

E90-DTU(xxxSLxx)E

Enthernet Gateway User Manual

成都亿佰特电子科技有限公司

Chengdu Ebyte Electronic Technology Co.,Ltd.

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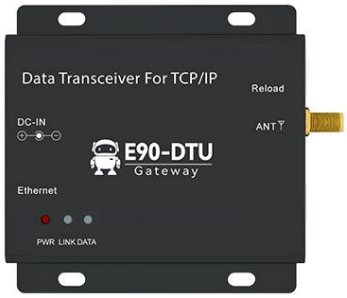
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Chapter1 Product description

Product introduction



E90-DTU(xxxSLxx)E is a wireless gateway (Ethernet interface data transmission radio) that supports 10M/100M rate and is developed by Chengdu Ebyte based on LoRa communication technology and Ethernet protocol . Supports 2-way Socket, provides six working modes: TCP Server , TCP Client , UDP Server , UDP Client , HTTP Client , MQTT Client , and supports six client connections in TCP server mode . .

Wireless communication uses LoRa direct sequence spread spectrum technology, which will bring longer communication distances, and has the advantages of concentrated power density and strong anti-interference ability. It has a software FEC forward error correction algorithm, which has high coding efficiency and strong error correction capability. In the case of sudden interference, it can actively correct the interfered data packets, greatly improving reliability and transmission distance, and helping users to efficiently Complete long-distance data transparent transmission.

Support users to perform relevant configuration through W EB web page and UDP host computer ;

E90-DTU(xxxSLxx)E includes the following models :

There are five models : E90-DTU(230SL30)E, E90-DTU(400SL22) E, E90-DTU(400SL30)E, E90-DTU(900SL22)E, and E90-DTU(900SL30)E .

Features

- Using the latest LoRa technology, it has a longer distance and more powerful performance than traditional LoRa data transmission radios;
- Adopts industrial -grade LoRa modulation technology, has data encryption, and the packet length can be set;
- Supports LBT function, the radio waits for transmission according to the current environmental noise intensity , improving the communication success rate of the radio in harsh environments;
- Support wireless sending of command data packets, remote configuration and communication encryption;
- It can realize multi-level relay networking, effectively expand the communication distance, and achieve ultra-long-distance communication;
- Industrial grade design can work in -40℃～+85℃ environment, wide voltage input (DC 8 ～ 28V);
- All-aluminum alloy shell, compact in size, easy to install and good in heat dissipation;
- Perfect shielding design, good electromagnetic compatibility and strong anti-interference ability;
- RJ45 adaptive 10/100M Ethernet interface;
- Support multiple working modes (TCPS , TCPC , UDPS , UDPC , HTTPC , MQTTC);
- three configuration methods: configuration tool, web page, and AT command;
- Support 2-way Socket;
- Server mode supports up to 10 Socket connections ;
- Support DHCP function;
- Supports DNS (domain name resolution) and custom domain name resolution servers;
- Supports a variety of Modbus gateways (simple protocol conversion, multi-host mode, storage gateway, configurable gateway, etc.);
- Supports quick access to Alibaba Cloud, Baidu Cloud, OneNET , Huawei Cloud, and version 3.1 standard

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MQTT servers;

- Support HTTP protocol (GET/POST request);
- Supports timeout restart function, time can be customized;
- Support short connection function, short connection interval can be customized;
- Supports heartbeat package and registration package functions;
- Supports serial port cache cleaning function;
- Supports access to external networks, LAN, and virtual serial port tools;
- Support hardware restoration to factory settings and online upgrade

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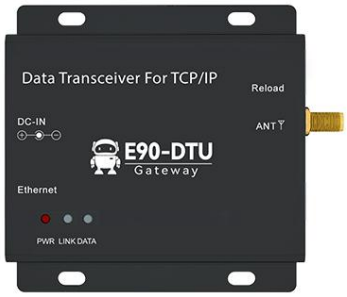
Chapter 2 Quick start

2.1 Hardware preparation before use

E90-DTU (xxxSLxx) E has a total of 5 products . Only the frequency and transmit power are different. The usage methods are the same. Here we take E90-DTU (400SL22) E and E 90-DTU (400SL22) for transparent transmission as an example . When using You need to choose products with the same series and frequency band .

In order to test E90-DTU(400SL22)E , the following hardware is required:

- One PC with network port ;
- E90-DTU(400SL22)E (or similar series products in other frequency bands), hereinafter referred to as "gateway radio";
- E90-DTU (400SL22) digital radio, hereafter referred to as the "serial radio" (for example, if necessary, purchase it separately);
- T X433-JKD-20P antenna 2 pieces (internal thread, internal needle) ;
- 2 DC12V-1A power adapters ;
- 1 network cable ;
- 1 USB to RS-485 serial port cable ;

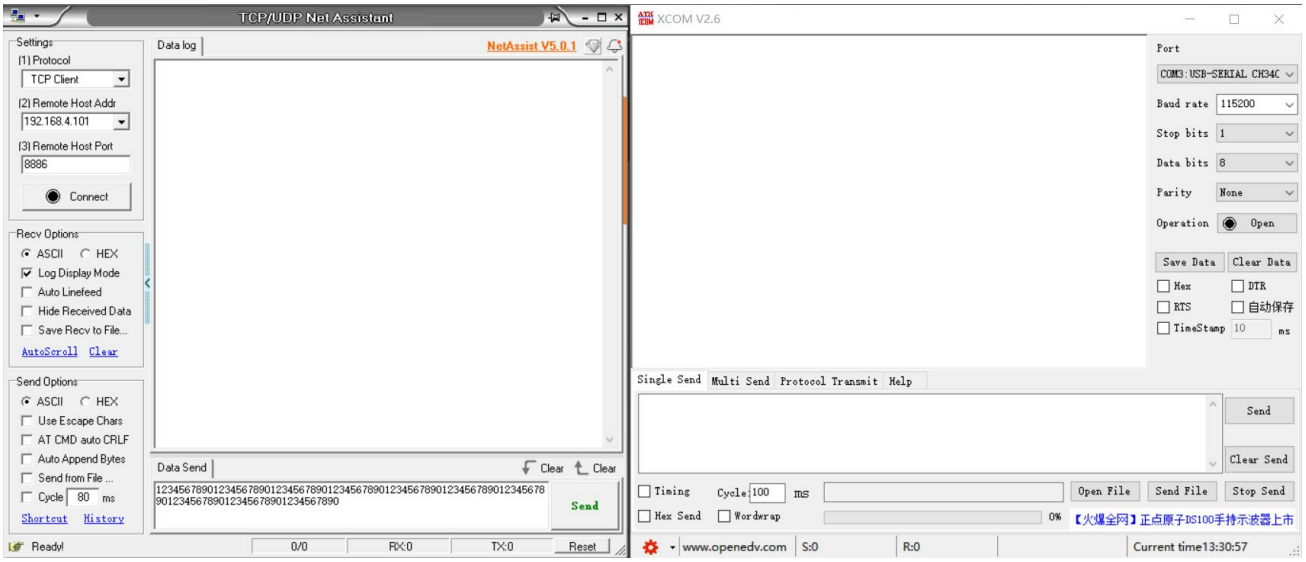
			
PC	E90-DTU(400SL22)E	E 90-DTU(400SL22)	
			
cable	D C12V-1A power supply × 2	Serial line	TX433-JKD-20P × 2

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2.2 Software preparation

On Ebyte's official website provide downloads of the network debugging assistant "Net Assist " and the serial port assistant "X COM ", as shown in the figure below. Official website address: https://www.cdebyte.com .

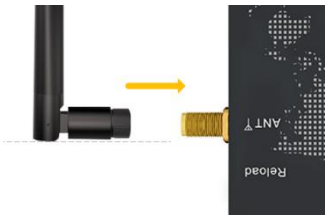
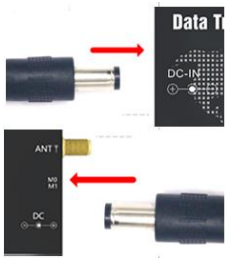
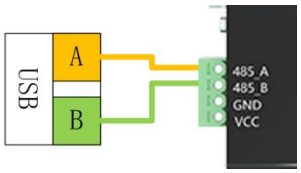


Download the configuration tool corresponding to the product details. "Gateway Radio" uses "Ebyte Network Configuration Tool" and "Serial Radio" uses " E90 -DTU(400SL30) ".



2.3 Hardware connection

Connect the antenna and power supply (DC : 8~28V) , RS485 connection and network cable connection for the E 90 radio:

			
Connect antenna	Above: "Gateway Radio" is connected Next: "Serial Radio" is connected	S-485 for "Serial Radio"	Connect the network cable to the "Gateway Radio"

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2.4 Wireless parameter configuration

2.4.1 Configure "Serial Radio"

Step 1: Turn on the power and connect the USB to RS -485 serial cable (serial cable A is connected to radio station 485_A , serial cable B is connected to radio station 485_ B) ;

Step 2: Check whether the radio is working in configuration mode. If it is not in configuration mode, configure the DIP switch according to the figure below to enter configuration mode;

	Categories	M1	M0	Notes
Mode 0	Normal Mode	ON	ON	Open UART Comm port and RF，transparent transmission is on, configuration over air via special command is available.
Mode 1	WOR Mode	ON	OFF	Can be defined as WOR transmitter and WOR receiver，WOR is available.
Mode 2	Configuration Mode	OFF	ON	Users access the register through the serial port to control the working state of the device. The DTU can be configured through the configuration software on computer.
Mode 3	Sleep Mode	OFF	OFF	DTU is in sleep mode.



Mode 0 Mode 1 Mode 2 Mode 3

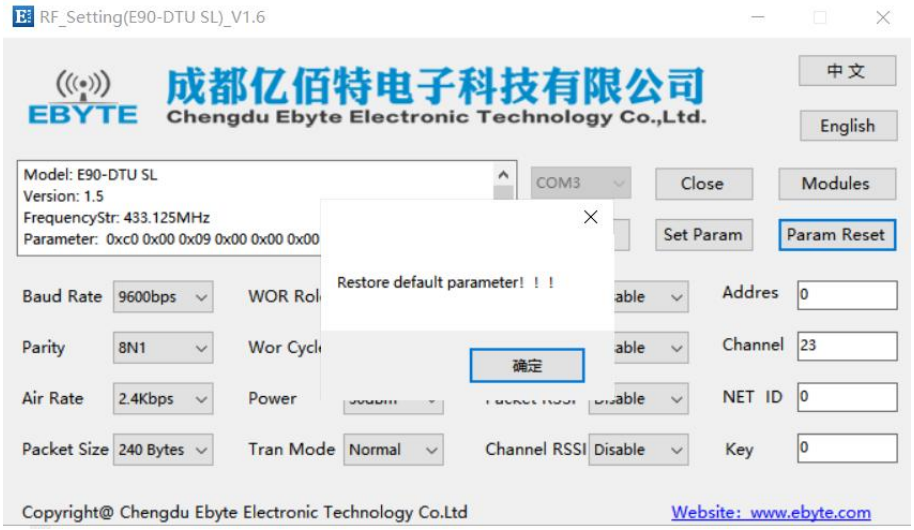
Step 3: Open the configuration host computer " E9x-DTU(xxxSLxx) " and select the corresponding serial port;



Step 4: "Open serial port" and click "Read parameters", then click "Restore factory settings";

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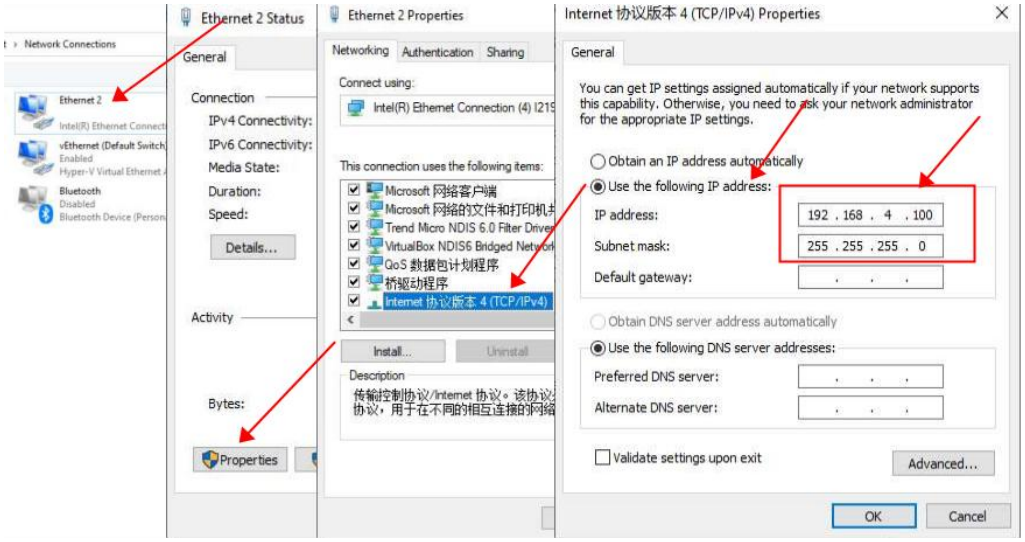
Step 6: Switch the DIP switch to exit "configuration mode" and enter "transmission mode";

2.4.2 Configure "Gateway Radio"

Step 1: Turn on the power and use a network cable to connect the PC and the "Gateway Radio";

Step 1: Perform factory configuration on the "Gateway Radio", press and hold the Reload button until the indicator light is all on;

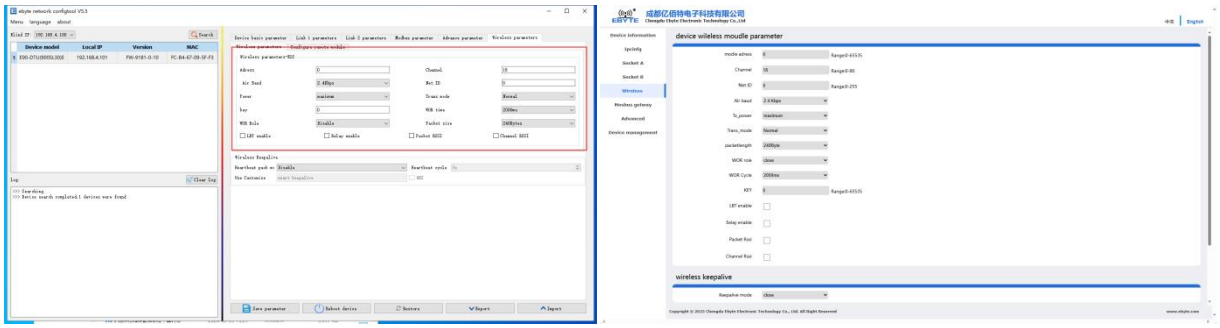
Step 2: Modify the IPv4 configuration of the PC , use static IP , and ensure that the "gateway radio" and the PC are in the same network segment. The factory default IP is 192.168.4.101 , so configure the static IP of the PC as 1 92.168.4.100 is shown in the figure below:



Step 3: Use "Ebyte Network Configuration Tool" or web page configuration;

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Step 4: Configure wireless parameters as shown in the figure above. Click "Save Configuration" on the host computer and click "Restart Device". Click Submit for web configuration and enter the configuration key: 1 23456. Wait for the configuration to be completed;

【Note】

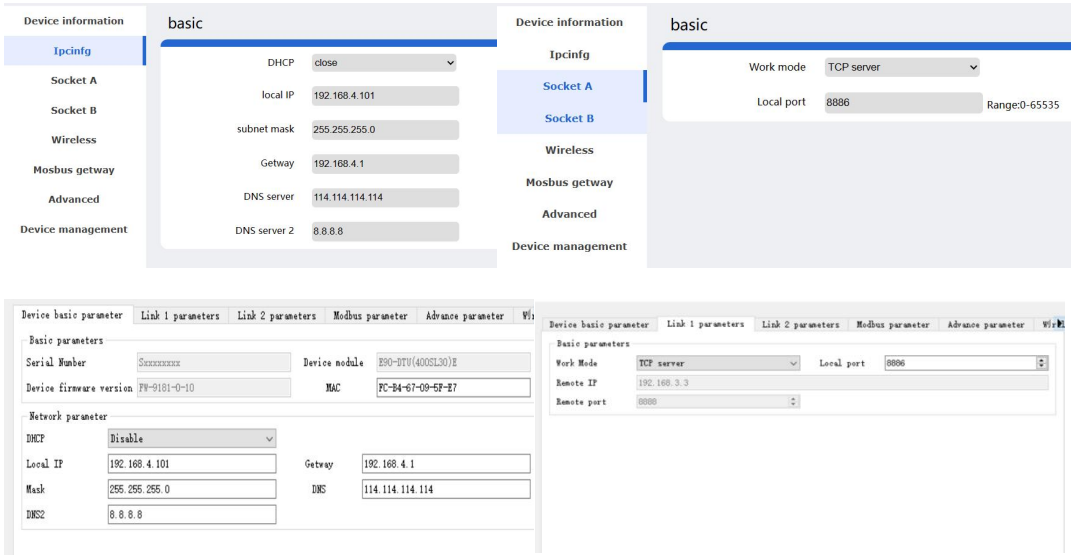
- browsers that do not support the IE kernel , you can use Firefox, G OOGLE , the latest Edge and other browsers;
- The host computer fails to search for the device. First check whether the network cable is connected normally, and then check whether the host computer has been opened multiple times in the LAN. If it still cannot be used normally, you can close the firewall and restart the host computer;

2.5 Network parameter configuration

Note: Because the device has 2 Sockets, the two links have completely independent functions and the same usage. This tutorial takes Socket A as an example. When using Socket B, please note that the parameters should not be exactly the same as Socket A, such as the local port.

2.5.1 TCP server uses

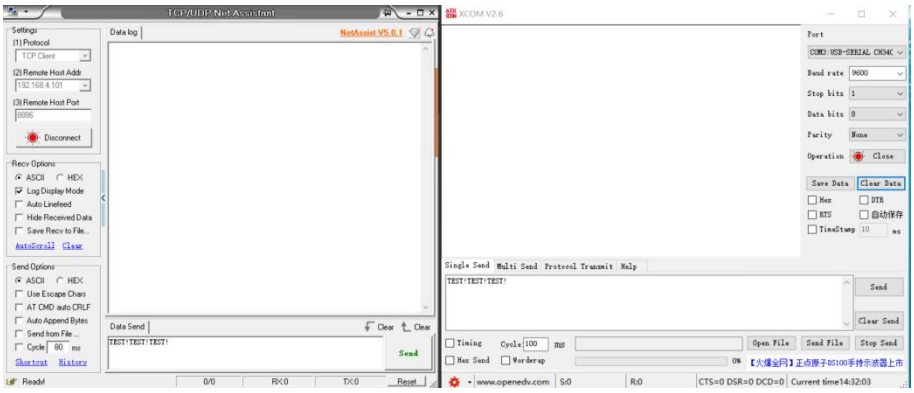
Configure the Ethernet parameters of the "Gateway Radio". The host computer and web page are configured as follows:



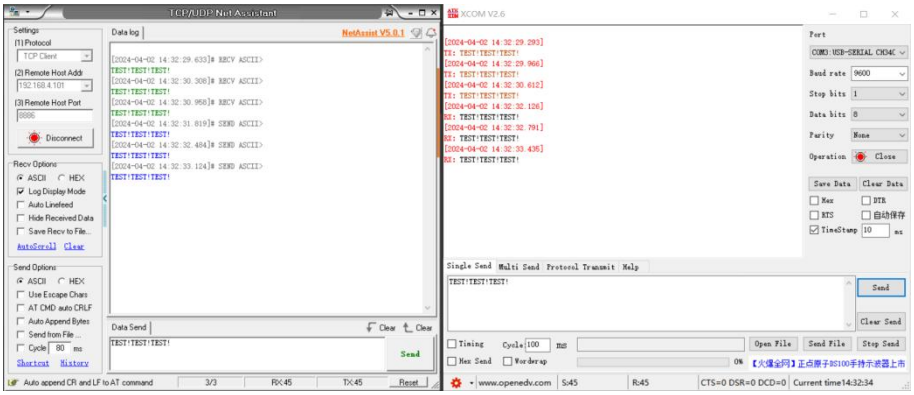
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Network Assistant (Net Assist) connects to the "Gateway Radio" as shown in the figure below (the device L INK indicator light is always on after the connection is successful. If the connection can be made but the indicator light does not light up, the device is in configuration mode and can be released by restarting the device), XCOM connection " Serial gateway":

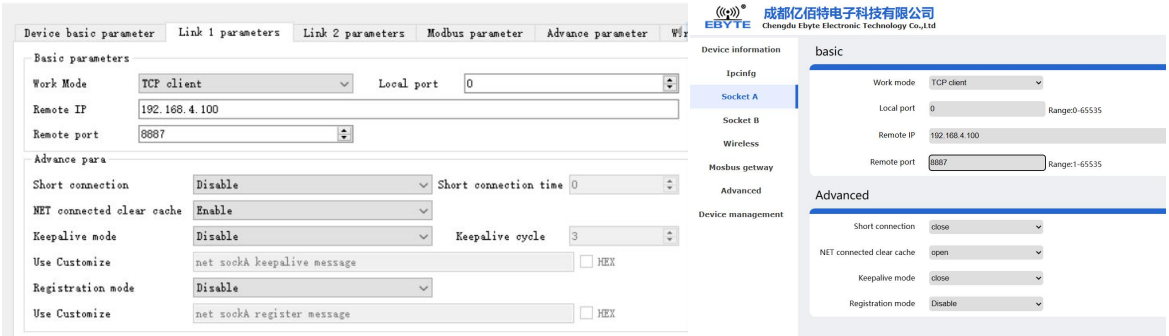


Data sending and receiving test:



2.5.2 TCP client usage

Configure the Ethernet parameters of the "Gateway Radio". The host computer and web page are configured as follows:

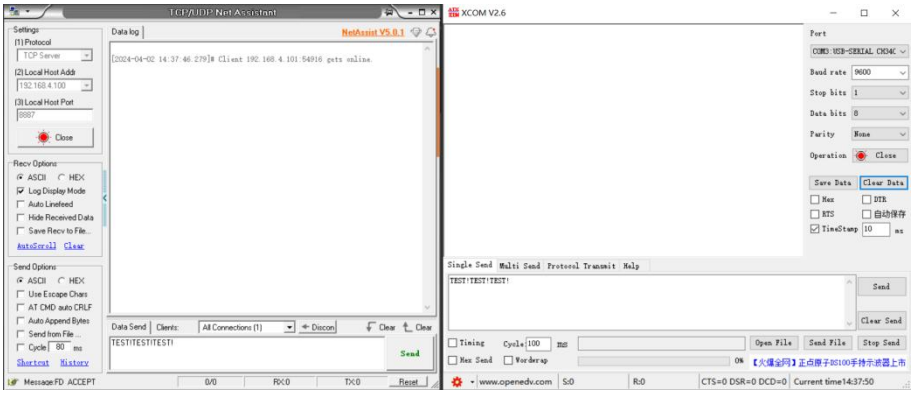


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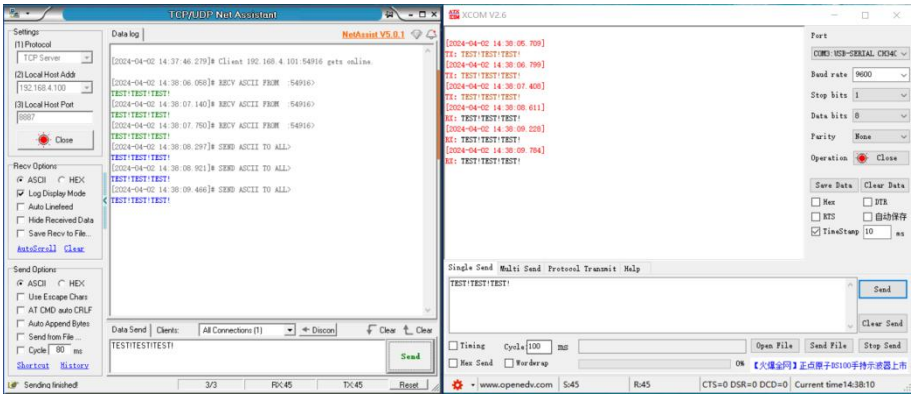
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Network Assistant (Net Assist) connects to the "Gateway Radio" as shown in the figure below (the L INK indicator light of the device is always on after the connection is successful), and XCOM connects to the "Serial Port Gateway":

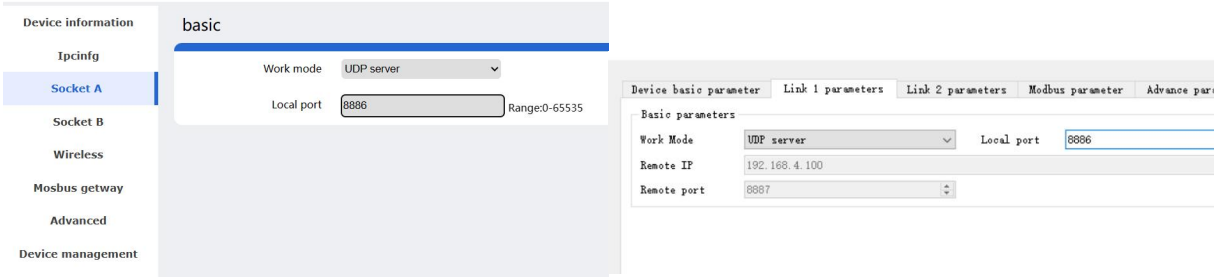


Data sending and receiving test:



2.5.3 UDP server using

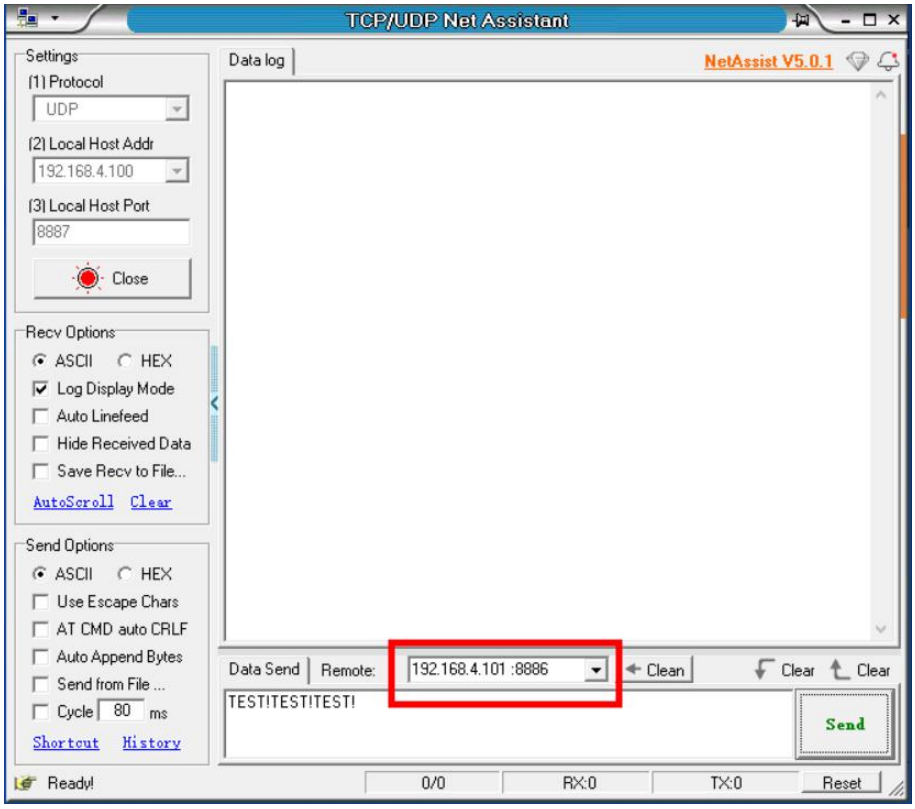
Configure the Ethernet parameters of the "Gateway Radio". The host computer and web page are configured as follows:



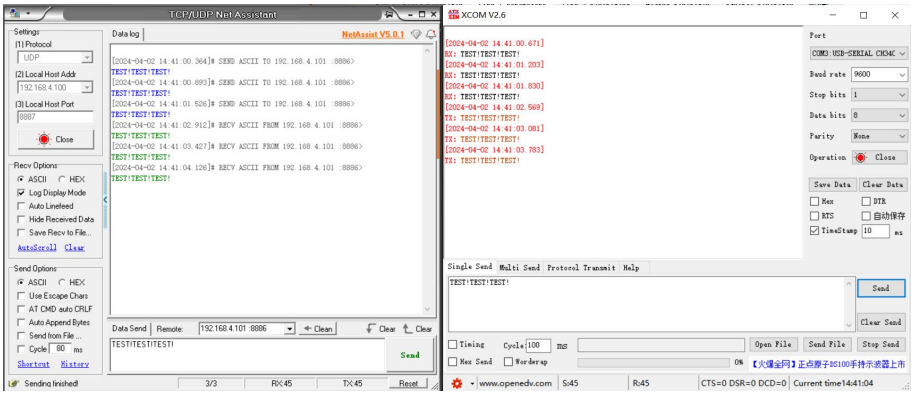
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After the configuration is completed, the L INK indicator light of the device is always on, and the Network Assistant (Net Assist) connects to the "Gateway Radio" as shown in the figure below:



Data sending and receiving test (in UDP server mode , data must be sent by PC first, so that UDP can dynamically adjust the destination address. Data sent through the serial port can only be received by the UDP of the last communication):

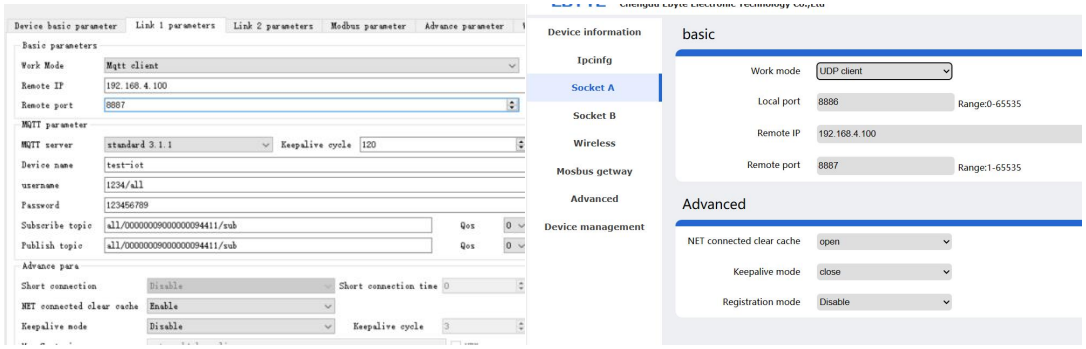


2.5.4 UDP client using

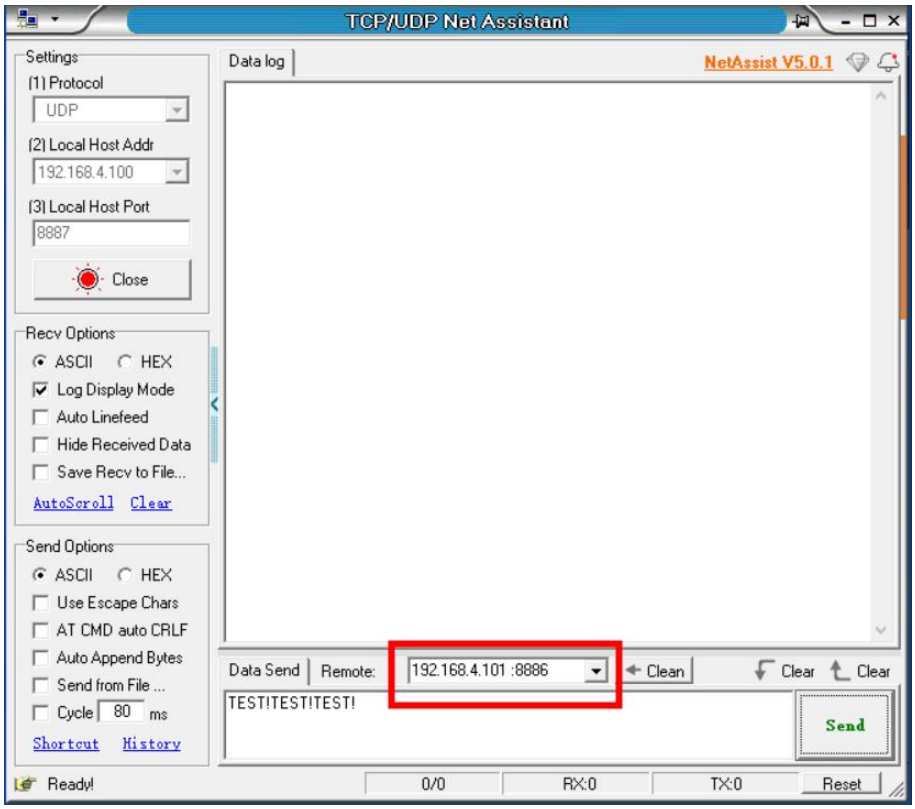
Configure the Ethernet parameters of the "Gateway Radio". The host computer and web page are configured as follows:

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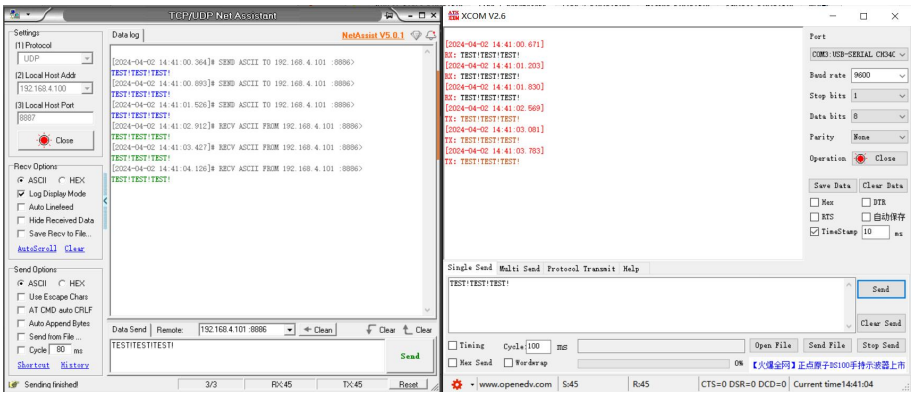
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After the configuration is completed, the L INK indicator light of the device is always on, and the Network Assistant (Net Assist) connects to the "Gateway Radio" as shown in the figure below:



Data sent through the serial port for data transmission and reception testing will only be received by UDP (192.168.4.100:8887) :



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Chapter3 Technical indicators

3.1 General specifications

Serial number	project	Specification
1	voltage	DC8~28V, 12V or 24V power supply recommended
2	Network port specifications	Standard RJ45, supports 10/100Mbps
3	Network protocol	IP, TCP/UDP, ARP, ICMP, IP v 4, MQTT , HTTP
4	Number of S o cket channels	2-way full function
5	Socket mode	TCP Server , TCP Client , UDP Server , UDP Client , H TTP Client 、MQTT Client
6	TCP Server connection	Supports up to 5 TCP connections
7	How to obtain IP	Static IP, DHCP
8	DNS	support
9	domain name server	Customizable, default 114.114.114.114
10	User configuration	Web page configuration, host computer, AT command
1 1	Antenna interface	SMA (external thread, internal hole)
1 2	Operating temperature	-40 ~ +85℃, industrial grade
1 3	Working humidity	10% ~ 90%, relative humidity, no condensation
1 4	Size	84 mm × 82 mm × 25 mm
1 5	Average weight	1 30 ± 5g
16	Storage temperature	-40～+125℃, industrial grade

3.2 Frequency range and number of channels

Model specifications	Factory default frequency	Frequency band range	channel spacing	Number of channels
	M Hz	M Hz	Hz	
E90-DTU(230SL30)E	2 30.125	2 20.125 ~ 2 36.125	2 50K	0 ~ 6 4 (default 4 0) half duplex
E90-DTU(400SL22)E E90-DTU(400SL30)E	4 33.125	4 10.125 ~ 4 93.125	1M	0~8 3 (default 2 3) half duplex
E90-DTU(900SL22)E E90-DTU(900SL30)E	8 68.125	8 50.125 ~ 9 30.125	1M	0～8 0 (default 1 8) half duplex

【Note】:

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When using multiple groups of digital transmission radio stations to communicate one-to-one at the same time in the same area, it is recommended that each group of digital transmission radio stations set a channel spacing of more than 3MHz.

3.3 Transmit power level

	E90 -DTU (230/400/900SL22)E	E90 -DTU (230/400/900SL30)E
high	2 2 (dBm) (default)	3 0 (dBm) (default)
middle	1 7 (dBm)	2 7 (dBm)
Low	1 3 (dBm)	2 4 (dBm)
extremely low	1 0 (dBm)	2 1 (dBm)

【Note】

1、 The lower the transmit power, the closer the transmission distance, but the operating current will not decrease in proportion. It is recommended to use the maximum transmit power ;

2、 The software adjustment power cannot be adjusted accurately and there are errors;

3.4 Air speed

Model specifications	airspeed range	Default parameters
E90-DTU(230SL30)E	2.4 , 4.8 , 9.6 , 15.6Kbps	2.4Kbps
E90-DTU(400SL22)E E90-DTU(400SL30)E	2.4 , 4.8 , 9.6 , 19.2 , 38.4 , 62.5Kbps	2.4Kbps
E90-DTU(900SL22)E E90-DTU(900SL30)E	2.4 , 4.8 , 9.6 , 19.2 , 38.4 , 62.5 Kbps	2.4Kbps

3.5 Transmitting and receiving length and packetization method

Model specifications	Packet bytes	Default parameters
E90-DTU(230SL30)E	32、64、128、240Bytes	240 Exchanged
E90-DTU(400SL22)E E90-DTU(400SL30)E	32、64、128、240Bytes	240 Exchanged
E90-DTU(900SL22)E E90-DTU(900SL30)E	32、64、128、240Bytes	240 Bytes

【Note】

It is recommended to use the default parameter 2 40B y tes for subcontracting;

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3.6 Communication distance

Model specifications	distance	Remark
E90-DTU(230SL30)E	10KM	In a clear and open environment, the antenna gain is 5d Bi , the antenna height is 2.5 meters , and the air rate is 2.4K bps
E90-DTU(400SL22)E	5 km	In a clear and open environment, the antenna gain is 5d Bi , the antenna height is 2.5 meters , and the air rate is 2.4K bps
E90-DTU(400SL30)E	10KM	In a clear and open environment, the antenna gain is 5d Bi , the antenna height is 2.5 meters , and the air rate is 2.4K bps
E90-DTU(900SL22)E	5 km	In a clear and open environment, the antenna gain is 5d Bi , the antenna height is 2.5 meters , and the air rate is 2.4K bps
E90-DTU(900SL30)E	10KM	In a clear and open environment, the antenna gain is 5d Bi , the antenna height is 2.5 meters , and the air rate is 2.4K bps

3.7 Work waste

Model specifications	Emission currentmA		Waiting current mA	
	12V	24V	12V	24V
E90-DTU(230SL30)E	230	120	17	8
E90-DTU(400SL22)E	80	40	11	7
E90-DTU(400SL30)E	330	220	15	8
E90-DTU(900SL22)E	90	40	11	7
E90-DTU(900SL30)E	340	150	15	8

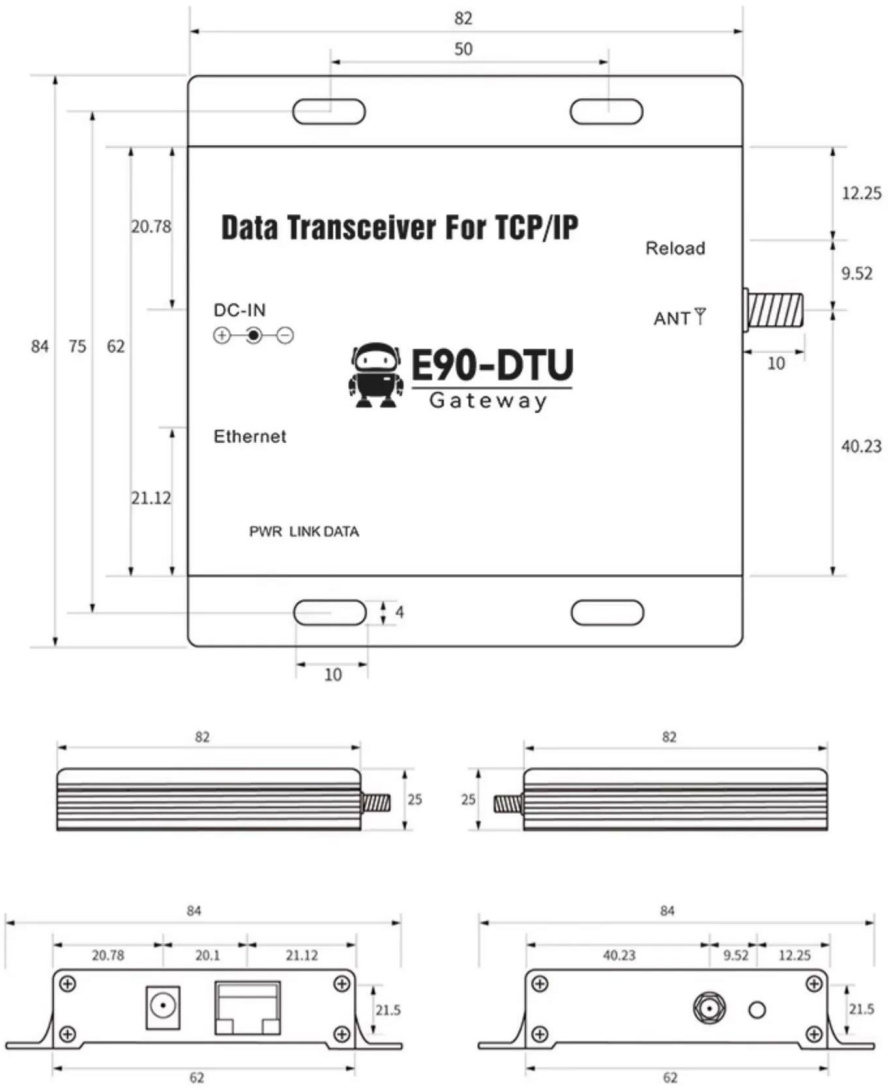
【Note】

The test data here are instantaneous peak values . It is recommended to keep more than 50% current margin when selecting a power supply, which is beneficial to the long-term stable operation of the radio.

3.8 Mechanical Dimensional Drawing

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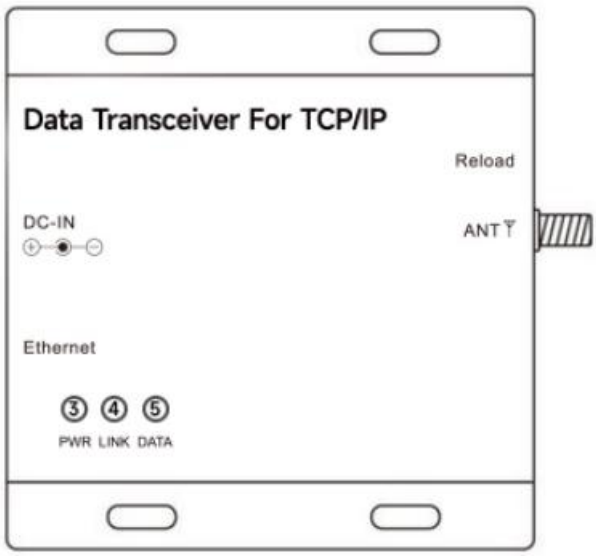


3.9 Pin definition



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.

serial number	identification name	Function Description
1	DC_IN	Power interface, 8~2 8V DC female socket (inner pin diameter 2.0 mm, hole diameter 5.5 mm)
2	Ethernet	Ethernet interface, standard RJ45 interface
3	PWR	Power indicator light , red, lights up when the power is turned on
4	LINK	Link indicator, green a) Off: The network cable is not connected or not connected to the server; b) Flashing: The network cable is connected normally but the link is not connected (2Hz square wave); c) Always on: The network link is connected successfully;
5	DATA	Serial port transceiver indicator light , yellow, flashes when receiving data from the server or radio frequency module data
6	ANT	SMA antenna interface (external screw, internal hole)
7	Reload	Restore to factory settings button

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Chapter4 Product basic functions

4.1 Default parameters

category	project	value
L ORA parameters	module address	0 5
	channel	40(230SL) , 23(400SL) , 18(900SL)
	Network ID	0
	Air speed	2.4Kbps
	transfer method	Transparent transmission
	Packet length	2 40 B y tes
	W OR role	closure
	W OR cycle	2000 ms
	communication key	0
	LBT enable	Disable
	Relay enabled	Disable
	DATARSSI	Disable
	Channel R SSI	Disable
Network parameters	How to obtain IP	static
	native port	8 886
	Native IP	1 92.168.4.101
	subnet mask	2 55.255.255.0
	gateway	1 92.168.4.1
	D NS server	1 14.114.114.114
	Network working mode	TCP server

4.2 LORA part

4.2.1 Basic wireless parameters

Channel: The devices that need to communicate should work on the same channel, and the current working frequency band can be calculated based on the channel value;

Working frequency = lowest frequency band + channel value * channel spacing

Module address: Transparent transmission should ensure that the addresses of the devices that need to communicate are the same. In the fixed-point mode, different devices on the same channel are distinguished. The relay mode is used to configure the relay address of the data. The configuration range is 0~6 5535 ;

Network ID : Transparent transmission should ensure that the network ID of the devices that need to communicate is the same. In relay mode, it is used to distinguish the destination of the data. The configuration range is 0~ 255 ;

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Airspeed: Ensure that the airspeed of the equipment that needs to communicate is the same;

Subpackage length: ensure that the subpackages of devices that need to communicate are the same;

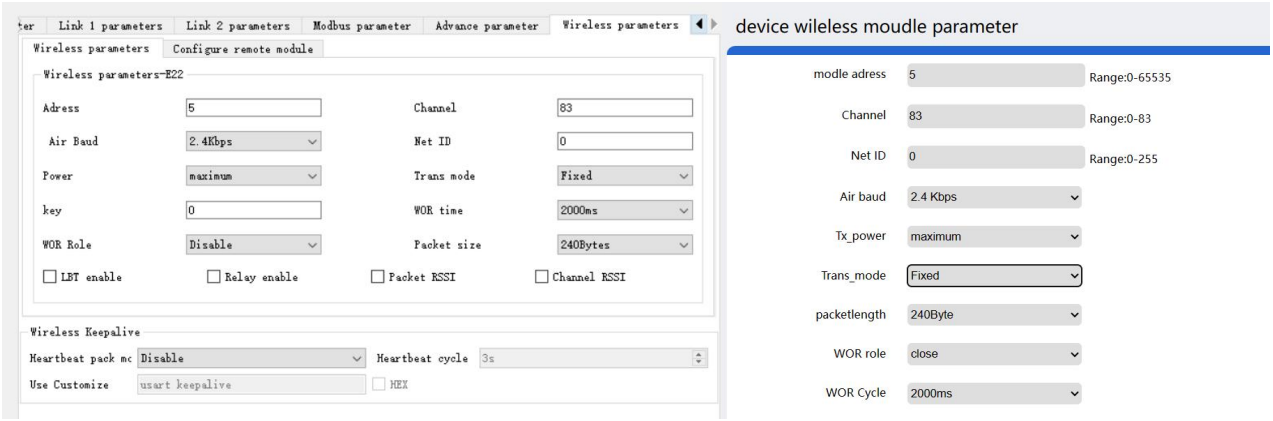
4.2.2 Broadcast monitoring

Set the DTU wireless address to 0xFFFF: you can monitor the data transmission of all modules on the same channel; the data sent can be received by modules with any address on the same channel, thus playing the role of broadcasting and monitoring.

4.2.3 Fixed point delivery

Supporting the address function, the host can transmit data to modules at any address and any channel to achieve networking, relay and other application methods: for example: module A needs to transmit data AA BB to module B (address 0x000 5 , channel 0x 05) CC (HEX:41 41 20 42 42 20 43 43) , its communication format is: 00 0 5 05 41 41 20 42 42 20 43 43 , where 00 0 5 is the module B address, 0 5 is the module B channel, then module B can receive AA BB CC (other stations do not receive data).

For example, configure the device with the parameters in the figure, and connect the PC to the "Gateway Radio". Refer to the "Quick Start".



DTU_2 is a "serial port radio" in the same frequency band (needs to be purchased separately) , and is also configured with the corresponding parameters in the figure.



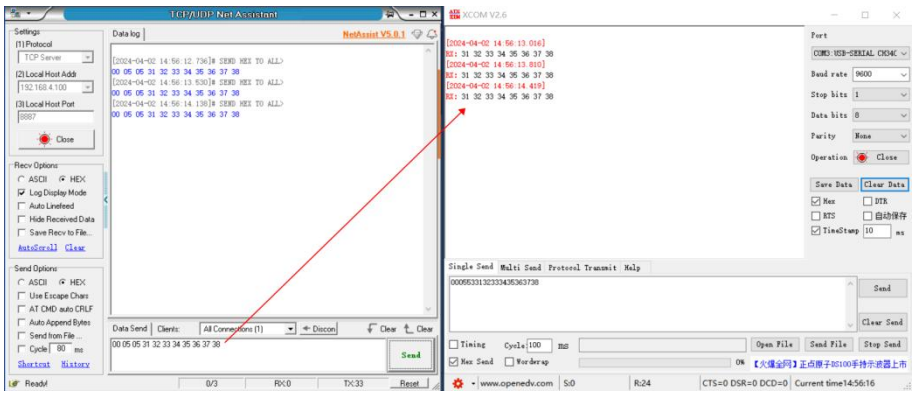
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Fixed-point delivery demonstration:

DTU_1 needs to add 00 05 05 (HEX) before the data when sending it to DTU_2 ;

DTU_2 needs to add 00 05 53 (HEX) before the data when sending it to DTU_1 ;



serial number	Relay mode description
1	After setting the relay mode through the configuration mode, switch to the general mode and the relay starts to work.
2	In relay mode , the "module address" no longer takes effect as an address parameter but as a network ID (NETID) forwarding pair . If it is received from one of the networks, it will be forwarded to the other network. The repeater's own network ID (NETID) is invalid.
3	In relay mode, the relay module cannot send and receive data and cannot perform low-power operation.

4.2.4 relay mode

Description of trunk networking rules:

1. Forwarding rules, the relay can forward data in both directions between two network IDs (NETID) .

2. In relay mode, the "module address" no longer takes effect as an address parameter but as a network ID (NETID) forwarding pairing.

As shown in the picture:

① Level 1 relay

"Node 1" NETID is 08 (0 x 08) .

"Node 2" NETID is 33 (0x21).

The module address of relay 1 is 2 081 (0x0821, ADDH: 0 x 08, ADDL : 0x21) .

So the signal sent by node 1 (0x08) can be forwarded to node 2 (0x21)

At the same time, node 1 and node 2 have the same address, so the data sent by node 1 can be received by node 2.

② secondary relay

The address of relay 2 is 8453 (0x2105 , ADDH : 0x21 , ADDL : 0x05) .

So relay 2 can forward relay 1's data to network NET ID: 05 (0x05) .

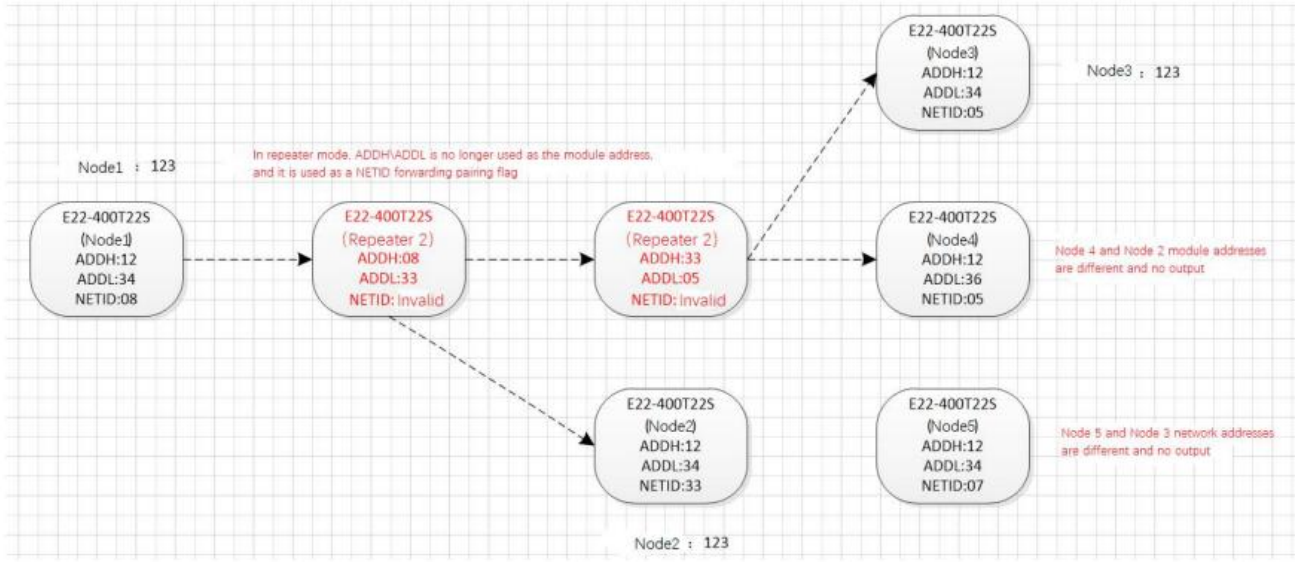
Therefore, node 3 and node 4 can receive the node 1 data. Node 3 outputs data normally. Node 4 has a different address from node 1, so no data is output.

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③ Two-way relay

As shown in the figure, the data sent by node 1 can be received by nodes 2 and 3 , and the data sent by nodes 2 and 3 can also be received by node 1.



4.2.5 Communication key

The web page configuration always displays 0 (configuration range 0 ~ 6 5535), and the communication key is used for user encryption to avoid interception of air wireless data by similar modules. The DTU will internally use these two bytes as calculation factors to transform and encrypt the air wireless signal.

Web page configuration requires configuring the key each time, otherwise the device will encrypt communication data with 0 pairs.

AT commands and the host computer can query the communication key of the current device. If the web configuration cannot query the communication key, it will always return 0.

4.2.6 LBT enable

DTU has the Listen before talk (LBT) function. When this function is turned on, wireless data will actively monitor the channel environment noise before transmitting. If the noise exceeds the threshold, the transmission will be delayed. This function can greatly improve the communication success rate of DTU in harsh environments. , can be used for network transmission and anti-collision processing, but may cause data delay. The maximum LBT dwell time is 2 seconds.

4.2.7 WOR role

WOR is closed. DTU works in transmission mode. The DTU will start wireless transmission of data input by the

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user through Ethernet. The wireless receiving function is turned on, and wireless data is output through Ethernet after receiving it.

WOR launcher. DTU transceiver is turned on, and when transmitting data, a wake-up code for a certain period of time is added.

WOR receiver. DTU cannot transmit data and works in WOR listening mode. The longer the WOR listening interval period, the lower the average power consumption, but the greater the data delay. The sending and receiving parties must be consistent (very important).

4.2.8 Data RSSI enable

That is the signal strength indication function. After enabling, when DTU wireless receives data, it will be followed by an RSSI strength byte (hexadecimal) after the user data . It can be used to evaluate signal quality, improve communication networks, measure distance, and can be used to manually implement LBT functions.

4.2.9 Channel RSSI enabled

After enabling, the command C0 C1 C2 C3 command can be sent in transfer mode or WOR send mode to read the register.

- Register 0x00 : Current environmental noise RSSI ;
- Register 0x01 : RSSI when data was last received . (The current channel noise is: dBm =-RSSI/2);
- Instruction format: C0 C1 C2 C3 + starting address + read length;
- Return: C1 + address + read length + read valid value; for example: send C0 C1 C2 C3 00 01
- Return C1 00 01 RSSI

Demonstration instructions, open the data R SSI and channel R SSI , first use the remote device to send 0x 31 , the gateway receives the data (0x 30) + RSSI (0xCE) , and then query the channel R SSI through the command C0 C1 C2 C3 00 02 (HEX) The R SSI results with data are shown below:



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4.3 Ethernet part

4.3.1 IP acquisition

Dynamic Acquisition (D HCP) :

The dynamic acquisition device will automatically obtain the IP address and subnet mask from the router and synchronize the router's gateway and DNS server . Therefore, in the dynamic acquisition mode, only the working mode and target parameters of the device can be configured.

Static configuration (STATIC):

You need to manually configure the device's IP (factory default: 1 92.168. 4. 101), subnet mask (factory default: 255.255.255.0), gateway (factory default: 1 92.168. 4.1) , and D NS server (factory default) Default: 114.114.114.114) and other parameters, the configuration should ensure that the communication equipment is in the same network segment and ensure to avoid IP conflicts , otherwise the equipment will not be able to access and configure the web page normally.

4.3.2 Device port

Random port:

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

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

When the device configures TCP client, HTTP client, and MQTT client modes on the web page, it will automatically configure a random port, which can be customized and canceled.

Static port:

The fixed port of the device (factory default: 8886) , the TCP server mode device listens to the configured port, accepts the client’s connection request and establishes a connection for data communication, the TCP client mode device initiates a connection request through the fixed port.

4.3.3 Subnet mask and gateway configuration

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

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

The gateway refers to the network number of the network where the current IP address of the module is located. If you connect to a device such as a router when connecting to the external network, the gateway is the route.

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4.3.4 Domain Name Resolution (DNS)

Domain name resolution uses a domain name resolution (DNS) server to convert domain names into network-identifiable IP addresses. The domain name resolution (DNS) server address of this product supports user customization. Domain name resolution can be achieved through a custom domain name resolution server when the domain name server is abnormal. The device will report the resolution to the custom domain name resolution (DNS) server during domain name resolution. request, and after the parsing is completed, the device connection parameters (usually IP address) are returned.

In DHCP mode, the domain name resolution (DNS) server address is automatically obtained (synchronized with the router's domain name resolution address) and cannot be customized.

In static IP mode, the default factory address of the domain name resolution (DNS) server is: 114.114.114.114 , which can be customized by the user.

4.3.5 Target IP/ domain name

The target IP parameter can automatically identify whether the configuration parameter is an IP address or a domain name input. The domain name input supports a maximum configuration of 128 characters.

4.4 SOCKET function

4.4.1 TCP server

TCP Server is the TCP server. In TCP Server mode, the device listens to the local port, accepts the client's connection request and establishes a connection for data communication. When the Modbus gateway function is turned off, the device will send the data received by the serial port to all client devices that are connected to the device. It supports up to 6 client connections. After the Modbus gateway function is enabled, non-Modbus data will be cleared and not forwarded.

Usually used for communication with TCP clients within the LAN.

Connection requests will no longer be accepted after more than 6 clients, and the web page configuration cannot be used when 6 clients remain connected.

4.4.2 TCP client

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

Using the client requires configuring the target IP address/domain name and target port accurately.

Note: When using as a client, it is recommended to set the local port to 0, which is a dynamic port.

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4.4.3 UDP server

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

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

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

[Note] In UDP mode, the data sent by the network to the device should be less than 5 12B it per packet, otherwise data loss will occur.

4.4.4 UDP client

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

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

In this mode, the target address is set to 255.255.255.255, and the sent data will be broadcast on the entire network segment, but the sending and receiving devices need to ensure that the ports are consistent, and the device can also receive broadcast data .

4.4.5 HTTP client

This mode can realize the HTTP automatic packet grouping function, and provides two modes: GET and POST. Customers can configure URL, Header and other parameters by themselves, and the device will group and send the packet, realizing fast communication between the data transmission station and the HTTP server, using HTTP In client mode, it is recommended to use random ports and enable short connections to save HTTP server resources. The size of a single request packet is affected by L ORA sub-packetization. When LORA is configured for 2 40 -byte sub-packetization, the single packet data cannot be larger than 2 40 .

（1）、 G ET usage demonstration

Use the HTTP mode of OneNET multi-protocol access to test the device HTTP-GET request.

through OneNET -HTTP access instructions (One NET usage support is not provided, users need to query the usage method by themselves, only parameter filling instructions are provided) :

{

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URL:/devices/863876867/datapoints?

Header : api-key: xxxxxxxx (Demo instructions only, users need to register their own accounts to use) Host: api.heclouds.com

HTTP Server : api.heclouds.com

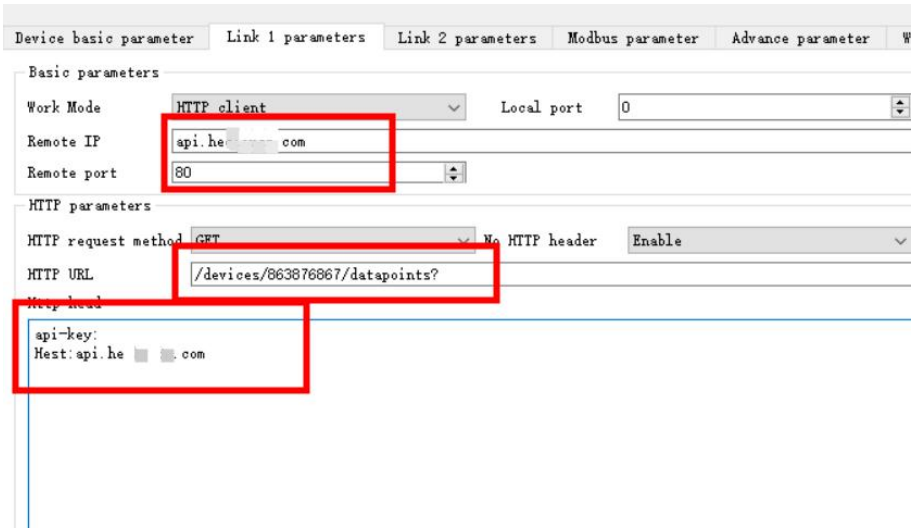
HTTP Port:80

Get send: datastream_id=char

}

The device needs to be connected to the Internet. It is recommended to use dynamic IP acquisition to prevent the device from being unable to access the network normally due to unreasonable parameter configuration. It is recommended to enable short links to save server resources and open a random port (local port: 0). Take the host computer configuration as an example. .

Return data configuration without header (line break can be entered in the H TTP header input box):



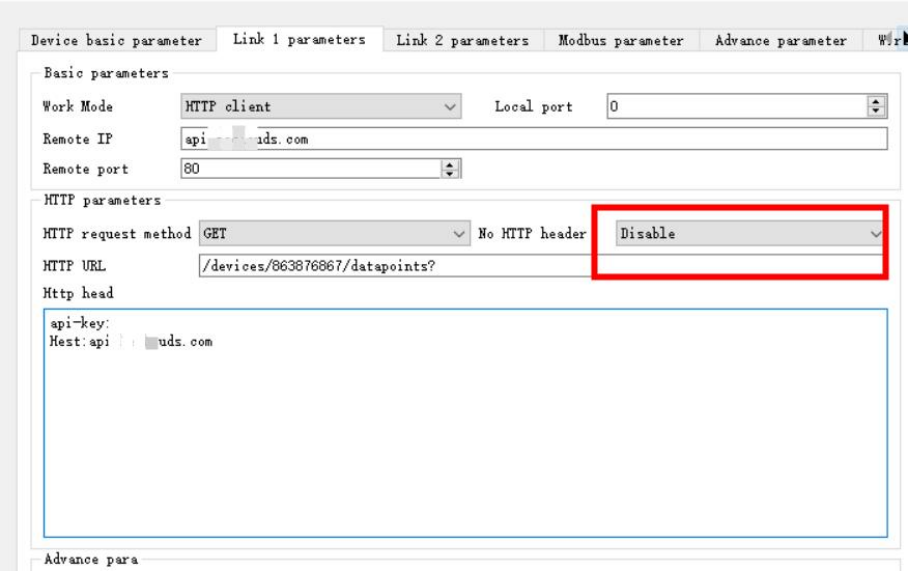
"Serial radio" (additional purchase required), wireless connection, refer to "Quick Start", no further explanation here, request data demonstration:



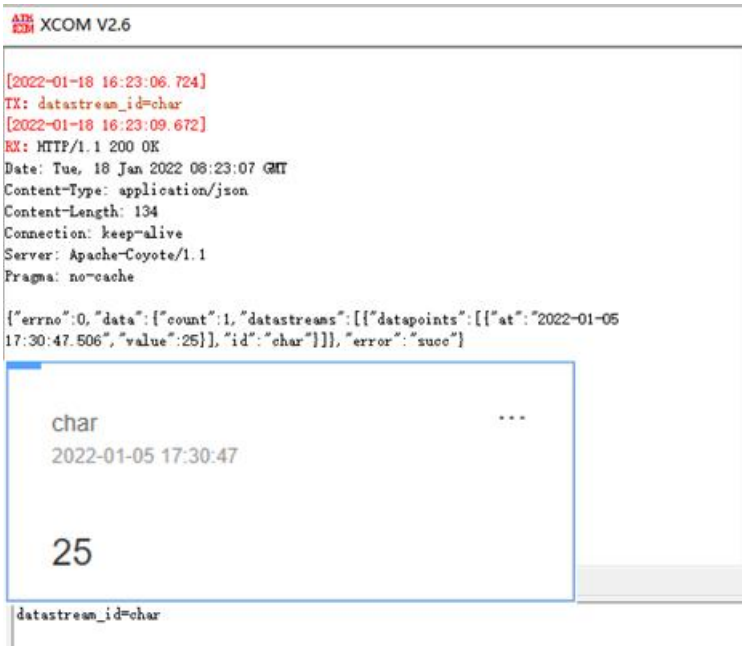
Return data configuration with header:

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Request a data demo:



（2）、 POST

Use the HTTP mode of OneNET multi-protocol access to test the device HTTP- POST request.

Query through OneNET-HTTP access instructions (OneNET usage support is not provided, users need to query the usage method by themselves, only parameter filling instructions are provided):

{

URL:/devices/863876867/datapoints

Header:api-key:xxxxxxxx (Demonstration only, users need to register their own account to use)Host:api.heclouds.com

HTTP Server: api.heclouds.com

HTTP Port:80

P ost send: {"datastreams":[{"id":"char","datapoints":[{"value":28}]}]}

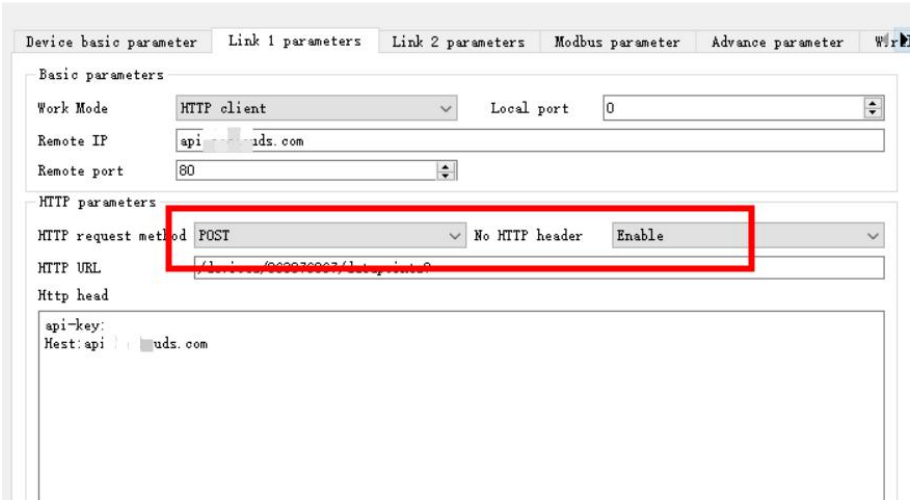
}

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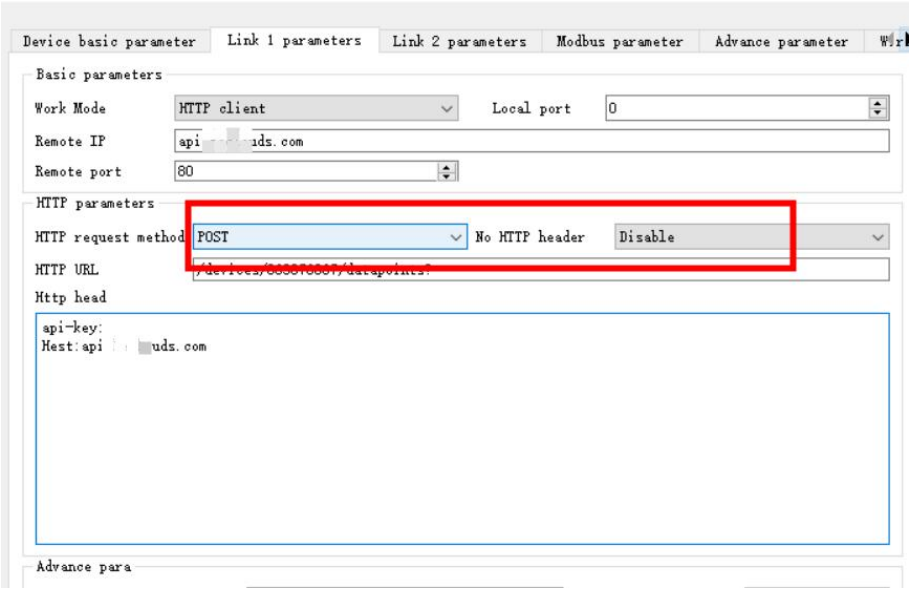
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The device needs to be connected to the Internet. It is recommended to use dynamic IP acquisition to prevent the device from being unable to access the network normally due to unreasonable parameter configuration. It is recommended to enable short links to save server resources and open a random port (local port: 0). Please refer to GET configuration.

Return data configuration without header (line break can be entered in the H TTP header input box):



Return data configuration with header (line break can be entered in the H TTP header input box):



"Serial radio" (additional purchase required), wireless connection, refer to "Quick Start", no further explanation here, request data demonstration:

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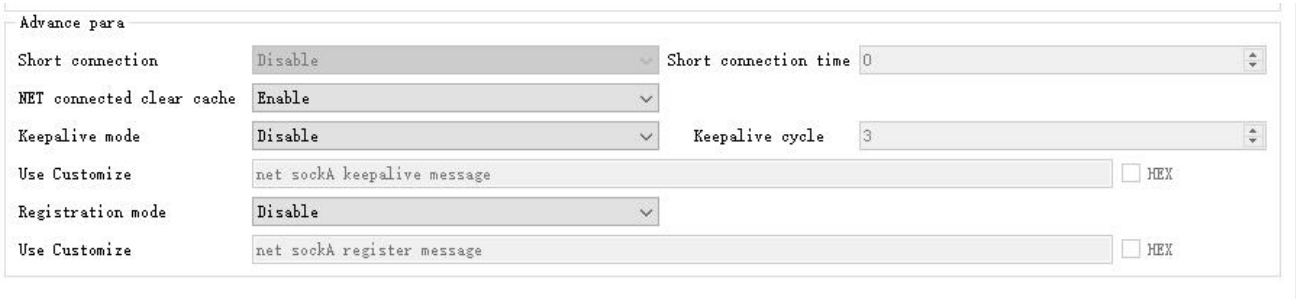
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4.4.6 MQTT client

Supports quick access to standard MQTT3.1.1 protocol servers (OneNET, Baidu Cloud, Huawei Cloud, user-built and other server types) and Alibaba Cloud servers, supports service quality level configuration (Qos 0, Qos 1), and supports ultra-long text Configuration to facilitate better access to network service operators (server address, three elements, subscription and publishing addresses support configuration of up to 128 characters).

When using the M QTT function, short links and other advanced settings should be turned off, as shown in the figure below (the picture above shows the host computer configuration , and the web page configuration automatically turns off short links):

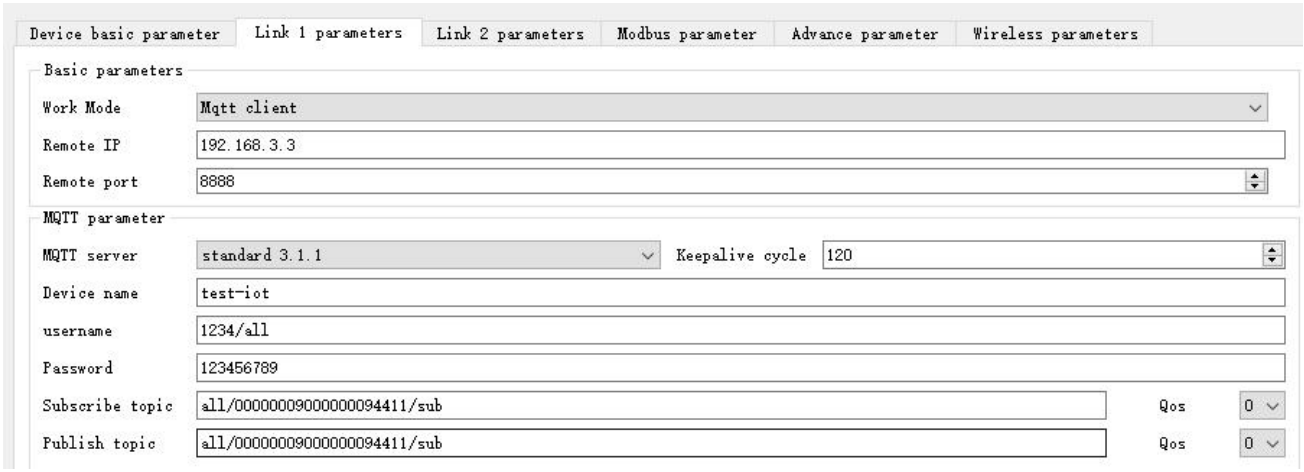


Standard MQTT3.1.1

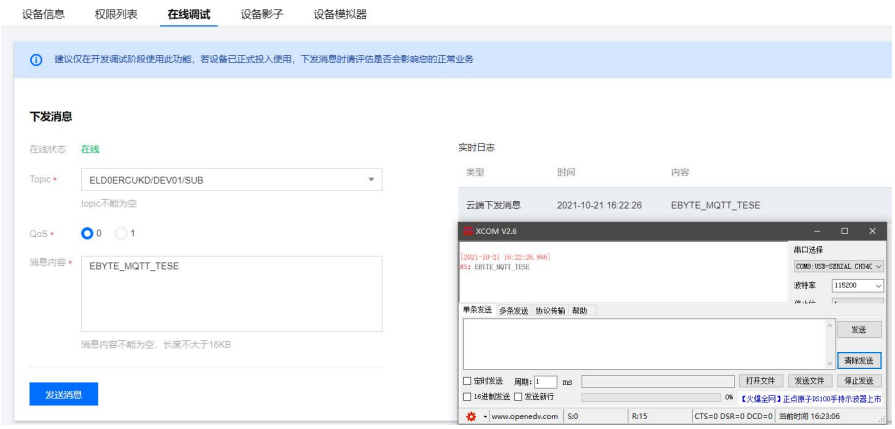
Standard M QTT3.1.1 cloud parameter configuration:

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QTT3.1.1 to achieve communication through Tencent standard M QTT3.1.1 platform :



4.5 Web page configuration

The device has a built-in web server, which facilitates users to set and query parameters through the web page.

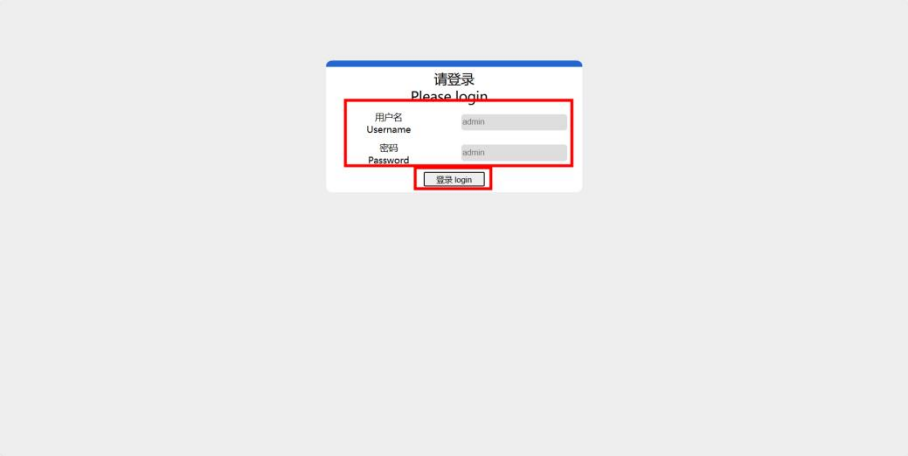
The port of the web server can be customized (2-65535), default: 80

Operation method (Microsoft Edge version 94.0.992.50 is taken as an example, and the IE kernel browser is not supported):

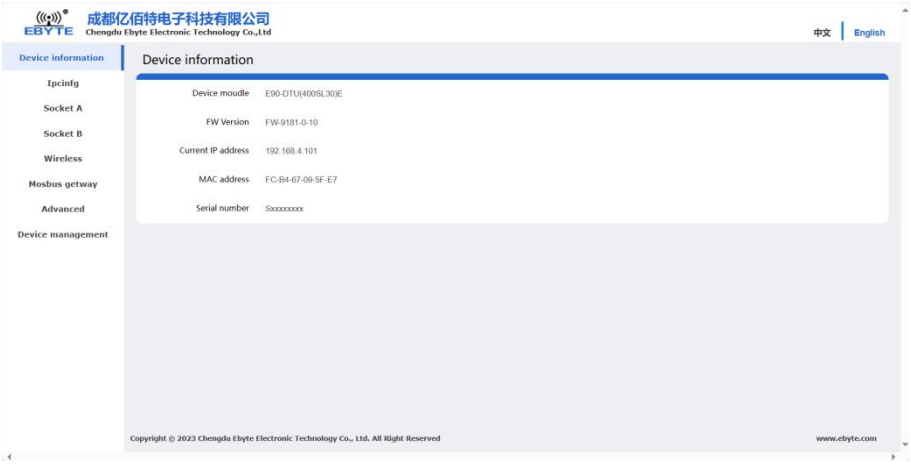
（1）、 Open the browser and enter the IP address of the device in the address bar, for example 192.168.4.101 (the IP address and the computer must remain in the same network segment. If it cannot be used, close the firewall and try again). If you forget the local IP , you can query it through AT commands and configuration software;

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（2）、 pops up on the web page , click Login to enter the main interface;



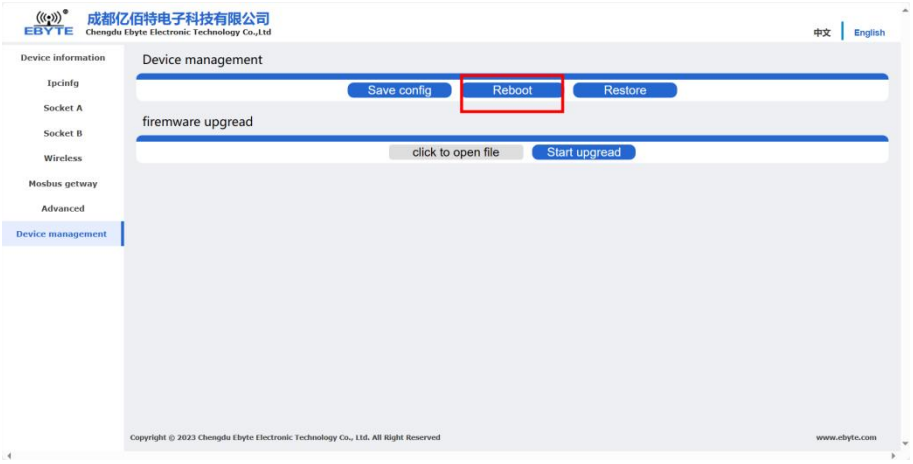
（3）、 After modifying the parameters, you can click Save Parameters in the device management at the bottom ;



（4）、 After the successful operation is displayed, click the Restart Device button on the right, and the parameters will take effect ;

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4.6 Hardware factory reset

To restore the buttons to factory settings, you need to effectively connect the network cable and power supply. Press and hold the Reload pin of the device until the LED indicator lights up to release the buttons.

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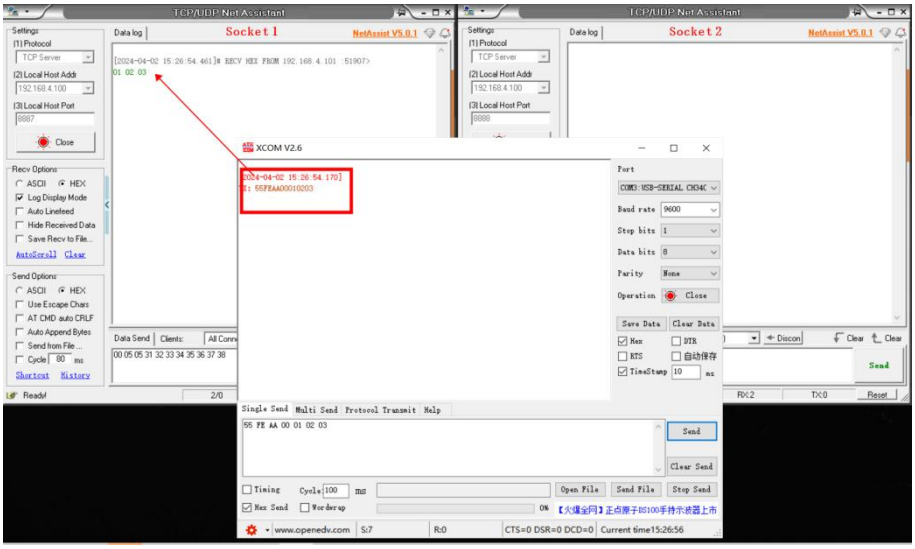
Chapter5 Advanced Features

5.1 Protocol distribution

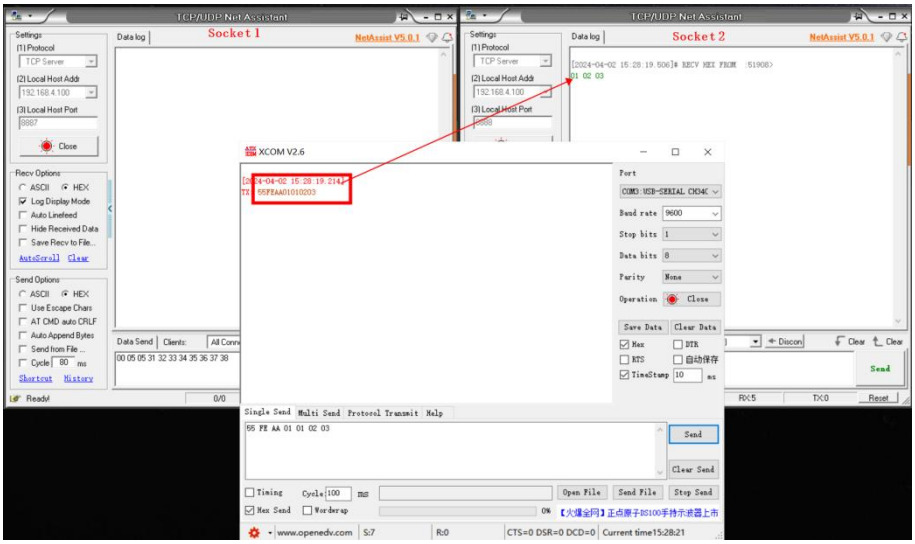
Supports socket distribution protocol. Data can be sent to different Sockets through specific protocols, and data received by different Sockets can also be distinguished by adding headers and tails.

turning on the protocol distribution mode, there will be the following possibilities. Here we take Socke t1 connected to the server port 8887 and Socke t2 connected to the server port 8888 as an example:

1. The serial port sends data if the data header is 55 FE AA 00, which means it meets the requirements, that is, 55 FE AA 00+data, then the data will only be transmitted to Socket 1 , and the received content only contains data, without the data header;



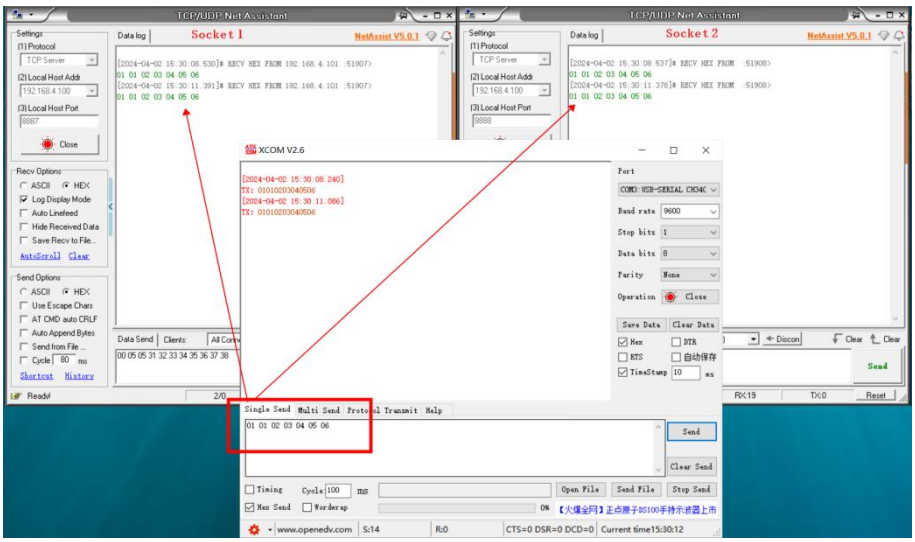
2. The serial port sends data if the data header is 55 FE AA 01, which means it meets the requirements, that is, 55 FE AA 01+data, then the data will only be transmitted to Socket 2 , and the received content only contains data, without the data header;



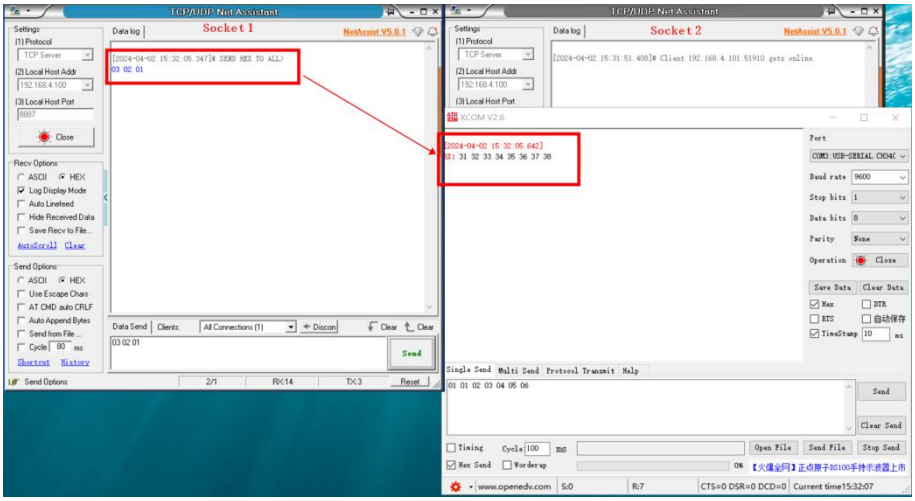
3. The data sent by the serial port is arbitrary data, and the data will be transmitted to two Sockets.

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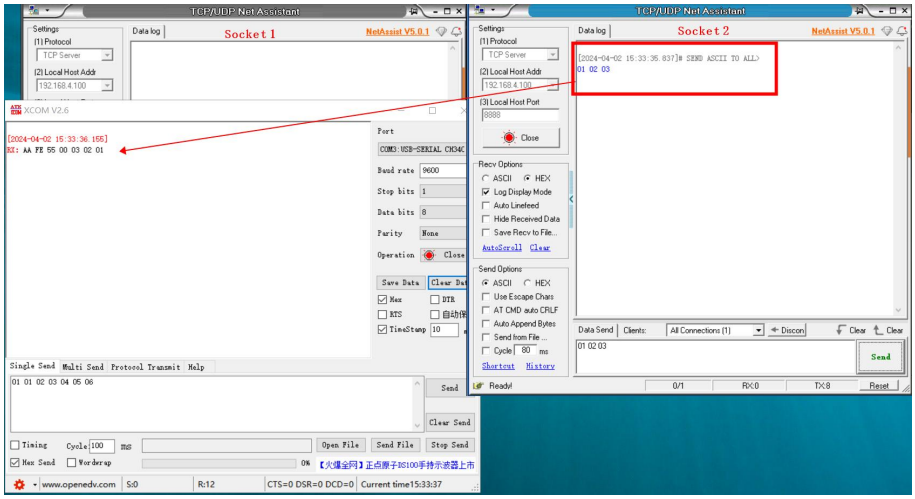
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4. Socket 1 sends any data. After the serial port receives it, it will add the data header AA FE 55 00 before the data.

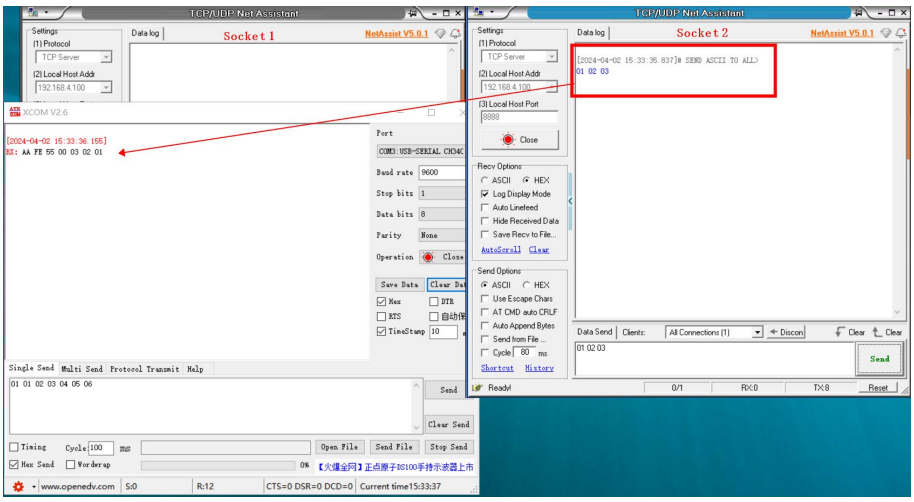


5. Socket 2 sends arbitrary data. After the serial port receives it, it will add the data header AA FE 55 01 before the data.



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5.2 Disconnect and reconnect

In client mode, the device attempts to actively connect to the server at a specified time after the network is disconnected.

Disconnection and reconnection interval : After the device is disconnected from the network , it will initiate a reconnection to the server every this time until it is connected. The range is 0-65535 seconds .

5.3 Restart after timeout

If the device has been running for a long time and you are worried that the device may encounter abnormal conditions, you can enable the timeout restart function .

Timeout restart time : During this time, if the physical layer (PHY) of the device does not receive any data, it is suspected that there is an abnormality in the physical layer, and the device will automatically restart. The range is 60-65535 seconds .

5.4 Web page configuration parameters

The web configuration parameters include web user name and device password. After modification, they can be displayed on the login page. The default is admin/admin.

5.5 Network AT

The device supports network AT commands. You can modify the device configuration parameters by issuing commands from the server. After enabling network AT, you can set the network AT header. Sending commands using the network AT header will be recognized by the device as AT commands, and the device will execute the command. And the command will not be transparently transmitted.

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5.6 Heartbeat bag

In client mode, users can choose to send heartbeat packets, customize the heartbeat packet time , and set separate heartbeat packets for each link. In TCPC mode, you can select MAC/SN or customized data. The time interval is configurable from 1 to 65535S. When customizing data, it supports sending ASCII or HEX format. The heartbeat packet content supports up to 128 bytes of data.

For MQTT heartbeat, you only need to configure the KeepAlive time in "MQTT Function Settings". It is recommended not to configure it less than 60s. For example, the Alibaba Cloud manual recommends using 120s.

5.7 Wireless heartbeat package

The gateway can be configured with a wireless heartbeat packet, which means it regularly sends data to the opposite device wirelessly. You can choose to send MAC/SN and customized data. The customized data is limited to 128 bytes, and you can choose ASCII or HEX format, ranging from 1 to 65535S. configuration.

5.8 Registration package

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

The registration package supports the following modes:

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

（2）、 SN is sent when the network establishes a connection with the device

（3）、 The data of the custom registration package is sent when the network establishes a connection with the device.

（4）、 Each packet of data sent by the device to the network is preceded by the MAC address.

（5）、 Each packet of data sent by the device to the network is preceded by SN .

（6）、 Every packet of data sent by the device to the network is preceded by custom registration packet data.

Customized registration package content supports up to 128 bytes of data, and can be sent in ASCII or HEX format.

5.9 Short connection

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

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

When the short link retention time is set to 0, the short link function is turned off. When the setting range is (1~65535) seconds, the short connection function is turned on, and the default retention time is 0 seconds (short link is turned off).

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5.10 Network connection clear cache

The device is in TCP/MQTT/HTTP client mode and the connection with the server is not established, the wirelessly received data will be placed in the buffer area. The serial port reception buffer is 1024 bytes. If it is larger than 1024 bytes, the earliest received data will be overwritten. Network After the connection is successful, you can choose to clear the serial port cache or send the cache through the network through configuration.

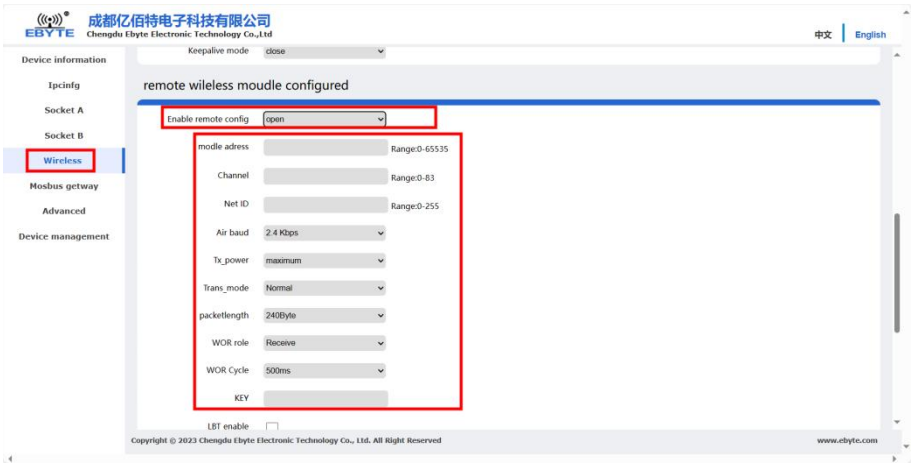
Enable: The device does not save the data received by the serial port before the connection is established.

Disabled: After the connection is established, the network will receive serial buffered data.

5.11 Remote configuration

The remote digital radio station can be configured through the remote configuration function of the host computer and the web page. This series of products (E90-DTU(xxxSLxx)E) does not support remote configuration. Remote configuration requires that the remote device and the configuration device can communicate normally, otherwise The configuration command cannot reach the remote device.

See the figure below for remote configuration instructions:



[Note] It is recommended that remote configuration be used in transparent transmission mode and air speed ≥ 2.4K bps , and only devices that can currently transmit data transparently can be configured.

5.12 Remote upgrade

In order to facilitate later maintenance and upgrade functions and replace different firmware, this product supports online firmware upgrade. Through the upgraded firmware provided by our company, users can upgrade or replace the current firmware through the host computer or web page .

Steps to upgrade firmware via web page :

Step 1: After entering the web page, go to the device management page, find the firmware upgrade section, and click to select the file.

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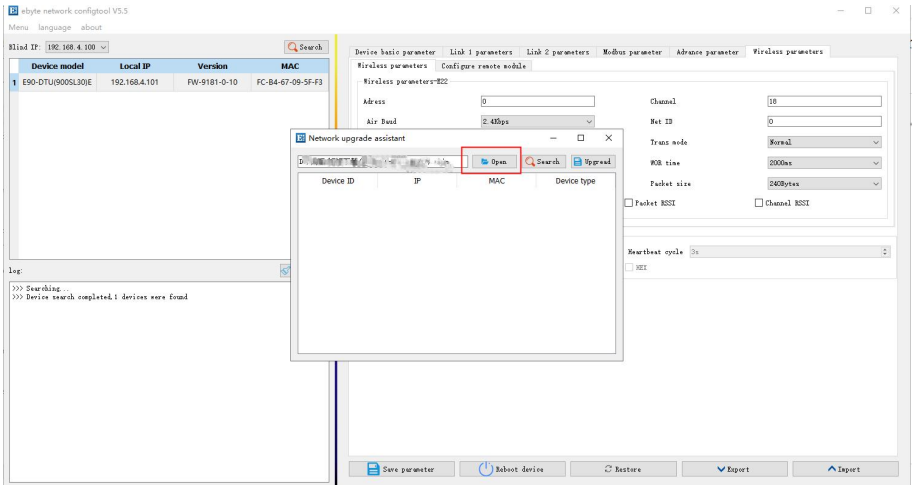
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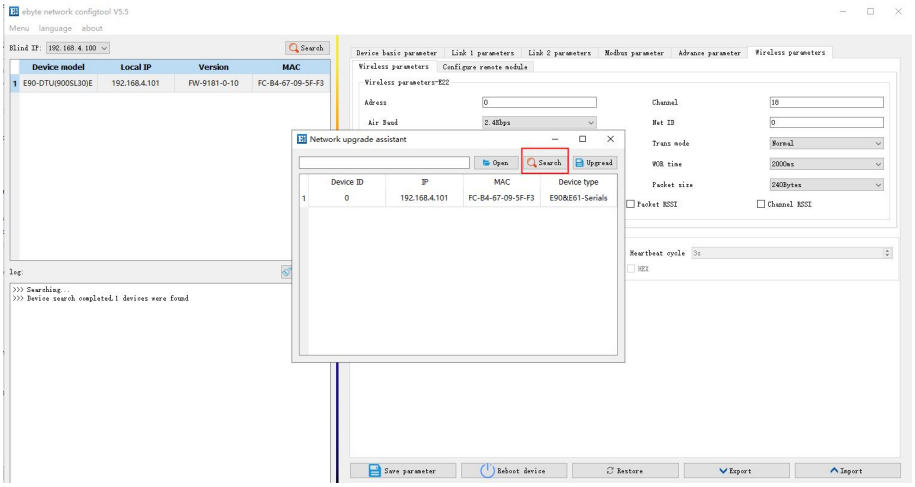
Step 2 : After selecting the file, click to start the upgrade. Wait until the progress bar is loaded and the device automatically restarts, that is, the upgrade is completed.

Steps to upgrade firmware via web page :

Step 1: Open the host computer, open the device upgrade assistant in the menu bar, and select the required firmware (the official website provides downloadable firmware);



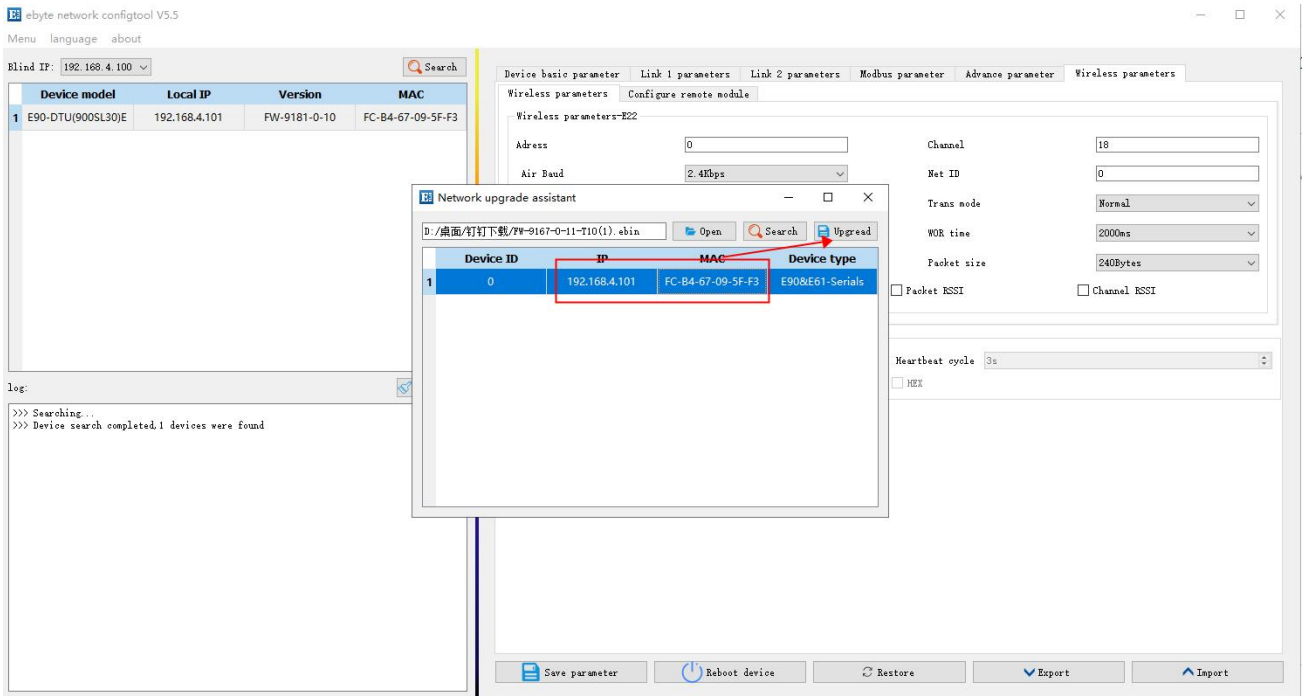
Step 2: Click to search for the device. After finding the device, click to stop the search;



Step 3: Select the device that needs to be upgraded;

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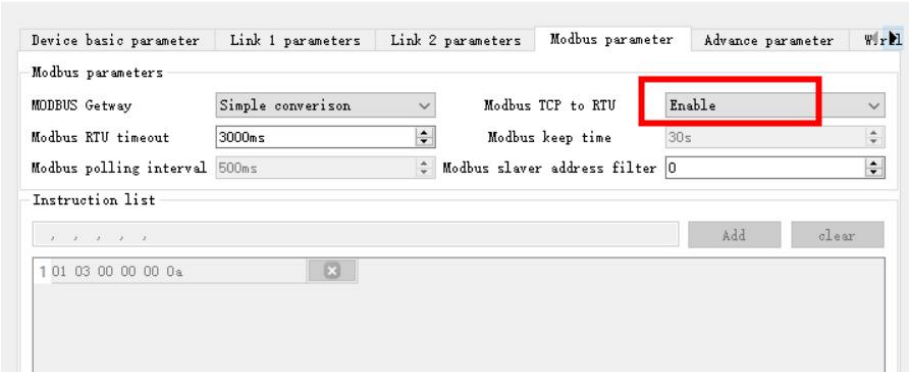


Step 4: Click to start the upgrade. The device indicator light will flash and wait for the upgrade to be completed.

[Note] When the device is first powered on, click "Search Device" in the upgrade assistant and the device will enter the firmware burning state. It will return to normal mode after power off and restart.

5.13 Modbus gateway

5.13.1 Protocol conversion



Enable: Verify Modbus data, discard non-Modbus data (RTU/TCP) without transmission, and convert the Modbus RTU protocol and Modbus TCP protocol to each other.

Disabled: No protocol conversion is performed but Modbus data is verified. Non-Modbus data (RTU/TCP) is discarded and not transmitted.

[Note] Due to the packetization mechanism of L ORA wireless modulation, the maximum single packet is 240 bytes , so a maximum of 117 registers (03 , 04 function codes) or 1872 discrete values (04) can be read continuously in Modbus at one time 1 , 0 2 function code).

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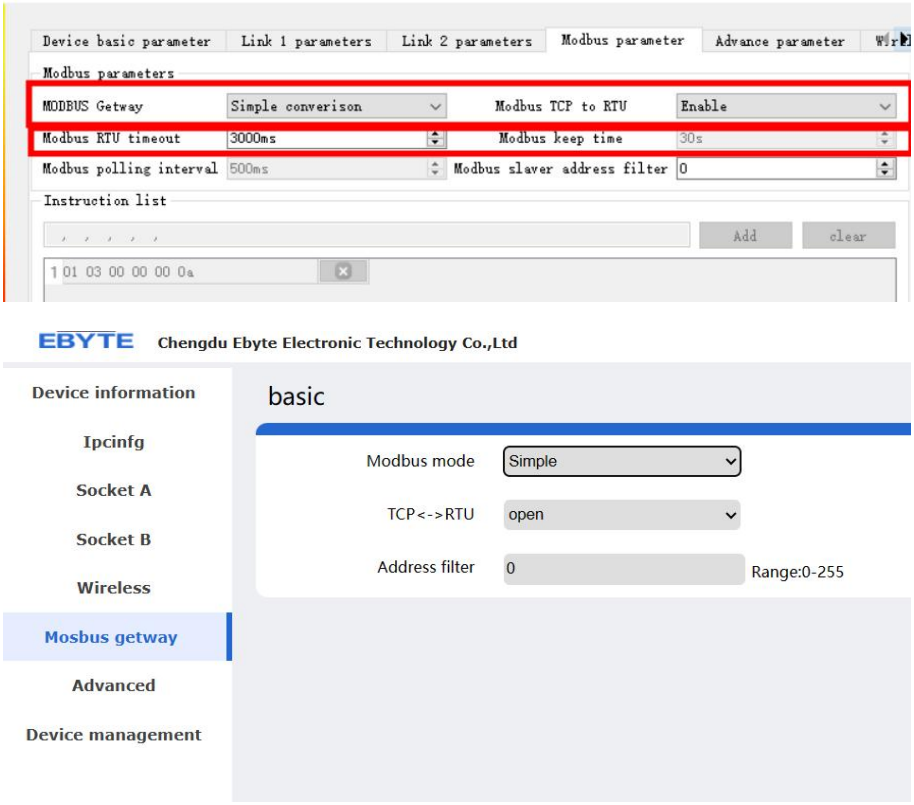
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5.13.2 Simple protocol conversion

Modbus RTU data to Modbus TCP data, or convert Modbus TCP data to Modbus RTU data, to achieve mutual conversion between Ethernet Modbus data and serial port Modbus data.

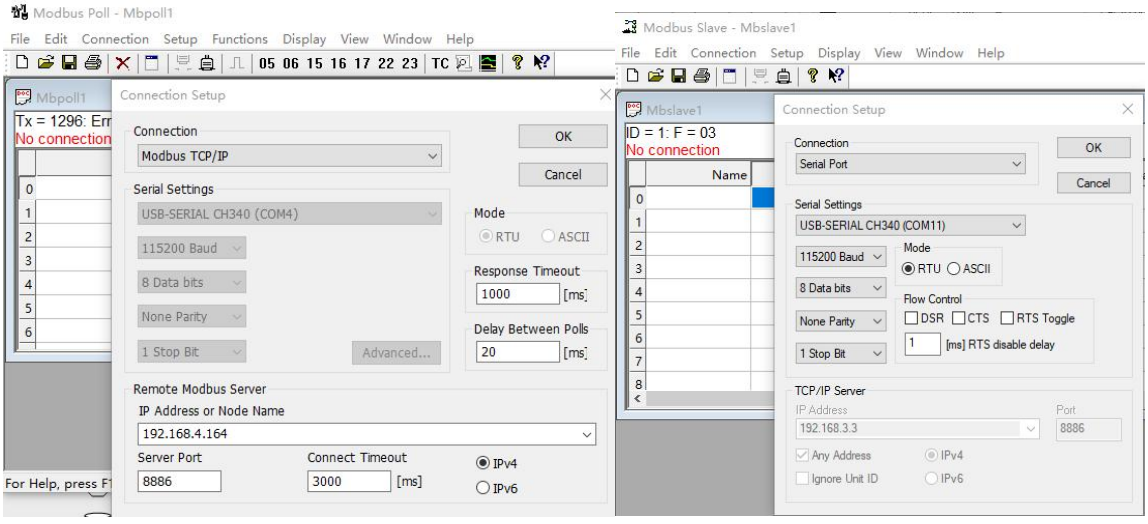
Simple protocol conversion can work in any mode (TCP client, TCP server, UDP client, UDP server, MQTT client). No matter what mode it works in, there can only be one Modbus master station.

Simple protocol conversion configuration:



Modbus Poll and Modbus Slave software debugging :

Software connection settings:

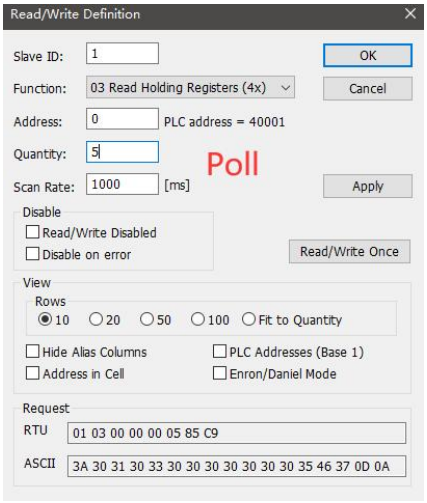


Software register reading and simulation configuration:

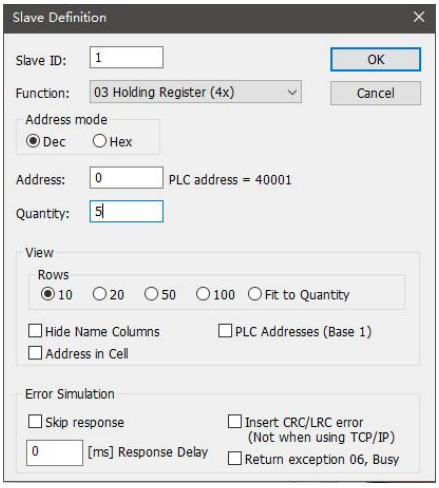
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Poll menu select Set up →Read/Write Definition



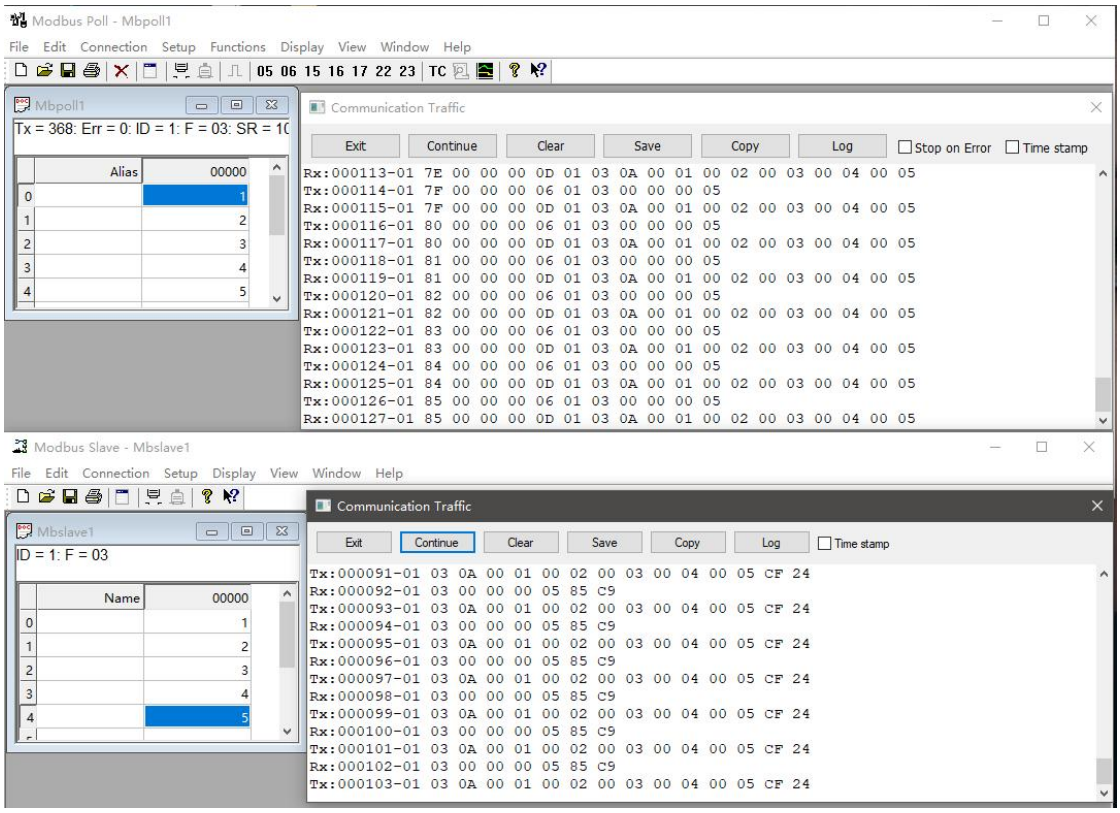
Slave menu select Se tup →Slave Definition



Communication demo:

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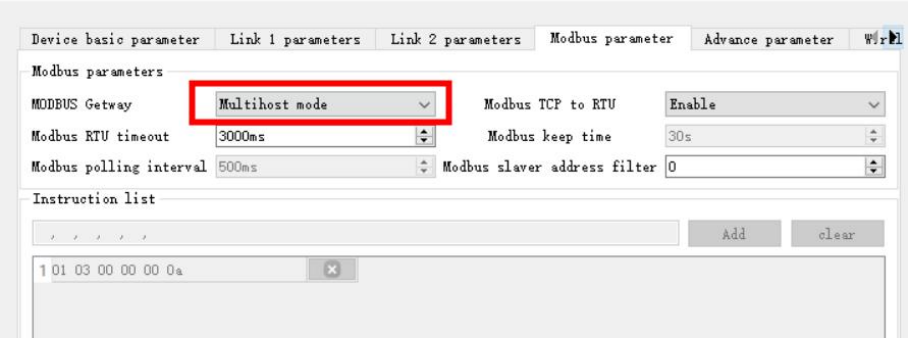
5.13.3 Multi-host mode

Relatively simple protocol conversion can only have one Modbus master station, while the multi-host mode can handle up to 5 Modbus TCP hosts. When multiple Modbus hosts access at the same time, the Modbus gateway will perform bus occupancy scheduling (RS -485 bus only It can process one request at a time, while the multi-host mode will sort and process according to the TCP request, and other links will wait), thereby solving the bus conflict problem (currently only supports 4 host connections), and only supports working in TCP server mode , the slave machine can only be connected to the serial port, otherwise it will not work properly.

As the number of hosts increases, the Modbus timeout and request interval should be increased accordingly. If multiple hosts require continuous high-speed requests, it is recommended to use a "storage gateway".

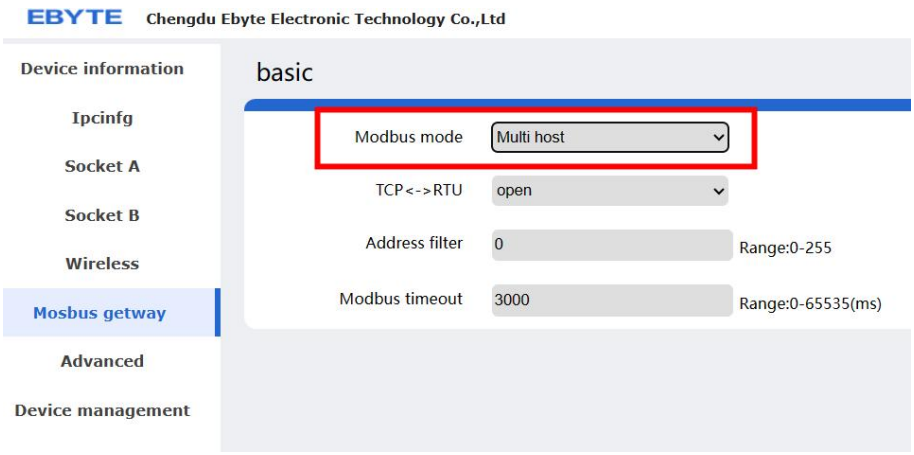
It is recommended to configure "simple protocol conversion" when there are no multiple hosts.

Multi-host mode configuration:



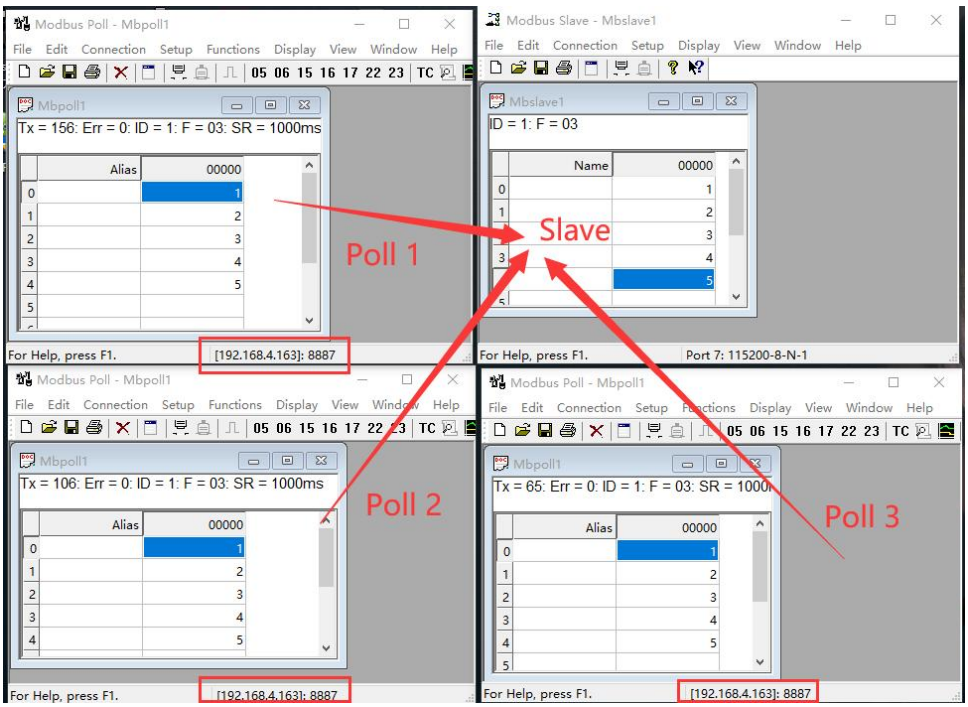
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Modbus Poll and Modbus Slave software debugging :

For software configuration and register configuration, refer to "Simple Protocol Conversion", and open multiple Modbus Poll software at the same time (3 channels are taken as an example, and up to 5 channels can be supported).



5.13.4 Storage gateway

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

As a storage gateway that optimizes multi-host request performance, it can only work in TCP server mode, improving the response speed on the network side.

Features:

（1） The gateway has a 3K cache for storing instructions and returned results (reading 10 holding registers as an example, it can store approximately 100 instructions and returned results);

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

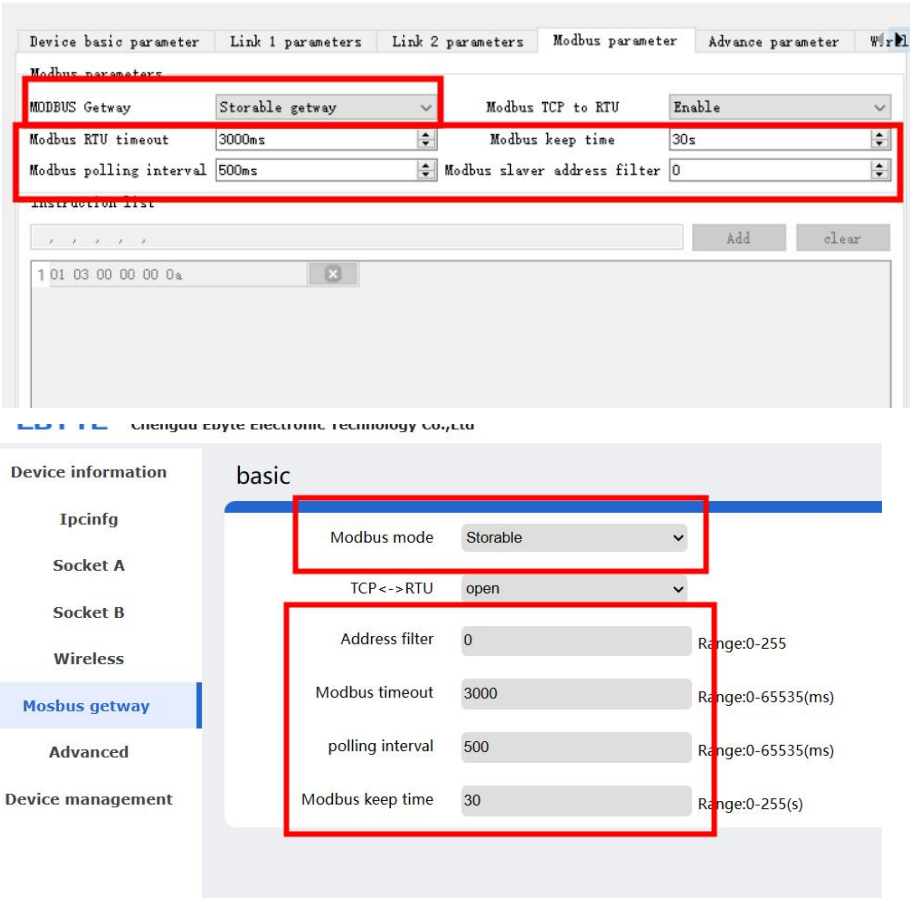
（3） The polling interval can be customized, 0 -65535 ms (default: 500ms) ;

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

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

（6） Only supports 0 1 , 0 2 , 0 3 , 0 4M od bus function code query result storage;

Storage gateway configuration:



5.13.5 Configurable gateway

The gateway automatically polls the RTU device register according to the preconfigured MODBUS command (only supports the configuration of the MODBUS read command). Non-storage table commands will directly operate the RTU device. Frequently read instructions can be stored in the gateway in advance, which can shorten the response time (query configured instructions). Due to the above characteristics, the serial port side of the configurable gateway can only be connected to Modbus slave stations.

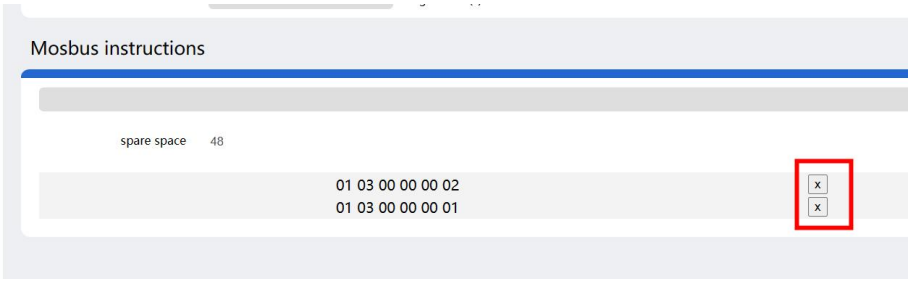
Instruction storage instructions (added, instruction errors and format errors cannot be added):

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Instruction storage description (delete):



5.13.6 Automatic upload

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

For command pre-storage, refer to "Configurable Gateway-Command Storage Instructions" and automatically upload the host computer/webpage configuration.

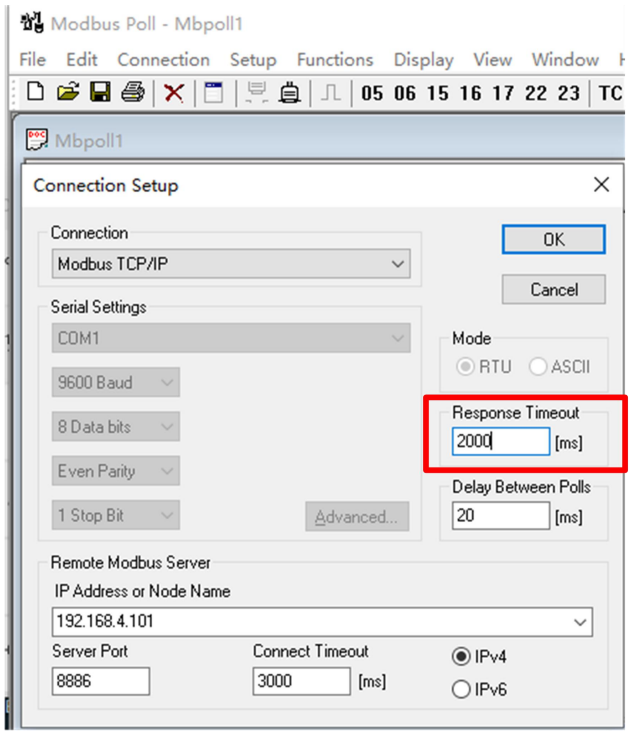
5.13.7 Simple protocol conversion demonstration case

Step 1: Test the data delay based on the actual application distance and adjust the Modbus timeout of the gateway; to roughly calculate the acceptance demo through X COM and the Network Debugging Assistant log.

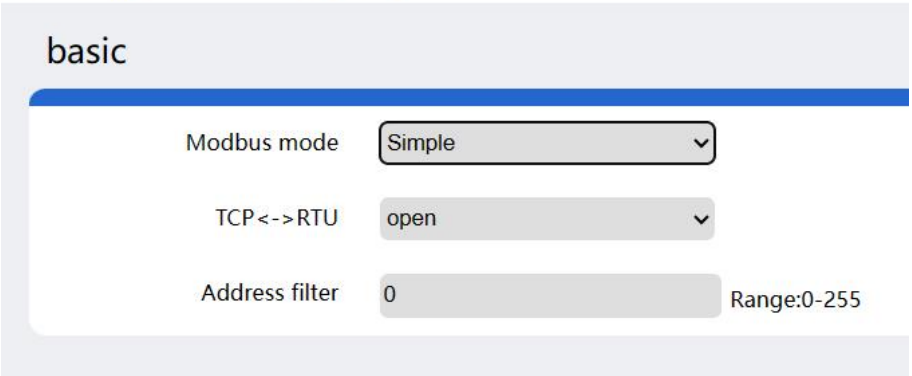
bus timeout of the E 90 gateway should be greater than the calculation time (it is recommended to use the maximum value for multiple transmissions). Here you can configure the timeout to 2000 ms (leave a certain margin, do not use 1 400ms directly), the terminal device (For example, the timeout time of Modbus Poll software) should be greater than or equal to the timeout time of the gateway.

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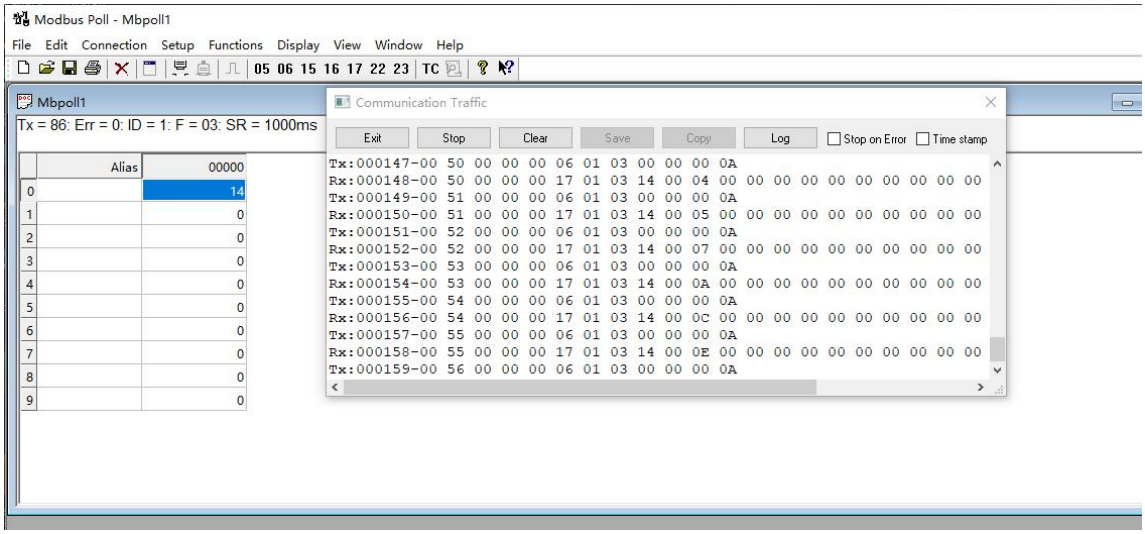
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Step 2: Enable Modbus gateway function (simple protocol conversion);



Step 3: Use Mod bus Poll and Modbus Slav e software to test the configuration. Refer to "Simple Protocol Conversion";



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Chapter6 Configuration method

6.1 Web page configuration

Related parameters can be customized through Web settings. Open the browser, enter the device IP in the address bar (default: 192.168. 4. 101) , enter the page, and query and set parameters. The configuration parameters will take effect after restarting.

Web page configuration initialization account : admin

Web page configuration initialization password : admin

Customizable configuration, only supports 6-digit uppercase and lowercase letters and numerical configuration.

Web page configuration requires a browser with a newer kernel to work properly, such as Microsoft Edge (96.0.1054.62), Google chrome (96.0.4664.110), Firefox (95.0.2), etc.

[Note] IE, 360 compatibility mode, QQ browser compatibility mode and other browsers that use the IE kernel are not supported for web page configuration.

6.2 PC configuration

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

【Note】:

Do not use multiple host computers in the same LAN environment. Industrial computers with multiple network cards need to be temporarily disabled and do not use network cards. Otherwise, the host computer will not be able to search for devices normally (the same device is displayed multiple times, the device cannot be found, and other abnormalities occur)

The host computer blocks the wireless network card, so the network cable must be connected to use the host computer. The wireless network card can be configured through the web page.

6.3 Network AT command configuration

After enabling network AT, the configuration can be completed through AT commands. For specific AT commands, please refer to " AT Command Set".

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Revise history

Version	Revision date	Revision Notes	Maintenance man
1.0	2024-3-14	initial version	LYL
1.1	2024-8-6	Image modification	LYL

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