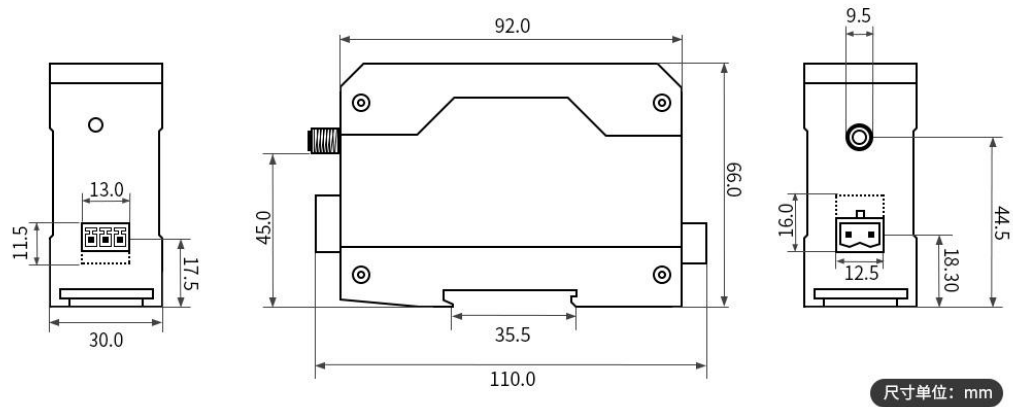


Figure 3 - 2 Dimensions

### 3.5 How it is installed

The equipment is mounted by rail.

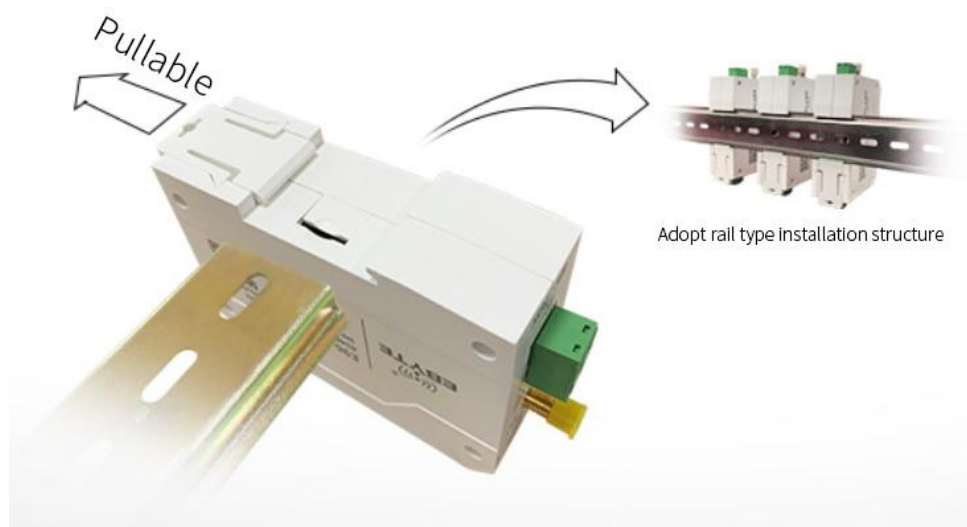


Figure 3- 3 Rail installation

## 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 through the web page.

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

How to do this:

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

It can also be opened by configuring the software's open web page configuration button.

Note: If you modify the port number, the address input bar to add the port number, for example, modify the page access port is 8080, the connection page configuration needs to enter 192.168.3.7:8080 in the address bar.

#### 4.1.2 Subnet mask/IP address

IP address is the module's identification in the local area network, in the local area network has uniqueness. Therefore, it cannot be duplicated with other devices on the same LAN. The IP addresses of the modules are static IP and DHCP.

- (1) Static IP: Static IP is required for the user to manually set, the setup process notes to write IP, subnet mask and gateway, static IP is suitable for the need to count IP and devices and to correspond to the scene.

Advantages: Access to the devices that can not assign IP addresses can be searched through the network segment broadcast mode, convenient unified management;

Cons: Different LAN intranet segments are different, resulting in no normal TCP/UDP communication.

- (2) Dynamic DHCP :D HCP primarily takes the role of obtaining information such as IP address, gateway address, DNS server address, etc. dynamically from the gateway host, thus eliminating

the tedious step of setting IP address. Suitable for scenarios where there is no requirement for IP, nor is ip 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 DHCP Serve-free network, such as directly connected to a computer, the module will not work 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 flag within the subnet.

Subnet mask must be set, we commonly use class C subnet mask: 255.255.255.0, network number is the first 24 bits, host number is the last 8 bits, the number of subnets is 255, module IP in the range of 255, 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 you connect to a device such as a router when you connect to an external network, the gateway is the route.

### 4.1.3 DNS server address

DNS servers are primarily used to convert domain names to NETWORK-recognized IP addresses. DNS server addresses are customizable and enable domain name resolution in cases where the local domain name server is abnormal. The device reports resolution requests to a custom DNS server when the domain name is resolved, making it easy and efficient to use.

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

In static IP mode, the DNS server factory address defaults to 114.114.114.114.

### 4.1.4 Restore factory settings

The device's Restore pin is pressed continuously for about 5 seconds until the device restarts and the device is restarted and the factory settings are restored.

The following table parameters are modified to factory default parameters when factory settings are restored.

Table 4- 1 partial factory default parameters

project	The default parameter
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 pack cycle	0
Time-out restart	300
Short connection	Shut down
The connection empties 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 Socket features

### 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 the Modbus feature is turned off, when the device serial port receives serial data, it is sent to all client devices connected to the device at the same time, supporting connections of up to 6 clients.

Typically used for communication with TCP clients within a local area network.

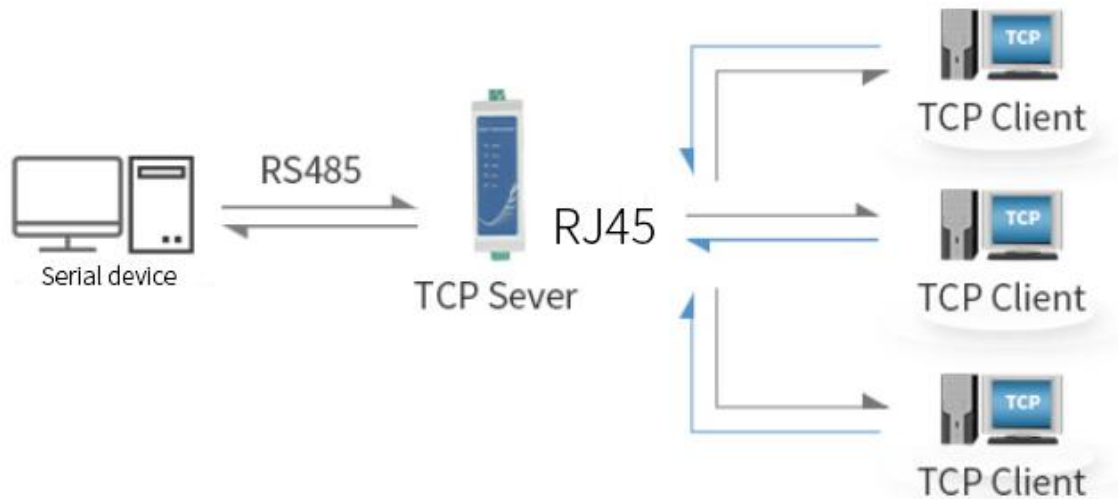


Figure 4-1 Server Mode Schematic

## 4.2.2 TCP Client mode

TCP Client is the TCP client. When the device is working, it initiates a connection request to the server and establishes a connection for the interaction of serial and server data. According to the TCP Protocol, TCP Client is a connection and disconnection distinction that ensures a 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 accurate configuration of the destination's IP address/domain name, target port.

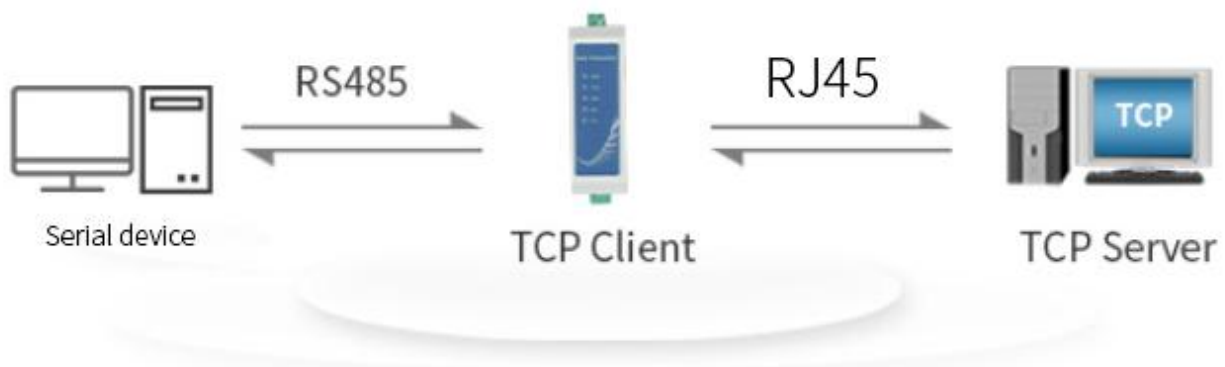


Figure 4- 2 Client mode diagram

### 4.2.3 UDP Server mode

UDP Server refers to a device that does not verify the source IP address of the data when communicating with the UDP protocol, saves the source IP address and source port of the packet after receiving one UDP packet, and sets it as the target IP and port, so the data sent by the device sends the packet only to the source IP address and port where the data was received by the last device.

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

Note: In UDP mode, the network should send less than 512Bit 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 IP and ports need to be developed to send data to each other. Typically used for data transfer scenarios where packet drop rates are not required, packets are small and send more frequently, and data is passed to the specified IP.

In UDP Client mode, the device will only communicate 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 255.255.255.255, and the sending data will be broadcast throughout the network segment, but the transceiver device needs to ensure that the port is consistent and that 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 for 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200, 230400bps.

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

Stop bit: You can set the range 1, 2.

Check bit: the check bit of data communication, support None, Odd, Even, Mark, Space five verification methods by setting serial parameters, to maintain consistent with serial connection

equipment serial parameters can ensure that the normal.

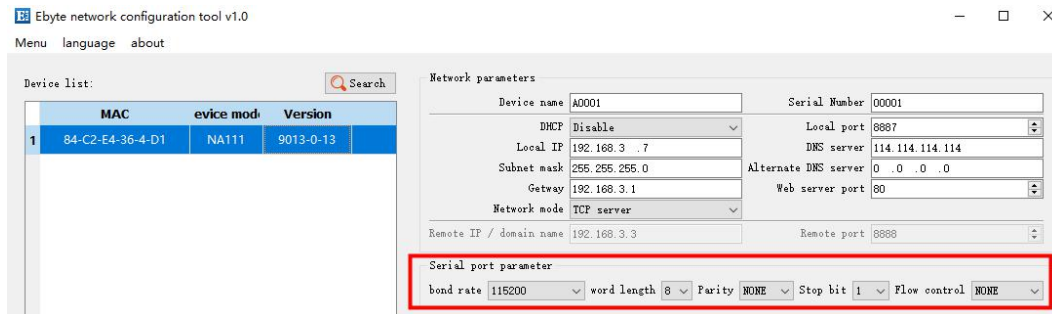


Figure 4-2 Upper machine serial port parameter configuration

### 4.3.2 Serial data is sent and received

The serial assistant (serial port side) 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 port side) receives the test data. The 485 interface enables half-duplex communication (i.e. data can be transmitted in both directions of a signal carrier, but not simultaneously).

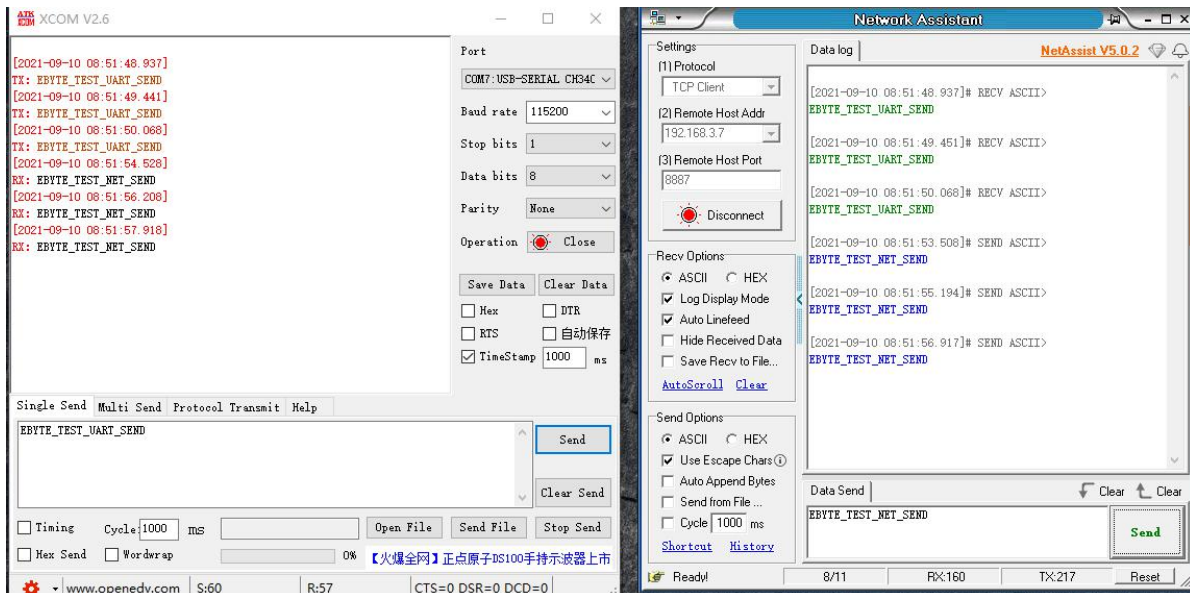


Figure 4- 3 Data send and receive diagrams

## 4.4 Advanced features

### 4.4.1 Heartbeat package function

In network transmission mode, users can choose to send a heartbeat package and customize the heartbeat package time. Heartbeat pack support network heartbeat package, serial heartbeat package.

Heartbeat package sending mode:

- (1) The default is to turn off heartbeat mode.
- (2) Serial mode -> device sends heartbeat content to the serial bus at a set heartbeat interval.
- (3) Gate mode -> device sends heartbeat content to the gate 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 package function is turned off, set value greater than zero then turn on the heartbeat package function, open can set the range: (1-65536) seconds, the default value is 0.

### 4.4.2 Register the package feature

In network transmission mode, users can choose to send the registration package and customize the registration package time.

The registration package supports several modes:

- (1) Send MAC address (OLMAC) when the network is connected to the device
- (2) Send custom enrollment package data (OLCSTM) when the network is connected to the device
- (3) After the network is connected to the device, each packet of data sent to the network by the device is preceded by a MAC address (EMBMAC)
- (4) Once the network is connected to the device, each package of data sent by the device to the network is preceded by custom enrollment package data (EMBCSTM)

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

Note: The web page configuration does not work properly using the connection to send MAC and the connection to send a custom registration package mode.

### 4.4.3 Short connection

Supports short network connections (which are turned off by default), and TCP short connections are primarily used to save server resource overhead and are typically used in multipoint (multi-client)-to-one (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 connection is successful, in the set time serial port did not receive the guide data or no data sent and received at the gate, the device will automatically disconnect. It is important to note that in the case of disconnection, the first packet of data sent activates the short connection mechanism and the first frame of data is 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, which does not take effect.

### 4.4.4 Time-out restart function

Supports time-out restart function (default: 300 seconds), which is mainly used to ensure long-term stable operation of the device, in the set time-out restart time did not send and receive data, the device will restart operation, so as to avoid abnormal circumstances on the communication.

Time-out restart time parameter range (60-65535) seconds, configured as 0 to indicate shutdown time-out 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 will be placed in the cache, the serial receiving cache is 512 bytes, after the network connection is successful, you can choose to empty the serial cache through the configuration or send the cache over the network.

Enable: 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 Disconnected restart function

After the device is disconnected, it attempts to actively connect to the server or waits for the client to connect at a specified time, and if the time-out and no reconnection succeeds, the device automatically restarts, preventing the network from recovering the connection after the device is dropped.

Disconnect re-connection time: The interval between each attempt by a 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 the preset value, and if the connection is not successful, the device will automatically restart.

The actual restart determination time is the disconnected re-connect time multiplied by the number of reconnations.

It is recommended to configure the network outage restart time to 5S and the number of network outage restarts to 5 times.

#### 4.4.7 Remote upgrade

In order to facilitate late maintenance and upgrade functions and replace different firmware, NA, NS, NT supports online upgrades, through our company to provide upgrade firmware users can upgrade or replace the current firmware via the upper computer.

Firmware upgrade procedure:

Step 1: open the computer, select the equipment that needs to be upgraded, open the device upgrade assistant in the menu bar;

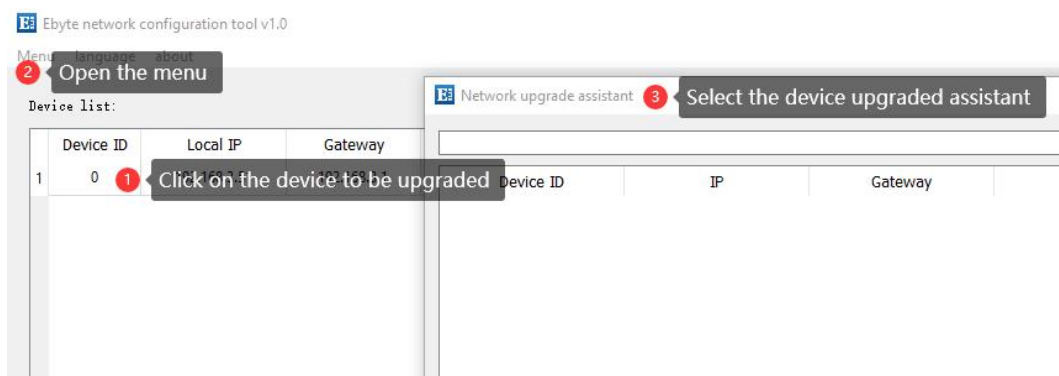


Figure 4-4 The first step of upgrading is explained

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

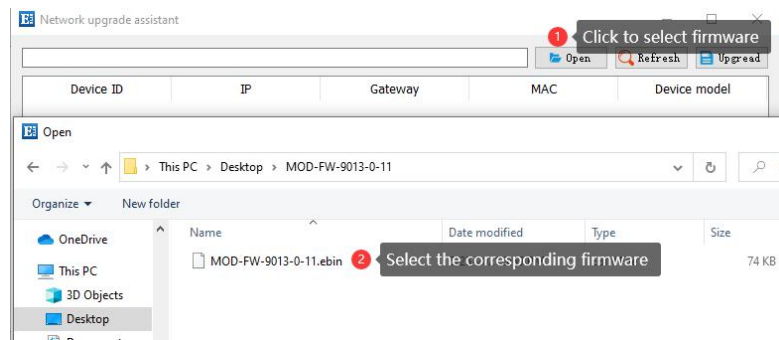


Figure 4-5 Upgrade the second step

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

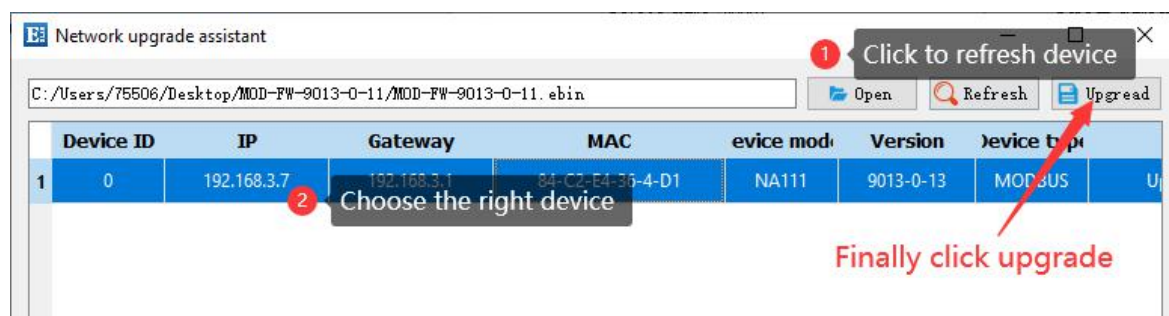


Figure 4-6 Upgrade the third step

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

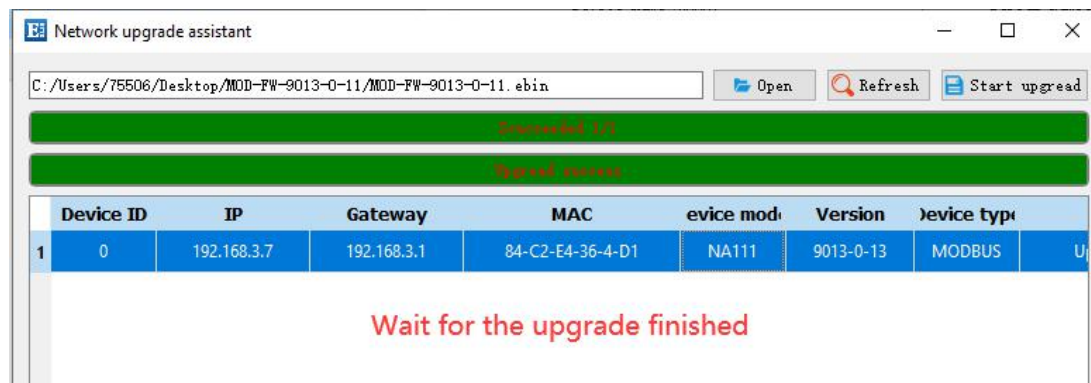


Figure 4-7 Upgrade the fourth step

## 4.5 Modbus gateway features

Supports 4 MODEBUDS 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 mode

Simple protocol conversion: convert The Modbus RTU data to TheModbus TCP data, or the Modbus TCP data to the Modbus RTU data, and realize the interoperability of the Ethernet Modbus data with the serial Modbus data.

Simple protocol conversion can work in TCP server mode or in TCP client mode, whether working on TCP server or TCP client can only exist a Modbus master.

The gateway works in TCP server mode:

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

The gateway works in TCP client mode:

- Ethernet side as the Main Modbus station, serial port side theoretically supports up to 128 RTU from the station;

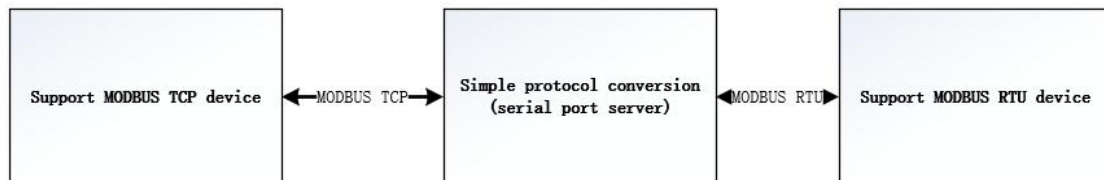


Figure 4-8 Simple Protocol Conversion

Simple protocol conversion parameter configuration:

- (1) Mode configuration: AT is configured as MOD1, web page, computer selection simple protocol conversion.
- (2) Modbus answer timeout configuration: range: 0-65535ms, default: 500ms.

### 4.5.2 Multi-host mode

For simple protocol conversion, there can only be one Modbus master, a feature upgrade, when multiple hosts access at the same time Modbus gateway will be bus occupancy scheduling, thus

resolving bus conflicts (currently only 6 host connections are supported), only support working in TCP server mode.

Because of the bus conflict detection mechanism, every additional Modbus master has an impact on the real-time nature of the data response.

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

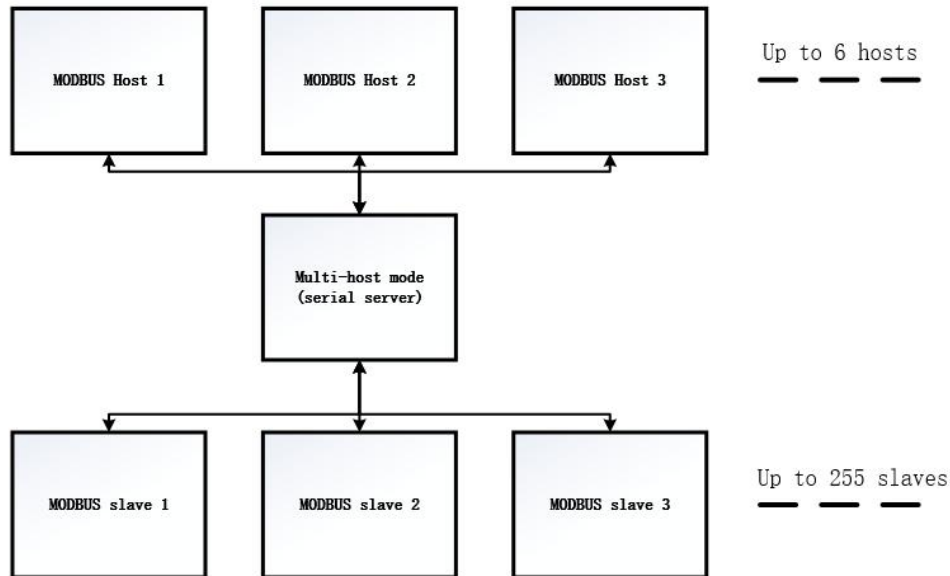


Figure 4- 9 Multi-Host Mode

Multi-host mode parameter configuration:

- (1) Mode configuration: AT is configured as MOD2, web page, computer selection multi-host mode.
- (2) Modbus answer timeout configuration: range: 0-65535ms, default: 500ms.

### 4.5.3 Storage gateway

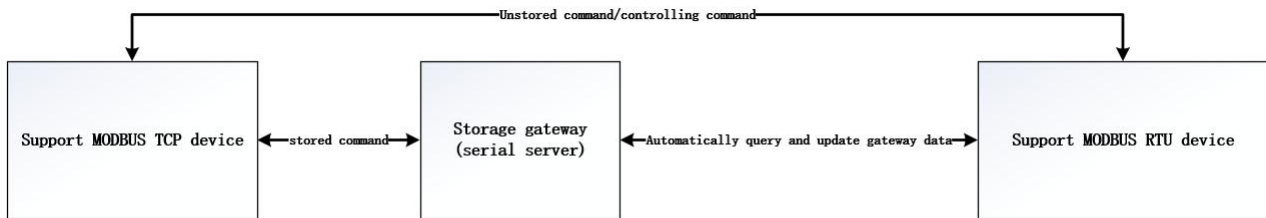
Based on the multi-host development of the optimization of network side reading speed of the gateway, storage network side issued reading instructions, when the network side read stored instructions, the gateway will replace the RTU device to quickly reply to THEMBUS TCP instructions, serial side automatically in the instruction storage time polling RTU device registers, update data.

Storage gateway as an upgraded version of multi-host mode, but also can only work in TCP

server mode, improve the response speed on the network side.

peculiarity:

- (1) The gateway allocates a total of 5K space for the storage of instructions and returns results;
- (2) RTU responds to timeouts by automatically deleting storage instructions to ensure the real-time nature of the data;
- (3) The gateway polls the RTU device according to the instruction storage time used for the configuration, the MODBUS host does not query the instruction again during 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 support 01, 02, 03, 04 MODBUS function code query results storage;



Only support 01, 02, 03, 04 functional code storage

Figure 4- 10 Storage Gateway

Storage gateway parameter configuration:

- (1) Mode configuration: AT is configured as MOD3, web page, computer selection storage gateway.
- (2) Modbus answer timeout configuration: range: 0-65535ms, default: 500ms.
- (3) Modbus instruction storage time settings: Range: 0-254s, for instruction storage time settings, default: 10s.

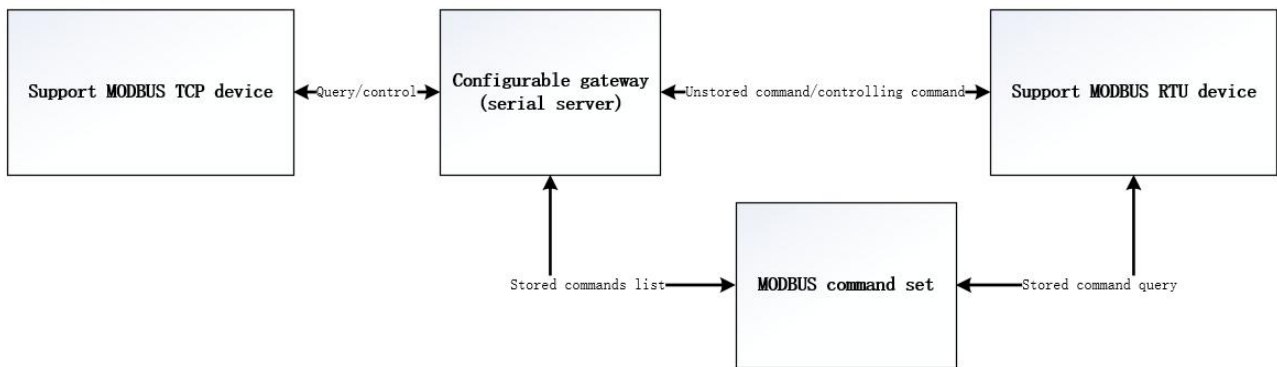
#### 4.5.4 Configurable gateway

Serial port will automatically poll the RTU device register (only support the configuration of THEMODBUS read instructions) according to the configured MODBUS instructions, and the unconfigured instructions and control instructions will operate the RTU device directly. You can store frequently read instructions in advance in the gateway, reducing response times (querying configured instructions). Due to the above features, only Modbus from the serial side of the storage

gateway can be connected.

Only 14 storage instructions can be configured using the web page, and 50 storage instructions can be configured using the computer and AT instructions.

You can improve the response speed of simple protocol transformation but have some impact on stability, and use it in scenarios that have high demands on response real-time.



Need to configure polling command in advance  
Only 01, 02, 03, 04 functional code storage can be configured

Figure 4-11 Configurable gateway

Configurable gateway parameter configuration:

- (1) Mode configuration: AT is configured as MOD4, web page, computer selection configurable gateway.
- (2) Modbus answer timeout configuration: range: 0-65535ms, default: 500ms.
- (3) Storage instructions: Web configuration format (e.g. 01,01,00,00,00,08), the computer directly input MODBUS instructions (e.g. 010100000008).

## 5. How it is configured

### 5.1 Web settings

You can customize the settings by web settings. Open your browser, enter your device IP (default: 192.168.3.7) in the address bar, go to the page, query, set parameters, and finally click on the "Submit" menu to wait for the page to return to the success prompt, you can take effect.

Note: Web settings cannot be used by devices if they have been connected to the server as client mode and successfully connected as a server to the client

Note: Web settings cannot be used if domain name resolution is turned on or DHCP is turned on and no IP address is obtained.  
This is shown in the drawings.

### 5.2 Configure tool software settings

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

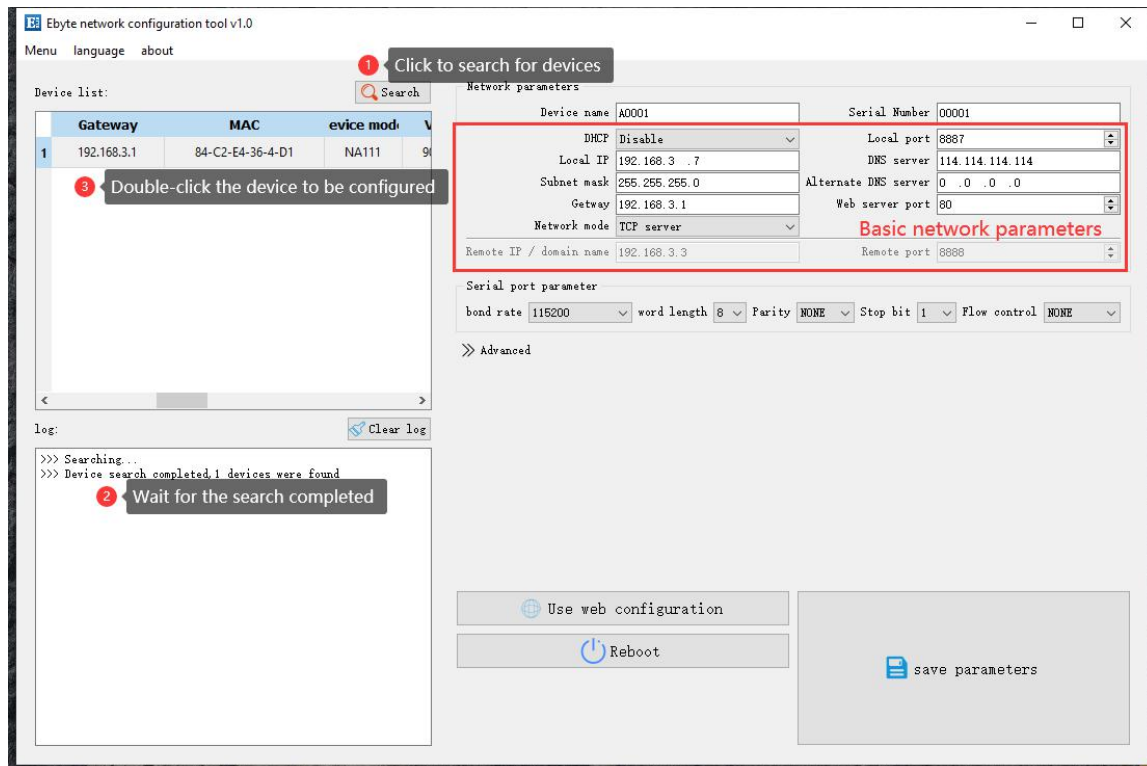


Figure 2- 7 Upper computer configuration

## 5.3 AT instruction configuration

The relevant parameters of the device are modified and can be done through the AT instruction configuration. For specific AT instructions, refer to the Serial Server AT Instruction Set.

## 6. Revise history

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

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

## 7. About us

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