

# VT-DTU 300

## User Manual



Figure 1 VT-DTU 300

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## 1. Overview

Rail-mounted CAT1 4G DTU, and supports 2G GPRS mode. It can achieve RS485 to 4G conversion, with CAT1 4G transmission speed reaching 5Mbps for uplink and 10Mbps for downlink. It can convert RS485 data to 4G and adopts a rail-mounted installation method, which is convenient for installation. Compared with the traditional desktop 4G DTU, its width is reduced to about one quarter of the original, and it is compact in size. It adopts terminal block power supply connection and uses a wide voltage input of 9 to 24V. The shell is made of high-temperature, flame-retardant alloy plastic, meeting the fire protection requirements of industrial sites.

The device not only features registration packets and heartbeat packets, but also has the latest functions such as MQTT and Modbus RTU to convert JSON and connect to cloud servers. It is characterized by high-speed transmission, low latency, and support for new technologies.

Advanced Settings such as device configuration, firmware upgrade, and MQTT/JSON configuration can be achieved through the serial port. It also supports remote centralized management of a large number of distributed devices through servers, allowing for remote configuration, remote status viewing, and remote program upgrading. When combined with public clouds, it can achieve device management on the Web end, data viewing on the Web end, and remote control.

Support uploading collected data in JSON format, with automatic data collection. The data collection supports Modbus RTU, 645 instrument 97 version, 645 instrument 07 version, various non-standard RS485 protocols, etc. Users can independently configure the data format and JSON keywords for uploading using Vircom. When uploading, it can support MQTT protocol, HTTP POST protocol, HTTP GET protocol, transparent transport protocol, and various non-standard network protocols. It has a reset button, which is convenient for resetting parameters when there are errors in the JSON format.

Supports edge computing functions, including: data over-limit alarm, data translation and scaling, data change upload, device offline alarm, device autonomous collection, device automatic connection and other functions. This function is generally used in conjunction with the JSON function.

There is a specially designed watchdog circuit that can ensure the stable operation of the 4G module for a long time. The product supports an industrial-grade temperature range of  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ . Passed electromagnetic compatibility tests such as electrostatic tests.



**Figure 2 Schematic diagram of the application environment**

Suitable for the following application fields:

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

## 2. Features

### Special features

1. Support the custom Modbus/DTL-645 to JSON conversion function.
2. It can be connected to various public clouds in MQTT+JSON and

HTTP+JSON modes.

3. Support MQTT gateway function. It can support MQTT SSL encrypted transmission.
4. Support edge computing functions: including data over-limit alarm, data translation and scaling calculation, data change upload, device offline alarm, etc.
5. Support for device cloud management: Through the user-built cloud, online monitoring of devices, remote configuration modification of devices, and remote upgrade of devices can be achieved.
6. Support offline data storage.

### **Ordinary function**

1. It supports three standard modes: TD-LTE/ FDD-LTE/ GSM, including China Unicom 4G, 2G, China Mobile 4G, 2G and China Telecom 4G networks.
2. Supports TCP client and UDP mode.
3. The serial port supports baud rates ranging from 300 to 921600, 5 to 8 data bits, no parity, odd parity, and even parity, and 1 to 2 stop bits.
4. Supports serial port (RS485) to 4G conversion.
5. Supports serial port transparent transmission and Modbus RTU to Modbus TCP and MQTT protocols.
6. Supports serial port AT command configuration and Vircom software for viewing and setting parameters.
7. Support the configuration of MQTT parameters via serial port.
8. Support the automatic collection and conversion of DTL-645/Modbus RTU into JSON format for the cloud platform.
9. The firmware of the device can be updated through the serial port, and the firmware of the device can be updated on the server side through the Vircom software.
10. Support remote device management, configuration and upgrade on the server side.

### 3. Technical parameters

Table 1 VT-DTU300 Technical parameter

| External interface      |                                                                                                                                                                                         |               |                 |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------|
| Serial port interface   | RS485: 3.5mmTerminal block                                                                                                                                                              |               |                 |
| Number of serial ports  | One, RS485（485A、485B、GND）                                                                                                                                                               |               |                 |
| Power interface         | 3.5mmTerminal block                                                                                                                                                                     |               |                 |
| Reset                   | Push-button one-click reset of factory Settings                                                                                                                                         |               |                 |
| Shell material          | Alloy flame-retardant plastic                                                                                                                                                           |               |                 |
| Indicator light         | SYS, WORK, 4G LINK, TCP LINK, TXD, RXD                                                                                                                                                  |               |                 |
| SIM card                | Voltage: 3V, 1.8V; Size: Micro Sim (not Nano SIM):<br>Dimensions are 12x15mm×0.8mm                                                                                                      |               |                 |
| Antenna interface       | 50Ω/SMA female rubber rod antenna or suction cup antenna (default is suction cup)                                                                                                       |               |                 |
| Size                    | L x W x H: 37.6 x 83.6 x 89.2mm                                                                                                                                                         |               |                 |
| Installation method     | 35mm rail mounting                                                                                                                                                                      |               |                 |
| Communication interface |                                                                                                                                                                                         |               |                 |
| Frequency Band          | 4G CAT1 supports three modes:<br>B1/B3/B5/B8@FDD LTE<br>B34/B38/B39/B40/B41@TDD-LTE<br>B3/B8@GSM<br>It includes China Unicom 4G, 2G, China Mobile 4G, 2G and China Telecom 4G networks. |               |                 |
| 4G transmission rate    | LTE: Max 10Mbps (downlink) /Max 5Mbps (uplink)<br>GPRS: 85.6Kbps (downlink) /Max85.6Kbps (uplink)                                                                                       |               |                 |
| Serial port parameters  |                                                                                                                                                                                         |               |                 |
| Baud rate               | 300~460800bps ,<br>The baud rate can be customized                                                                                                                                      | Parity bits   | None, odd, even |
| Data bits               | 5~8                                                                                                                                                                                     | Stop position | 1~2             |
| Software                |                                                                                                                                                                                         |               |                 |

|                                   |                                                                                                                                                                                                                                                 |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protocol                          | TCP client, UDP                                                                                                                                                                                                                                 |
| Transfer protocol                 | Modbus TCP、MQTT、JSON                                                                                                                                                                                                                            |
| Modbus gateway                    | Modbus TCP to RTU simple conversion, Pre-configured Table (ZLMB) mode                                                                                                                                                                           |
| JSON gateway                      | The device end supports Modbus RTU and DLT-645.<br>The server supports HTTP POST/GET, MQTT, transparent transmission, and custom protocols.<br>Translation and zooming, offline alarm, over-limit alarm, change upload, data format conversion; |
| SSL                               | Support SSL encryption                                                                                                                                                                                                                          |
| Offline storage                   | 256K                                                                                                                                                                                                                                            |
| Address resolution                | Support DNS resolution                                                                                                                                                                                                                          |
| Interconnection method            | Connect to the server. The N series supports P2P mode and M2M mode                                                                                                                                                                              |
| Operating mode                    | Vircom tools, serial port AT command configuration, device cloud management                                                                                                                                                                     |
| Other software functions          | Custom registration package heartbeat packet, NTP, built-in TCP heartbeat, FOTA upgrade                                                                                                                                                         |
| <b>Hardware</b>                   |                                                                                                                                                                                                                                                 |
| Input voltage:                    | 9~24V DC                                                                                                                                                                                                                                        |
| Input current                     | When dialing /4G communication, 50mA@12V, idle 25mA@12V                                                                                                                                                                                         |
| EMC Electromagnetic Compatibility | Static electricity (GB/T17626.6-2018) : Contact 8KV, non-contact 15KV;<br>Fast group pulse (GB/T17626.4-2018) : Power supply ±4KV, signal ±2KV;<br>Surge (GB/T 17626.5-2008) : ±4KV for power supply, ±2KV for signal.                          |
| <b>Environmental requirements</b> |                                                                                                                                                                                                                                                 |
| Operating temperature             | -40~85℃                                                                                                                                                                                                                                         |
| Storage temperature               | -45~100℃                                                                                                                                                                                                                                        |
| Humidity range                    | 5~95% relative humidity                                                                                                                                                                                                                         |

## 4. Instruction

### 4.1 Hardware specifications



Figure 3 VT-DTU300 Front view

The rail installation method is adopted. The antenna can be selected as a suction cup antenna (default) or a rubber rod antenna.

Table 2 Indicator contents

| Indicator light | Color | Name             | Explanation                                                                                                                   |
|-----------------|-------|------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>SYS</b>      | green | Power light      | It indicates that the device has been turned on and the system is running.                                                    |
| <b>WORK</b>     | green | Work light       | It indicates the operational status inside the equipment and its debugging purpose. Users do not need to pay attention to it. |
| <b>TXD</b>      | green | Serial port data | It indicates that there is data output from the serial port.                                                                  |



|                 |      |                                  |                                                                                                                          |
|-----------------|------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------|
|                 |      | transmission light               |                                                                                                                          |
| <b>4G</b>       | blue | 4G connection light              | A constant light indicates that the 4G call has been successful.                                                         |
| <b>TCP LINK</b> | blue | TCP connection light             | Indicates the establishment of a TCP connection with the server.                                                         |
| <b>RXD</b>      | blue | Serial port receiving data light | This indicates that data has been received through the serial port. The flashing time of this light is relatively short. |

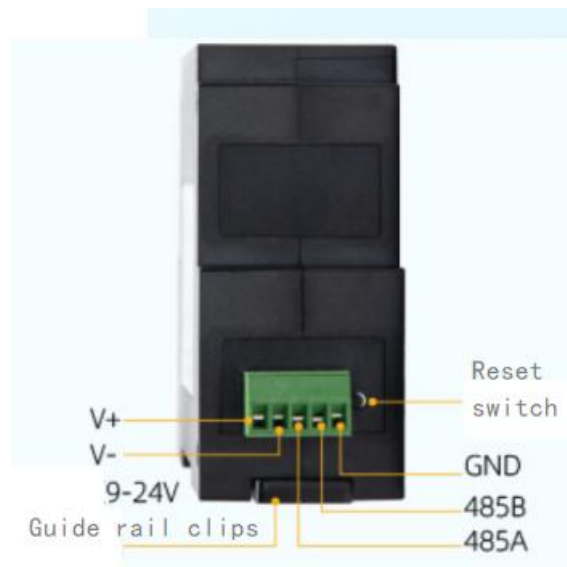


Figure 4 Interface diagram

The interface is shown in Figure 4:

1. Power input: Interface form 3.5mm terminal, input voltage DC+9V to +24VDC, power needs to be above 3W. It is recommended to use a 12V1A power adapter.
2. RS485 interface: RS485 signal input. Be careful not to connect the power supply wrongly.
3. Reset: Press the button for more than 3 seconds, and the device will reset to the default parameters. If the wrong configuration file is downloaded, you can also skip the configuration file by pressing the key and powering on.

The dimensions are shown in Figure 5

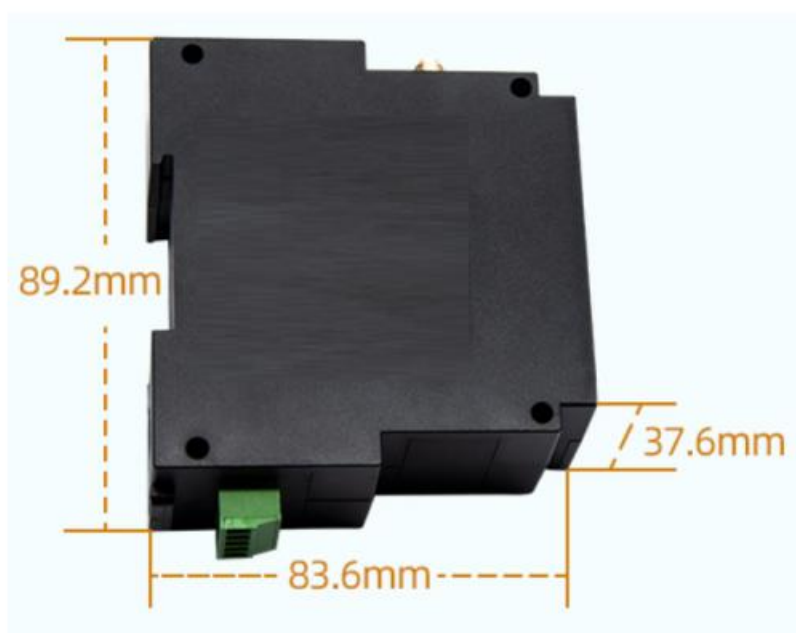


Figure 5 Dimension drawing

4. Antenna: The antenna interface adopts 50Ω/SMA (female connector), and the external antenna must be suitable for the 4G working band. Rubber sticks or suction cup antennas can be provided. The suction cups can be attached to the metal casing of the chassis. By default, a suction cup antenna (with a suction cup antenna lead of 1.5 meters in length) is provided.
5. SIM Card installation: When installing the SIM card, make sure the device is not powered on. The SIM card is a Micro Sim (not a Nano SIM). Please refer to the position of the film on the front of the product for the card insertion direction. When installing, press the card inward. Once you hear a click, it will lock. When taking out the card, press it inward. After releasing your hand, the card will pop out naturally.

## 5. Configuration

The device can be configured with parameters through the serial port. After connecting to the remote server, it can also be remotely configured through the remote server by installing configuration software.

### 5.1. Serial Port AT Command Configuration

Download the Vircom configuration tool. This software can configure Dtus

through serial ports.

Connect the USB-to-RS485 cable to the serial port of the device, power on, open Vircom (hereinafter referred to as the configuration tool), and enter the main interface of the configuration tool as shown in Figure 6.

Click on Device Management, select Serial Port Search, as shown in Figure 7, and a serial port parameter selection interface will pop up, as shown in Figure 8. Select the serial port number, here it is COM15, and the baud rate is 115200. Here, 115200 is the default setting at the factory. If the user previously set the device to another baud rate, it can also be searched.

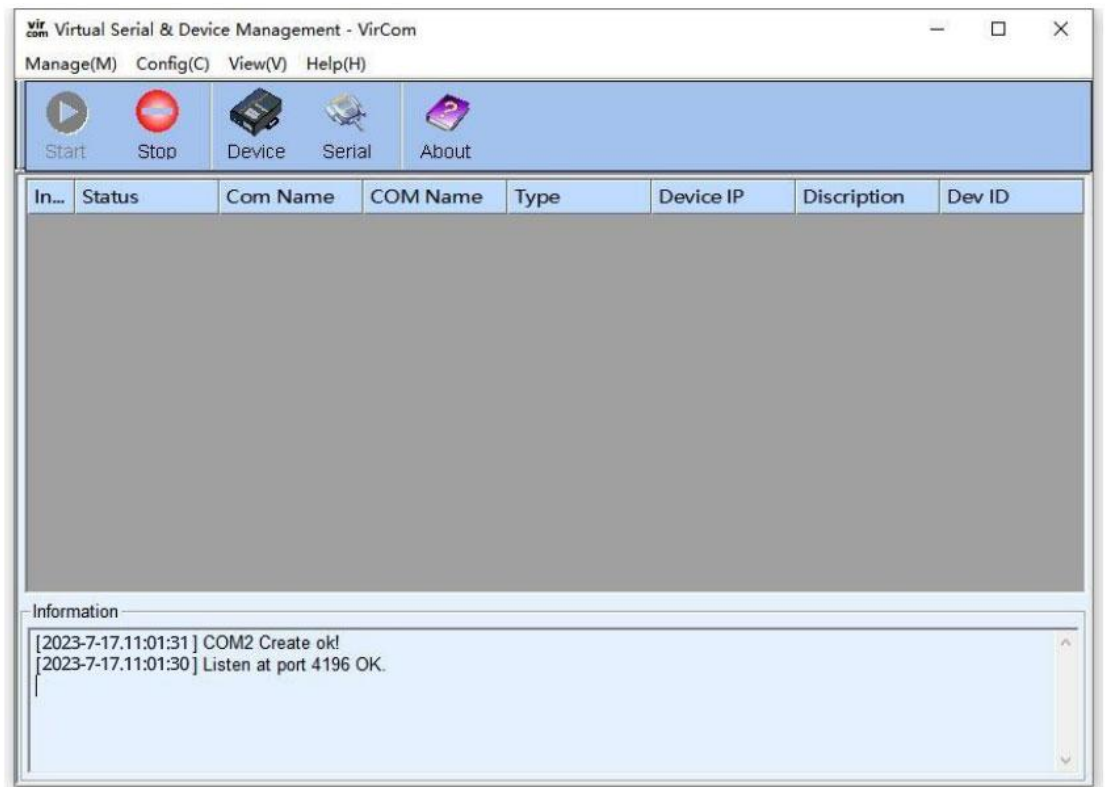
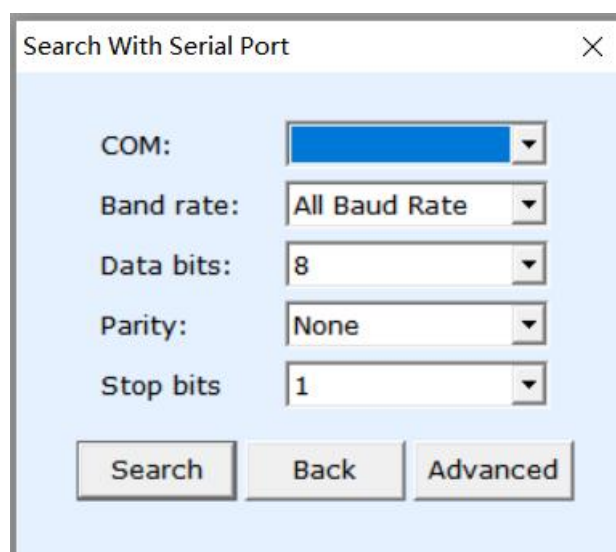


Figure 6 Vircom Main Interface



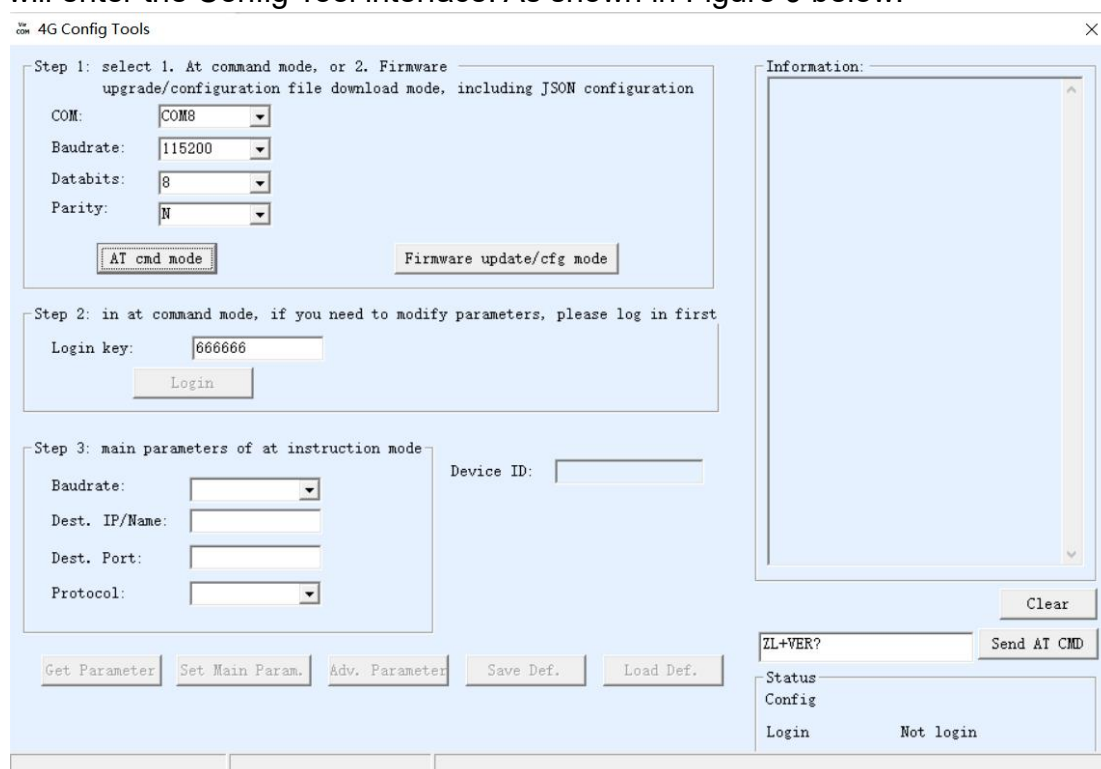
Figure 7 Serial port search interface



A dialog box titled "Search With Serial Port" with a close button (X) in the top right corner. It contains five dropdown menus for configuring serial port parameters: "COM:" (empty), "Band rate:" (set to "All Baud Rate"), "Data bits:" (set to "8"), "Parity:" (set to "None"), and "Stop bits" (set to "1"). At the bottom, there are three buttons: "Search", "Back", and "Advanced".

Figure 8 Serial port parameter Settings

After power-on, wait for 15 seconds, that is, when the dialing light starts to flash, select and click "Search" for the serial port. At this point, the configuration tool will attempt to communicate with the device. If successful, it will enter the Config Tool interface. As shown in Figure 9 below:



The "4G Config Tools" main interface. It features three main steps for configuration:

- Step 1:** select 1. At command mode, or 2. Firmware upgrade/configuration file download mode, including JSON configuration. It includes dropdowns for COM (COM8), Baudrate (115200), Databits (8), and Parity (N). There are two buttons: "AT cmd mode" and "Firmware update/cfg mode".
- Step 2:** in at command mode, if you need to modify parameters, please log in first. It includes a "Login key:" field with the value "666666" and a "Login" button.
- Step 3:** main parameters of at instruction mode. It includes fields for Baudrate, Dest. IP/Name, Dest. Port, and Protocol (dropdown). There is also a "Device ID:" field.

At the bottom, there are buttons for "Get Parameter", "Set Main Param.", "Adv. Parameter", "Save Def.", and "Load Def.". On the right side, there is an "Information:" text area, a "Clear" button, a "ZL+VER?" field, and a "Send AT CMD" button. At the very bottom right, there is a status section with "Status" (Config), "Login" (Not login), and a "Not login" label.

Figure 9 ConfTool interface

Click to enter the AT command mode. The configuration tool will attempt to

communicate with the device. If the communication is successful, the AT command return information will be displayed on the right side. The configuration mode will show that it has entered the configuration mode, as shown in Figure 10 below

The screenshot displays the '4G Config Tools' application window. It is divided into several sections:

- Step 1:** 'select 1. At command mode, or 2. Firmware upgrade/configuration file download mode, including JSON configuration'. It includes fields for COM (COM8), Baudrate (115200), Databits (8), and Parity (N). Buttons for 'Close' and 'Firmware update/cfg mode' are present.
- Step 2:** 'in at command mode, if you need to modify parameters, please log in first'. It has a 'Login key' field with '666666' and a 'Login' button.
- Step 3:** 'main parameters of at instruction mode'. It includes fields for Baudrate (115200), Dest. IP/Name (110.40.140.67), Dest. Port (1883), and Protocol (TCP Server). A 'Device ID' field shows '284064502541'. Buttons for 'Get Parameter', 'Set Main Param.', 'Adv. Parameter', 'Save Def.', and 'Load Def.' are at the bottom.
- Information:** A text area on the right showing AT command responses:
 

```
+ZL_MODE: 2
+HEARTIME: 0
+HEARTDAT: 6865617274
+DATAB: 8
+CHECKB: N
+EN_ENROL: 0
+ENROL: 7a6c616e
+APNN:
+APN_USERNAME:
+APN_PASSWORD:
+MQTT_USERNAME: philips
+MQTT_PASSWD: 123456
+MQTT_CLIENT: id284064502541
+MQTT_SUBSCRIBE_TOPIC: pub/philips/284064502541
+MQTT_SUBSCRIBE_QOS: 1
+MQTT_WILL_FLAG: 1
+MQTT_PUBLISH_TOPIC: sub/philips/284064502541
+MQTT_PUBLISH_QOS: 1
+MQTT_KEEPAIVE: 60
+MQTT_WILL_TOPIC: will/philips/284064502541
+MQTT_WILL_MESSAGE: 284064502541 is
downloaded
+Z_RMT_MAG: 0
+Z_RMT_IP: 47.95.144.92
+Z_RMT_PORT: 4195
+ZL_STORAGE_EN: 0
```
- Status:** A section at the bottom right showing 'Config Entered Config' and 'Login Login'.
- Footer:** A status bar at the very bottom shows 'field strength: temperature: °C ID: 866824064502541 Hardware Ver: HRA3, Software Ver: V2.01'.

**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.

The screenshot shows the '4G Config Tools' window. It is divided into three main steps:

- Step 1:** Select 1. At command mode, or 2. Firmware upgrade/configuration file download mode, including JSON configuration. Fields include COM (COM8), Baudrate (115200), Databits (8), and Parity (N). Buttons: Close, Firmware update/cfg mode.
- Step 2:** In at command mode, if you need to modify parameters, please log in first. Field: Login key (666666). Button: Login (highlighted with a red box).
- Step 3:** Main parameters of at instruction mode. Fields include Baudrate (115200), Dest. IP/Name (110.40.140.67), Dest. Port (1883), and Protocol (TCP Server). Device ID: 284064502541. Buttons: Get Parameter, Set Main Param., Adv. Parameter, Save Def., Load Def.

**Information:** A text area on the right displays AT command responses, including +STAT, +ID, +VER, +BAUD, +PIFADD, +PPORT, +PROTOCOL, +ZL\_MODE, +HEARTTIME, +HEARTDAT, +DATAB, +CHECKB, +EN\_ENROL, +ENROL, +APNN, +APN\_USERNAME, +APN\_PASSWORD, +MQTT\_USERNAME, +MQTT\_PASSWORD, +MQTT\_CLIENT, +MQTT\_SUBSCRIBE\_TOPIC, +MQTT\_SUBSCRIBE\_QOS, +MQTT\_WILL\_FLAG, +MQTT\_PUBLISH\_TOPIC, +MQTT\_PUBLISH\_QOS, +MQTT\_KEEPAIVE, and +MQTT\_WILL\_TOPIC.

**Status:** A table at the bottom right shows the status of various commands:

| Command | Status         |
|---------|----------------|
| ZL+VER? | Entered Config |
| Config  | Entered Config |
| Login   | Login          |

At the bottom, there is a status bar showing field strength, temperature, ID (866824064502541), and hardware/software versions (HRA3, V2.01).

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.

This screenshot is a zoomed-in view of the 'Step 3: main parameters of at instruction mode' section. The fields for Baudrate (115200), Dest. IP/Name (110.40.140.67), Dest. Port (1883), and Protocol (TCP Server) are visible. The 'Device ID' is 284064502541. The 'Set Main Param.' button is highlighted with a red box. Other buttons include 'Get Parameter', 'Adv. Parameter', 'Save Def.', and 'Load Def.'.

The status bar at the bottom shows field strength, temperature, ID (866824064502541), and hardware/software versions (HRA3, V2.01).

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.



Advanced Parameters

Work Parameters

Work Type: Transparent

DNS Server IP:

Heart Beat Interval: Disable

Heart Beat Content: ASCII

Serial Data Bits: 8

Serial Parity: N

Stop Bits:

Login Key:

Enable Register Pkt: Disable

Register Pkt Content: ASCII

APN:

APN UserName:

APN Key:

Enable P2P: Disable

No Data Restart: 1500 Min(0 disable)

Enable Off-line Storage

MQTT Parameters

MQTT version: V3.1.1

User Name:

Key:

Client ID:

Subscribe Topic

Subscribe QOS: 1

Publish Topic:

Publish QOS: 1

Keep Alive Time: 60

Enable Will: 1

Last-will Topic Topic

Last-will Message

Remote Device Manage

Enable Remote Device Manage

Server IP/DNS:

Server TCP Port:

Set Cancel Get Default

Figure 13 Advanced Parameters

4G Config Tools

Step 1: select 1. At command mode, or 2. Firmware upgrade/configuration file download mode, including JSON configuration

COM: COM8

Baudrate: 115200

Databits: 8

Parity: N

Close Firmware update/cfg mode

Step 2: in at command mode, if you need to modify parameters, please log in first

Login key: 666666

Login

Step 3: main parameters of at instruction mode

Baudrate: 115200

Dest. IP/Name: 110.40.140.67

Dest. Port: 1883

Protocol: TCP Client

Device ID: 284064502541

Get Parameter Set Main Param. Adv. Parameter Save Def. Load Def.

field strength: temperature:°C ID:866824064502541 Hardware Ver:HRA3,Software Ver:V2.01

Information:

```
+ZL_MODE: 2
+HEARTIME: 0
+HEARTDAT: 6865617274
+DATA8: 8
+CHECKB: N
+EN_ENROL: 0
+ENROL: 7a6c616e
+APN:
+APN_USERNAME:
+APN_PASSWORD:
+MQTT_USERNAME: philips
+MQTT_PASSWD: 123456
+MQTT_CLIENT: id284064502541
+MQTT_SUBSCRIBE_TOPIC: pub/philips/284064502541
+MQTT_SUBSCRIBE_QOS: 1
+MQTT_WILL_FLAG: 1
+MQTT_PUBLISH_TOPIC: sub/philips/284064502541
+MQTT_PUBLISH_QOS: 1
+MQTT_KEEPLIVE: 60
+MQTT_WILL_TOPIC: will/philips/284064502541
+MQTT_WILL_MESSAGE: 284064502541 is
downloaded
+Z_RMT_MAG: 0
+Z_RMT_IP: 47.95.144.92
+Z_RMT_PORT: 4195
+ZL_STORAGE_EN: 0
```

Clear

ZL+VER? Send AT CMD

Status

Config Entered Config

Login Login

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.

4G Config Tools

Step 1: select 1. At command mode, or 2. Firmware upgrade/configuration file download mode, including JSON configuration

COM:

Baudrate:

Databits:

Parity:

Step 2: in at command mode, if you need to modify parameters, please log in first

Login key:

Step 3: main parameters of at instruction mode

Baudrate:

Dest. IP/Name:

Dest. Port:

Protocol:

Device ID:

ZL+VER?

Status

Config

Login Not login

Figure 15 Configuration interface

Webpage&code download tool

☒ Direct download mode

Configuration save location: C:\Users\judy\Desktop\config

Special configs:

Config file source: Read from local directory

Modbus config MQTT config JSON config Register packet Command transform HTTP GET/POST Param file Timely cmd. serial out Clear local dir.

☐ Code file download mode

Select code file: C:\firmware.bin

☐ Download through the network

Device IP address or domain: 192.168.1.200

Download port (Don't modify): 1092

☒ Download through serial port

Serial port: COM8

Baud Rate: 115200

Flash size: 256 KB

DevID: Bind ID Clear config file

Please close any other configuration window before downloading.

Download

Figure 16 Firmware/configuration file interface

MQTT settings

Port for MQTT (only supported by XX12 series): 1

MQTT server IP:

MQTT server port: 1883

User name: mqttname

Key:

MQTT ID (Unique): mqttid28276 ☐ Add device ID at the end

Subscribe Topic1: mqttsub

Subscribe Topic2:

Subscribe Topic3:

Publish Topic: mqttsub ☐ Add device ID at the end

MQTT+TLS Certificate information

The certificate is of X.509 type. Please place three certificate files in the file download directory and download them together with the mqtt.txt file to the device's internal system.

Only fill in the file name and extension, do not write the directory name. Support certificate bidirectional authentication. Only supported in the XX12 series.

CA certificate file name (including extension):

Client certificate file name:

Client private key file name:

Name of issuing authority (CN):

Advanced Save Delete Cancel

Figure 17 MQTT configuration interface

JSON To Modbus RTU Settings

Config and options

Select port (only supported by XX12 series):  ☐ Time sharing collection for each port

Time zone:  ☐ The keyword name is Unicode encoding

- Data transmit interval to server:  (ms, range: 100 - 31718940, max 8.8hours, 0 is no send)  
☐ Enable short link, when time come start link, then wait  ms for establish TCP connection  
Then send data, then after 1s close connection. ☐ Upload according to NTP time.
- Select the cloud platform to access:
- The Uploader Protocol of JSON:   
GET/POST URL(not include the ahead "http://")   
When selecting the GET protocol, the [#JSON\_NAME] input in the URL will be replaced with the corresponding value of JSON\_NAME. Design JSON\_NAME by 'JSON upload' below.  
The Variable Name of the POST(Like name={ }). No need for pure json):
- Add prefix to upload data(e.g. 01 02):  Data format:   
Select ASCII data format, and the [#JSON\_NAME] appearing in the prefix will be replaced with the corresponding value of JSON\_NAME. JSON\_NAME designde by 'JSON upload' below.

Register packet (sent when connecting to server):

- After  times of upload, serial send data:  Condition(Def. empty):   
Design timing send serial command table(support transparent transmission when NO JSON):
- Add or Remove Modbus Registers:
- Click to save JSON settings and display the results:
- Export/Import config file.

Figure 18 JSON configuration interface

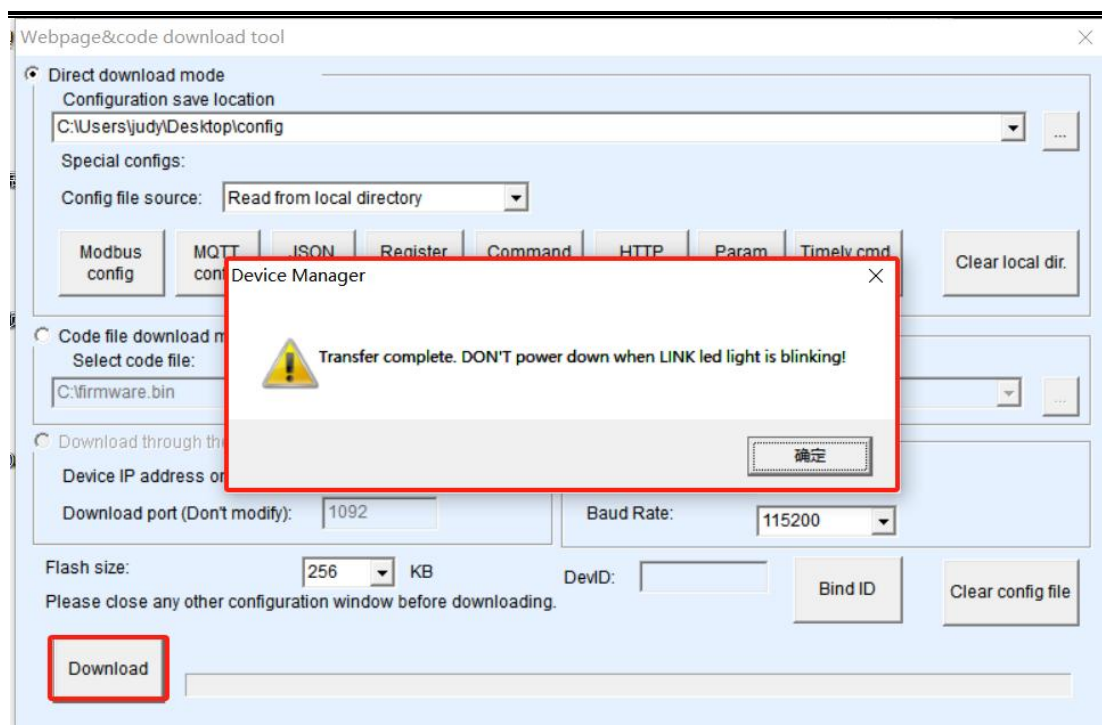


Figure 19 Download interface

## 6. Product Functions

### 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.

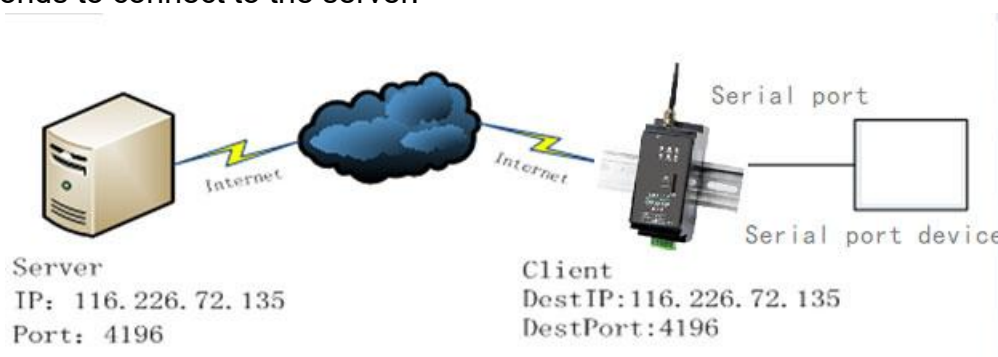


Figure 20 Network connection structure diagram

We run the TCP tool SocketDlgTest on the server.

The screenshot displays the Valtoris VT-DTU300 software interface. It is divided into several sections:

- Communication settings:** Includes fields for Work mode (set to TCP Server), Local port (8888), UDP Dest IP/Port dynamic (unchecked), Dest IP (192.168.1.200), Dest port (1001), and Group IP (230.90.76.1). An 'Open' button is present.
- Receive settings:** Includes checkboxes for 'Receive as Hex' and 'Receive to file', and a 'Clear window' button.
- Send settings:** Includes checkboxes for 'Send as Hex (format 01 02)' and 'Send every' (100 ms), a 'Send receive mode' dropdown (set to 'What rec'), and a 'Modify send-file' button.
- Receive window:** A large text area for displaying received data.
- Send window:** A text area for inputting data to be sent, with a 'Send' button.
- Information:** A section with a 'close information report' checkbox and a 'Clear Info.' button.
- Log/Status:** A text area at the bottom showing system messages, including '11:36:18.837 :TCP listen at port 8888 OK!', '11:36:15.448 :TCP client connected to www.p2p-zlan.com:4195!', '11:36:15.417 :TCP client connecting www.p2p-zlan.com(47.95.144.92):4195.', '11:36:15.324 :TCP client socket create OK!', and '11:36:12.290 :UDP socket closed!'.
- Bottom bar:** Includes 'Local IP: 192.168.1.118', an 'Advance' button, and 'Count and checksum TXD: 0 0 RXD: 0 0' with a 'Reset cnt' button.

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:



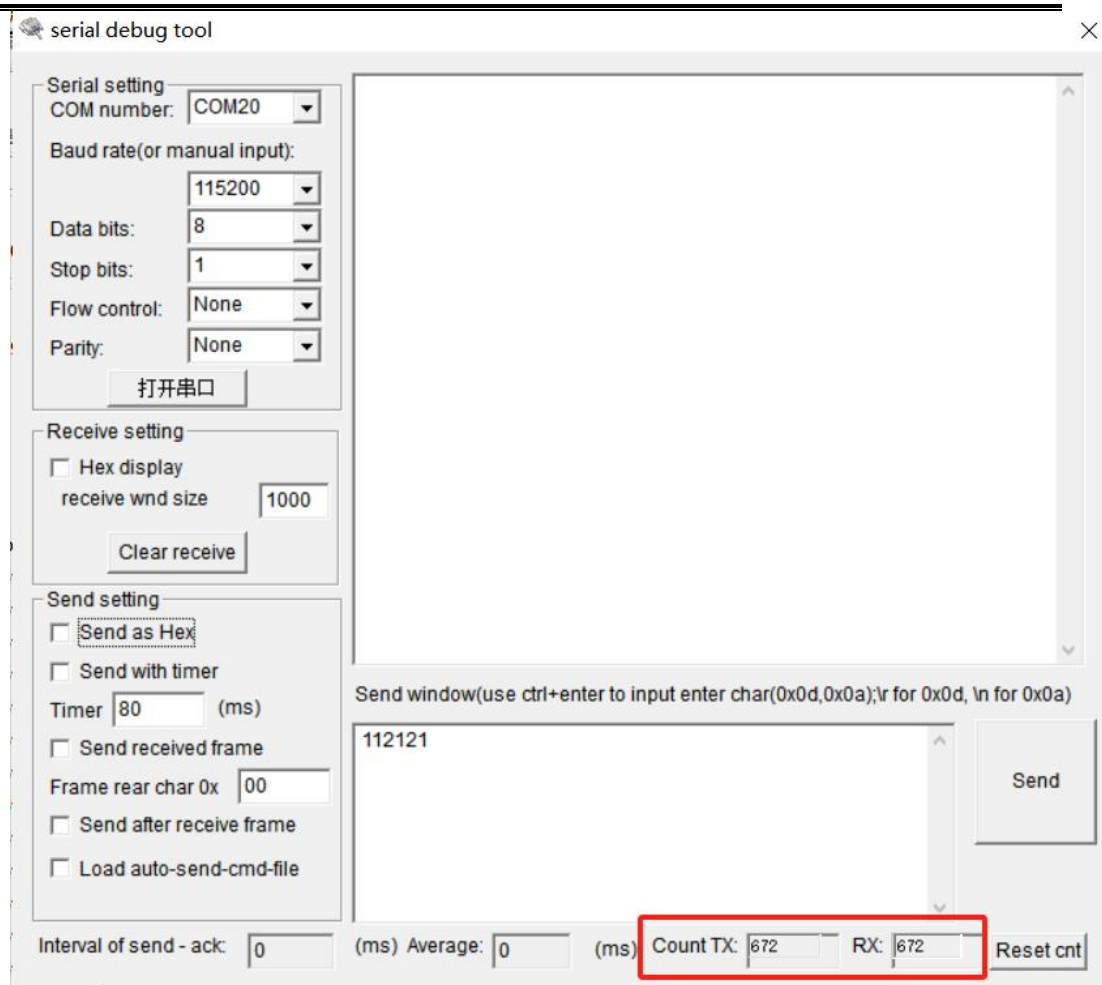


Figure 22 Serial port debugging tool for the device end

### 6.1.2 Modbus Protocol Conversion Test

The configuration parameters are basically the same as those for the protocol-free transparent transmission test. It is only necessary to change the conversion protocol to the MODBUS protocol. It can realize the conversion of the serial port MODBUS RTU protocol to the network MODBUS TCP protocol, and convert the network MODBUS TCP protocol to the serial port MODBUS RTU protocol.

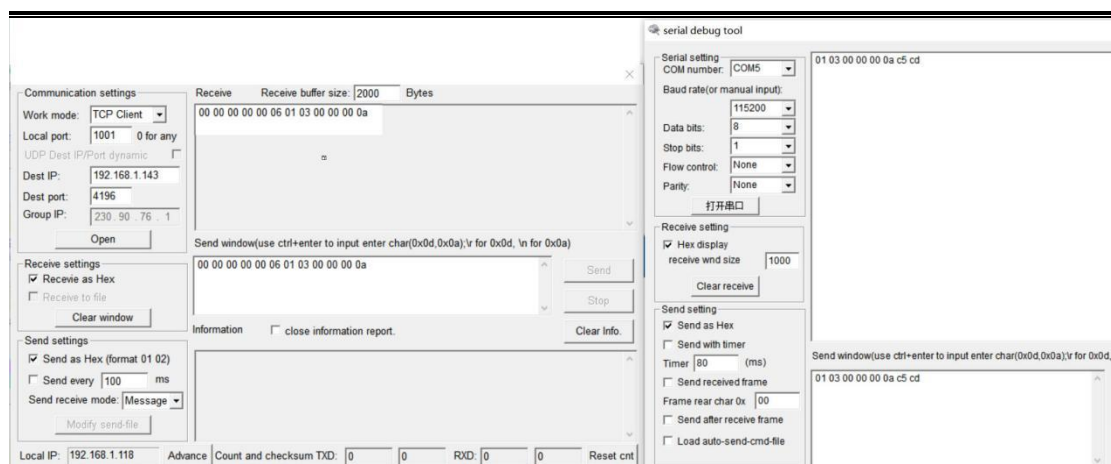


Figure 23 Modbus Protocol conversion test

### 6.1.3 MQTT Protocol Testing

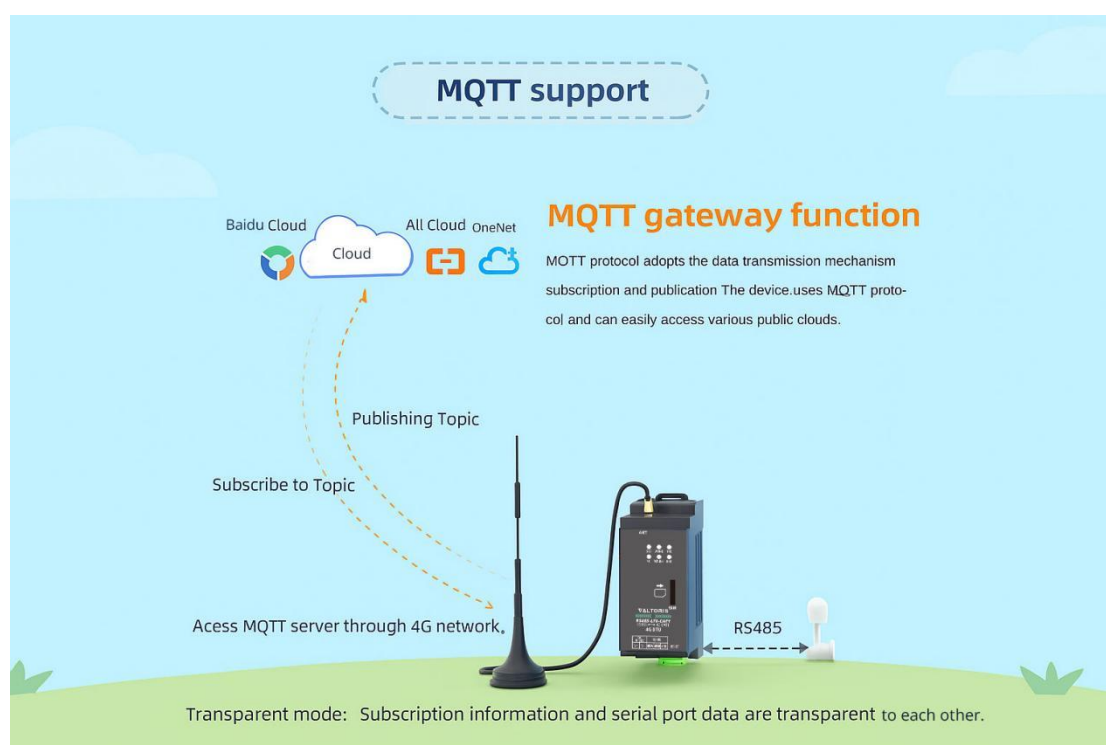


Figure 24 Schematic diagram of MQTT

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

4G Config Tools

Step 1: select 1. At command mode, or 2. Firmware upgrade/configuration file download mode, including JSON configuration

COM: COM8  
Baudrate: 115200  
Databits: 8  
Parity: N

Close Firmware update/cfg mode

Step 2: in at command mode, if you need to modify parameters, please log in first

Login key: 666666  
Login

Step 3: main parameters of at instruction mode

Baudrate: 115200  
Dest. IP/Name: iot-as-mqtt.cn  
Dest. Port: 1883  
Protocol: TCP Client

Device ID: 284064502541

Information:

```
+STAT:
+ID: 866824064502541
+VER: R485-LTE-CAT1 @HW: HRA3, SW: V2.01
+BAUD: 115200
+PIPAD:
+PPOINT: 1883
+PROTOCOL: SEV
+ZL_MODE: 2
+HEARTIME: 0
+HEARTDAT: 6865617274
+DATAB: 8
+CHECKB: N
+EN_ENROL: 0
+ENROL: 7a6c616e
+APNN:
+APN_USERNAME:
+APN_PASSWORD:
+MQTT_USERNAME: mqttname
+MQTT_PASSWORD:
+MQTT_CLIENT: mqttid28446
+MQTT_SUBSCRIBE_TOPIC: mqttsub
+MQTT_SUBSCRIBE_QOS: 1
+MQTT_WILL_FLAG: 0
+MQTT_PUBLISH_TOPIC: mqttsub
+MQTT_PUBLISH_QOS: 1
+MQTT_KEEPAIVE: 60
+MQTT_WILL_TOPIC:
+MQTT_WILL_MESSAGE:
+Z_RMT_MAC: 0
+Z_RMT_IP: 47.95.144.92
```

Clear

ZL+VER? Send AT CMD

Status

Config Entered Config

Login Login

field strength: temperature:°C ID:866824064502541 Hardware Ver:HRA3,Software Ver:V2.01

Figure 26 Alibaba Cloud IP and Port



Advanced Parameters

Work Parameters

Work Type: **MQTT**

DNS Server IP:

Heart Beat Interval: **Disable**

Heart Beat Content:  ☐ ASCII

Serial Data Bits: **8**

Serial Parity: **N**

Stop Bits:

Login Key:

Enable Register Pkt: **Disable**

Register Pkt Content:  ☐ ASCII

APN:

APN UserName:

APN Key:

Enable P2P: **Disable**

No Data Restart: **1500** Min(0 disable)

☐ Enable Off-line Storage

MQTT Parameters

MQTT version: **V3.1.1**

User Name: **112121@a1WSVHIXKDH**

Key: **041BD699CB041300ADD336E96**

Client ID: **thod-hmacsha1,timestamp-**

Subscribe Topic: **XkDh/112121/user/test**

Subscribe QOS: **1**

Publish Topic: **WsVHIXkDk112121/user/1**

Publish QOS: **1**

Keep Alive Time: **60**

Enable Will: **0**

Last-will Topic:

Last-will Message:

Remote Device Manage

☐ Enable Remote Device Manage

Server IP/DNS:

Server TCP Port:

Set Cancel Get Default

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.

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产品：上云测试

云栖运行日志 设备本地日志 日志转储

112121

消息内容 DeviceName 业务类型(主键) 操作 @ 内容 状态 @

|                         |                                |    |        |        |                       |                       |     |
|-------------------------|--------------------------------|----|--------|--------|-----------------------|-----------------------|-----|
| 2021/02/04 17:50:13.17  | 0a3027af16124322312967569f1ae3 | -  | 112121 | 设备行为   | online                | ["Content":"onlin...  | 200 |
| 2021/02/04 17:50:15.87  | 0a3027af16124322315797827f1ae3 | -  | 112121 | 设备行为   | /a1WSVHXkDh/112121... | ["Content":"pubs...   | 200 |
| 2021/02/04 17:50:18.02  | 0a3027af16124322317997993f1ae3 | 报警 | 112121 | 设备到云消息 | /a1WSVHXkDh/112121... | ["Content":"Publ...   | 200 |
| 2021/02/04 17:19:05.216 | 0a3027d816124303452136931d5383 | -  | 112121 | 设备行为   | offline               | ["Content":"offlin... | 200 |
| 2021/02/04 17:19:04.243 | 0a3027d816124303442406303d5383 | 报警 | 112121 | 设备到云消息 | /a1WSVHXkDh/112121... | ["Content":"Publ...   | 200 |
| 2021/02/04 17:19:02.888 | 0a3027d816124303428855445d5383 | 报警 | 112121 | 设备到云消息 | /a1WSVHXkDh/112121... | ["Content":"Publ...   | 200 |
| 2021/02/04 17:19:01.126 | 0a3027d816124303411254245d5383 | 报警 | 112121 | 设备到云消息 | /a1WSVHXkDh/112121... | ["Content":"Publ...   | 200 |
| 2021/02/04 17:18:59.568 | 0a3027d81612430339563159d5383  | 报警 | 112121 | 设备到云消息 | /a1WSVHXkDh/112121... | ["Content":"Publ...   | 200 |
| 2021/02/04 17:18:58.11  | 0a3027d816124303380102142d5383 | 报警 | 112121 | 设备到云消息 | /a1WSVHXkDh/112121... | ["Content":"Publ...   | 200 |
| 2021/02/04 17:18:56.452 | 0a3027d816124303364511342d5383 | 报警 | 112121 | 设备到云消息 | /a1WSVHXkDh/112121... | ["Content":"Publ...   | 200 |

Figure 28 Alibaba Cloud Log Service

For more details

|         |                           |
|---------|---------------------------|
| Topic   | /a1WSVHXkDh/112121/user/1 |
| Time    | 2021/02/04 17:51:52.932   |
| Content | Text (UTF-8) TEST         |

Figure 29: Alibaba Cloud receives serial port data

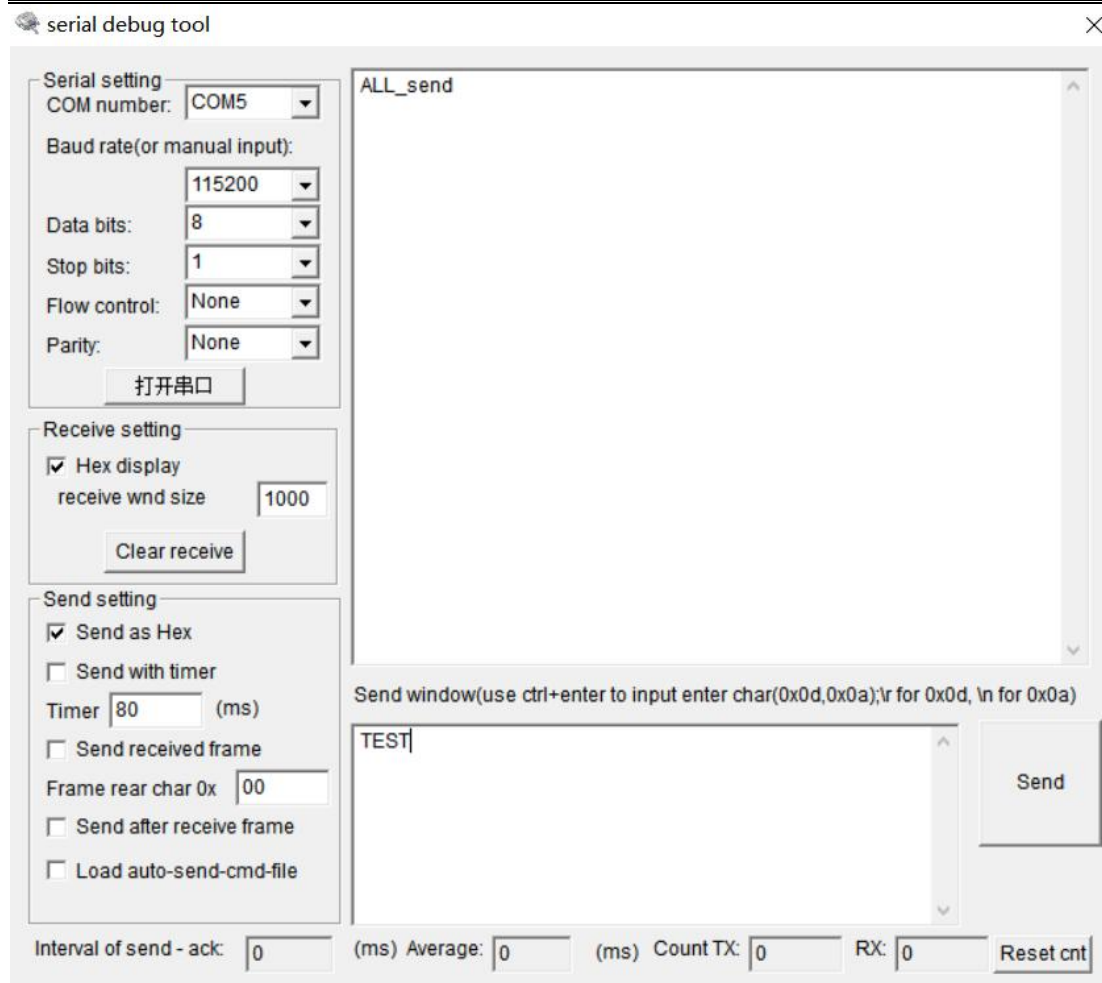
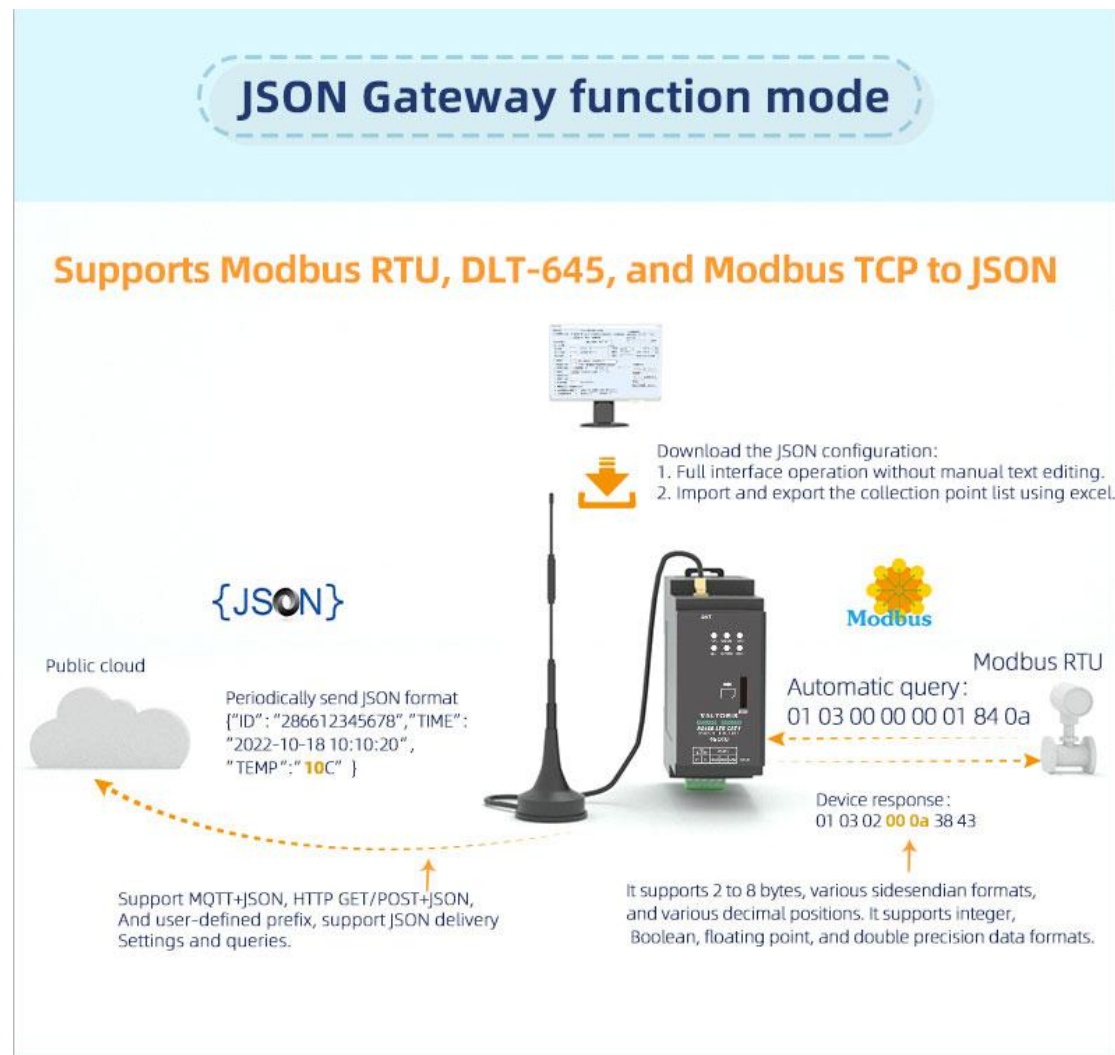


Figure 30 shows the serial port receiving data from Alibaba Cloud

## 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.

### JSON To Modbus RTU Settings

Config and options

Select port (only supported by XX12 series):  ☐ Time sharing collection for each port

Time zone:  ☐ The keyword name is Unicode encoding

- Data transmit interval to server:  (ms, range: 100 - 31718940, max 8.8hours, 0 is no send)  
☐ Enable short link, when time come start link, then wait  ms for establish TCP connection  
Then send data, then after is close connection. ☐ Upload according to NTP time.
- Select the cloud platform to access:
- The Uplayer Protocol of JSON:   
GET/POST URL(not include the ahead "http://")   
When selecting the GET protocol, the [#JSON\_NAME] input in the URL will be replaced with the  
corresponding value of JSON\_NAME. Design JSON\_NAME by 'JSON upload' below.  
The Variable Name of the POST(Like name={ }). No need for pure json:
- Add prefix to upload data(e.g. 01 02):  Data format:   
Select ASCII data format, and the [#JSON\_NAME] appearing in the prefix will be replaced with the  
corresponding value of JSON\_NAME. JSON\_NAME designde by 'JSON upload' below.  
  
Register packet (sent when connecting to server):
- After  times of upload, serial send data:  Condition(Def. empty):   
Design timing send serial command table(support transparent transmission when NO JSON):
- Add or Remove Modbus Registers:
- Click to save JSON settings and display the results:
- Export/Import config file.

Figure 32 Configuration JSON upload

Add JSON Node

Following is the 1. th design of register. It has been added: ☐

JSON node data type: ☒ Object data(Default value, including this node and later ones with { }, need Input JSON keyword)  
☐ Array data(including data by [ ], without JSON keyword)

Corresponding JSON Keyword: 1 Data source: Modbus RTU

Modbus RTU Settings

- Slave Address: 1 - IP: 0 . 0 . 0 . 0
- Modbus Function Code: 3 - Port: 502
- Register Address: 1

645/698 Protocol

- 645/698 Version: 97 Version
- Device ID(6B): 000000000001
- Data type: 9410
- Keep invalid 0 ☐
- Read FE numbers: 0
- Write FE numbers: 0
- 698 Data type: Total positiv
- 698 Client Addr(CA): 0

1. Data length: 2 Bytes. 4 Bytes order: Big Endian (AI) (big-endin 4 bytes: Data ABCD, low address store 2 bytes AB)

2. Decimal point places: 0 digit. After get as intenger left shift the decimal point.

3. Enable shift and scale: ☐ ubtract integer: 0 then divid float: 1 Register is float ☐

4. Data format: Unsigned int Bool value at postion bit: 1

5. Add unit name to rear:

6. Add quotation to data: ☐

7. The Period between two RTU cmd: 200 (ms) minimum 10. 100ms for 9600bps, and 500ms for 2400bps.

If timeout wait more: 0 (ms), before send next command. Set 0 to disable this function.

8. Transmit data to server when data changes: ☐

9. If RS485 device offline, set special value: ☐ Special value type: Special vs , special value: 0 .Set data to 1 if online: ☐

10. Enable overrun alarm: ☐ , minimum normal value: 0 maximum normal value: 0

Embedded JSON Related

Enter Embedded Exit Embedded

Design and View

Enter Next Del and Next

Exit Design

Save and Exit Cancel and Exit

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

Add JSON Node

Following is the 21. th design of register. It has been added: ☐

JSON node data type: ☒ Object data(Default value, including this node and later ones with { }, need Input JSON keyword)  
☐ Array data(including data by [ ], without JSON keyword)

Corresponding JSON Keyword: Data source: Modbus RTU

Modbus RTU Settings

- Slave Address: 20 - IP: 0 . 0 . 0 . 0
- Modbus Function Code: 3 - Port: 502
- Register Address: 21

645/698 Protocol

- 645/698 Version: 97 Version
- Device ID(6B): 000000000001
- Data type: 9410
- Keep invalid 0 ☐
- Read FE numbers: 0
- Write FE numbers: 0
- 698 Data type: Total positiv
- 698 Client Addr(CA): 0

1. Data length: 2 Bytes. 4 Bytes order: Big Endian (AI) (big-endin 4 bytes: Data ABCD, low address store 2 bytes AB)

2. Decimal point places: 0 digit. After get as intenger left shift the decimal point.

3. Enable shift and scale: ☐ ubtract integer: 0 then divid float: 1 Register is float ☐

4. Data format: Unsigned int Bool value at postion bit: 1

5. Add unit name to rear:

6. Add quotation to data: ☐

7. The Period between two RTU cmd: 200 (ms) minimum 10. 100ms for 9600bps, and 500ms for 2400bps.

If timeout wait more: 0 (ms), before send next command. Set 0 to disable this function.

8. Transmit data to server when data changes: ☐

9. If RS485 device offline, set special value: ☐ Special value type: Special vs , special value: 0 .Set data to 1 if online: ☐

10. Enable overrun alarm: ☐ , minimum normal value: 0 maximum normal value: 0

Embedded JSON Related

Enter Embedded Exit Embedded

Design and View

Enter Next Del and Next

Exit Design

Save and Exit Cancel and Exit

Figure 34 Save and exit after the configuration is completed



JSON To Modbus RTU Settings

Config and options

Select port (only supported by XX12 series):  ☐ Time sharing collection for each port

Time zone:  ☐ The keyword name is Unicode encoding

- Data transmit interval to server:  (ms, range: 100 - 31718940, max 8.8hours, 0 is no send)  
☐ Enable short link, when time come start link, then wait  ms for establish TCP connection  
Then send data, then after is close connection. ☐ Upload according to NTP time.
- Select the cloud platform to access:
- The Uploader Protocol of JSON:   
GET/POST URL(not include the ahead "http://")   
When selecting the GET protocol, the [#JSON\_NAME] input in the URL will be replaced with the corresponding value of JSON\_NAME. Design JSON\_NAME by 'JSON upload' below.  
The Variable Name of the POST(Like name={ }). No need for pure json:
- Add prefix to upload data(e.g. 01 02):  Data format:   
Select ASCII data format, and the [#JSON\_NAME] appearing in the prefix will be replaced with the corresponding value of JSON\_NAME. JSON\_NAME designde by 'JSON upload' below.

Register packet (sent when connecting to server):

- After  times of upload, serial send data:  Condition(Def. empty):   
Design timing send serial command table(support transparent transmission when NO JSON):
- Add or Remove Modbus Registers:
- Click to save JSON settings and display the results:
- Export/Import config file.

```

{
  "1":0,
  "2":0,
  "3":0,
  "4":0,
  "5":0,
  "6":0,
  "7":0,
  "8":0,
  "9":0,
  "10":0,
  "11":0,
  "12":0,
  "13":0,
  "14":0,
  "15":0,
  "16":0,
  "17":0,
  "18":0,
  "19":0,
  "20":0,
  "":0
}

```

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.

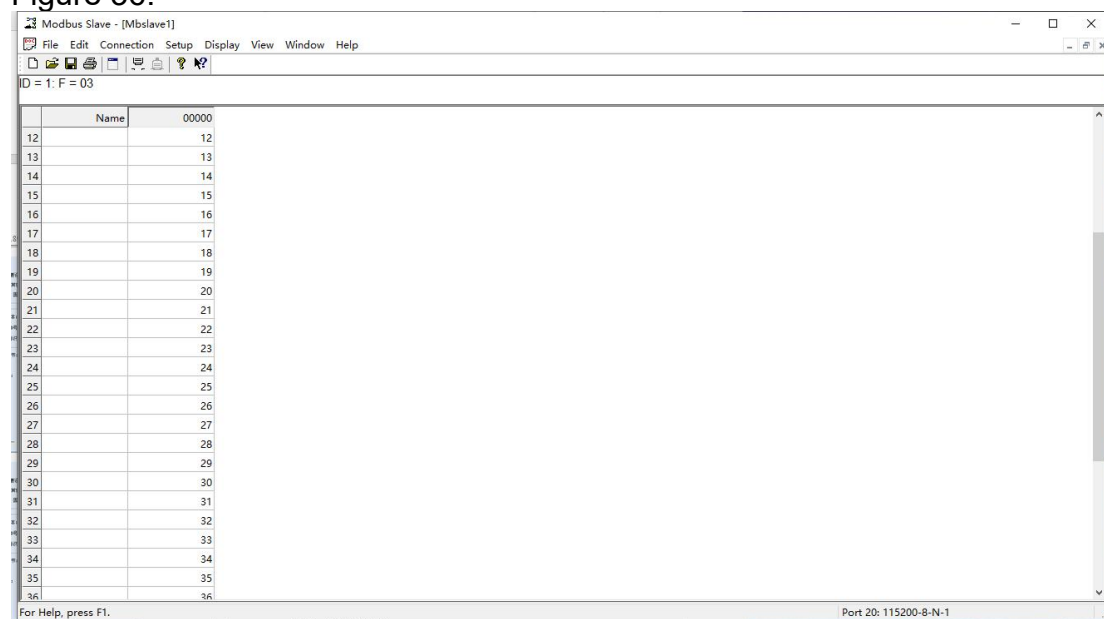




Figure 36: Modbus Slave fills in the simulation data

### 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.

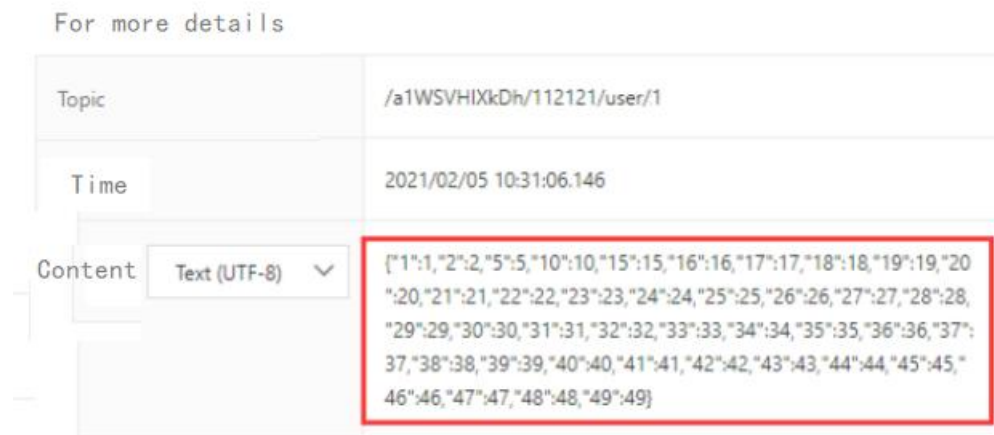
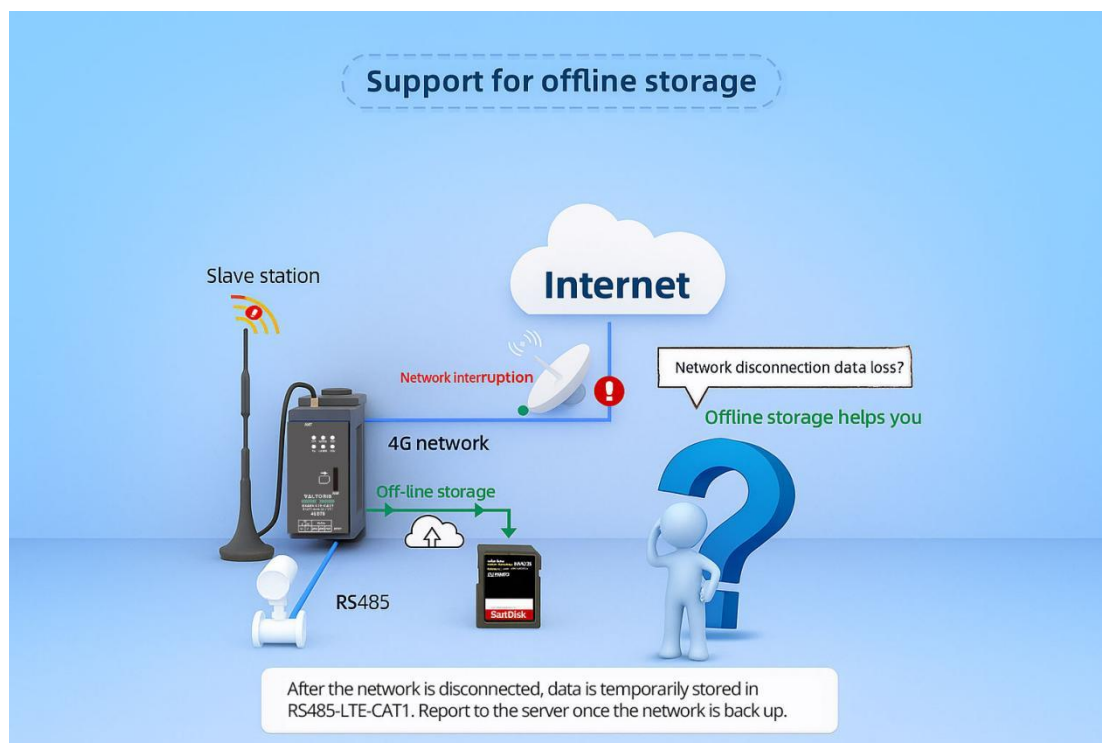


Figure 37 shows the serial port receiving data from Alibaba Cloud

## 6.3 Offline storage usage method

### 6.3.1 Introduction



**Figure 38 Schematic diagram of offline storage**

After the device enables the offline data storage function, when data transmission fails due to network anomalies (such as mobile network disconnection or server connection failure), the data sent to the TCP/UDP server or MQTT will be saved inside the device (not lost after power failure and restart). The time information of each piece of data can be added through the Json conversion function. Used to distinguish the time of each piece of data. When the network returns to normal, the previously saved data will be uploaded to the TCP/UDP server or MQTT server without any modification, and no time information will be added. The interval for sending each piece of data can be configured. The size of the saved data is fixed, but the size of the data that can be saved varies among different devices. When the saved size is exceeded, the earliest received data will be discarded and the latest data will be saved.

#### Example 1

The function of converting Modbus to Json has been configured. Data is uploaded every 10 seconds. Data format:

```
{"time":"2021-07-08 17:09:15","1":0}
```

When the device abnormally loses network connection, it will save the data to be uploaded. Assuming the network returns to normal after 5 minutes, the server will continuously receive the previously saved data

```
{ "time": "2021-07-08 17:09:15", "1": 0 }
{ "time": "2021-07-08 17:09:25", "1": 0 }
{ "time": "2021-07-08 17:09:35", "1": 0 }
.....
{ "time": "2021-07-08 17:14:05", "1": 0 }
{ "time": "2021-07-08 17:14:15", "1": 0 }
```

The interval time for each packet of data is a fixed and configurable uplink interval time.

### Example 2

Device transparent transmission data

When the device abnormally loses network connection, the serial port receives the following five pieces of data:

```
{ "a": "1", "1": 0 }
{ "b": "1", "2": 0 }
{ "c": "1", "3": 0 }
{ "d": "1", "4": 0 }
{ "e": "1", "5": 0 }
```

When the network returns to normal, the server will continuously receive 5 pieces of data:

```
{ "a": "1", "1": 0 }
{ "b": "1", "2": 0 }
{ "c": "1", "3": 0 }
{ "d": "1", "4": 0 }
{ "e": "1", "5": 0 }
```

The interval time for each packet of data is a fixed and configurable uplink interval time.

## 6.3.2 Configuration Method

**Query offline data storage function:** ZL+DATA\_STORAGE\_EN?\r\n

Device reply: ZL+DATA\_STORAGE\_EN=1/0\r\n

1 is to enable the offline data storage function, and 0 is to disable it.

**Enable/Disable the offline data storage function :**

ZL+DATA\_STORAGE\_EN=1/0\r\n

Device reply: ZL+DATA\_STORAGE\_EN=1/0\r\n

1 is to enable the offline data storage function, and 0 is to disable it.

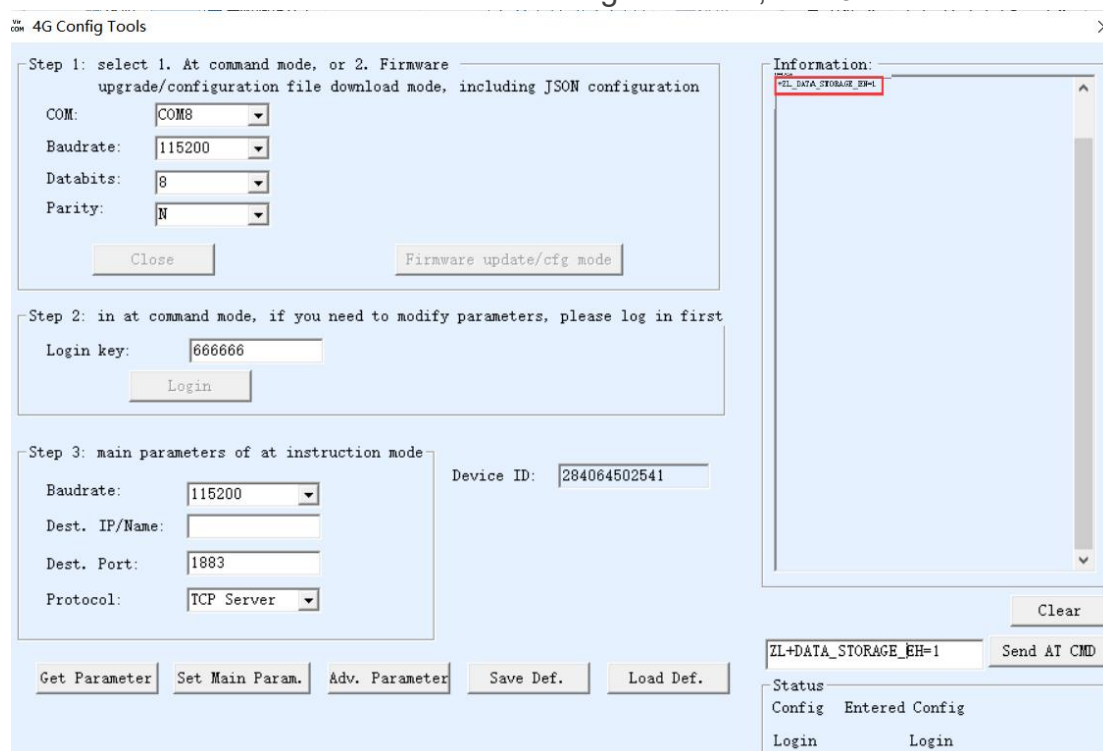


Figure 39 Interface

The interval time posted on the query data:

ZL+DATA\_STORAGE\_SPAN=?\r\n

Device reply: ZL+DATA\_STORAGE\_SPAN=XXX\r\n

XXX represents the interval time for data upload, with the unit being ms.

**Set the interval time for data upload:** ZL+DATA\_STORAGE\_SPAN=XXX\r\n

Device reply: ZL+DATA\_STORAGE\_SPAN=XXX\r\n

XXX represents the interval time for data upload, with the unit being ms.

It is recommended to set the time between 100 and 1000.

The screenshot shows the '4G Config Tools' window. It is divided into three main steps:

- Step 1:** select 1. At command mode, or 2. Firmware upgrade/configuration file download mode, including JSON configuration. It includes fields for COM (COM8), Baudrate (115200), Databits (8), and Parity (N). Buttons for 'Close' and 'Firmware update/cfg mode' are present.
- Step 2:** in at command mode, if you need to modify parameters, please log in first. It includes a 'Login key' field (666666) and a 'Login' button.
- Step 3:** main parameters of at instruction mode. It includes fields for Baudrate (115200), Dest. IP/Name, Dest. Port (1883), and Protocol (TCP Server). A 'Device ID' field shows 284064502541. Buttons for 'Get Parameter', 'Set Main Param.', 'Adv. Parameter', 'Save Def.', and 'Load Def.' are at the bottom.

On the right side, there is an 'Information' panel showing '+ZL+DATA\_STORAGE\_SPAN:1000'. Below it, a 'Send AT CMD' button is visible, with a red box highlighting the command 'ZL+DATA\_STORAGE\_SPAN?'. A 'Status' table is at the bottom right:

| Status | Entered Config |
|--------|----------------|
| Config | Entered Config |
| Login  | Login          |

Figure 40 Login interface

## 7. AT Command

### 7.1. Login and Configuration

#### 7.1.1. Enter configuration mode

Instruction: REQUEST CFG MODE

Function: Enter configuration mode. During the device startup stage, send this command. After the device starts up completely, it can enter 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

### **7.3.8. 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 0X56  
Return: +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 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\_KEEPLIVE =\*\*\*\*\r\n

Set the MQTT live retention time

Return: + ZL+ MQTT\_KEEPLIVE:\*\*\*\* \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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