VT-DTU500C

User Manual

Figure 1 VT-DTU500C

CONTENT

1. Overview

VT-DTU500C supports 2G GPRS mode. It converts RS485 to 4G, with CAT1 4G transmission rates up to 5Mbps upstream and 10Mbps downstream. It also supports RS485 to 4G conversion and features Rail mounting for easier installation. Compared to traditional wall-mounted 4G DTUs, its width is reduced to approximately 1/4, resulting in a smaller footprint. It uses a terminal block power input, supporting a wide voltage range of 9-24V. The shell is made of high-temperature-resistant, flame-retardant alloy plastic, meeting industrial fire protection requirements.

VT-DTU500C not only has the function of registering messages, heartbeat packets, but also the relatively new MQTT, Modbus RTU to JSON to connect to the cloud server. It has the features of high-speed transmission, low latency, support for new technologies and so on.

VT-DTU500C supports device configuration, firmware upgrades, and MQTT/JSON configuration via the serial port. Furthermore, a large number of distributed devices can be remotely and centrally managed through a server, enabling remote configuration, viewing, and program upgrades. In conjunction with the public cloud, web-based device management, web-based data viewing, and remote control are also possible.

Collected data can be uploaded in JSON format, enabling automated data collection. Data collection supports Modbus RTU, 645 instrument version 97, 645 instrument version 07, and various non-standard RS485 protocols. Vircom allows users to configure the uploaded data format and JSON keywords. Uploads support MQTT, HTTP POST, HTTP GET, transparent transmission protocols, and various non-standard network protocols.

Supports edge computing functions, including data overrun alarms, data panning and scaling, data change uploads, device offline alarms, device independent data collection, and automatic device connection. This function is usually used in conjunction with the JSON function.

A specially designed watchdog circuit ensures long-term stable operation of the 4G module.

The product supports an industrial temperature range of -40°C to 85°C and has passed electromagnetic compatibility tests, including those for static electricity.

Applications:

1. Data collection in the Industrial Internet and industrial automation sectors.
2. New energy, solar power, wind power generation, and power data collection and monitoring.
3. Access control and security.
4. Collection and monitoring of hydrological, meteorological, and environmental data.
5. Intelligent transportation and vehicle-mounted data collection.
6. Smart agriculture, smart greenhouses, and smart animal husbandry.

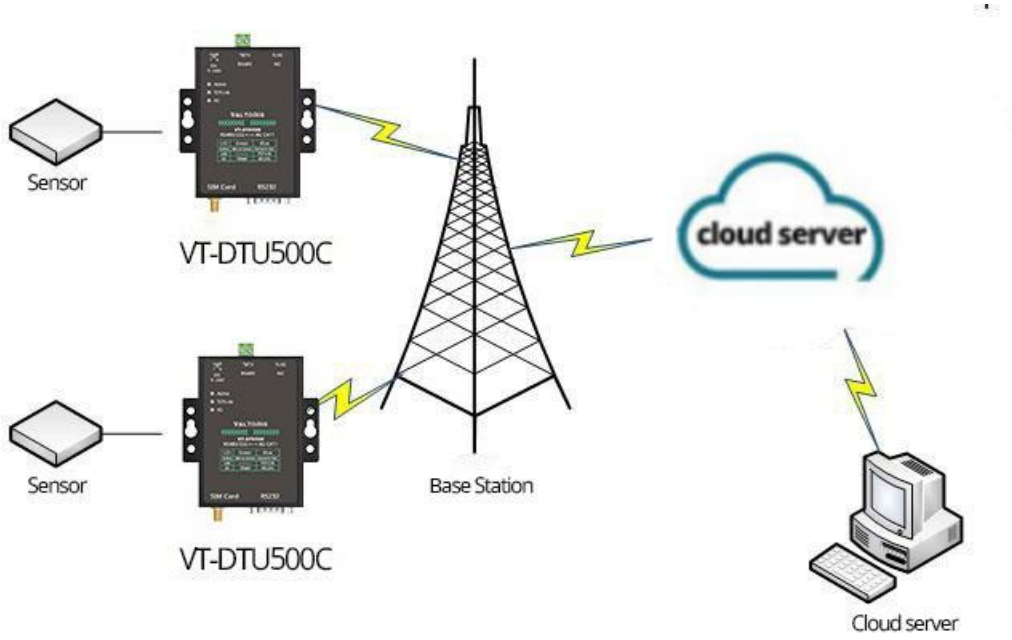

Figure 2. Application Environment

2. Features

1 Support 3 modes，TD-LTE/ FDD-LTE/ GSM，including Unicom, 4G，2G，mobile 4G，2G and telecom 4G.

2 Support TCP client, UDP mode.

3 Serial port support 300~921600 baud rate, support 5~8 data bits, support no check, odd check, even check, support 1~2 stop bit.

4 Support serial port（RS232/485）To 4G.

5 Support serial port transparent transmission, Modbus RTU to Modbus TCP, MQTT protocol.

6 Support serial port AT command configuration, and VIRCOM software to view some parameters.

7 Support for serial port configuration of MQTT parameters.

8 Support DTL-645/Modbus RTU automatic collection and conversion to cloud platform JSON format.

9 The VT-DTU500C firmware can be updated on the device through the serial port, and the firmware can be updated on the server side through the Vircom software.

10 Support server side remote device management, device configuration, device upgrade.

3. Technical parameters

Table 1 VT-DTU500 Technical parameter

Specifications	
Support Mode	4G CAT1 support 3 modes： B1/B3/B5/B8@FDD LTE B34/B38/B39/B40/B41@TDD-LTE B3/B8@GSM including Unicom 4G，2G，Mobile 4G，2G and telecome 4G Internet.
Transmission rate	LTE：Max 10Mbps（downlink）/Max 5 Mbps（uplink） GPRS：85.6Kbps（downlink）/Max85.6Kbps（uplink）
SIM card	Voltage：3V，1.8V； Mini SIMCard (2FF), Size: 25mm × 15mm

Antenna	50Ω/SMA Rubber stick antenna or suction cup antenna is optional
Interface	RS232/RS485
Serial port data	Baud rate：300~921600bps；Digit bit：5～8 bits；Stop bits：1～2 bits；Check bits: none, even, odd.
Power supply	Q2.1 socket，Can be customized for power terminal input.
Power supply：	DC 9V~24V
Working current	dial/4G When communication 50mA@12V，free 25mA@12V
Operating temperature：	-40~85℃
Storage temperature	-45~165℃
Humidity range	5~95% relative humidity
Device size	Length×Width×Height=9.4cm×6.5cm×2.5cm

4. Instruction

4.1 Hardware specifications

Figure 3. VT-DTU500C Front View

VT-DTU500C Adopts anti-radiation metal shell, two hanging lugs on both sides, which can be fixed with screws; It can also be equipped with guide rail accessories.

Table 2 Indicator contents

Signal	Green	Blue
Active Signal light	The serial port sends data	The serial port receives data
Link Signal light	VT-DTU500C start but the network is not connected	A constant blue indicates that a TCP connection has been established

4G Signal light	Power supply signal	The blue flashing indicates that 4G is dialing. The dialing starts 15 seconds after the system is powered on. Generally, it can be dialed within 10 seconds. Blue is always bright, indicating 4G connectivity

Figure 4 interface picture

Figure 4 shows the upper end interface:

1. Input power supply：interface Q2.1 socket，input voltage DC+9V~ +24VDC, power need above 3W. default adapter is 12V. Can be customized for power terminal input.

2. RS485 interface：RS485 signal input，Be careful not to connect the power.

3. RJ45 interface：Leave it to later to extend the Ethernet interface. It is currently invalid.

Figure 5 shows the lower ports：

Figure 5 lower ports pictur

4. Antenna：VT-DTU500C antenna interface using 50Ω/SMA (female head), external antenna must be suitable for 4G working band antenna. ZLAN can provide glue stick or suction cup antenna, the suction cup can be sucked to the metal housing of the chassis (the default suction cup antenna lead is 1.5 meters long)

5. SIM Card installed：When installing the SIM card, ensure that the device is not powered on. Using a pen tip and a screwdriver, push the SIM card slot out and push the SIM metal face down into the slot.

6. DB9：RS232 signal input.

5. Configuration

The device can configure parameters through a serial port and can also be configured remotely by installing configuration software on a remote server after connecting to it.

5.1 Serial port AT instruction configuration

Connect the USB to RS232 line to the serial port of VT-DTU500C, power on VT-DTU500C, open Vircom (hereinafter referred to as configuration tool), and enter the main interface of the configuration tool as shown in Figure 6.

Click Device Management to select serial port search, as shown in Figure 7, and the serial port parameter selection interface appears, as shown in Figure 8. Select the serial port number, here is COM15, and the baud rate is 115200. 115200 is the factory default setting, and if the user previously set VT-DTU500C to other baud rate, it can also be searched.

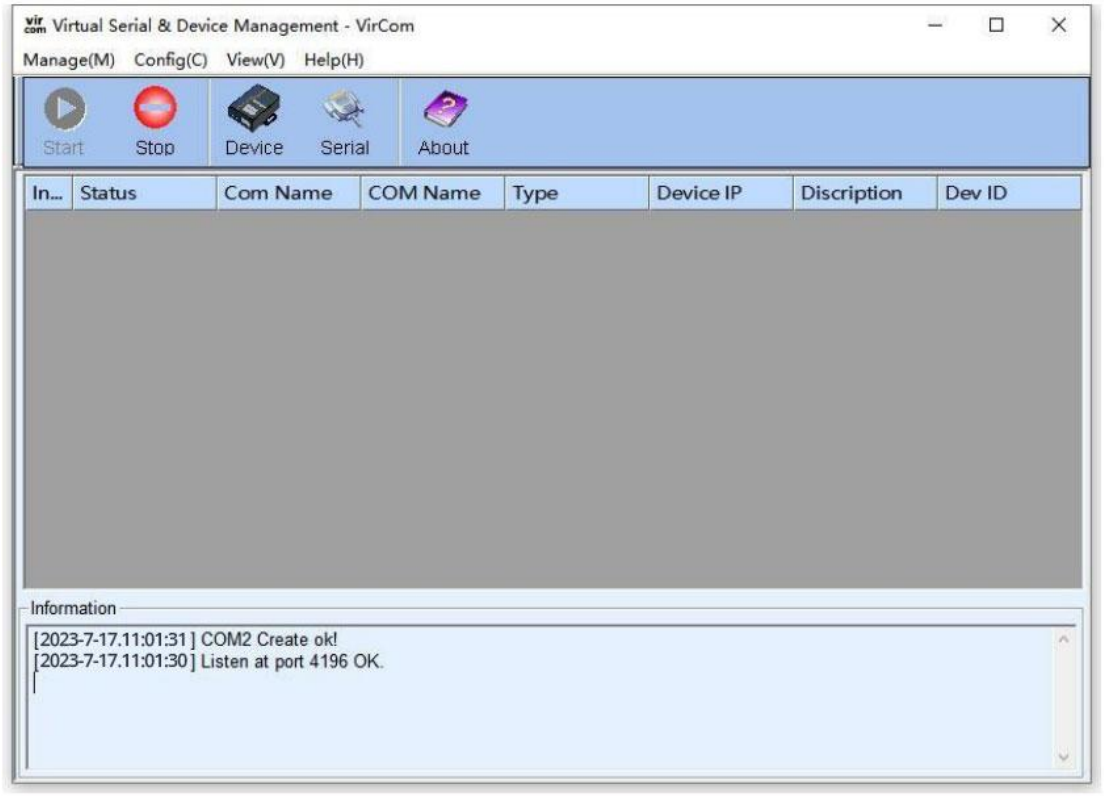

Figure 6 Vircom Main Interface

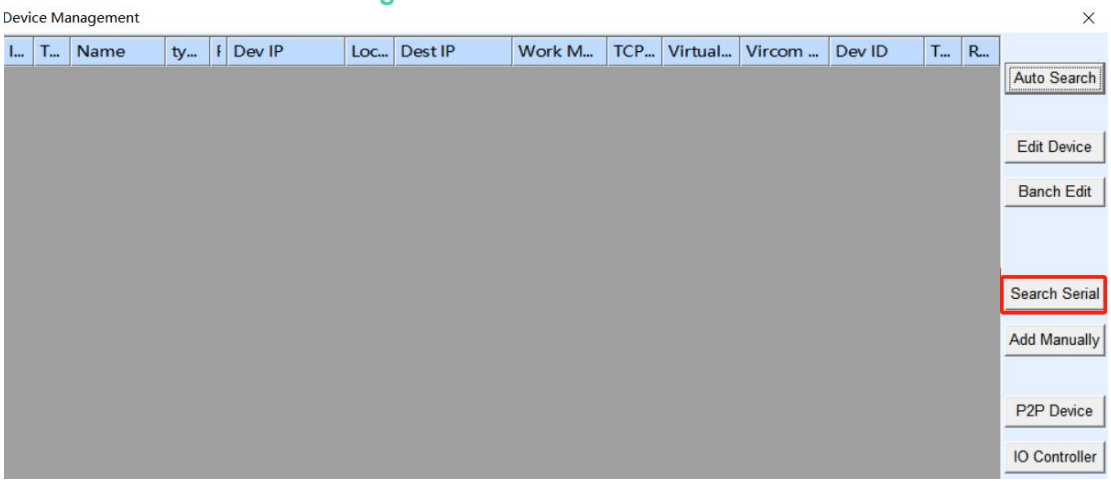

Figure 7 Serial port search interface

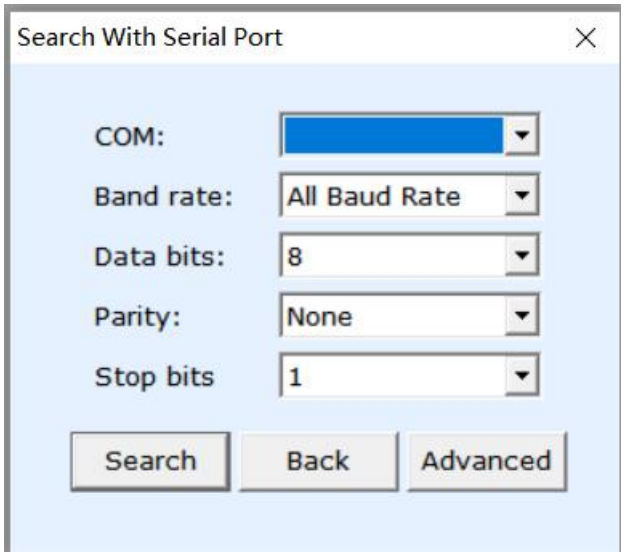

Figure 8 Serial port parameter Settings

After power on, wait for 15 seconds, that is, after the dial light starts flashing, select and click the "Search" serial port. At this time, the configuration tool will attempt to communicate with the device. If successful, it will enter the Conftool interface. See Figure 9 below：

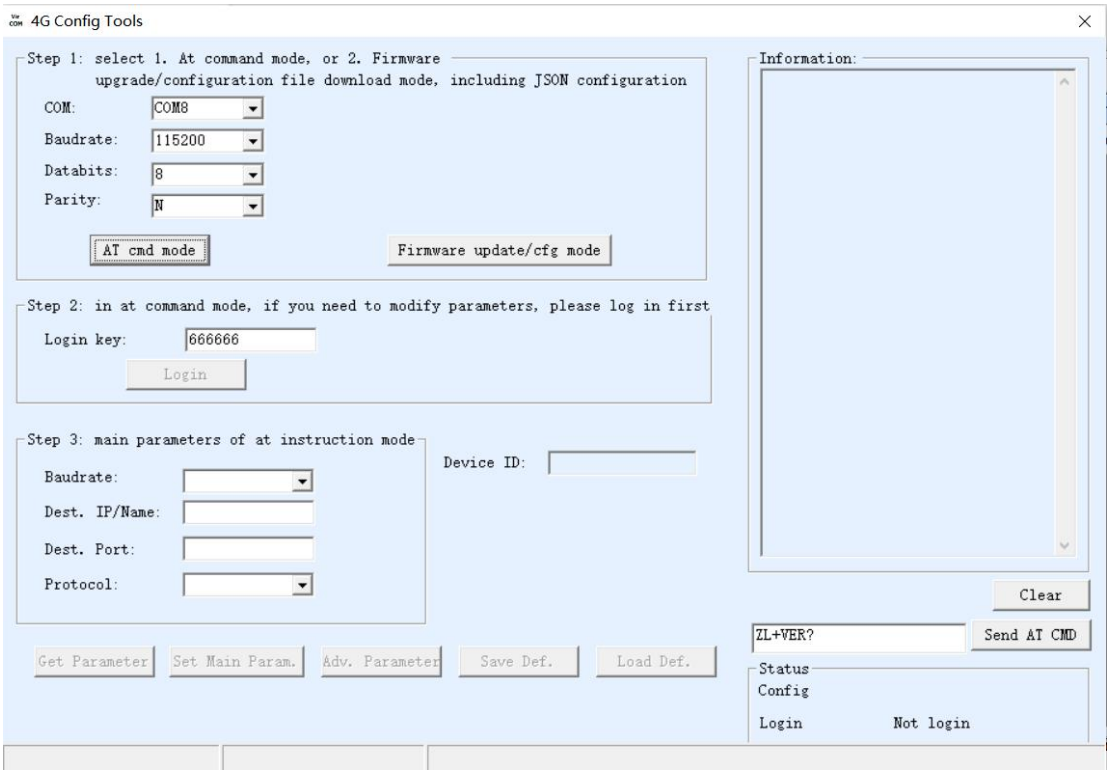

Figure 9 ConfTool interface

Click to enter the AT command mode, and the configuration tool will attempt to communicate with the device. After successful communication, the return information of AT command will be displayed on the right side, and the configuration mode will be shown as having entered the configuration mode, as shown in Chart 10 below：

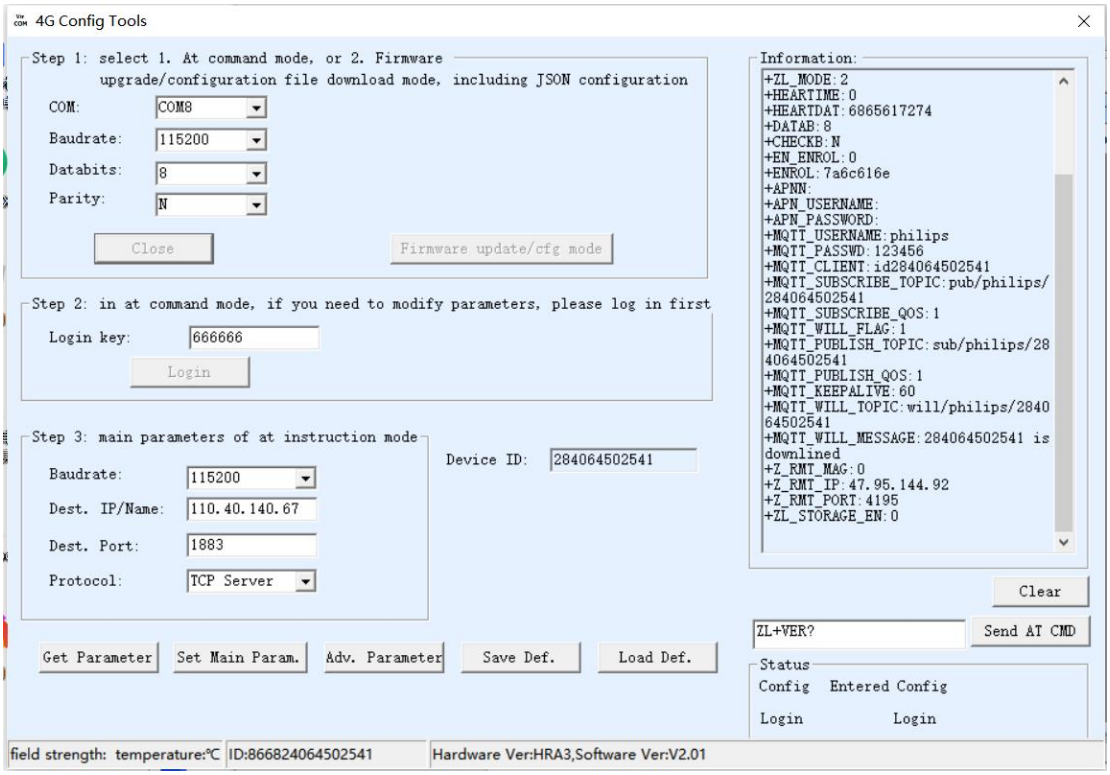

Figure 10 Display the interface for entering configuration mode

The default login password is 666666. Before clicking "Login", all parameters are read-only and cannot be set or modified. Click the "Login Button"

It can be seen that after logging in, the LOGIN status changes to "Logged in", and the message "+LOGIN OK" appears on the right, as shown in Figure 11.

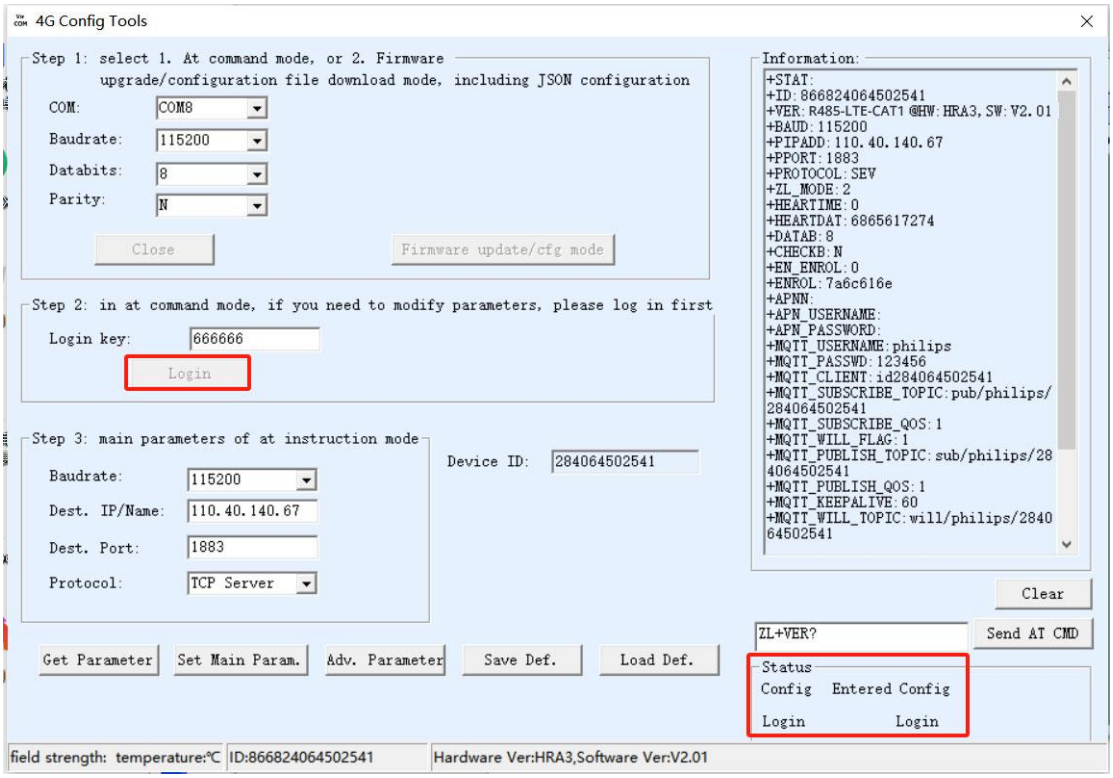

Figure 11 Login interface

The main parameters of the AT command mode include baud rate, destination IP, destination port and protocol. The protocol supports either TCP or UDP protocols. After modifying the corresponding parameters, click "Set Parameters" to set the new parameters to the device. At the same time, the device will return the successfully set parameters, as shown in Figure 12.

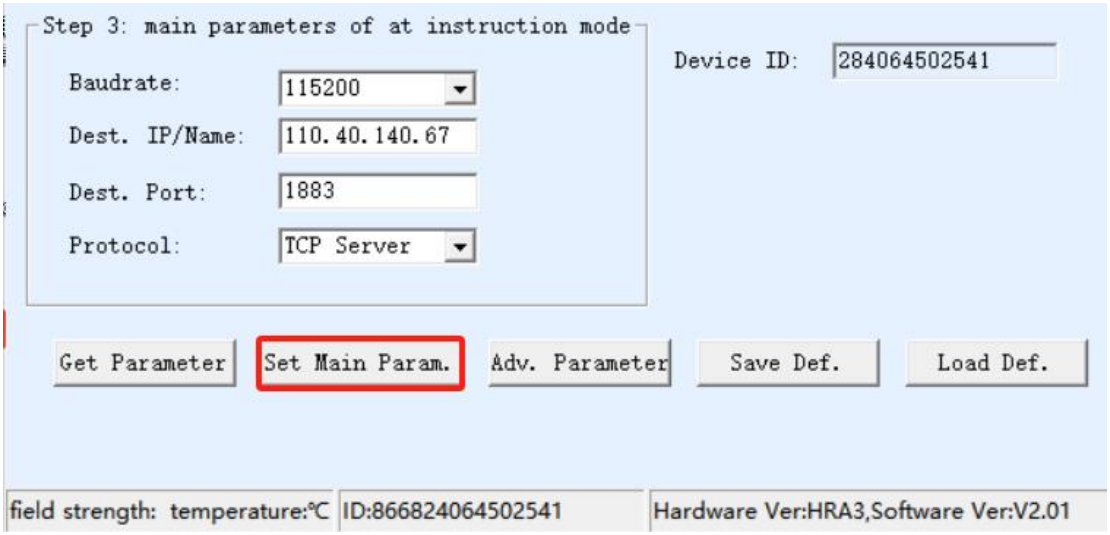

Figure 12 Setting parameters

The "Get Parameters" button can be used to obtain the parameters of the current device. Parameters are obtained by sending AT instructions. The data returned by the AT instructions is listed on the right. For the AT command, you can refer to other chapters of this article. Since "Get Parameters" will be automatically executed once after a successful "Open", there is generally no need to click the "Get Parameters" button.

Click "Advanced Parameters". The advanced parameters box is shown in Figure 13. The commonly used parameters are:

1. Heart rate interval: A heart rate packet with an interval of 15 seconds can be set.
2. Heartbeat content: Set the content of the heartbeat pack.
3. Serial port data bit
4. Serial port check bit
5. Enable the registration package: Whether to enable the registration package.
6. Registration package content: The content of the registration package sent after connecting to the server.
7. APN: The name of the access point of APN.
8. APN username
9. APN password
10. MQTT parameters: Used to set the parameters for accessing the MQTT server
11. Remote device management: It is used for devices with remote management functions to connect to remote servers

After selecting the parameters, click the "Take Effect Advanced Parameters" button, and observe the information bar on the right to check whether the setting information returned by the device is consistent with the information filled in, as shown in Figure 14.

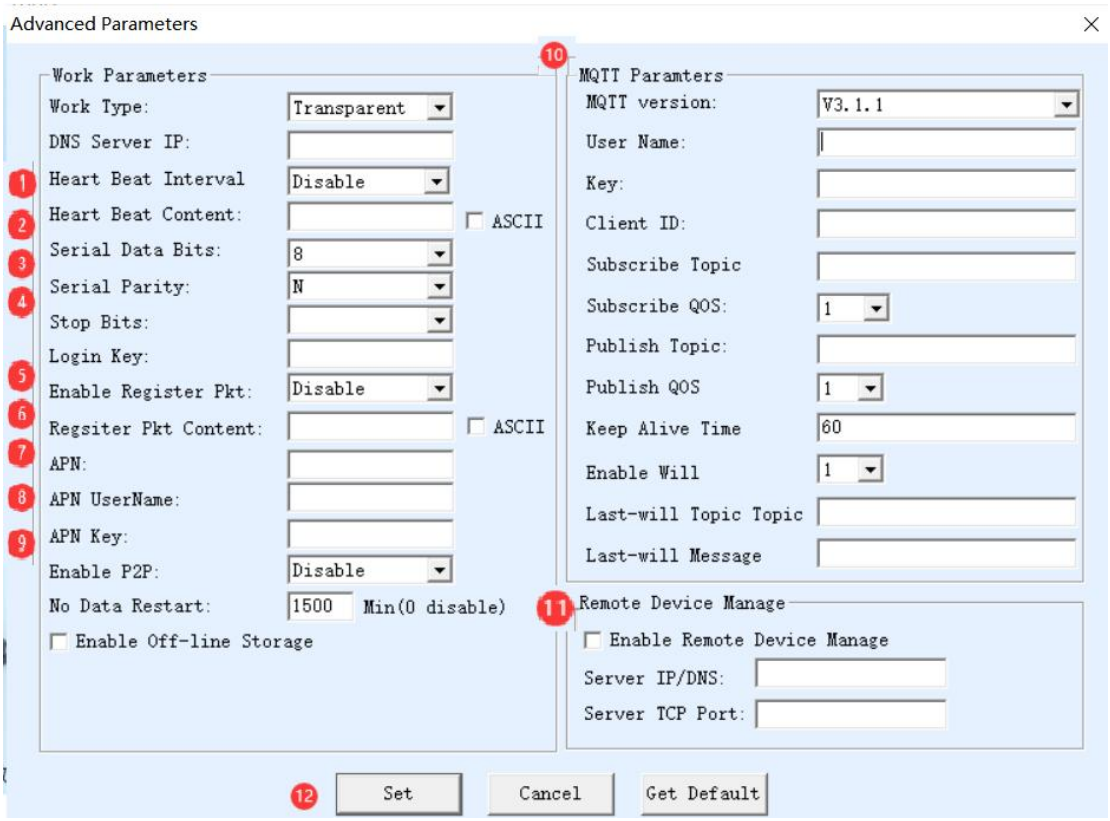

Figure 13 Advanced Parameters

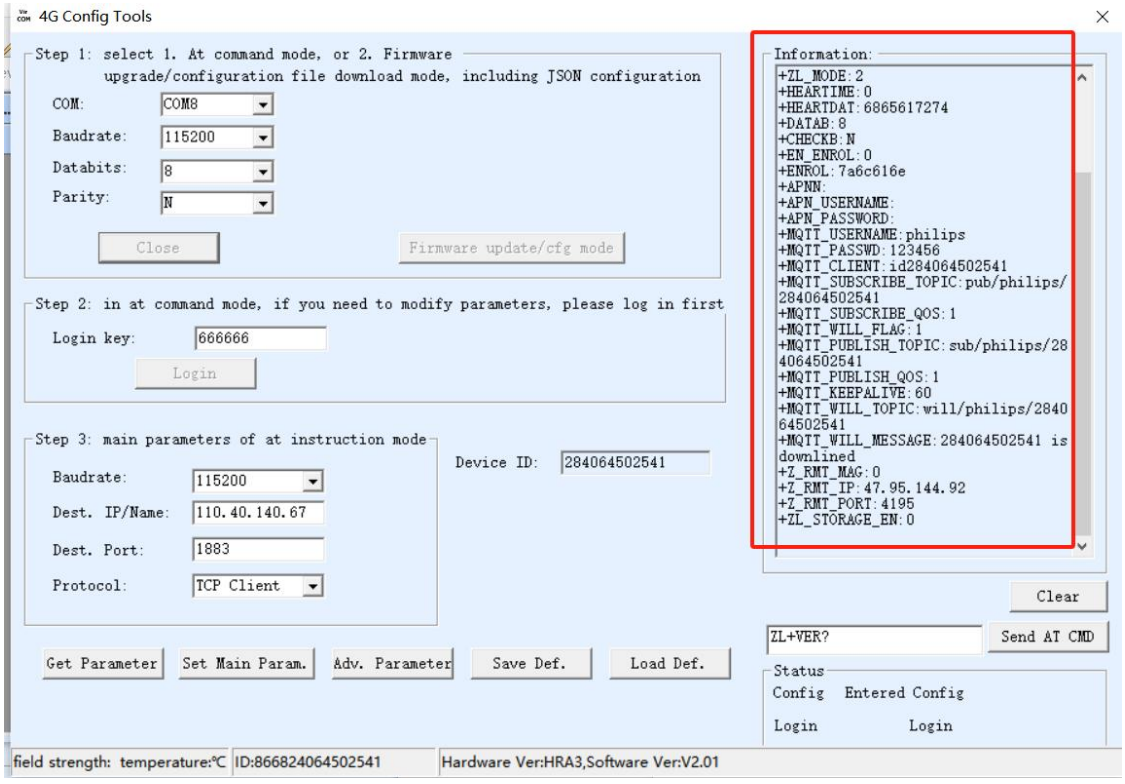

Figure 14 sets advanced parameters to return information

5.2 Firmware/Configuration file mode

After entering the ConfTool interface, click the firmware/configuration file mode button as shown in Figure 15 to jump to the firmware/configuration file interface as shown in Figure 16. First, create a local configuration web page root directory to store the configuration file. Click on the MQTT configuration to input the information for connecting to the MQTT server. After the Settings are completed, click Save the MQTT configuration as shown in Figure 17. Click on the JSON configuration to perform the JSON up-and-down configuration. Save the JSON configuration as shown in Figure 18. Click the download button, and the configuration software will download all the files in the directory to the device. After the download is successful, a transfer completion interface will pop up, and the device will automatically restart, as shown in Figure 19.

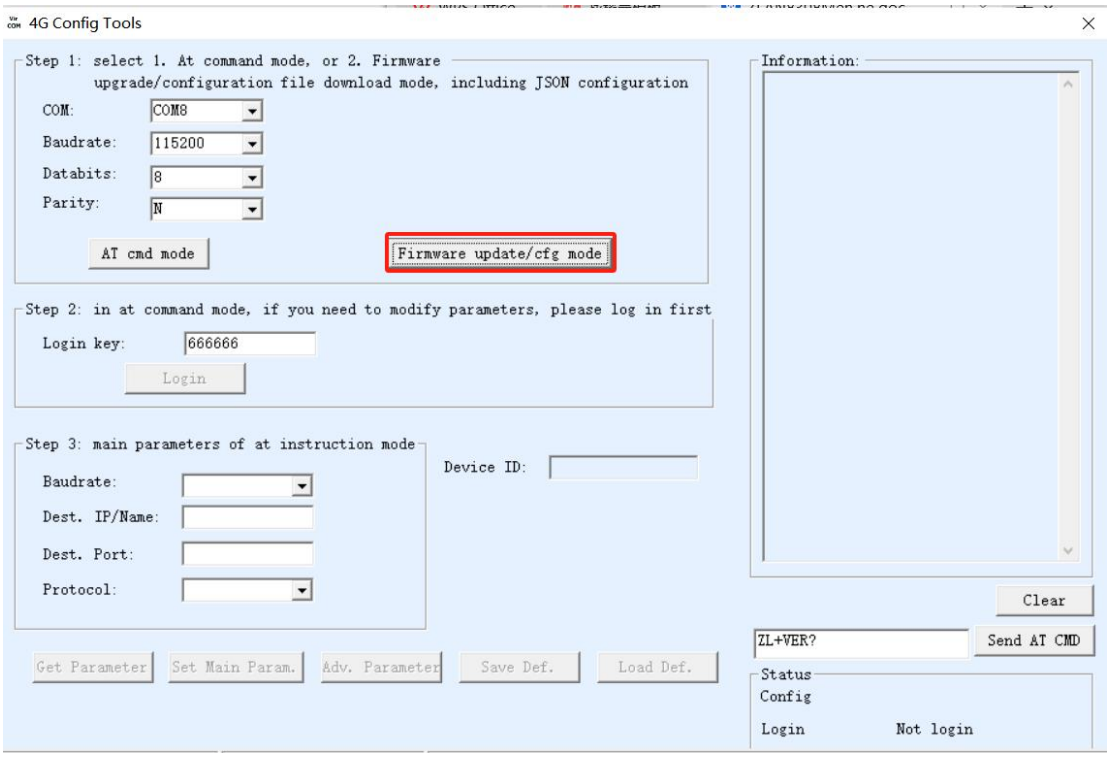

Figure 15 Configuration interface

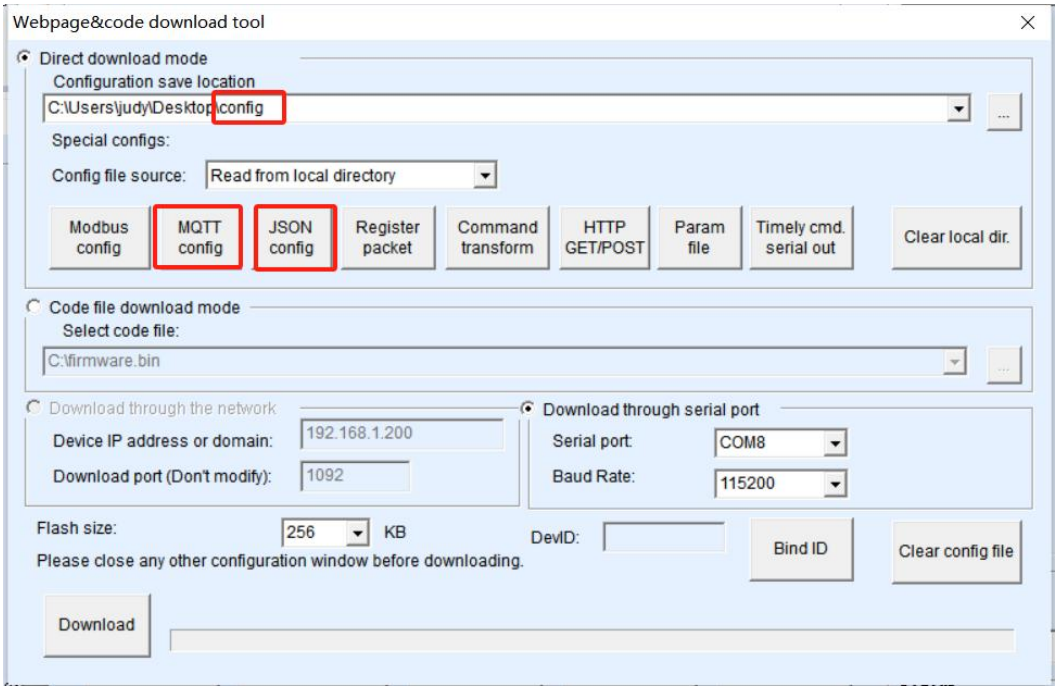

Figure 16 Firmware/configuration file interface

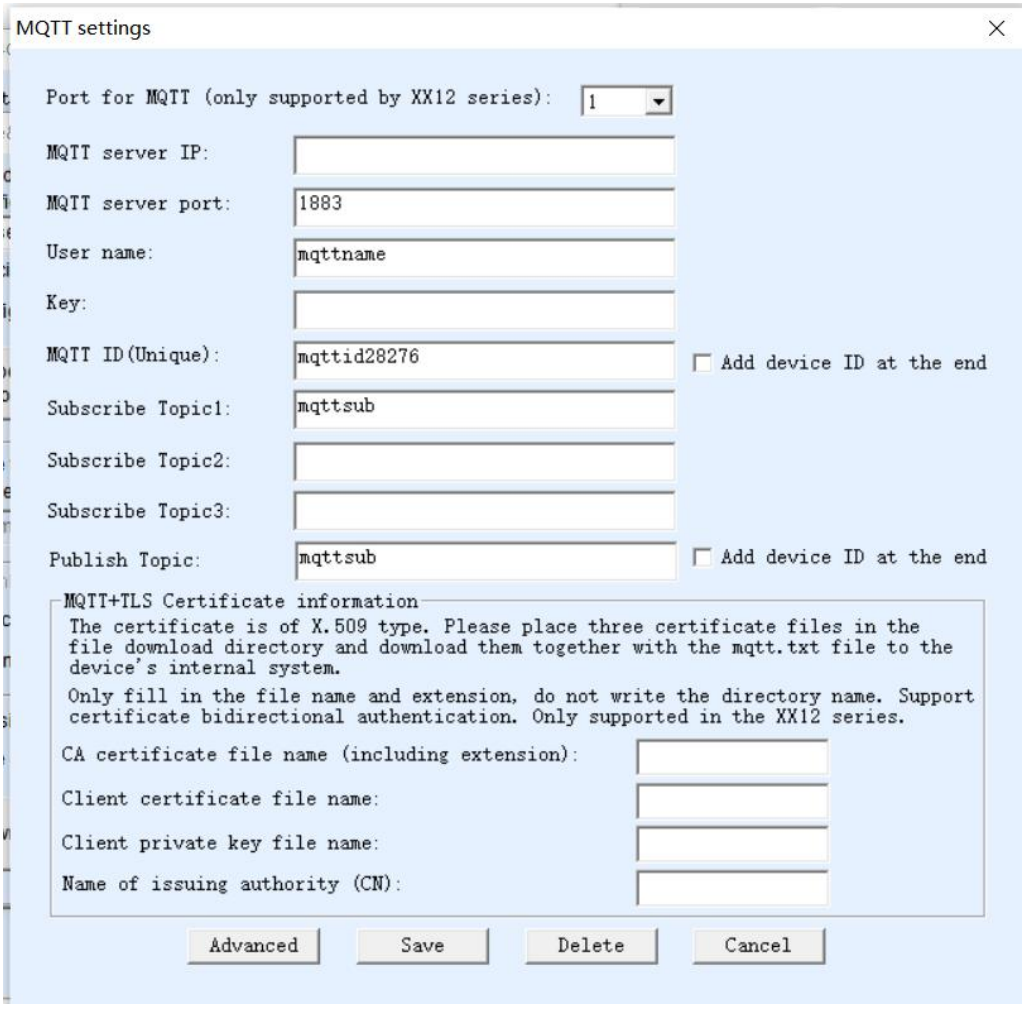

Figure 17 MQTT configuration interface

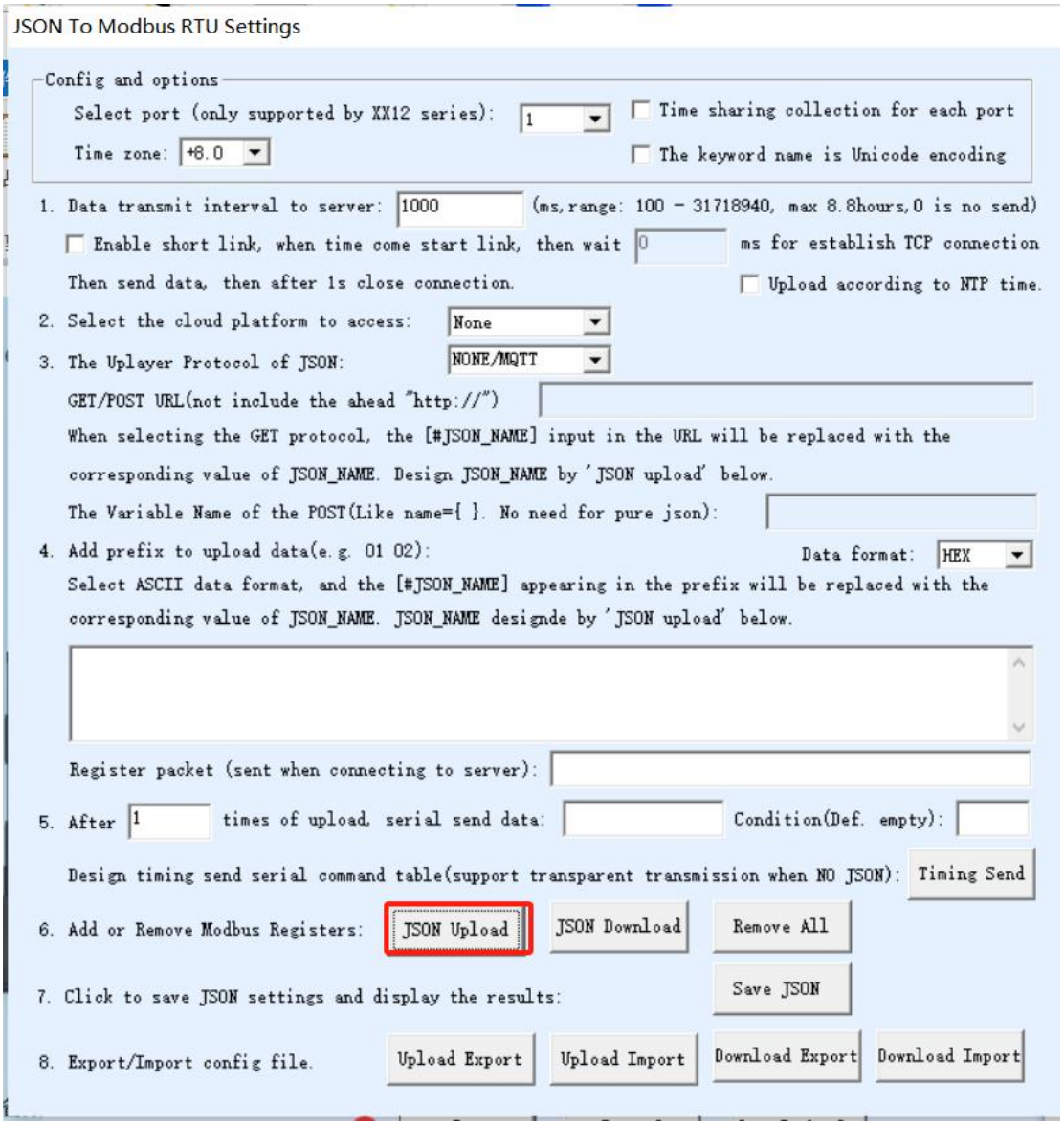

Figure 18 JSON configuration interface

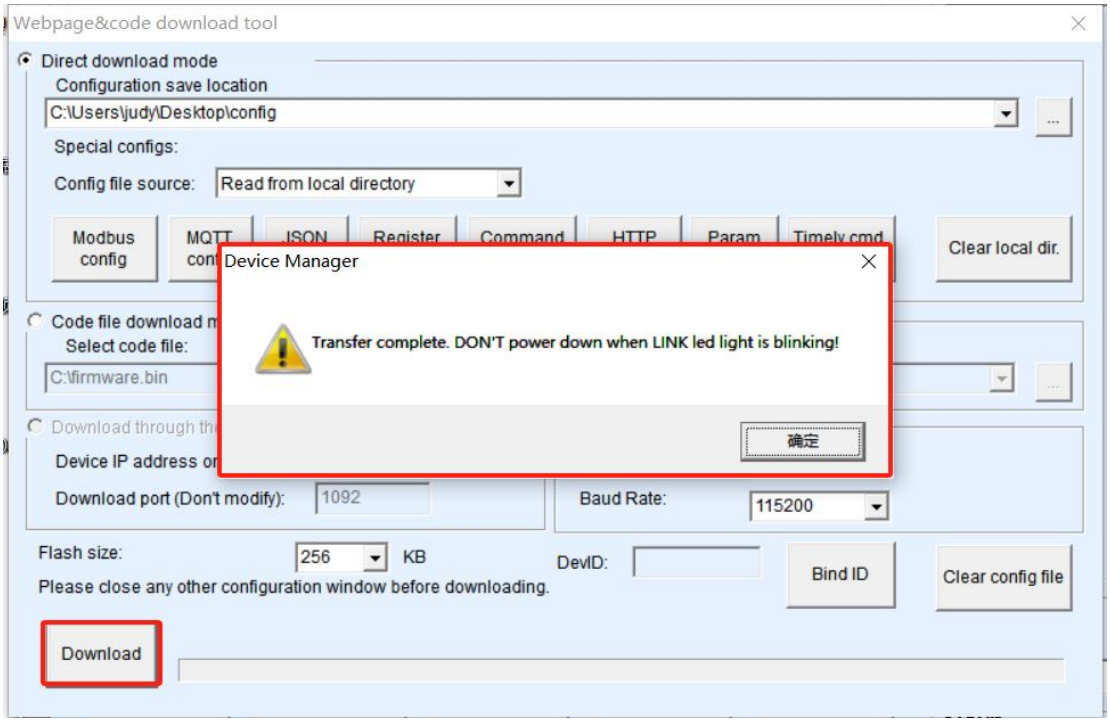

Figure 19 Download interface

6. Product Function

6.1 Communication test

6.1.1 Server Transparent Transmission Test

Suppose there is the following networking structure as shown in the figure below, configured to connect to the *** port of the server ***.***.***.***. Please configure it through the methods in the "Serial Port Configuration" section. After the configuration is completed and the power is restored, it takes 20 to 40 seconds to connect to the server.

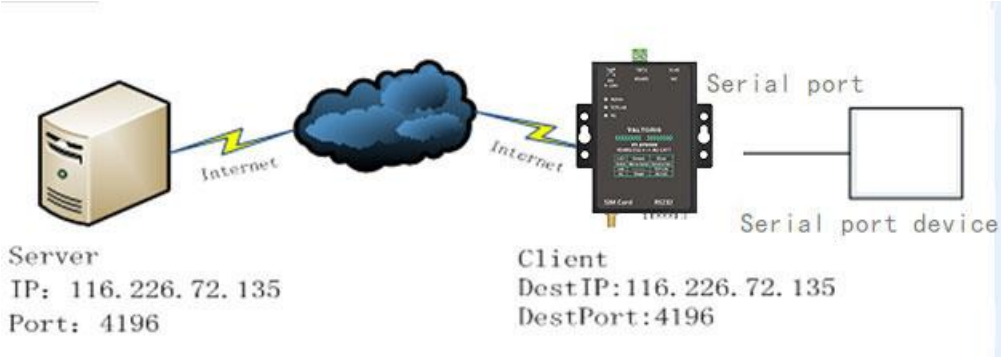

Figure 20 Network connection structure diagram

We run the TCP tool SocketDlgTest on the server.

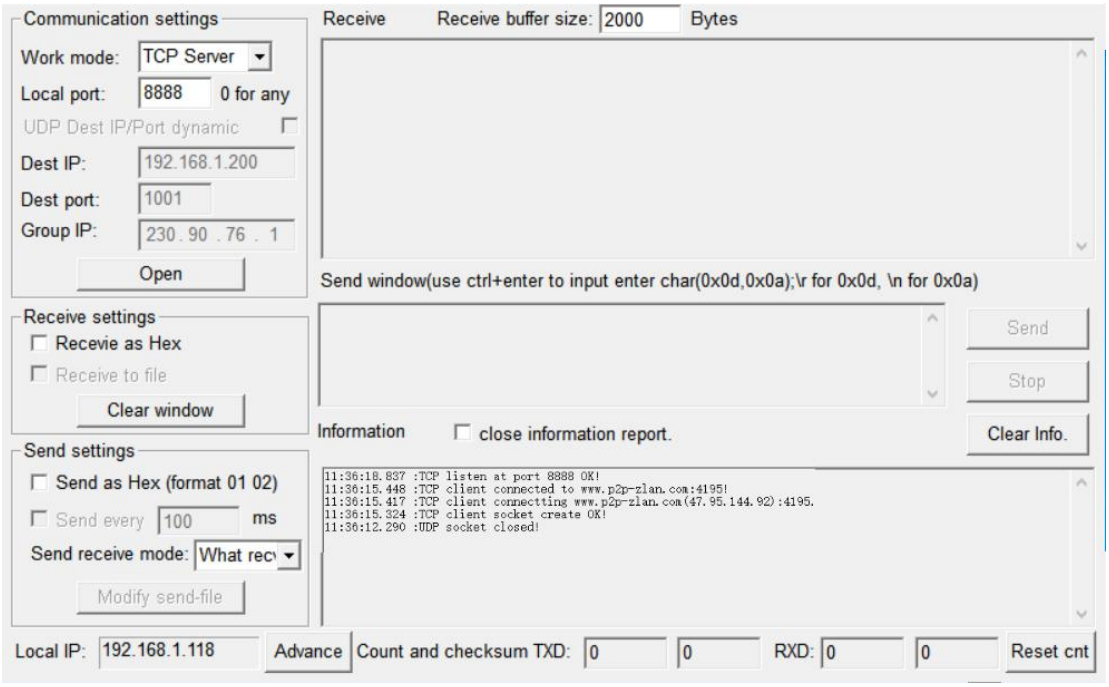

Figure 21 Server-side tools

As shown in the figure, select the local port as 4196 (note that if you are running the Vircom tool, you need to change the port), and then click the "Open" button. When The device is connected to the server, it will display "The NO..." is accepted!" The information.

Now connect the device's serial port to a USB-to-485 serial port cable, and open the serial port debugging tool, as well as the correct COM port.

Now, when data is sent through the serial port, the server side will reply with the corresponding data. Similarly, when the device receives the message reply from the server and outputs it through the serial port, the serial port tool will receive the same data here. This demonstrates the two-way communication from the serial port to 4G network, as shown in Figure 22 below:

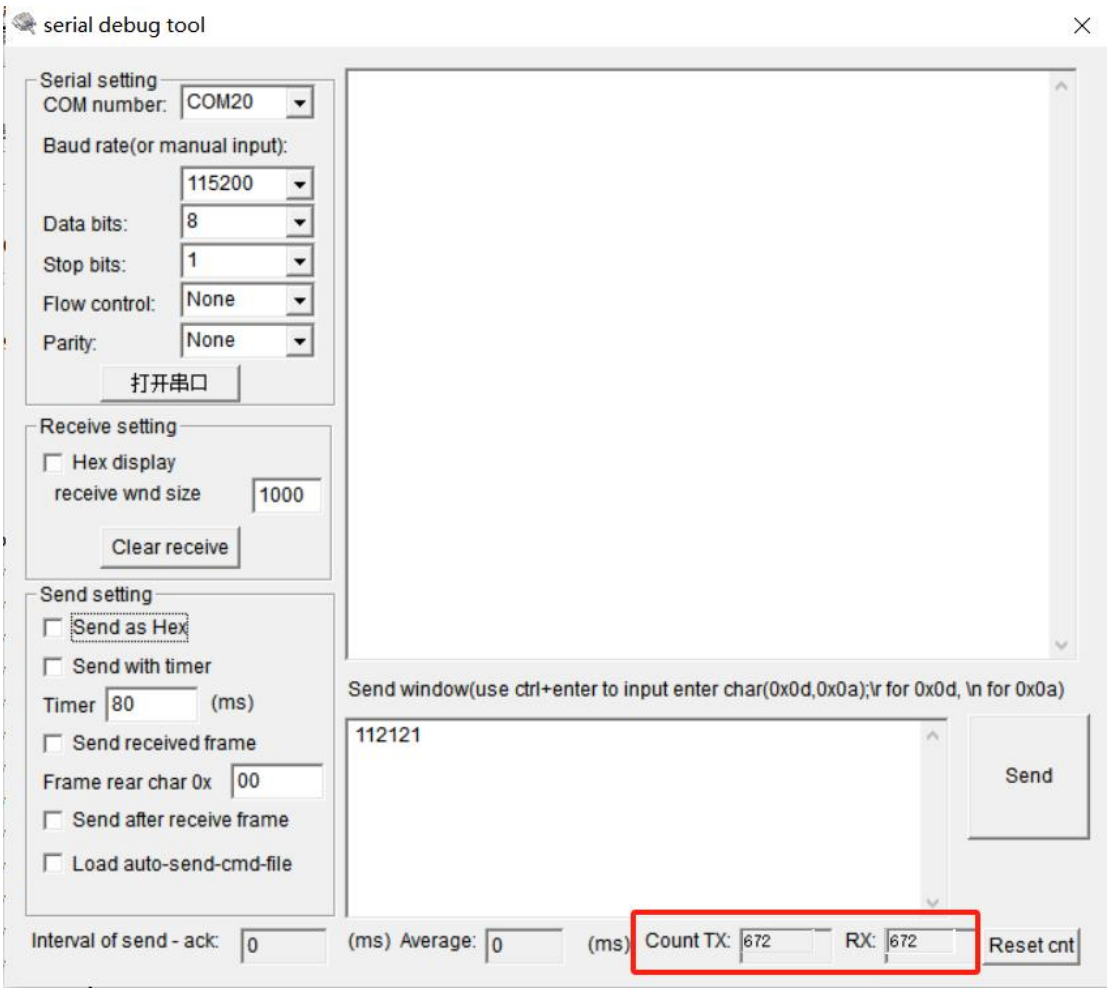

Figure 22 Serial port debugging tool for the device end

6.1.2 Modbus Protocol Conversion Test

The configuration parameters are basically the same as the no-protocol pass-through test; you only need to change the transformation protocol to the Modbus protocol. The serial port Modbus RTU protocol can be converted to the network Modbus TCP protocol, and the network Modbus TCP protocol can be converted to the serial port Modbus RTU protocol.

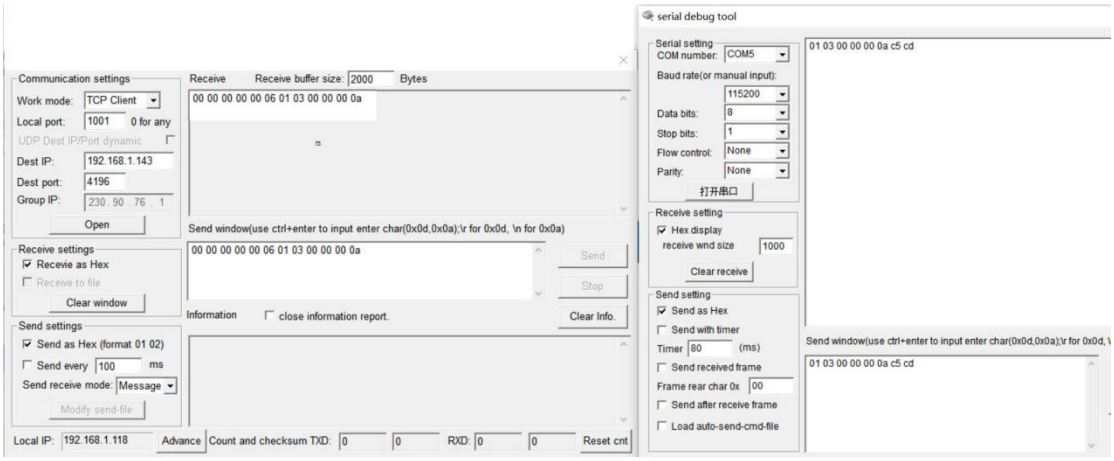

Figure 23 Modbus Protocol conversion test

6.1.3 MQTT Protocol Testing

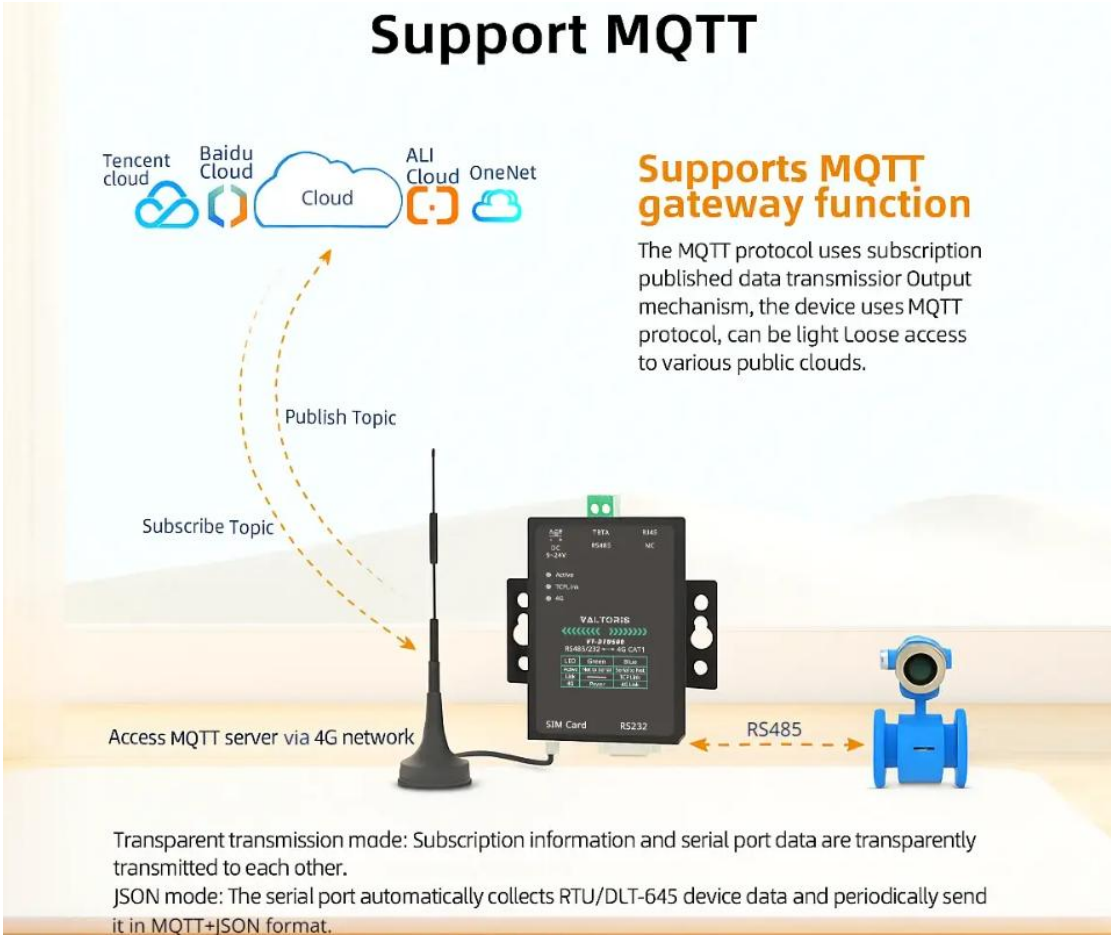

Figure 24 Schematic diagram of MQTT

This test is for connecting to Alibaba Cloud. Create a subscription topic named "test" and a publishing topic named "1" on Alibaba Cloud, as shown in Figure 25. According to the configuration instructions in step 5, first fill in the IP and port configuration of the MQTT server, save the parameters, and the parameter filling is

shown in Figure 26. Then, on the advanced parameter page, fill in the MQTT ID, username, password, as well as the subscription and publication topic and the retention time. The parameter filling is shown in Figure 27. Please note to select the working mode as MQTT mode.

Topic	Operation permission	
/a1WSVHIXkDh/${deviceName}/user/test	Subscribe	-
/a1WSVHIXkDh/${deviceName}/user/1	Publish	-

Figure 25 Adds a theme to Alibaba Cloud

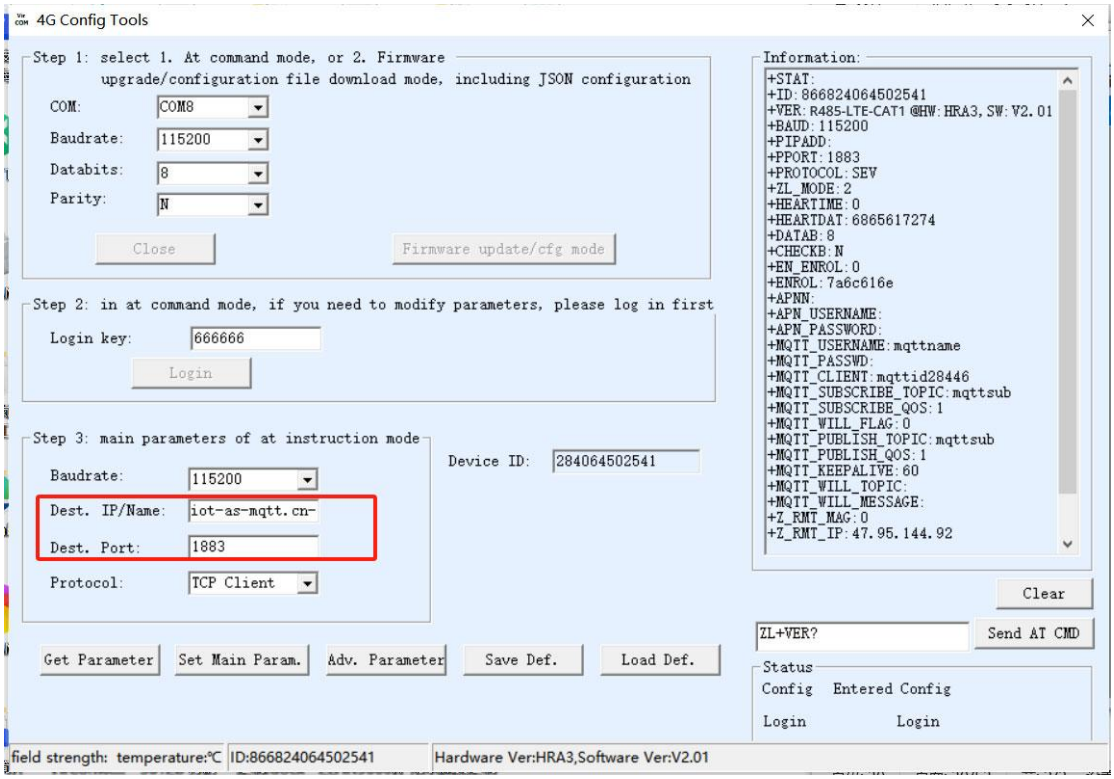

Figure 26 Alibaba Cloud IP and Port

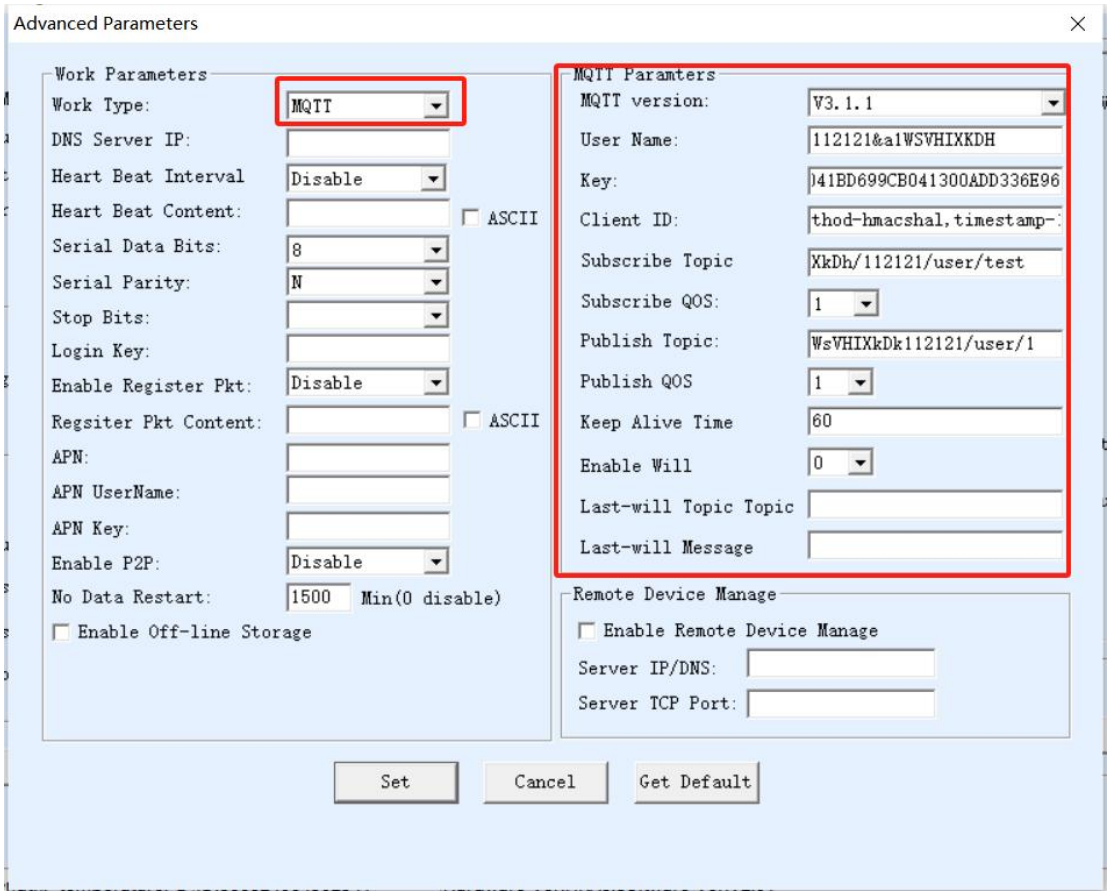

Figure 27 Configuration of Alibaba Cloud MQTT

After the Settings are completed, open the Alibaba Cloud Device Management interface and enter the log service page to view the information sent on the device, as shown in Figure 28. Data is sent through the serial port of the device. A message (" MTEST ") is sent to the MQTT server of Alibaba Cloud via the subject of 1. Alibaba Cloud receives the data as shown in Figure 29. The Alibaba Cloud server then sends a message (" ALI_send ") to the serial port of the device via the test subject as shown in Figure 30. This completes the MQTT sending and receiving test.

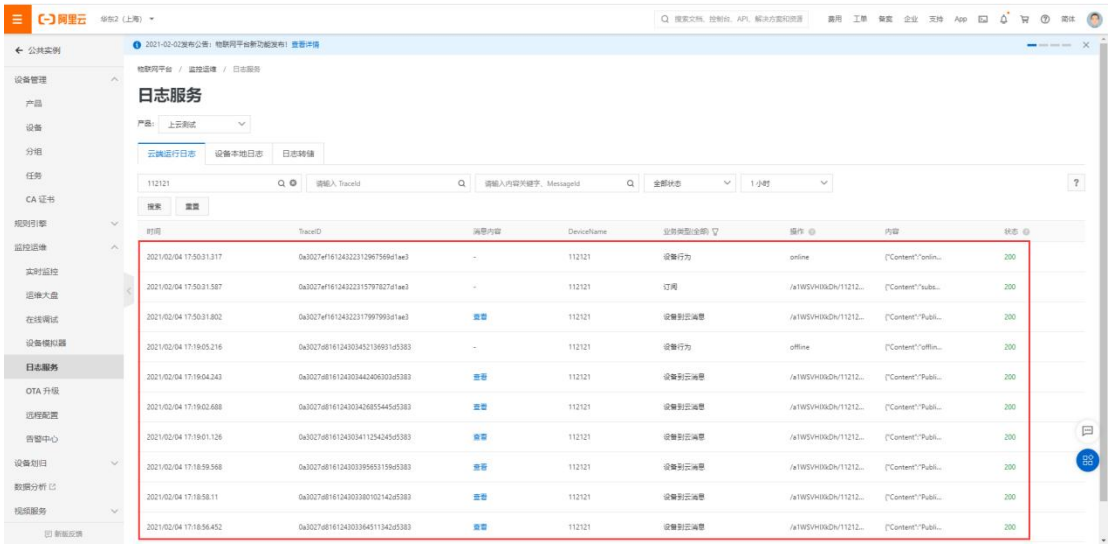

Figure 28 Alibaba Cloud Log Service

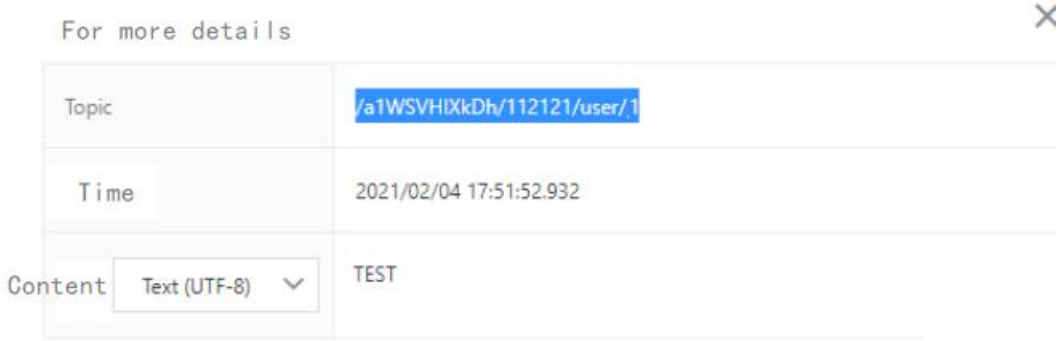

Figure 29: Alibaba Cloud receives serial port data

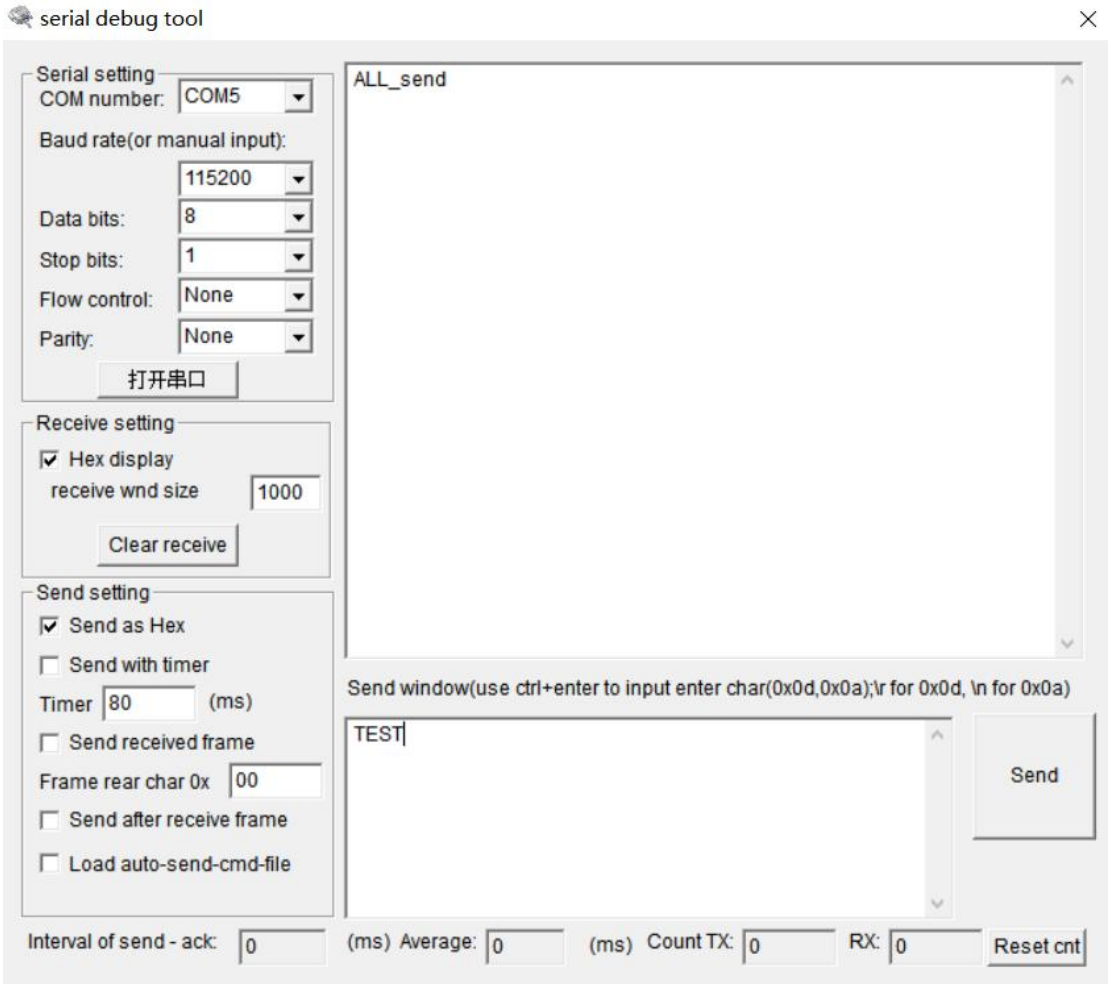

Figure 30 shows the serial port receiving data from Alibaba Cloud

6.2 MODBUS RTU to JSON Conversion Test

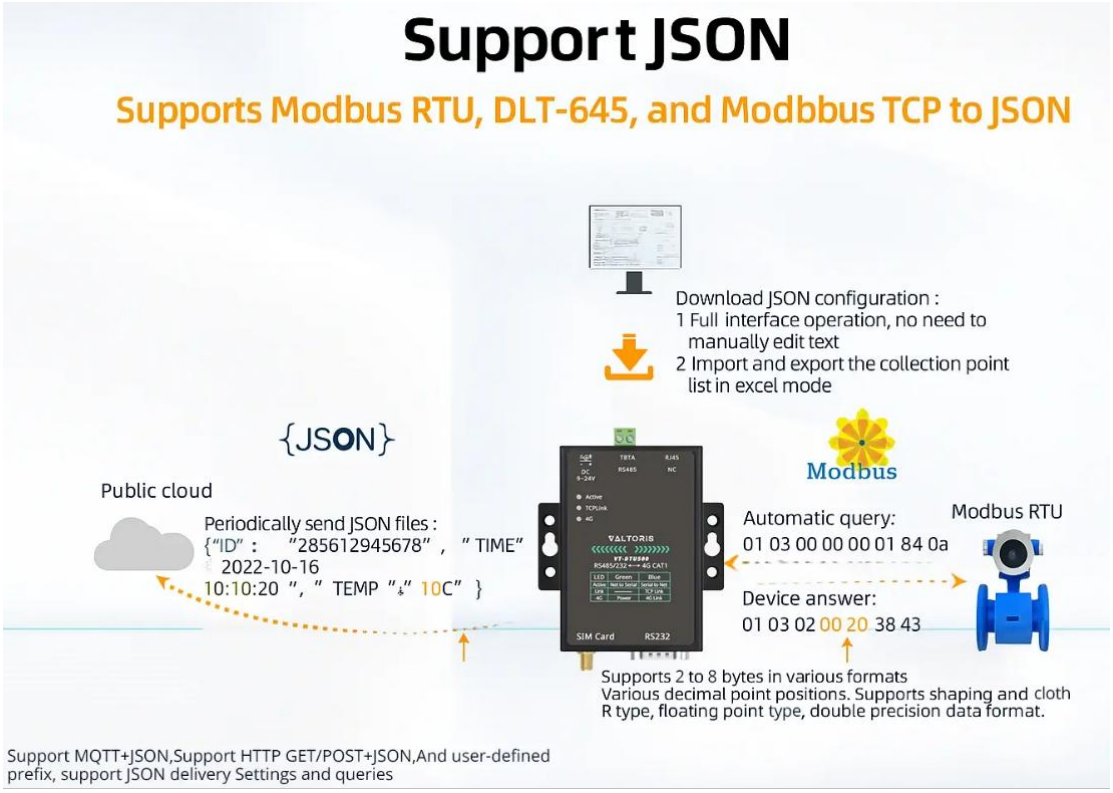

Figure 31: Schematic diagram of JSON

6.2.1 Configure JSON for Posting

Through the above section: Modbus protocol conversion test, a simple JSON upload template is configured. The configuration process is shown in Figures 32, 33, 34, and 35 below. Data from some MODBUS nodes is collected and converted into JSON format for upload.

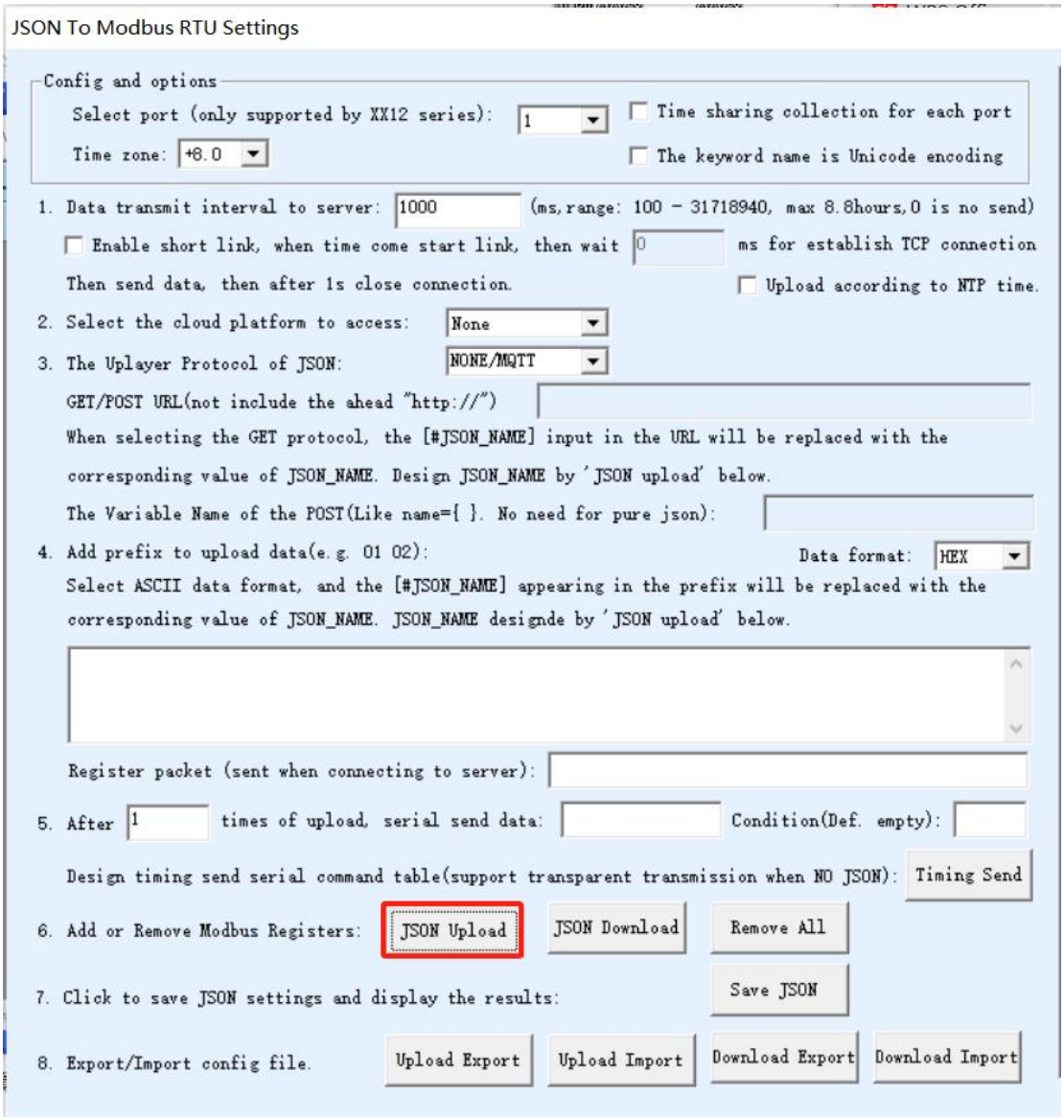

Figure 32 Configuration JSON upload

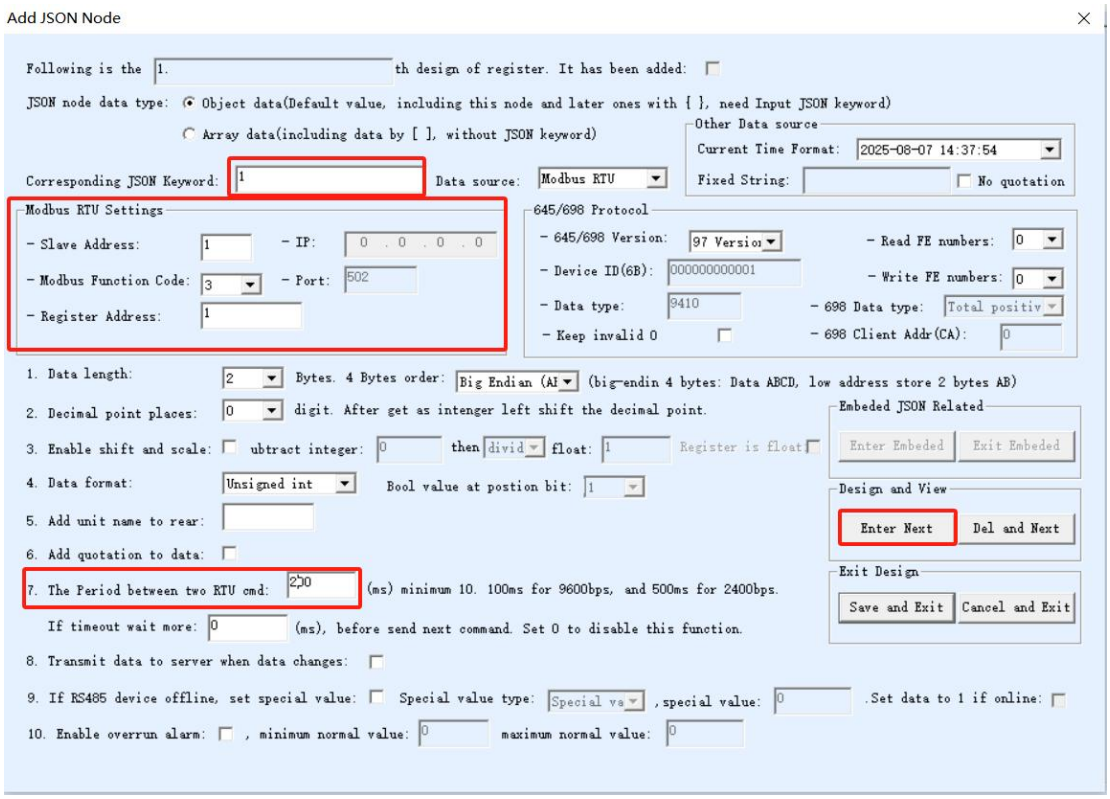

Figure 33 Configure the keywords for collection, register addresses, and collection intervals

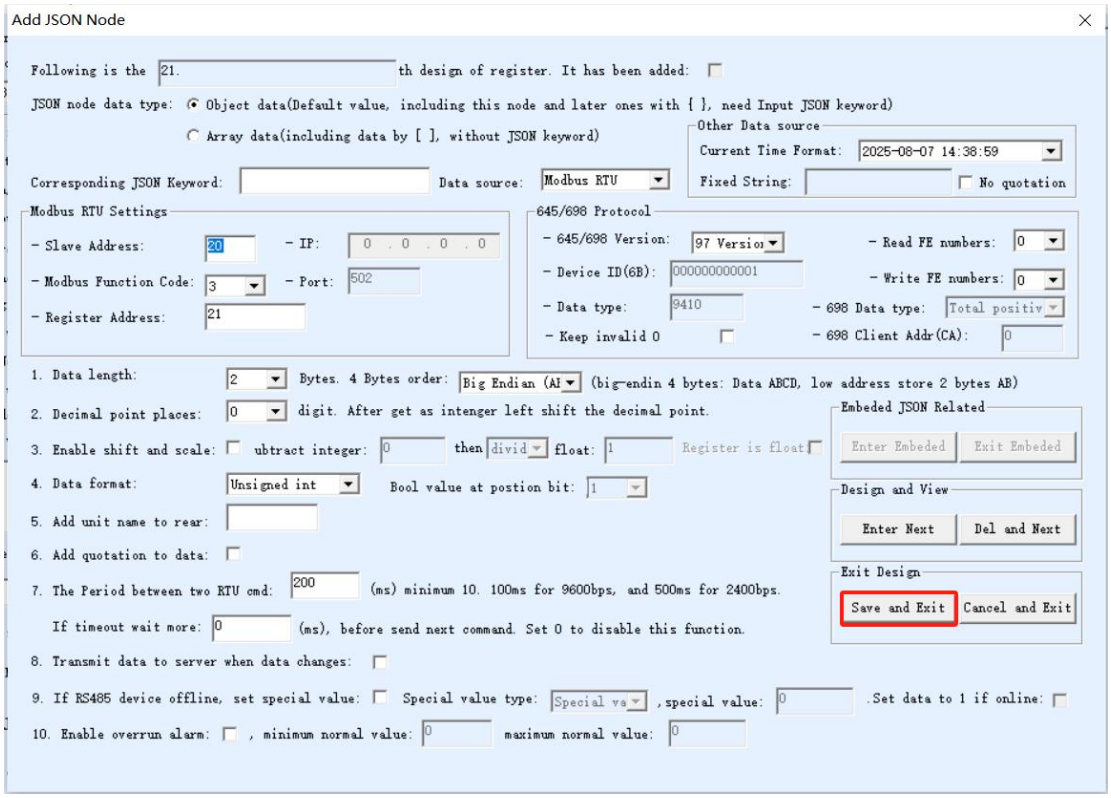

Figure 34 Save and exit after the configuration is completed

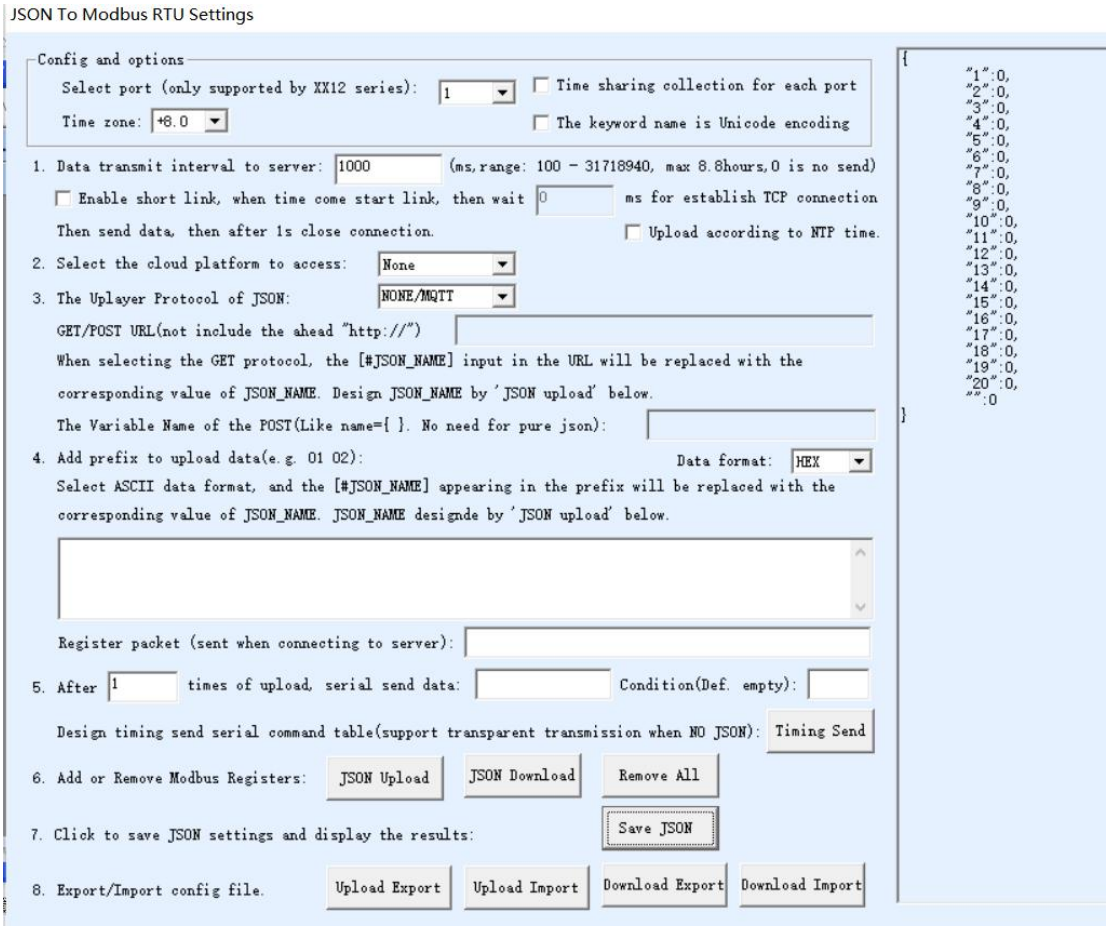

Figure 35 saves the JSON Settings and views the preview of the JSON format

6.2.2 Configure the MODBUS RTU simulation device

Simulate the MODEBUS Slave device through the Modbus Slave software, connect the device to the computer via the serial port cable, and open the connection of Modbus Slave. The configuration of Modbus Slave is shown in Figure 36.

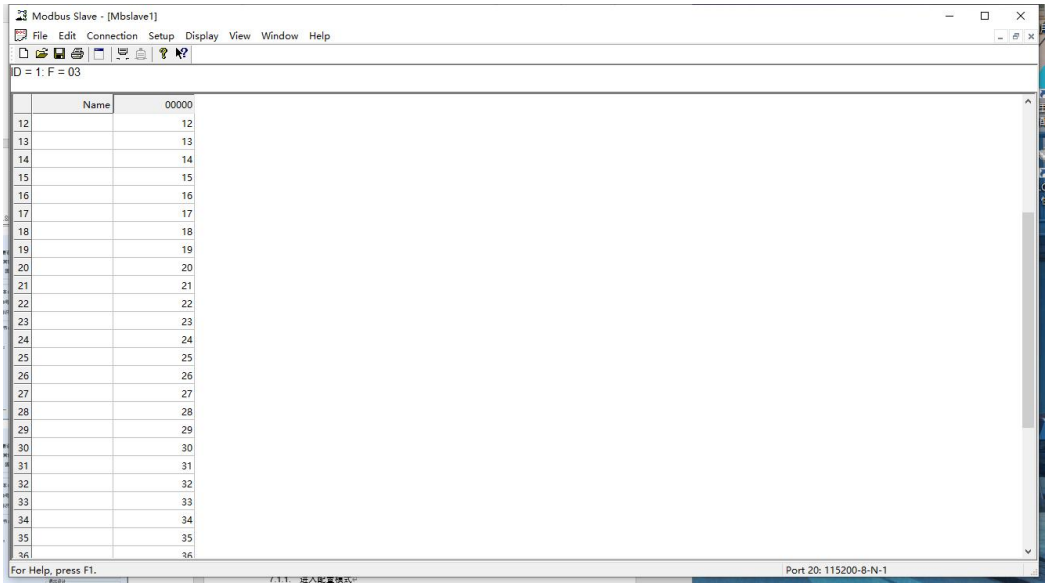

Figure 36: Modbus Slave fills in the simulation data

6.2.3 View the JSON posted above

By using the Alibaba Cloud log service to view the uploaded JSON data, it can be observed that the collected data is consistent with the data configured by Modbus Slave. This completes the simple MODBUS to JSON conversion test.

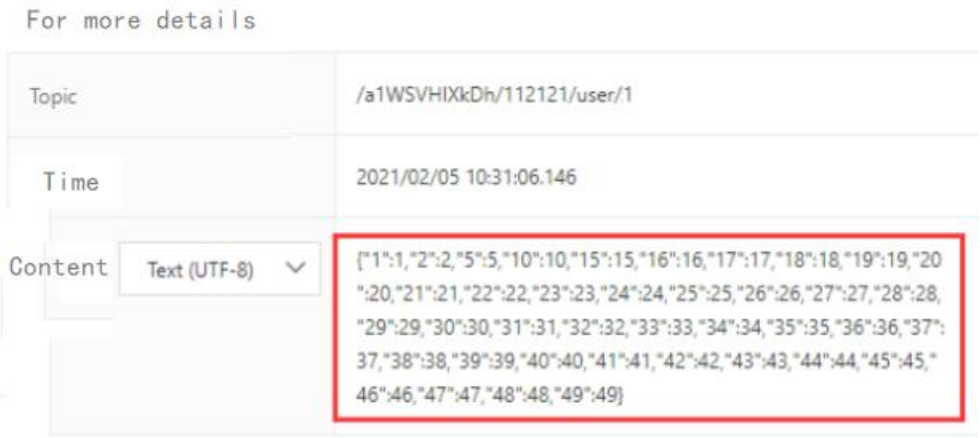

Figure 37 shows the serial port receiving data from Alibaba Cloud

7. AT Instruction

7.1 Login and configuration

7.1.1 Enter configuration mode

Instruction：REQUEST CFG MODE

Function： Enter the configuration mode. Send this command during the startup phase of the device. After the device is started up, the device can enter the configuration mode.

Return：CFG MODE\r。

7.1.2 Login

Instruction：ZL+LOGIN=666666\r\n

Function: Login. Modifying device parameters can only be successful when logged in.

Return：+LOGIN:OK\r\n(Success)or+LOGIN:NG\r\n(Failure)

7.1.3 Obtain the device status

Instruction：ZL+STAT?\r\n

Function: Query the signal strength, temperature and voltage of the device

Return：+STAT：Intensity, temperature, voltage \r\n

7.2 Serial Port Parameters

7.2.1. Obtain serial port parameters

Instruction：ZL+BAUD?\r\n

Function: Obtain baud rate

Return：+BAUD:n\r\n，n Indicate the specific baud rate

7.2.2. Obtain the check bit

Instruction：ZL+CHECKB?\r\n

Function: Obtain the check bit

Return：+CHECKB:N/O/E\r\n

N: No verification

O: Even parity

E: Odd parity

7.2.3. Obtain data bits

Instruction：ZL+DATAB?\r\n

Function: Obtain data bits

Return：+DATAB:5/6/7/8\r\n

7.2.4. Set serial port parameters

Instruction：ZL+BAUD=n\r\n

Function: Set the check bit

Return：+BAUD:n\r\n

7.2.5. Set the check bit

Instruction：ZL+CHECKB= N/O/E \r\n

Function: Set the check bit

Return：+CHECKB:N/O/E\r\n

N: No verification

O:Even check

E:Odd parity

7.2.6. Set data bits

Instruction：ZL+DATAB=5/6/7/8\r\n

Function: Set data bits

Return：+DATAB:5/6/7/8\r\n

7.3 Network Parameters

7.3.1. Obtain the destination IP or domain name

Instruction：ZL+PIPADD?\r\n

Function: Obtain the destination IP or domain name

Return：+PIPADD=ip\r\n

7.3.2. Obtain the destination port

Instruction：ZL+PPORT?\r\n

Function: Obtain the destination port

Return：+PPORT=n\r\n

7.3.3. Obtain the working mode of the equipment

Instruction：ZL+PROTOCOL?\r\n

Function: Obtain the working mode of the equipment

Return：+PROTOCOL=TCP/UDP\r\n

7.3.4. Obtain the IP address of the DNS server

Instruction：ZL+PDNS?\r\n

Function: Obtain the IP address of the DNS server

Return：+PDNS=ip\r\n

7.3.5. Set the destination IP or domain name

Instruction：ZL+PIPADD=ip\r\n

Function: Set the destination IP or domain name

Return：+PIPADD=ip\r\n

7.3.6. Set the destination port

Instruction：ZL+PPORT=n\r\n

Function: Set the destination port

Return：+PPORT:n\r\n

7.3.7 Set the working mode

Instruction：ZL+PROTOCOL=TCP/UDP \r\n

Function: Set the working mode

Return：+PROTOCOL=TCP/UDP\r\n

7.3.7. Set the IP of the DNS server

Instruction：ZL+PDNS=ip\r\n

Function: Set the IP address of the DNS server

Return：+PDNS=ip\r\n

7.4 Registration package and heartbeat package

7.4.1. Query the contents of the registration package

Instruction：ZL+ENROL?\r\n

Query the content of the registration package (default registration package is in hexadecimal)

Return：+ENROL:1234567890\r\n

7.4.2. Whether the registration package is enabled

Instruction：ZL+EN_ENROL?\r\n

Query whether the registration package is enabled (1 enabled, 0 disabled)

Return：+EN_ENROL:1\r\n

7.4.3. Set the contents of the registration package

Instruction：ZL+ENROL=123456\r\n

Set the content of the registration package (the default registration package is in hexadecimal). The actual registration package is 0X12, 0X34, and 0X56Return：+ENROL:123456\r\n

7.4.4. Enable/Disable Registration Package

Instruction：ZL+EN_ENROL=1\r\n

Enable/Disable registration package, where 1 indicates enable and 0 indicates disable

Return：+EN_ENROL:1\r\n

7.5 Remote management function

7.5.1 Query the remote management function

Instruction：ZL+Z_RMT_MAG?\r\n

Check whether the remote management function is enabled. 1 indicates enabled and

0 indicates disabled

Return：+ ZL+Z_RMT_MAG:1\r\n

7.5.2 Enable the remote management function

Instruction：ZL+Z_RMT_MAG=1\r\n

Enable/Disable remote management function: 1 indicates enabled, 0 indicates disabled

Return：+ ZL+Z_RMT_MAG:1\r\n

7.5.3 Query the IP address of the remote management serverQuery the IP address of the remote management server

Instruction：ZL+Z_RMT_IP ?\r\n

Query the IP address of the remote management server **********

Return：+ ZL+Z_RMT_IP =**********\r\n

7.5.4 Query the port of the remote management server

Instruction：ZL+ Z_RMT_PORT ?\r\n

Query the remote management server port ****

Return：+ ZL+ Z_RMT_PORT =****\r\n

7.5.5 Set the IP address of the remote management server

Instruction：ZL+Z_RMT_IP =**********\r\n

Set the IP address of the remote management server

Return：+ ZL+Z_RMT_IP:**********\r\n

7.5.6 Set the port of the remote management server

Instruction：ZL+ Z_RMT_PORT =****\r\n

Set the port of the remote management server

Return：+ ZL+ Z_RMT_PORT:**** \r\n

7.6 MQTT Parameter

7.6.1 Set the MQTT username

Instruction：ZL+ MQTT_USERNAME =****\r\n

Set the MQTT username

Return：+ ZL+ MQTT_USERNAME:**** \r\n

7.6.2 Set the MQTT password

Instruction：ZL+ MQTT_PASSWD =****\r\n

Set the MQTT password

Return：+ ZL+ MQTT_PASSWD:**** \r\n

7.6.3 Set the MQTT client ID

Instruction：ZL+ MQTT_CLIENT =****\r\n

Set the MQTT client ID

Return：+ ZL+ MQTT_CLIENT:**** \r\n

7.6.4 Set the MQTT publishing theme

Instruction：ZL+ MQTT_PUBLISH_TOPIC =****\r\n

Set the MQTT publishing theme

Return：+ ZL+ MQTT_PUBLISH_TOPIC:**** \r\n

7.6.5 Set up MQTT subscription topics

Instruction：ZL+ MQTT_SUBSCRIBE_TOPIC =****\r\n

Set up MQTT subscription topics

Return：+ ZL+ MQTT_SUBSCRIBE_TOPIC:**** \r\n

7.6.6 Set the quality of MQTT subscriptions

Instruction：ZL+ MQTT_SUBSCRIBE_QOS =1\0\r\n

Set the quality of MQTT subscriptions 1\0

Return：+ ZL+ MQTT_SUBSCRIBE_QOS: 1\0\r\n

7.6.7 Set the quality of MQTT publishing

Instruction：ZL+ MQTT_PUBLISH_QOS =1\0\r\n

Set the MQTT publication quality to 1/0

Return：+ ZL+ MQTT_PUBLISH_QOS: 1\0\r\n

7.6.8 Set the MQTT live retention time

Instruction：ZL+MQTT_KEEPALIVE =****\r\n

Set the MQTT live retention time

Return：+ ZL+ MQTT_ KEEPALIVE:**** \r\n

7.6.9 Set the MQTT last wish topic

Instruction：ZL+ MQTT_WILL_TOPIC =****\r\n

Set the MQTT last wish topic

Return：+ ZL+ MQTT_WILL_TOPIC:**** \r\n

7.6.10 Set the MQTT last wish message

Instruction：ZL+ MQTT_WILL_MESSAGE =****\r\n

Set the MQTT last wish message

Return：+ ZL+ MQTT_WILL_MESSAGE:**** \r\n

8. After-service and Technical Support

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