ZLAN8309S

Modbus

Iot gateway

RS232/485 to RJ45/WIFI/4G

ZL DUI 202401009.1.0

Version Information

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Catalogue

1. Summary

ZLAN8309S series is a compact and powerful Internet of Things gateway launched by Shanghai ZLAN after the successful launch of ZLAN8309. In terms of hardware, it integrates a variety of interfaces: 4G, WIFI, network port and 232/485 interface. In terms of software, it has multiple practical functions such as data acquisition, Modbus gateway, MQTT gateway, RS485 to JSON conversion and routing. In order to meet the needs of different countries for network frequency bands, the ZLAN8309S series also offers multiple seed models to choose from.

8309S sub-models as followings：

Figure 1ZLAN8309S sub-models

Item No.	Function	4G suitable zones
ZLAN8309S	WiFi/Eth/CAT1 4G Single serial port server /includes router function	China, India, Southeast Asia
ZLAN8309S-E	WiFi/Eth/CAT1 4G Single serial port server /includes router function	Europe, Middle East
ZLAN8309S-SA	WiFi/Eth/CAT1 4G Single serial port server /includes router function	South America, Australia
ZLAN8309S-NA	WiFi/Eth/CAT1 4G Single serial port server /includes router function	North America
ZLAN8309S-G	WiFi/Eth/CAT1 4G Single serial port server /includes router function	Universal

ZLAN8309S series support 9 ~ 24V wide voltage, round hole power access (can change the terminal access).

Figure 1 ZLAN8309S series IoT gateway

The basic application of ZLAN8309S can realize the conversion of 1 TCP/IP protocol to the serial port, and can realize the data collection of the serial port device through the network. The network side can use the virtual serial port to connect the serial port software or the direct TCP/IP communication software.

ZLAN8309S also supports the Modbus RTU to Modbus TCP function, and supports the storage Modbus gateway feature. It can also be used as a non-storage Modbus gateway.

ZLAN8309S series applications：

Power electronics, smart meters and energy consumption monitoring;

As a gateway to the Internet of Things as a communication bridge between devices and the cloud;

Various configuration software and device communication interfaces;

Access control security field equipment networking；

A typical application connection is shown in Figure 2. The original serial device

is connected to the serial port of ZLAN8309S, and the 8309S is connected to the computer through network cable /WiFi or to the cloud server through 4G. The software on the computer connects to the 8309S through TCP/IP, virtual serial port, or cloud server. Thereafter, any data sent by the serial device is transparently transmitted to the computer's software, and the data sent by the software to the ZLAN8309S over the network is transparently transmitted to the serial device.

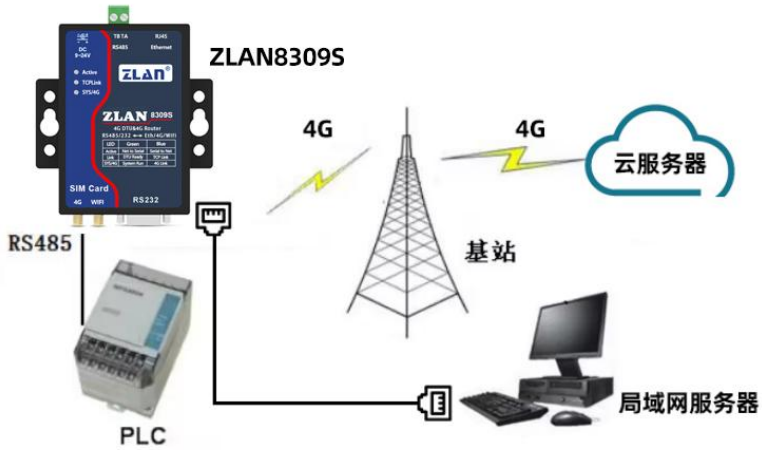

Figure2Connection map

2. Function characters

2.1. Hardware characters

ZLAN8309S series character as followings：

1. Various network connection methods: Support network ports, WIFI, 4G multiple ways to connect to the network.

2. Micro design: alloy metal shell anti-interference, small size, easy to install.

3. Abundant panel indicators are convenient for debugging: SYS/4G lights indicate the working status of the equipment, while independent TCP Link lights and Active lights indicate the TCP link status and data communication status respectively.

Software functions

1 Support TCP server, TCP client, UDP mode, UDP multicast. The TCP client

also supports the TCP server function. The TCP server supports 30 TCP connections and the TCP client supports 7 destination IP addresses.

2 The baud rate ranges from 300 to 921600bps, and the data bit ranges from 7 to 8 bits. The parity bit can be none, odd, even, mark, or space.

3 Supports the MAC address sending function when the device is connected, facilitating device management by the cloud.

4 Provide computer side search, configure device secondary development kit DLL development library.

5 Supports Web browser configuration, dynamic IP address acquisition by DHCP, and DNS server addresses.

6 Support cloud remote device search, device parameter configuration, device program upgrade.

7 Remotely check the TCP connection status and serial port data sending and receiving status through the software. The virtual serial port supports data monitoring.

2.2. Advanced software functions

Advanced software features supported by the 8309S series as followings：

1. Support Modbus gateway function, support Modbus RTU to Modbus TCP; Support ZLMB configurable table Modbus gateway function.
2. Multi-host function: In the question-and-answer query mode, multiple computers can access the same serial port at the same time. It can also realize multi-host application from one serial port to multiple serial ports.
3. Support MQTT gateway function.
4. Support Modbus RTU, Modbus TCP and 645 instrument-to-JSON protocols, support HTTP POST, HTTP GET format upload data.
5. The NTP protocol is used to obtain network time for sending protocol content.
6. Support custom heartbeat packet and registration packet functions: can facilitate communication and device identification with the cloud.

3. Technical parameter

Figure 2 8309S Technical parameter

Outline	
Interface：	LAN:RJ45、485：connection terminal 、232：DB9
Power supply：	Round hole mode (adjustable terminal)
Size：	length×width×height=9.4cm×6.5cm×2.5cm
Antenna：	WIFI*1、4G*1 Interface:50Ω/SMA male connector
SIM card	Power supply：3V，1.8V；size：big card（Card can purchase card sleeves to use）
CPU parameter	
RAM:	64M
FLASH：	64M
Frequency：	580M
Serial port parameter	
Baud rate：	300~921600bps
Digit bits：	7～8 bits
Check bits：	None, odd check, even check, mark, space
Software	
Protocol：	ETHERNET、IP、TCP、UDP、HTTP、ARP、ICMP、DHCP、DNS
Configuration：	ZLVirCOM tool、WEB
Transfer protocol：	Modbus TCP、MQTT、JSON、HTTP
Modbus gateway：	Support multi-host mode, storage mode, Pre-configuration table (ZLMB) mode
Communication mode：	TCP/IP Direct communication, virtual serial port mode
Working mode	
TCP server, TCP client (while TCP server also exists), UDP, UDP multicast	
Power supply requests	
Power supply：	9～24V DC

Secondary development	
Development platform	Linux environment; Developed based on openwrt open source router system
Development language	C language
Compiler：	mipsel-openwrt-linux-gcc
Openwrt version	Official source 21.02
Environmental requirement	
Operating temperature：	-40~85℃
Storage temperature：	-45~165℃
Humidity range：	5~95% relative humidity

4. Usage

4.1. Hardware specifications

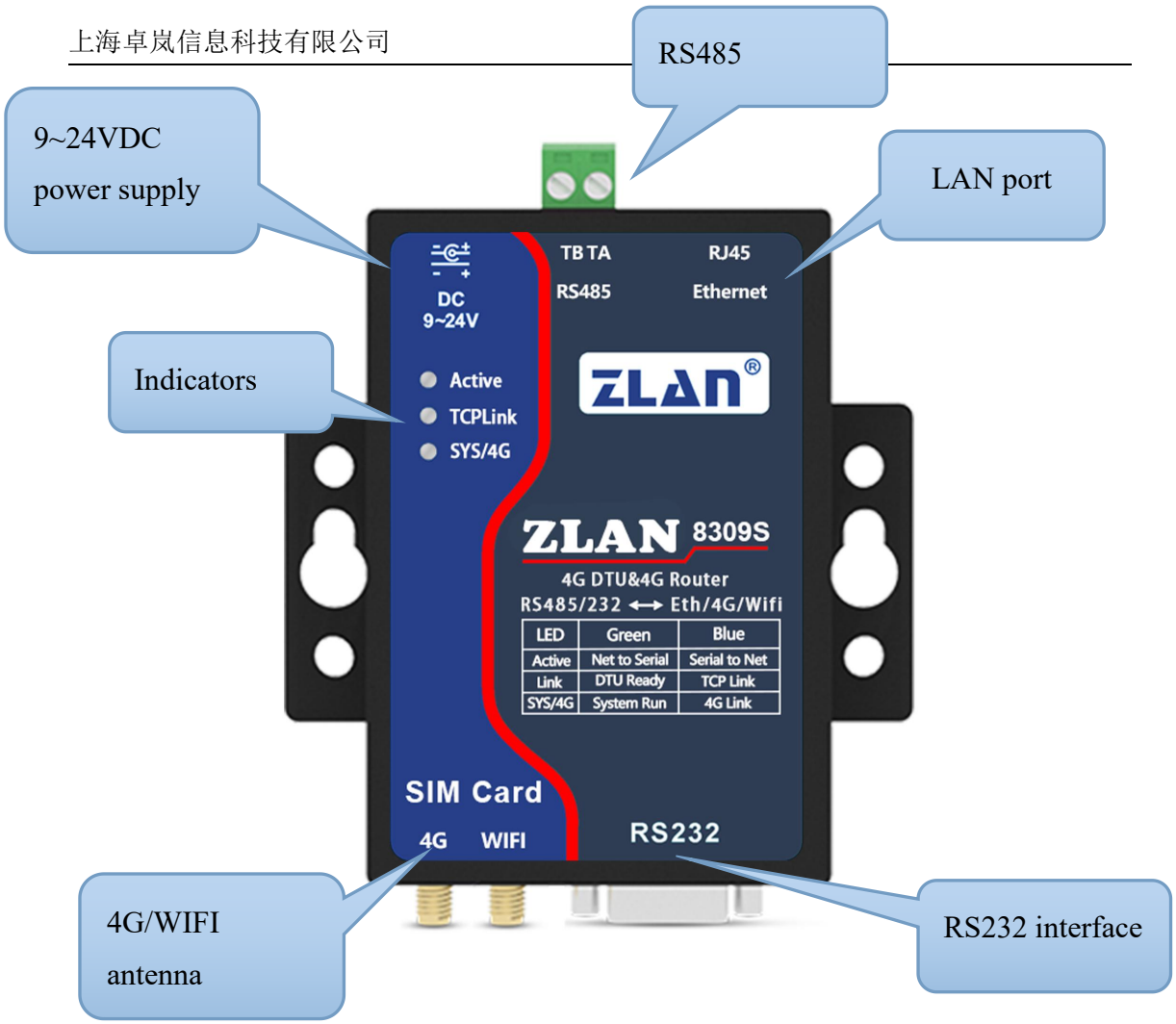

Figure 3 8309S front view

The main view of the ZLAN8309S is shown above, with a black radiation-resistant SECC metal housing.

1. one Power supply: 9~24VDC round hole input, can change the terminal.

2. RS232: DB9 male input.

3. RS485:TA (+),TB (-) terminal input.

4. RJ45 port: The network port is a LAN port.

5. Antenna: The left is the 4G antenna, the antenna interface adopts SMA (male head), and the external antenna must use an antenna suitable for 4G working band; On the right is the WiFi (2.4G) antenna, the antenna interface adopts 50 Ω /SMA (male head), and the external antenna must use an antenna suitable for the 2.4G WIFI working band.

6. Indicator: Divided into Active light, TCPLink, SYS/4G light.

Figure 3 Indicator contents

Active	(1) When the network port sends data to the serial port, the indicator is green. The flashing time is one second longer than the actual communication time, making it easier to detect short data communications. (2) When the serial port sends data to the network port, the indicator is on blue and green at the same time. If the blue color is displayed, the serial port returns data to the network port. This can determine whether the device has a response to the command of the upper computer, if there is no corresponding indicates that the serial port baud rate is not correct or the serial port is not connected.
TCP Link	(1) Steady green indicates that the internal module is working properly. (2) If it is steady blue, the TCP connection is established (or in UDP mode). It can be used to determine whether the gateway establishes a communication link with the host software.
SYS/4G	(1) Blinking green indicates that the gateway WIFI function works normally. (2) If it is steady blue, the gateway is dialing up 4G. (3) If the indicator blinks blue, the 4G dial-up of the gateway is successful.

Use the indicator to debug communication methods:

1) If the 4G light is on, it indicates that the 4G dial has not succeeded, please check the SIM card.

2) If the Link indicator is not blue (only considering the TCP working mode), the host software is not connected to the serial port server. Please consider whether the IP address is configured in the same network segment.

3) If the ACT indicator does not blink, it indicates that there is no data communication. Check the parameter Settings and serial port connection.

Figure 4 interface picture

Figure 4 shows the upper end interface of ZLAN8309S:

1. one Power input: Q2.1 socket, DC+9V~ +24VDC. The default adapter is 12V. Can be customized as power terminal type input.
2. Input RS485 signals. Be careful not to connect the power supply.
3. RJ45 port, Ethernet access port, LAN port.

Figure 5 shows the lower ports of the ZLAN8309S：

Figure 5 lower ports picture

4. Antenna: The antenna interface uses 50Ω/SMA, and the external antenna must use an antenna of the appropriate working band.

5. SIM Card installation: When installing the SIM card, ensure that the device is not powered on. Use a pen tip or screwdriver to push the SIM card out of the slot and push the SIM card face down into the slot.

DB9: RS232 signal input.

4.2. Hardware connection

Generally, the serial port server only needs to be connected to the power supply,

serial port, and network cable.

The serial port must be connected according to the user serial port device. To connect port 485, connect the positive part of port 485 to 485A and the negative part of port 485 to 485B.

At the same time, the network port must be connected to the LAN port of the 8309S. It can be directly connected to the computer or connected to the network through the switch.

4.3. Software installation

ZLVircom can be used to configure parameters such as device IP and create virtual serial ports. If the virtual serial port function is not required, you can download the no-installation version. Download address：http://www.zlmcu.com/download.htm

Figure 4 ZLVircom version

software name	Specifications
ZLVircom Device Management Tool (non-installed version)	The non-installed version does not include the virtual serial port function
ZLVircom-Device Management Tool (Installation version)	The installed version contains ZLVircom_x64.msi and ZLVircom_x86.msi. x64 is installed for 64-bit operating systems, and x86 versions are installed for 32-bit operating systems

Follow the default prompts during installation. After installation, zlvircom will be started every time the computer starts, which is used to create a virtual serial port

4.4. Parameter configuration

After ZLVircom is installed and equipment hardware connection is completed, ZLvircom software is run as shown in the figure below, and then click "Equipment management" as shown in Figure 7. ZLVircom can be used to search and configure equipment parameters in different network segments, which is very convenient, as long as the equipment and the computer running ZLVircom are in the same switch.

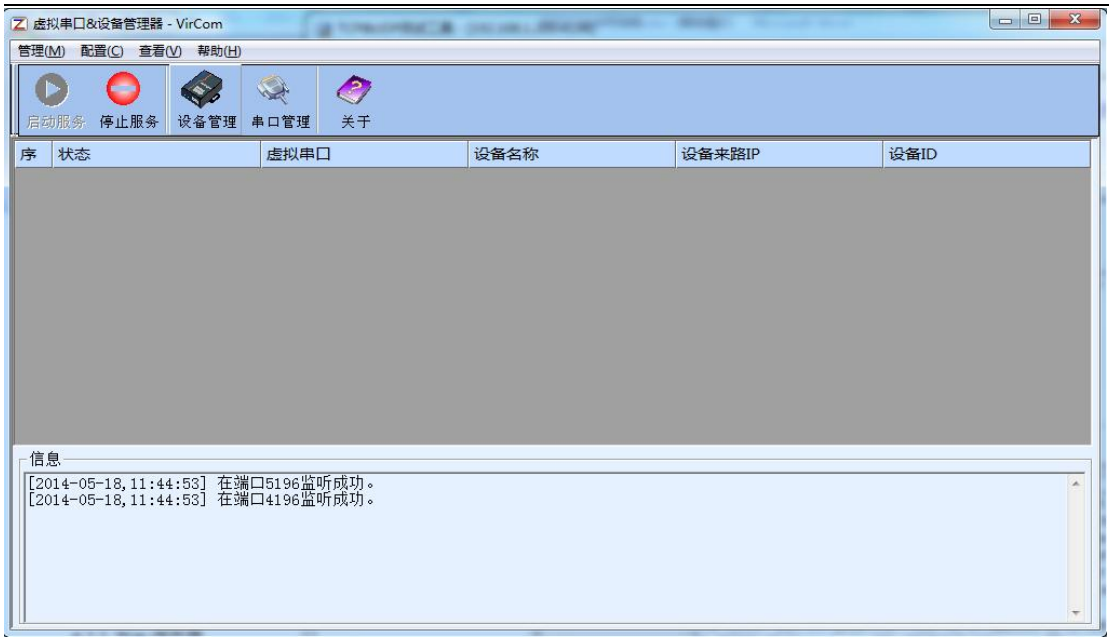

Figure 6 ZLVircom Main page

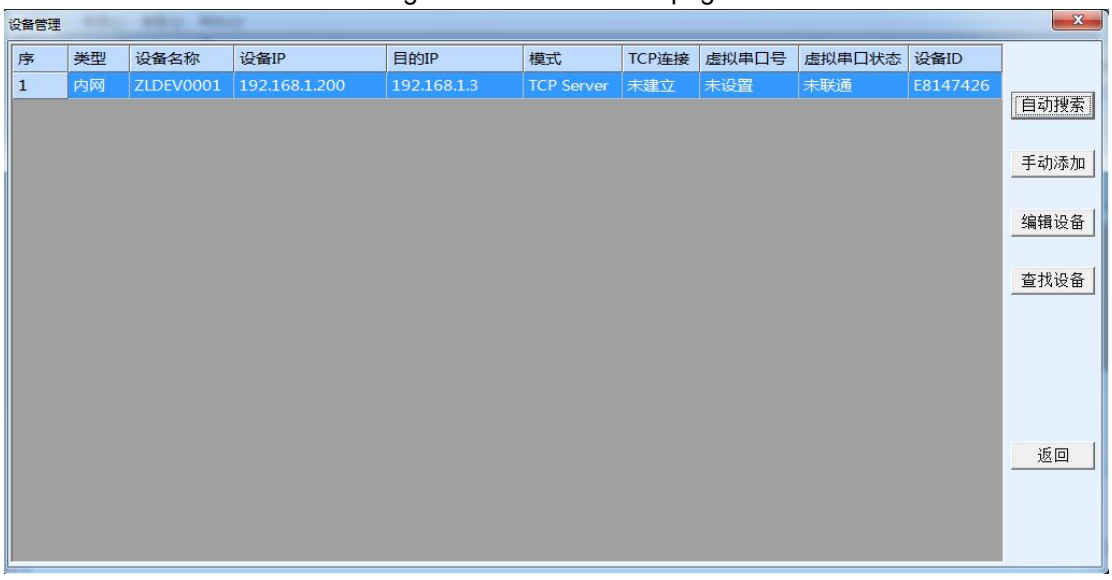

Figure 7Device list

View all online devices in the device list. Click "Edit Device" to configure parameters.

Figure 8 Device parameter

In this interface, the user can set the parameters of the device, and then click "Modify Settings", then the parameters are set to the flash of the device, power failure is not lost. At the same time, the device automatically restarts.

The main parameters are: baud rate, data bit, check bit in serial port Settings; IP address, subnet mask, gateway in network Settings; Sometimes according to the computer software, you also need to configure the working mode of the serial port server.

The following table describes other parameters：

Figure 5 Parameter contents

parameter name	value range	Contents
Virtual serial port	The virtual serial port is not used or created	You can bind the current device to an existing virtual serial port. Add a COM port in Serial Port Management on the home screen
Equipment type		Only the model of the core module is displayed
Device name	random	You can give the device an easy-to-read name, up to 9 bytes, support Chinese names

Device ID		The factory unique ID cannot be modified.
Firmware version		Firmware version of the core module
Features supported by the device		See Table 6 for the functions supported by the device
IP mode	static、DHCP	Users can choose between static or DHCP (dynamic IP acquisition)
IP address		IP address of the serial port server
Interface	0～65535	Listening port of the serial port Server in TCP Server or UDP mode. If you use port 0 as the client, you are advised to set port 0 to improve the connection speed. If port 0 is used, the system randomly assigns a local port. The difference between this and non-zero port is: (1) When the local port is 0, a new TCP connection is established with the PC when the module restarts, and the old TCP connection may not be closed, and the device may have multiple fake connections. Generally, the host computer wants to close the old connection when the module restarts; Specifying a non-zero port closes the old connection. (2) If the local port is 0, the TCP connection takes a shorter time to re-establish. When the serial port server is in TCP client mode, it also acts as a TCP server to listen for connections on the port. The local port number used by the TCP client to connect to the server is Port +1.
Working mode	TCP server mode, TCP client mode, UDP mode, UDP multicast mode	When set to TCP server, the serial server waits for the computer to connect. If TCP client is configured, the serial port server initiates a

		connection to the network server specified by the destination IP address.
Subnet mask	Eg：255.255.255.0	The subnet mask must be the same as that of the local LAN.
Gateway	Eg：192.168.1.1	It must be the same as the local LAN gateway.
Destination IP address or domain name		In TCP client or UDP mode, data is sent to the computer indicated by the destination IP or domain name.
Destination port		In TCP client or UDP mode, data is sent to the destination port of the destination IP address.
Baud rate	300~9121600	Serial baud rate
Digit bits	7、8	
Check bits	None, Even, Odd, tag, space	
Stop bits	1、2	
Flow control	No flow control, hard flow control CTS/RTS, hard flow control DTR/DCR, soft flow control XON/XOFF	Available only for RS232 serial ports
DNS server		If the destination IP address is described by a domain name, enter the IP address of the DNS server. If the IP address mode is DHCP, you do not need to specify the DNS server. The DNS server automatically obtains the IP address from the DHCP server.
Destination mode	Static and dynamic	TCP client mode: In static destination mode, the device automatically restarts after five consecutive failed attempts to connect to the server
Conversion	NONE 、 Modbus	NONE indicates that data is transmitted

protocol	TCP<->RTU、Real_COM	transparently from the serial port to the network. Modbus TCP<->RTU will convert Modbus TCP protocol directly into RTU protocol, which is convenient to cooperate with Modbus TCP protocol; RealCOM is designed to be compatible with the older version of the REAL_COM protocol. It is a virtual serial port protocol. However, it is not necessary to select the RealCom protocol when using the virtual serial port.
Keepalive timing time	0～255	Heartbeat interval. (1) If the value ranges from 1 to 255 and the device is in TCP client working mode, the device automatically sends TCP heartbeat packets at Keepalive intervals. This ensures the TCP validity of the link. If the value is set to 0, there is no TCP heartbeat. (2) If the value is set to 0 to 254, and the conversion protocol is REAL_COM, the device will send data with length 1 and content 0 at keepalive intervals to implement the heartbeat mechanism in the Realcom protocol. If the value is set to 255, there is no realcom heartbeat. (3) When the value is set to 0 to 254, if the device works on the TCP client, the device will send device parameters to the destination computer at keepalive intervals. If the value is set to 255, no parameter is sent, enabling remote device management
Disconnected reconnection time	0～255	In TCP client mode, each disconnection Reconnection Time re-initiates a TCP connection to the computer when the connection is unsuccessful. The value ranges from 0 to 254 seconds. If the value is set to 255, the reconnection

		is never performed. Note that the first TCP connection (such as hardware power-on, device restart through zlvircom software, and no data light) is generally carried out immediately, and only after the first connection fails will it wait for the "disconnection reconnection time" to try again, so the "disconnection reconnection time" will not affect the normal connection establishment time between the network and the server.
Web access port	1～65535	The default is 80
Indicates the multicast address		This parameter is used for UDP multicast
Enable registration package		When a TCP connection is established, the registration packet is sent to the computer. The realcom protocol must be selected after the registration package is enabled. TCP server and TCP client modes are supported.
Packet length	1～1400	One of the serial port framing rules. Serial port server After receiving data of this length, the serial port sends the received data to the network as one frame.
Packet interval	0～255	Serial frame rule 2. When the data received by the serial port server stops for a period longer than the specified period, the received data is sent to the network as a frame.

The functions supported by the device are described as follows：

Figure 6Functions supported by the device

Name	Specifications
Web download	Support through the web page to control the serial port output

	command, only the products with the suffix W have this function
Domain name system	The destination IP address can be a domain name (such as the starting www server address).
REAL_COM protocol	A non-transparent serial port server protocol, suitable for multiple serial port servers to bind virtual serial ports over the Internet. Because the protocol contains the MAC address of the device, it helps the host computer to identify the device. Generally, it can not be used.
Modbus TCP to RTU	Can realize Modbus TCP to RTU. It also supports the multi-host function.
Serial port modification parameter	Support serial port class AT instruction to configure and read device parameters.
Automatic IP acquisition	Supports the DHCP client protocol
Storage extends EX functionality	Subsequent extension
Multi-tcp connection	The TCP server supports more than one TCP connection.
UDP multicast	UDP multicast
Multipurpose IP	As a TCP client, seven destination IP addresses can be connected at the same time.
Proxy server	Supports the proxy server function (requires a specific model).
SNMP function	Supports SNMP to Modbus RTU. This function is supported only when the suffix is -SNMP
P2P function	Supports the function of accessing devices in any network through P2P traversing technology. Models ending in N support this function.

4.5. TCP Communication test

After device parameters are configured, you can use the serial port tool or TCP debugging tool to test the TCP

connection.

Figure 9 TCP Communication diagram

Now suppose the PC COM port (USB serial port) and gateway serial connection, then open the ZLComDebug (http://www.zlmcu.com/download/Comdebug.rar) serial debugging assistant, and open the corresponding COM figure 10. Open TCP&UDP debugging assistant SocketTest (http://www.zlmcu.com/download/SocketTest.rar), and as a way of TCP client, fill in the destination IP for a serial port server IP (for example 192.168.1.200), The destination port is the port of the serial server (4196), and then click the "Open" button as shown in Figure 11. On the Ttest of SocketTest, input "socket send" and click send, the data is transferred to the RS485 interface through the network port of the serial server, and then sent to ZLComDebug, which is then displayed in ZLComDebug. On the other hand, input "Comdebug send" in ZLComDebug and click "send" to send to socket test.

This demonstration demonstrates the transparent data forwarding function of serial port to network port and network port to serial port of serial port server.

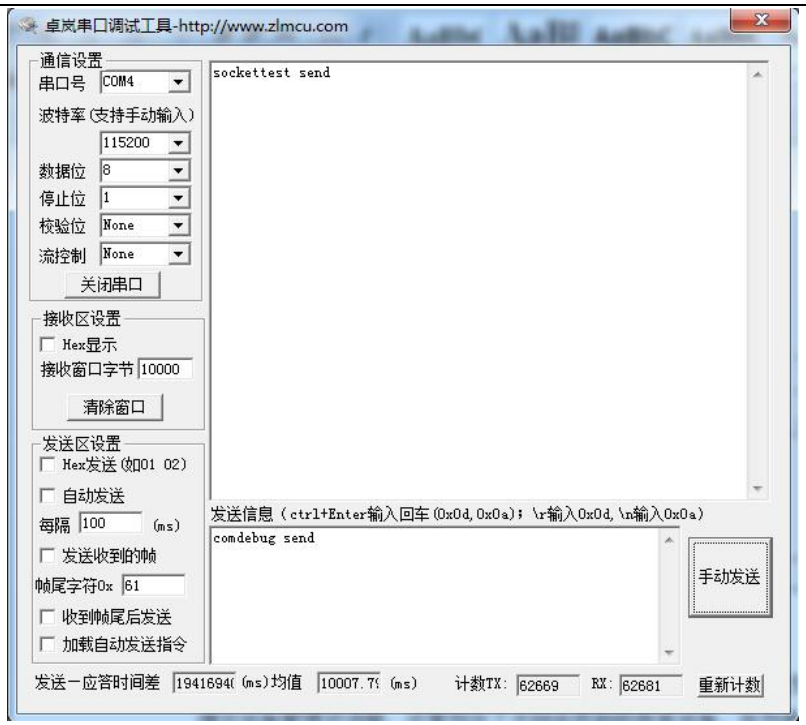

Figure 10 comdebug receive and send page

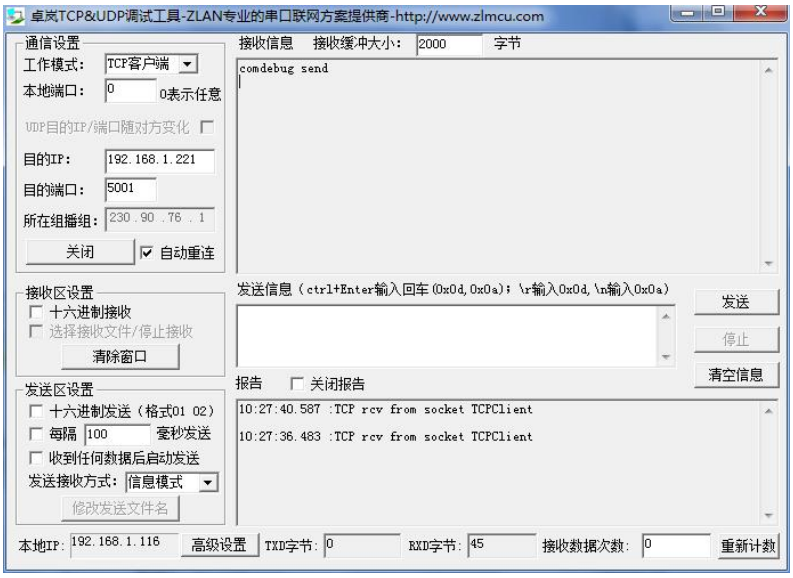

Figure 11 socket test receive and send page

4.6. Virtual Serial Port Test

The SocketTest shown in Figure 9 communicates directly with the serial server through TCP. In order to enable users to communicate with the serial server even with

the developed serial software, a virtual serial port needs to be added between the user program and the serial server. As shown in Figure 12, ZLVircom and the user program run on a computer. ZLVircom virtualizes a COM port and makes this COM port correspond to this serial port server. When the user program opens COM communication, it can be sent to the user serial port device through the ZLVircom serial port server. This procedure is demonstrated below：

Figure 12 Functions of the virtual serial port

Click "Serial port management" in the main interface of ZLVircom, then click "Add", select to add COM5, where COM5 is the COM port that does not exist in the computer.

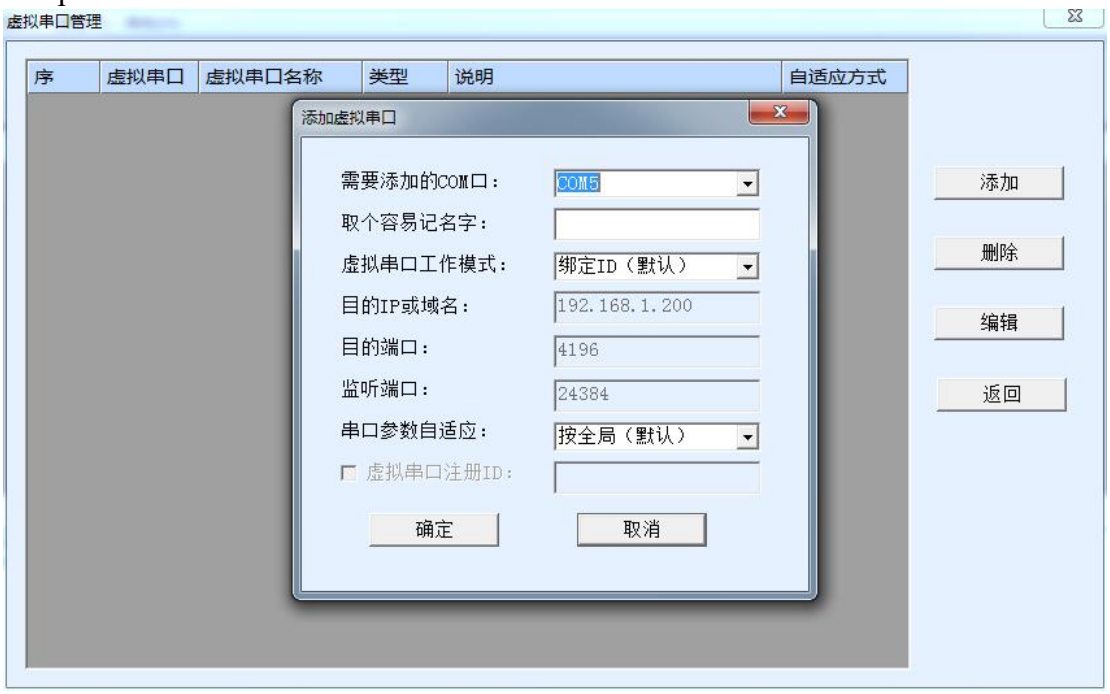

Figure 13 Adding a virtual serial Port

Then go to Device Management and double-click the device that you want to bind

to COM5. Select COM5 from the Virtual Serial Port list in the upper left corner. Then click "Modify Settings". And return to ZLVircom's main interface. You can see that COM5 has connected to the device whose IP address is 192.168.1.211. COM5 can be used instead of SocketTest to communicate at this time.

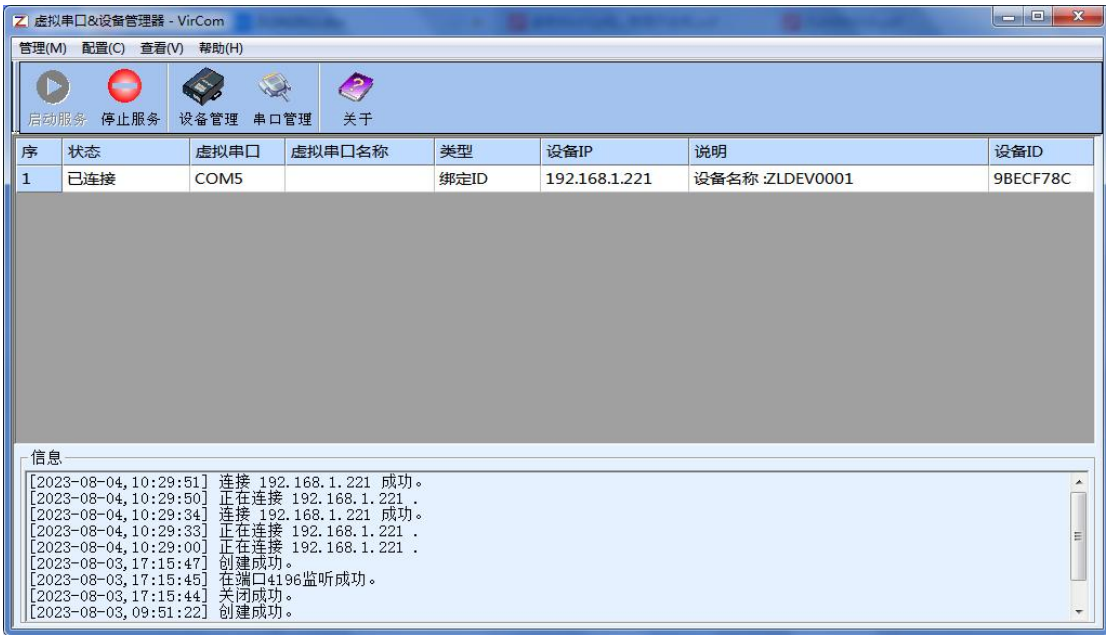

Figure 14 virtual serial port is connected

Open ZLComdebug to simulate the user's serial port program, open COM5(the above virtual serial port), and open a ZLComdebug to simulate a serial device, open COM4(hardware serial port). The data link sent by COM5 is as follows: COM5ZLVircom serial port Server network port Serial port Server serial port COM4. Conversely, COM4 to COM5 can also transmit data: COM4 serial port server serial port Serial port server network port ZLVircomCOM5. Figure 15 shows how both parties send and receive data.

If the COM4 is replaced by the user serial port device, the COM5 can realize the communication with the user device.

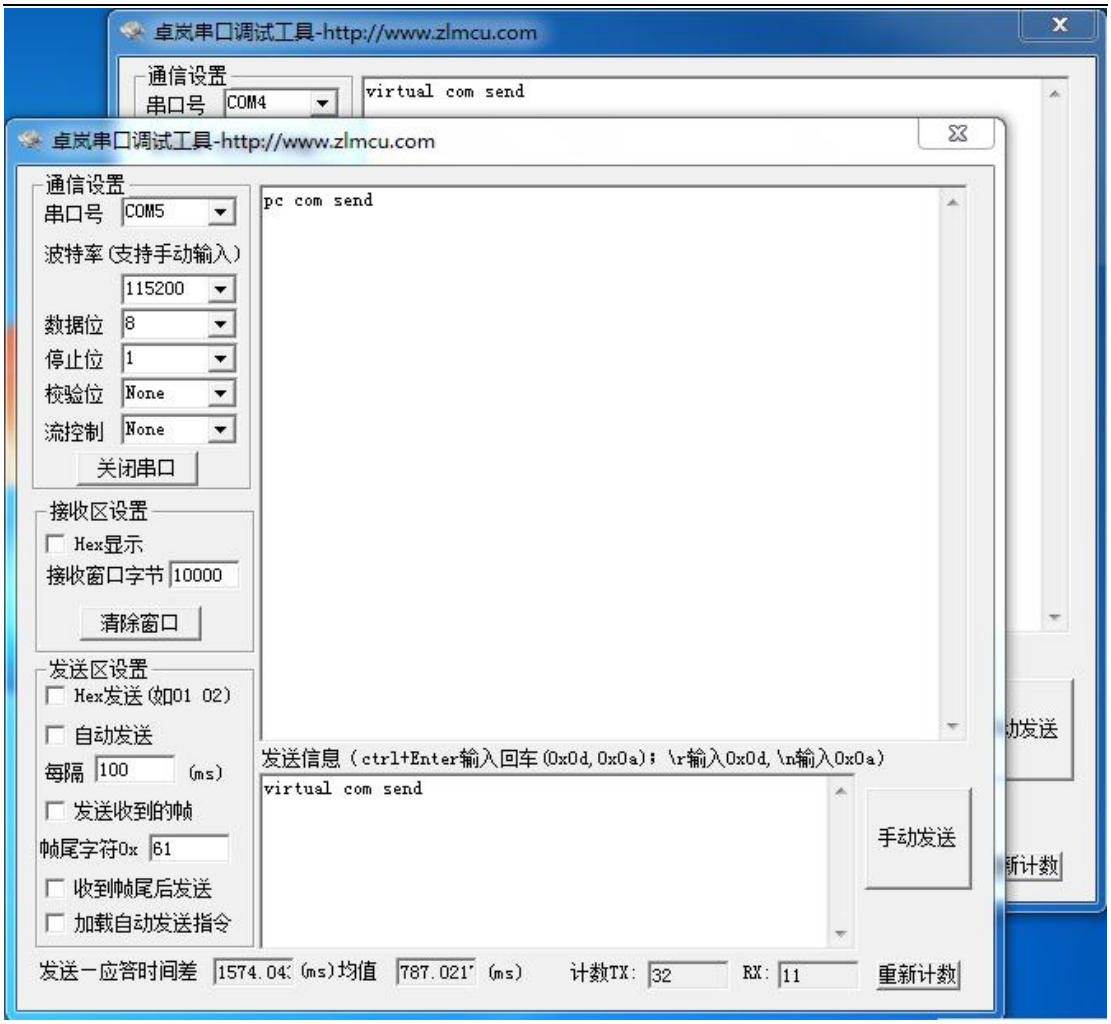

Figure 15 Communication through the virtual serial port

4.7. Modbus TCP test

By default, serial port and network port data are transmitted transparently. If you need to convert Modbus TCP to RTU, you need to select "Modbus TCPRTU" as the conversion protocol in the device setup dialog box, as shown in Figure 16. In this case, the device port automatically changes to 502, and the Modbus TCP tool connects to port 502 of the serial port server IP address. The Modbus TCP command is converted to RTU command and output from the serial port. For example, if the port of the serial port server receives the Modbus TCP command 00 00 00 00 00 06 01 03 00 00 00 00 00 0a, the serial port outputs the command 01 03 00 00 00 00 00 a c5 cd. Note: The serial port may send more than one 01 03 00 00 00 00 0a c5 cd

command, this is because the default Modbus is stored mode, will automatically rotate the query command. How do I switch to non-storage mode.

Figure 16 The Modbus TCP function is enabled

If the Modbus TCP software of the user is used as the Slave station, it is necessary to change the working mode to the client on the basis of selecting the conversion protocol, change the destination IP address to the IP address of the computer where the Modbus TCP software is located, and the destination port is 502, as shown in Figure 17.

Figure 17Modbus TCP being client side

4.8. Web Configuration

ZLVircom can search and configure device parameters in different network segments. Web configuration requires first to ensure that the computer and the serial server are in the same IP segment, and the IP address of the serial server needs to be known in advance. But Web configuration can be done on any computer without

ZLVircom.

1. In the address box of your browser, enter the IP address of the gateway, for example, http://192.168.1.200.

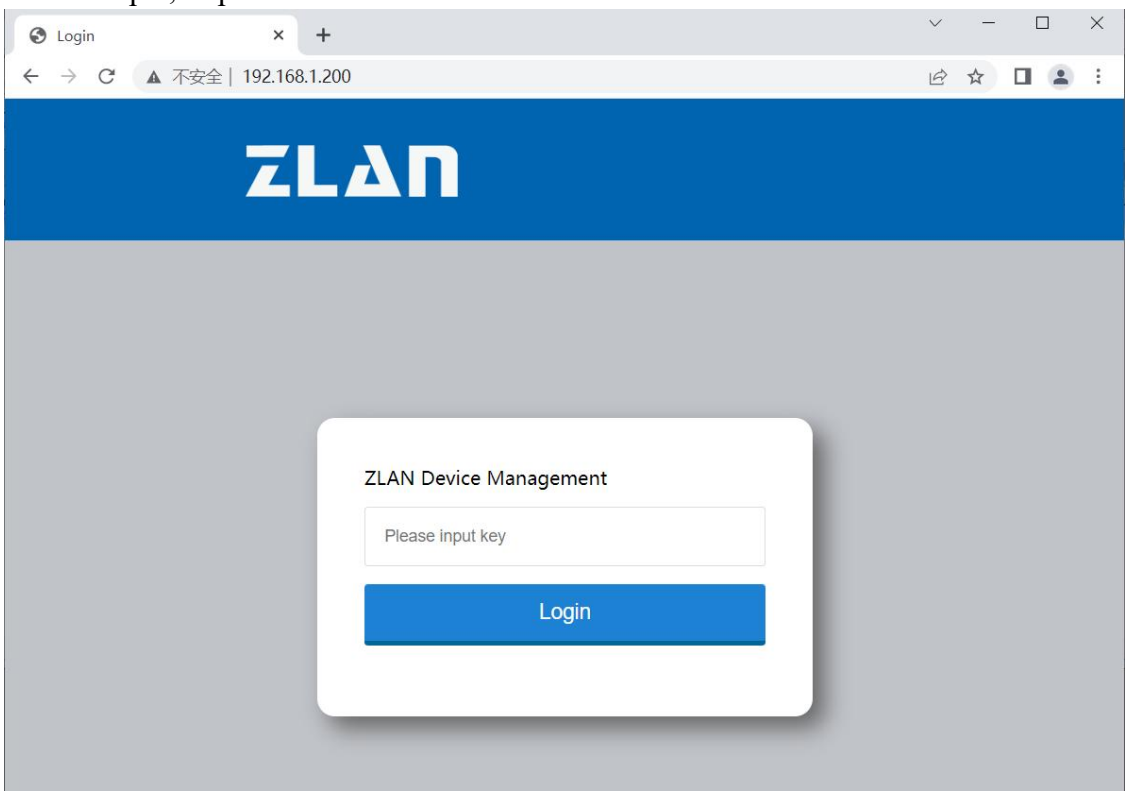

Figure 18Login page

2. Enter the Password in Password. The default password is 123456. Click the login button to sign in.

Figure 19 Web Configuration interface

3. You can modify serial port server parameters in the displayed web page. For details about related parameters, see Table 5.

4. Click the "Submit Modification" button after modifying the parameters

5. Working mode and conversion protocol

In different applications can choose different serial server working mode, conversion protocol, so as to be more stable and reliable use, the following details.

The use of serial port server is basically divided into two types: with virtual serial port and non-virtual serial port, as shown in Figure 9 TCP communication diagram and Figure 12 function of virtual serial port respectively. The user software that needs to be connected with the virtual serial port is a serial port (COM port), that is, the user software and the user device are serial ports. Non-virtual serial port mode The user software is directly TCP/IP communication but the user device is still serial port.

In the non-virtual serial port mode, the "conversion protocol part" is divided into

transparent transmission, Modbus TCP to RTU, Realcom protocol three modes. If the user software uses the Modbus TCP protocol and the lower computer uses Modbus RTU, select Modbus TCP to RTU. The Realcom protocol is used only when the multi-serial server serves as the TCP client to connect to a server and the virtual serial port is used on the server.

Usage is summarized as follows：

Figure 7Network configuration mode

No	Virtual serial port usage	Equipment operating mode	Conversion protocol	Specifications
1	use	TCP server	none	It is suitable for the occasion when the user software opens COM port to collect data actively
2	use	TCP client side	none	If the TCP server is selected, the device may fail to reconnect after disconnection.
3	none	TCP server	Modbus TCP to RTU	The user software is Modbus TCP and the user device is Modbus RTU. And the Modbus TCP master station.
4	none	TCP client side	Modbus TCP to RTU	The user software is Modbus TCP and the user device is Modbus RTU. And Modbus RTU is the master station.
5	use	TCP client side	Realcom protocol	When the multi-serial port server serves as the TCP client and the virtual serial port is used, the Realcom protocol is recommended.
6	none	TCP client side	none	It is suitable for connecting a cloud with a large number of

				devices. In general, the cloud is a server with a public IP address on the Internet.
7	none	TCP server	none	Applicable to devices and computers on the same local network, local monitoring, no need to cross the Internet communication.

5.1. Virtual Serial Port Mode

If the user software uses the COM port to communicate, it must use the virtual serial port mode. Including some PLC software, configuration software, instrument software and so on.

See if monitoring computers and devices are on the local network:

a) If the computer is a server with a public IP address leased on the Internet, the device must use TCP client mode to connect the device to the server. In this case, you can select 2 and 5 in Table 7. If multiple serial servers are used, you must select 5.

b) All in the local network (can ping each other), it depends on whether the host computer actively queries or the device actively sends data. If the device acts as the TCP client to send packets, mode 2 must be used. Otherwise, mode 1 can be used.

5.2. Direct TCP/IP communication mode

If the Modbus TCP protocol is not required and the virtual serial port is not required, the user software may directly communicate with the network port of the serial port server for TCP/IP communication, and the serial port server converts TCP/IP data to serial port data and sends it to the serial port device.

Generally, the user of this kind of usage develops the host computer network communication software by himself, which integrates the analysis of the serial

communication protocol of the device. This method is more flexible and efficient than virtual serial port. Correspond to 7 and 8 in Table 7.

The "TCP Communication Testing" section briefly describes how the serial server communicates when it acts as a TCP server. Here we will talk about how TCP clients, UDP mode, and multi-TCP connections communicate with computer software. The Ttest computer software is based on SocketTest (software that mimics user TCP/IP communication) as an example.

Zlan serial port to network port module complies with the standard TCP/IP protocol, so any network terminal that complies with the protocol can communicate with the serial port server, Zlan technology provides a network debugging tool (SocketDlgTest program) to simulate the network terminal to communicate with the serial port server.

For two network terminals (in this case, the network debugging tool and the serial server) to communicate, their parameter configurations must be paired.

5.2.1. TCP Client mode

There are two working modes in TCP mode: TCP server and TCP client. No matter which mode is used, one side must be the server and the other side is the client, and then the client can access the server.

When the serial server is the client, there must be three relationships, as shown in Figure 20. (1) Working mode: The working mode of the serial port server is the server mode of the network tool corresponding to the client. (2)IP address: The destination IP address of the serial port server must be the IP address of the computer where the network tool is located. (3) Port: The destination port of the serial port server must be the local port of the network tool. After this setting, the serial port server can automatically connect to the network tool and send and receive data after the connection is established.

Figure 20The serial server serves as the client

5.2.2. The client connects to multiple servers

When the ZLAN serial port server serves as the TCP client, seven destination IP addresses can be connected at the same time. Data sent from the serial port is sent to all seven destination IP addresses at the same time. If there are not that many servers, the rest of the destination IP is vacant. Its use is as follows：

Figure 21The first destination IP address and port number

Figure 22 left 2～7 IP and ports

The first IP is set in the device setup screen shown in Figure 21, where the first IP can be a domain name. Remaining 2 to 7 destination IP addresses On the device Settings screen, click More Advanced Options to open more advanced options.

All seven destination IP addresses can be automatically connected after being set. If the destination IP addresses fail to be connected, they are reconnected repeatedly after the Disconnection time.

5.2.3. TCP server mode

When the serial server acts as the server, there are also three mappings, as shown in Figure 23, which are not explained here. After this setting, click the open button of the network tool to establish a TCP connection with the serial port server. After the connection is established, you can send and receive data.

Figure 23The serial server serves as the server

When the serial port server serves as the server, it can accept 30 TCP connections at the same time. The data received by the serial port is forwarded to all established

TCP connections. If you want to send data only to the TCP that recently received network packets, you need to enable the multi-host function. For details, see 7.4 Multi-Host Function.

5.2.4. Act as both client and server

Zlan serial port server supports the device in the TCP client mode can also accept TCP connections, that is, also has the TCP server function.

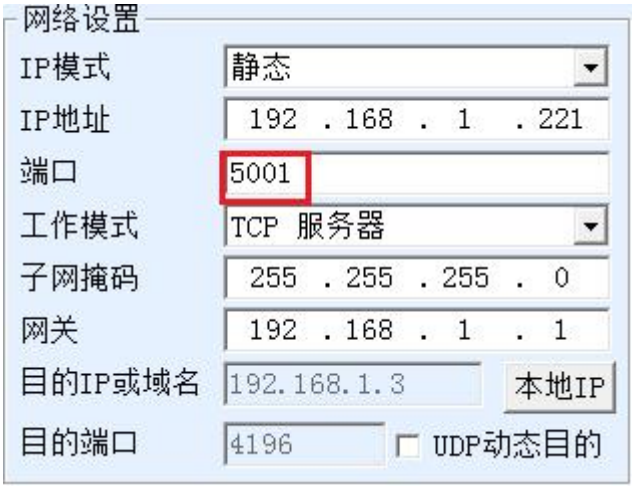

Figure 24Act as both of client and server

By default, when ZLVircom is configured, if the working mode is changed to "TCP client" mode, the port (that is, the local port) will automatically become 0 (0 means that an idle port is randomly selected). In order to support the TCP server mode, the computer software must know the local port of the device, so a value needs to be specified here. As shown in Figure 24, the computer software can now connect to port 5001 of 192.168.1.200 for communication. In addition, the device acts as a client and connects to port 1024 of 192.168.1.189. Note that because the local port 1024 is occupied by the server, the local port used by the client is "port +1", that is, the software on 192.168.1.189 sees that the incoming port of the device is 1024+1=1025.

5.2.5. UDP mode

In UDP mode, parameter configuration is shown in Figure 25. The left side is the configuration of serial server in ZLVircom, and the right side is the setting of network debugging tool SocketDlgTest. First, both must be in UDP working mode. In addition,

the destination IP address and port of the network tool must point to the local IP address and port of the serial port server. The blue arrow indicates that the destination IP address of the serial port server must be the IP address of the computer where the network tool is installed, and the destination port of the serial port server must be the local port of the network debugging tool. These network parameters must be configured to ensure two-way UDP data communication.

Figure 25 UDP Mode parameter configuration

6. Configure the communication mode

If you don't have an Internet cable and want to connect your device via WiFi, you need to do the following:

Turn on WLAN in the lower right corner of your computer：

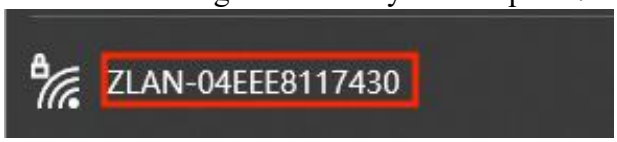

Figure 26 8309S Hotspot name

Connect ZLAN-XXXXXXXX WiFi. The default password is 66666666.

If you have a network cable and want to connect the device through the cable, directly connect the network cable to the LAN port, open your browser, enter 192.168.8.1 in the address bar, press enter to confirm, you can open the route configuration page of ZLAN8309S.

(Using a wired connection requires the same network segment as the computer's Ethernet and ZLAN8309S)

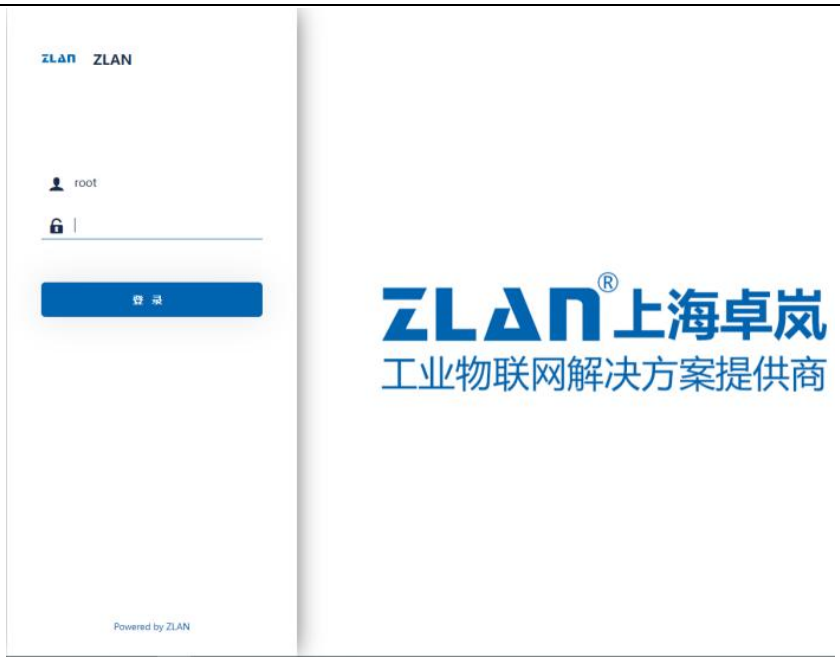

Figure 27 Communication method login page

The initial password is not required. You can directly click to log in. After login, the configuration page will be displayed：

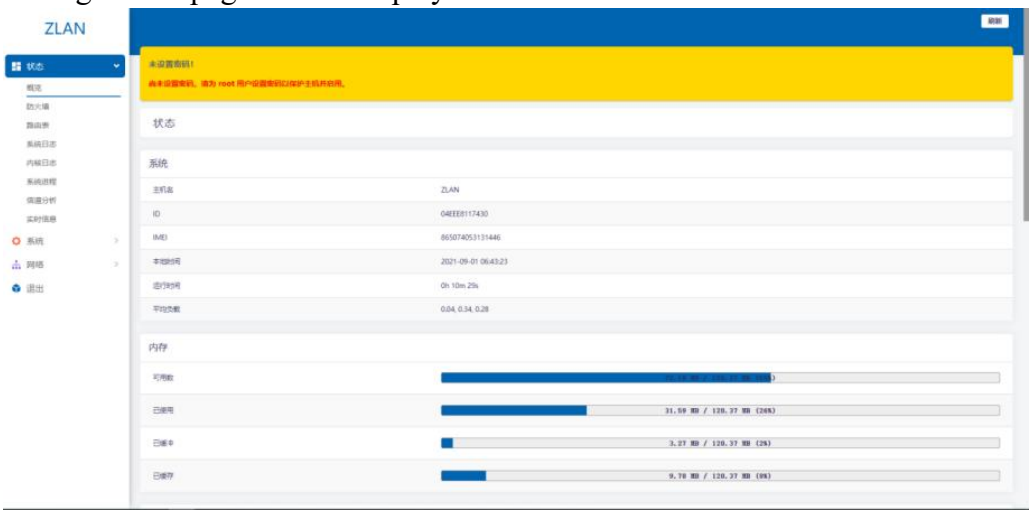

Figure 28 Communication mode configuration page

Click Network > Interface, you can see the existing interfaces of the device, mainly LAN port, WAN port, and WAN_4G port.

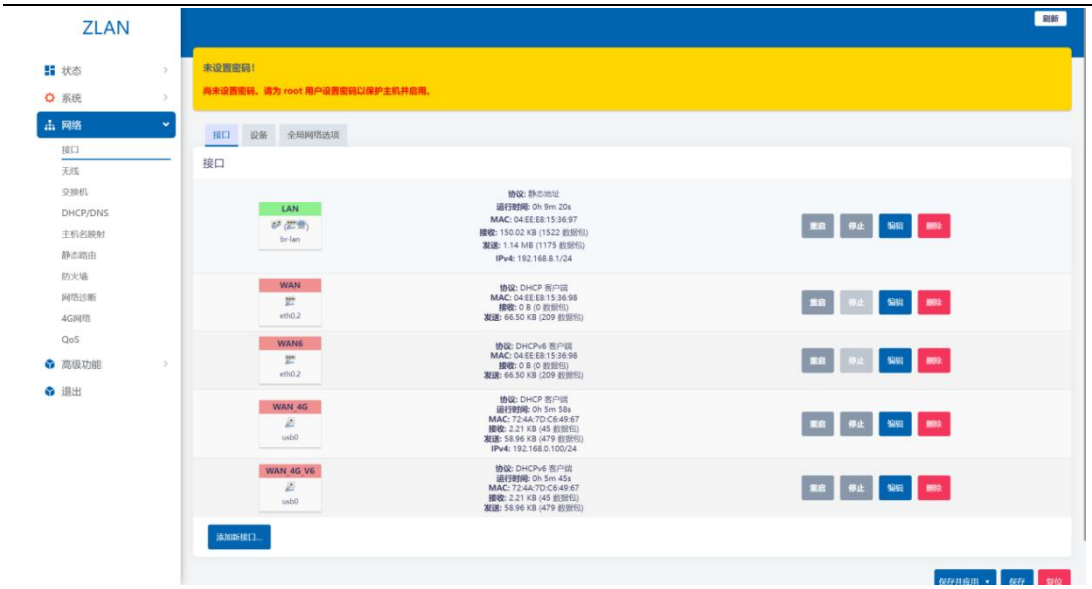

Figure 29Interface page

Initial configuration: Click the menu bar on the left side of the web page: Network -- > Interface, you can see the interface page as shown above. WAN Port mode The default mode is Wired priority mode, that is, WAN ports access the Internet through network cables. Related parameters can be viewed by clicking Network -- >4G network.

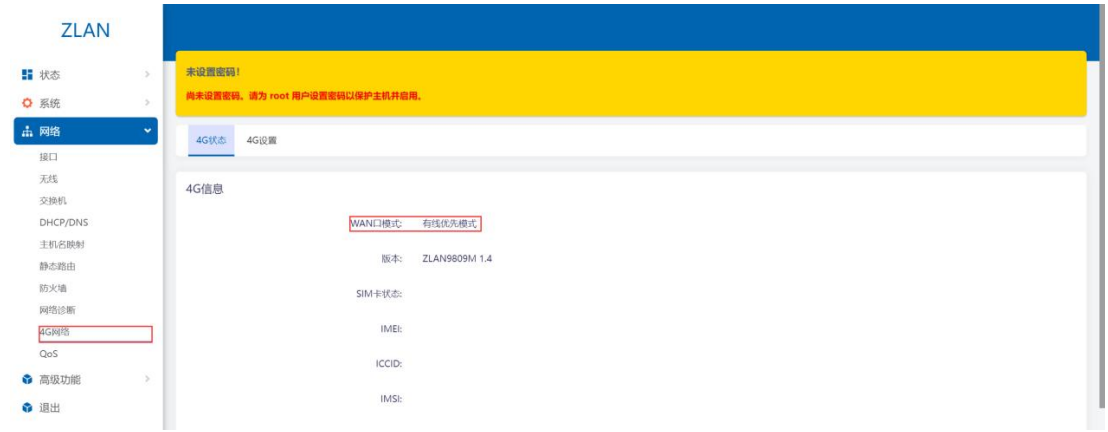

Figure 304G LAN status

6.1. Network cables connection

6.1.1. LAN port mode

If ZLAN8309S is used as a network port serial port server, you do not need to enter the route configuration page. Connect the LAN port of the 8309S to the company's local area network (LAN) using a crossover cable or a direct connection cable to communicate with other network devices in the LAN.

6.2. WiFi Connection

WiFi communication has two forms, the first WiFi relay: In the relay mode, the serial IP and LAN port of the 8309S device is in a subnet under the local area network.

The second kind of WiFi bridge: the serial port IP of the 8309S will be in the same network segment as other devices and the parent network of the LAN port.

6.2.1. WiFi Relay mode

Click the menu bar on the left side of the web page: Network -- > Wireless, you can see the wireless overview, 8309S device is equipped with a wireless network card in the 2.4G band.

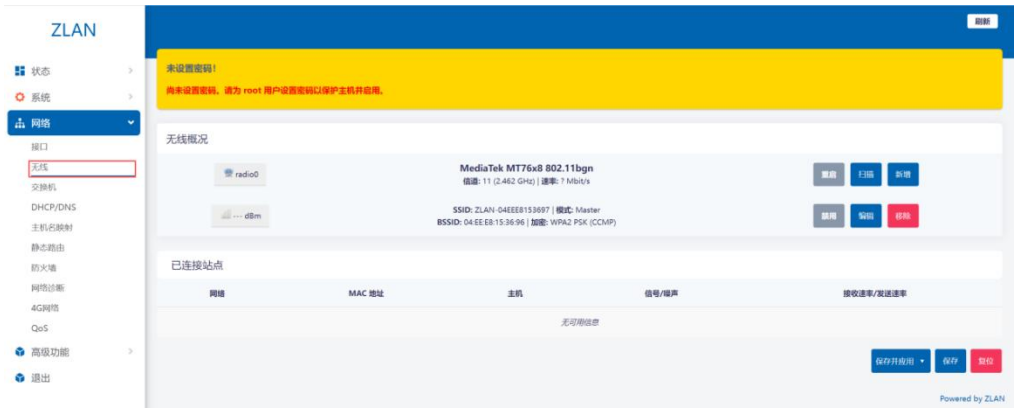

Figure 31Wireless summary

WiFi relay mode, that is, the 8309S accesses the upper-level network through the upper-level WiFi. Enter the communication mode configuration page, click the left menu bar: Network -- >WiFi, and click the scan button on the right of the network card：

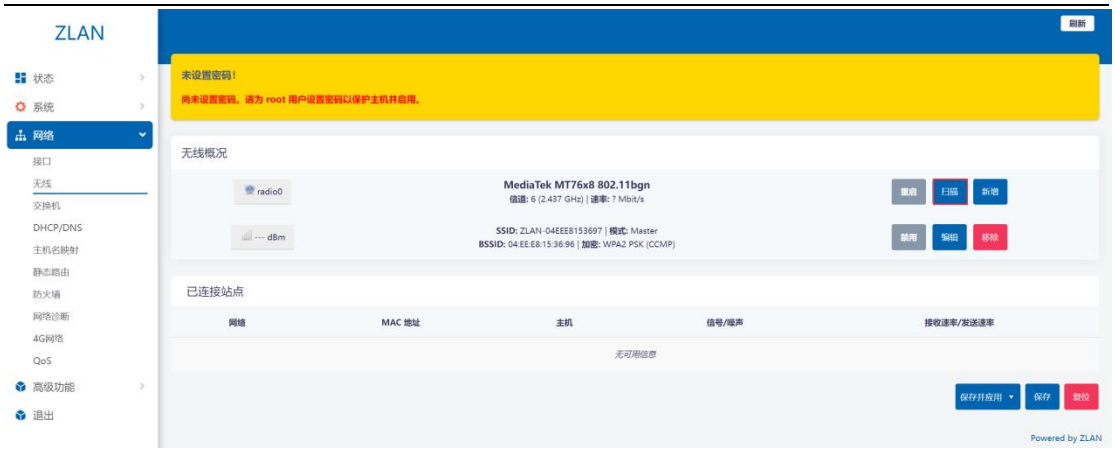

Figure 32 scan button

Step 2: Select the upper-level network you want to access on the open page and click Join Network.

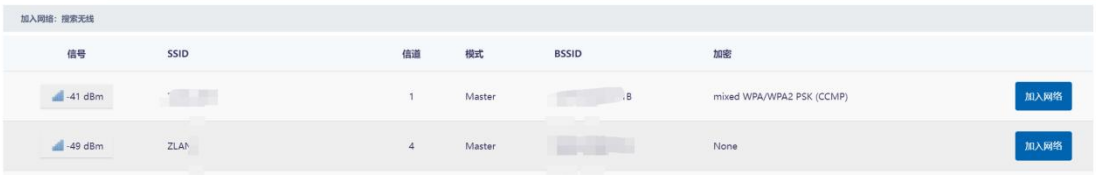

Figure 33 Add network

Step 3: Enter your upper-level network password on the open page, the default name of the new network interface is wwan, you can modify it yourself, and then click the Submit button in the lower right corner, the second interface will pop up.

Figure 34 Example Modify the name of a network interface

The second page has operating frequency, transmission power and other options.

If the WiFi version of the device to be connected is older and does not support 802.11/N, you can change the operating frequency to Legacy. Under normal circumstances, there is no need to set any parameters, just click Save.

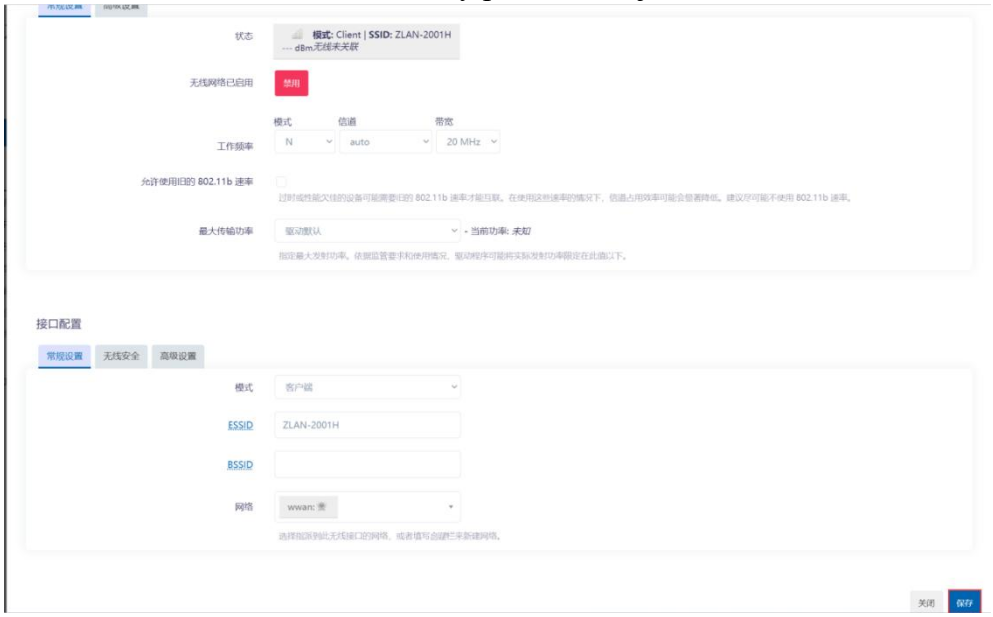

Figure 35 Interface configuration

Click Save and enter the page as shown in the following figure. You can see an additional mode in the wireless overview: Client wireless. The web page indicates that the interface has multiple unapplied changes. Click Save and apply them to take effect.

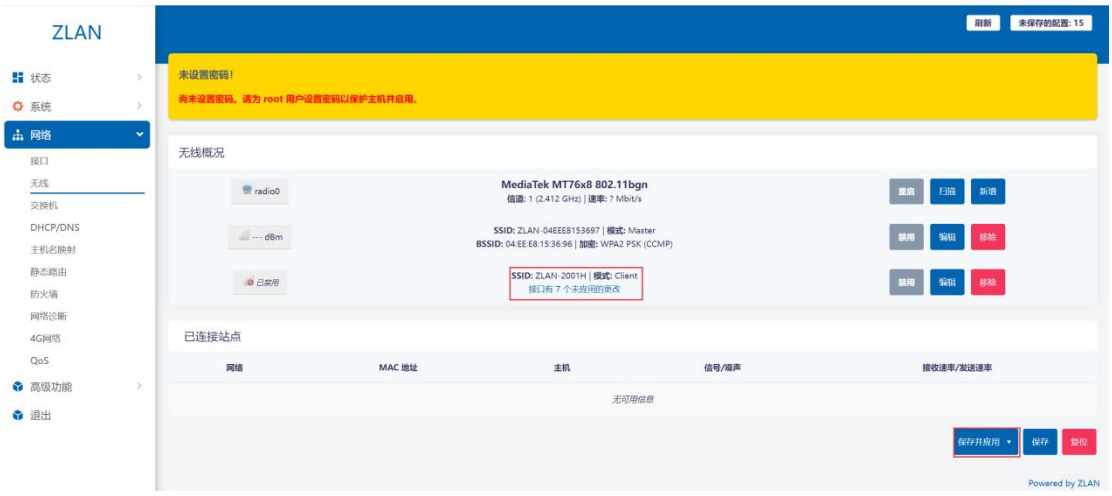

Figure 36 save button

Step 4: Click on the left menu bar: Network -- > Interface, then we can see the

newly added interface.

Figure 37 Interface page

Step 5: Click on the left menu bar: Network -- >4G Network -- >4G Settings: Set the WAN port mode to wired_mode: (if it is already there is no need to perform this step)

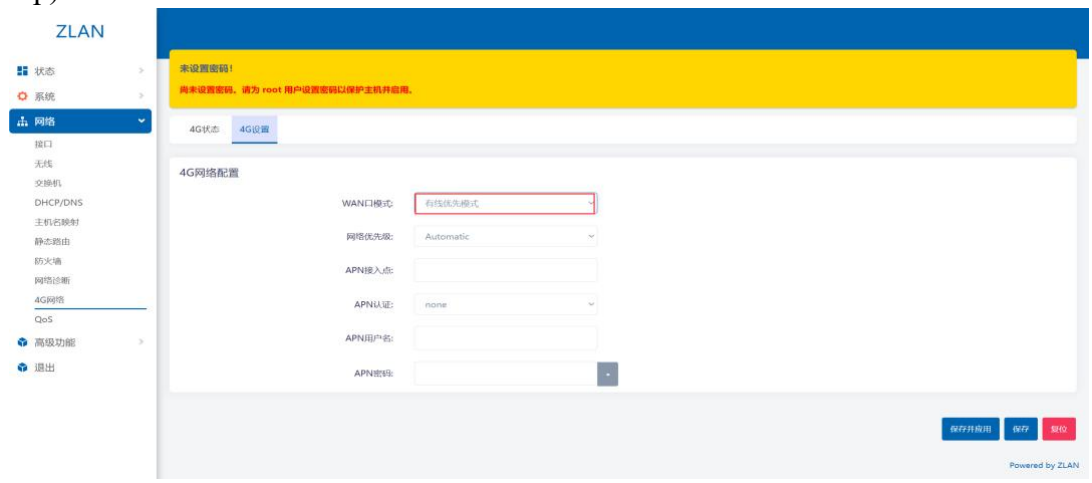

Figure 38 Cable connection mode

It is worth noting that the serial port IP of the 8309S is not in the same network segment as the WiFi upper-layer network.

6.2.2. WiFi bridge connection mode

If the serial port IP address of the 8309S and other LAN ports are in the same

network segment as the upper-layer network, set the WiFi mode to bridge mode.

Click Advanced Function -> Trunk, select trunk bridging mode, select the name of the AP to be brided, enter the password of the AP for the upper-level WiFi, and select the corresponding encryption mode. The IP address of the device should be set to an IP address in a different network segment from the upper-level network port：

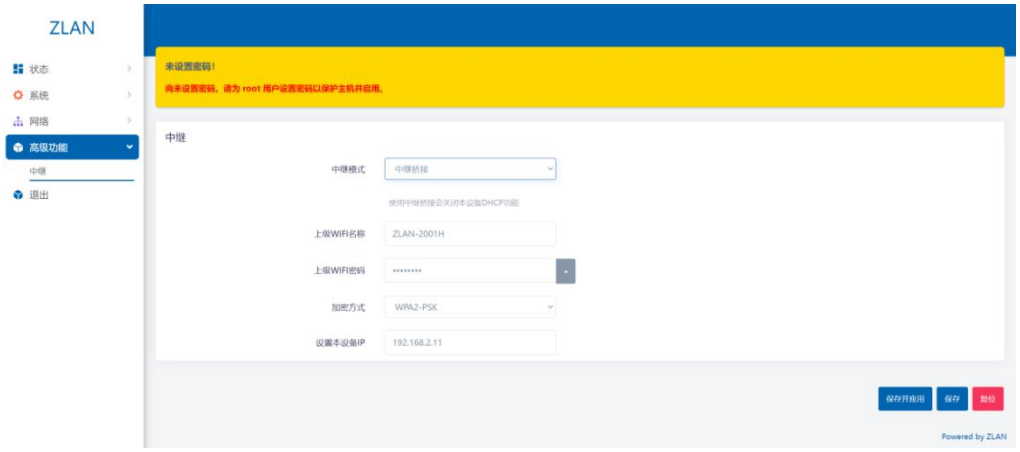

Figure 39 Advanced function

Step 2: Fill it out as required, click "Save and apply" in the lower right corner, and wait for the application to complete. After the relay is successful, menu bar: Network -> Wireless:

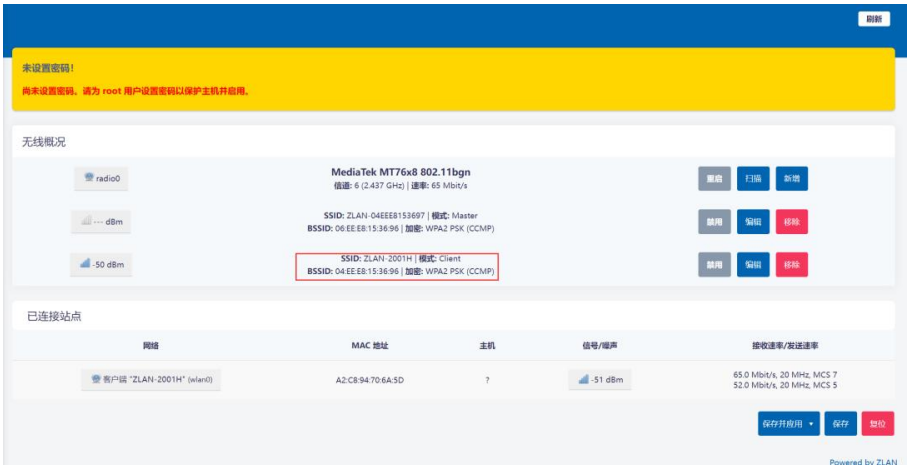

Figure 40 Relay wireless Overview

The upper-level WiFi is displayed here. If the encryption mode is also displayed, the connection to the upper-level WiFi is successful.

Then click on the menu bar: Network -> Interface. Check whether the relay

interface has an IP address. If an IP address exists, the relay is successful.

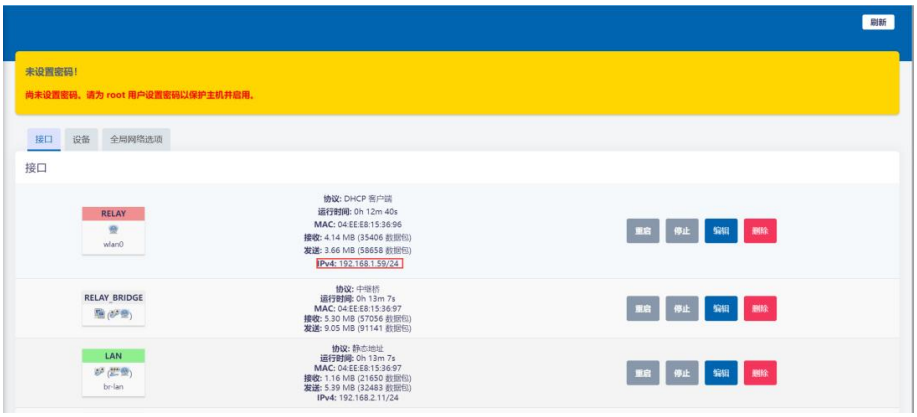

Figure 41 relay interface

After the configuration is complete, wait for 10 seconds. In this case, the 8309S can bridge to the upper-level AP over WiFi, and the serial port IP address of the 8309S can obtain the network segment assigned by the upper-level AP. It can communicate directly with the upper-layer network.

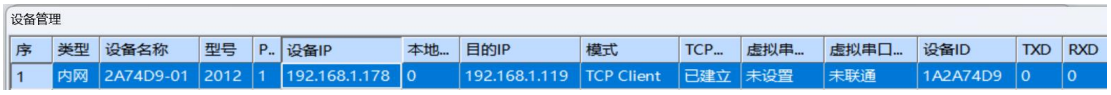

Figure 42 8309S serial port IP

6.3. 4G mode

In 4G mode, the ZLAN8309S accesses the external network by inserting a 4G SIM card.

4G mode supports APN (Access point name). Enter the APN name, authentication mode, user name, and password as required by the APN provider.

Step 1: Insert the SIM card and connect the 4G antenna.

Step 2: Click the left menu bar: Network -- >4G Network -- >4G Settings: Set the WAN port mode to 4G priority mode (if it is already, there is no need to perform this step) and click Save and set in the lower right corner.

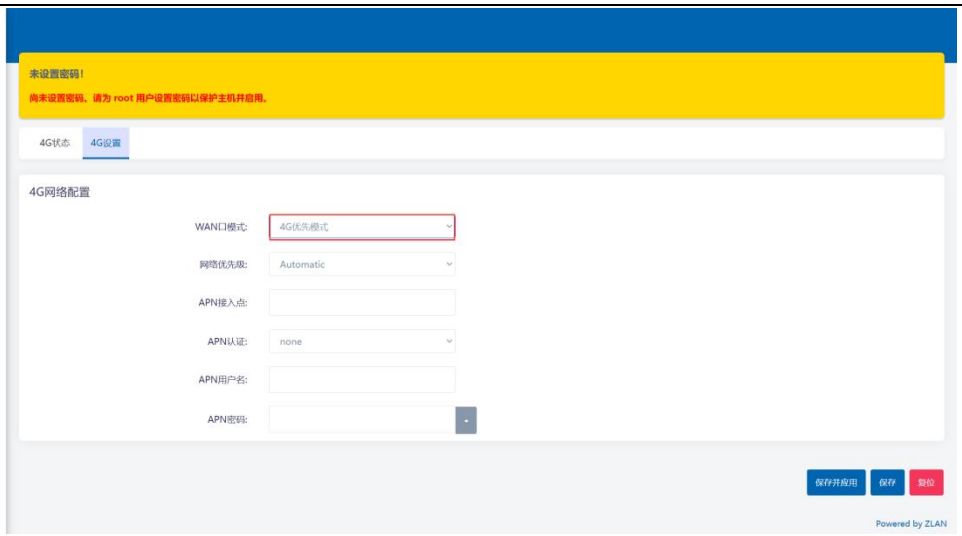

Figure 43 4G Priority mode

完成后 8309S 即可通过 4G 接入外网，8309S 的串口 IP 以及 LAN 口其它设备可以通过 4G 上网。

7. Modbus advanced function

Serial port server with Modbus gateway function itself does not have station address and register, it is a communication bridge, it will generate Modbus RTU specification according to the user software to Modbus gateway in the Modbus TCP instruction, function code, register number, register number, and output from the serial port. Think of it as a protocol "translator".

7.1. Start Modbus gateway

First of all, the serial port server should support Modbus gateway, that is, the function of "Modbus TCP to RTU" in the function supported by the device in Table 6 of the device setup dialog box should be checked.

By default, the serial port server is in common transparent mode. If you want to switch to Modbus gateway mode, select Modbus TCPRTU in Conversion Protocol. The device automatically changes Port to 502 (port of the Modbus server). The Modbus gateway is enabled.

When the serial port RTU device serves as the slave station, the Modbus TCP software on the upper computer connects to port 502 of the Modbus gateway, and the

Modbus gateway needs to work in TCP server mode. If serial port RTU is used as the primary station, the Modbus gateway works on the TCP client, and the destination IP address is the IP address of the computer on which the Modbus TCP software is installed. The destination port is usually 502.

7.2. Storage Modbus gateway

ZLAN8309S can save the contents of the read registers inside the gateway, so the speed of Modbus TCP query can be greatly improved, and the performance is better when supporting multi-host access.

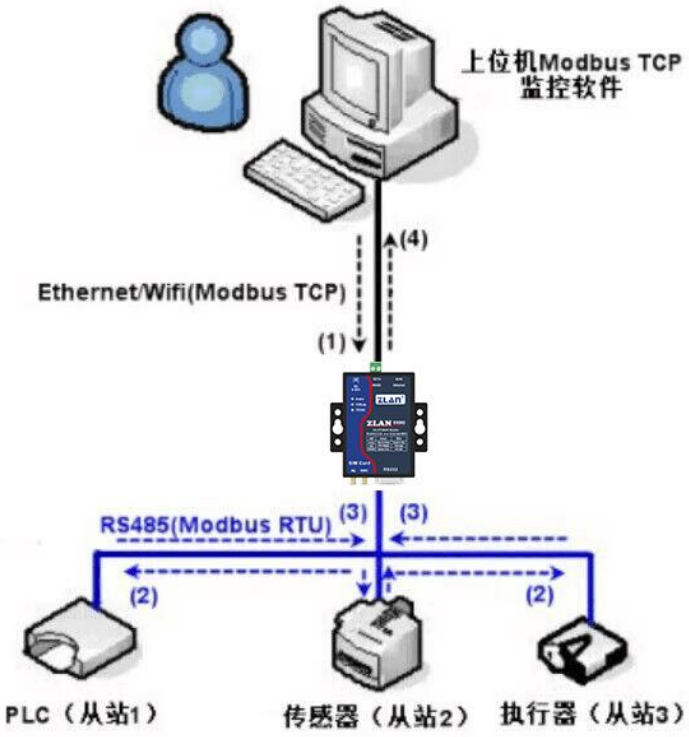

Figure 44Storage Modbus gateway working mode

As shown in Figure 44, the normal Modbus TCP data flow direction is (1) (2) (3) (4). That is, the Modbus TCP command is first converted into the corresponding command of Modbus RTU, and then the device responds to the Modbus RTU command to the Modbus gateway, and then the Modbus gateway is converted into Modbus TCP and sent to the monitoring host computer.

We know that Modbus TCP is a network communication, the transmission speed is very fast, generally within 3ms can answer, while Modbus RTU is RS485,

generally only 9600bps speed, generally send and return an instruction at least 30ms. In this way, the query response time of the common non-storage Modbus gateway is relatively long. In addition, if there are a lot of upper computers to query data at the same time, then the serial port will be congested. If the network is like a highway and the serial port is like a single-log bridge, then the original way is to pass the traffic of the highway on the single-log bridge.

Register-saving Modbus gateway solves the above problems. It can temporarily save the register data obtained by the query in the Modbus gateway, so that when the Modbus TCP query comes, the Modbus gateway can immediately return the command, and really bring the fast characteristics of Modbus TCP into play. On the other hand, ZLAN8309S can actively send instructions from the serial port to automatically update the data content of the currently saved register and save a copy of the latest register value.

In addition, the module is also a fully automatic configuration free Modbus gateway, the user does not need to configure the required register address, function code, slave station address, etc. The ZLAN8309S automatically identifies and dynamically adds these registers according to Modbus TCP instructions from the network port.

When monitored by multiple computers, ZLAN8309S can show good response speed, no matter what baud rate the serial port is, it can generally give the host response data within 3ms. And it shows a good speed of real-time update of serial data.

The register-saving Modbus gateway is the real Modbus TCP to Modbus RTU, which really plays the advantages of fast Modbus TCP and multi-host query at the same time.

Notice When the serial port server serves as the TCP client, it does not have the storage function and automatically switches to the non-storage mode.

The features of storage Modbus are listed below:

1. The first Modbus TCP query instruction is non-stored. Because you must wait for the RTU device to return the data slowly before you can return the register contents to

the network port.

2. If a specific command is no longer queried by the host computer on the network within 5 seconds, the command is automatically deleted and no longer sent from the serial port to the RTU device.

3. Currently, 10K Modbus cache can be stored, and about 500 instructions can be stored at the same time for ordinary single-register queries. When multiple instructions are queried at the same time, they are sent in order of priority, the first instruction is sent, the first instruction is answered and waits for 485 anti-conflict time (refer to the multi-host part), the second instruction is sent... . Do not return to the first command until the last command has been answered.

7.3. Disable the storage-type function

Although the memory Modbus has a fast response speed, some users do not want the RTU device to not want to receive a large number of query instructions, which affects the internal processing speed of the instrument. At this point, you can disable the storage function.

To disable storage type, click the "More Advanced Options" button in the "Parameter Configuration" dialog box and select Simple Modbus TCP to RTU. Then go back to device Settings and click Modify Settings.

Notice When you configure the conversion protocol in Web mode, it is a non-storage Modbus gateway by default.

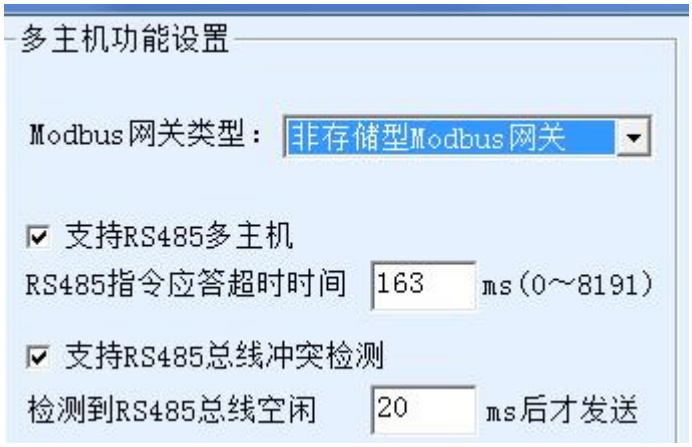

Figure 45 new version zlvircom setting

7.4. Multi-host function

As shown in Figure 45, "RS458 multi-host support" and "RS485 bus collision detection function" are the multi-host functions of Zlan. They are generally enabled and disabled simultaneously. After this function is enabled, the device whose protocol is converted to Modbus TCP has the function of a storage Modbus gateway; otherwise, it is a non-storage Modbus gateway. If the conversion protocol is none, the user-defined RS485 protocol can generally also have the function of a serial port device accessed by multiple hosts at the same time, which can not be achieved in a pure RS485 network, because multiple master stations send conflicts on the RS485 bus at the same time. The multi-host of Zlan serial port server can "coordinate" the RS485 bus to achieve the purpose of multi-host access.

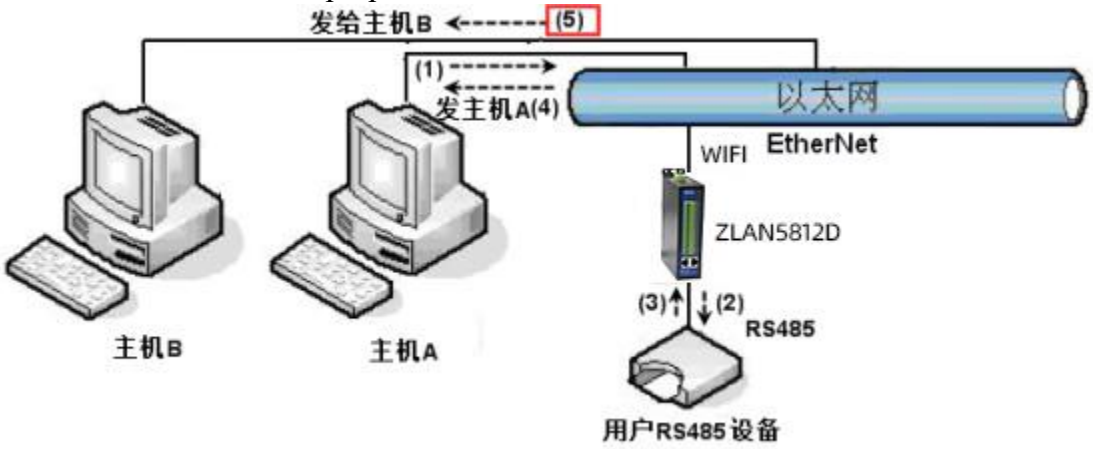

Figure 46Multi-host function demonstration

As shown in Figure 46, when two hosts: host A and host B are connected to the serial port server at the same time, host A sends (1) instruction, RS485 device receives (2) instruction, RS485 device returns (3) instruction, but the port end of the serial port server sends (4) to host A and (5) to host B at the same time. Because host B did not send the query, but it also received the reply instruction (5), host B may generate a communication exception error. In multi-host mode, there will be only instructions (4) and no instructions (5), because the serial server will automatically remember the host that needs to be returned, and only the command will be returned

to the most recent communication host, host A queries will only reply to A, host B queries will reply to host B.

Another effect is that in the ordinary mode, host A and host B send data at the same time will produce a combination of instructions on the RS485 bus, so that it can not be recognized normally; In the multi-host mode, the serial port server can schedule the sequence of A and B in using the bus, so as to effectively solve the conflict problem of multi-machine simultaneous access.

If the conversion protocol is set to None, the multi-host function is disabled by default. To enable multiple hosts, click More Advanced Options in the Device configuration dialog box and select RS485 Multi-Host Support.

7.5. Multiple host parameters

The meanings of RS458 Multi-host support and RS485 bus conflict detection are described as follows.

Figure 47 RS485 Multi-host support

The response timeout period of an RS485 command is as follows: Indicates the maximum interval between sending the command and receiving the response from the serial port on the server. The value must be greater than the actual maximum interval. Because if it is determined to be a timeout, the next instruction will be sent.

Figure 48 RS485 Conflict prevention idle time

RS485 bus collision time: indicates how many milliseconds the serial port server

waits to send the second command after receiving the reply of the first command. This parameter actually defines the speed of instruction rotations. The recommended value is above 20ms. Generally, you do not need to change the value of Maximum Wait time 3 seconds.

When the user uses ZLVircom to select the conversion protocol as "after Modbus TCP to RTU", ZLVricom will automatically check the above two enable boxes (unless the user manually enters the advanced option to remove), and the above two times will be automatically configured according to the baud rate. However, if the Modus command is long or the protocol is converted to None, you need to manually set the two parameters.

The following describes the recommended values for setting the above parameters:

1. Figure 48 shows the RS485 bus collision prevention time. Generally, you can set it to twice the value of Packet Interval in the lower right corner of the parameter configuration page, but the value cannot be less than 20.

2. Figure 47 shows the "RS485 command response timeout time", which is generally determined by the length of the command to and from the reply. If the send command is N bytes and the reply is M bytes, the recommended value is "Packet Interval" x (N+M+5) +100。

7.6. Non-storage multi-host

Some places must use non-storage Modbus, this is because when a certain event occurs to read the register data, but the read data is the data before the storage collection, which is logically incorrect, so it must also support non-storage Modbus collection. But on the other hand, it is also necessary to support multiple hosts at the same time, and you only need to select a non-storage Modbus gateway type.

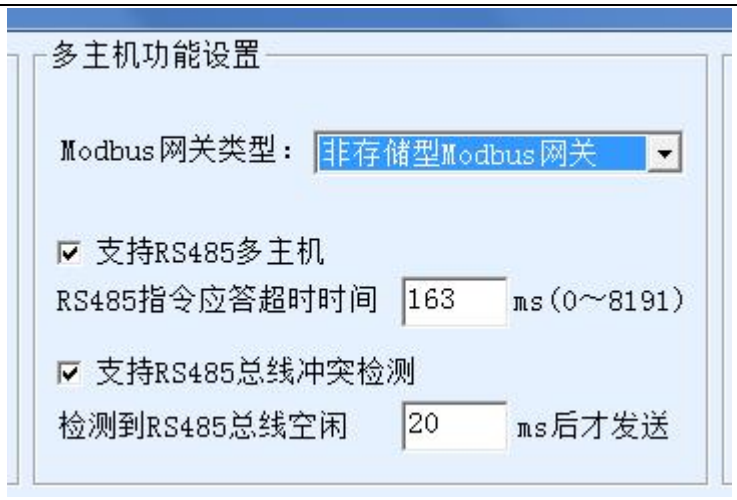

Figure 49 Multi-host non-storage Settings

7.7. Modbus for multi-destination IP addresses

As shown in Figure 46, if the serial port device (RTU device) acts as the primary station and the network port device (Modbus TCP device) acts as the secondary station, there are multiple network port secondary devices at the same time. In this case, you can use the method described in the section about Connecting a Client to multiple servers to enable the serial port server to connect to multiple network ports simultaneously as a client.

In this case, the following functions need to be implemented: When the serial port RTU sends commands to multiple network port devices, the network port device identifies whether to send commands to itself through the Slave ID field, and only the network port device corresponding to the Slave ID responds. After the network port response is sent to the serial port server, it is converted into an RTU command and sent to the RTU device through the serial port.

At this time, it should be noted that the two check marks "RS485 bus collision prevention time" as shown in Figure 48 and "RS485 command response timeout time" as shown in Figure 47 need to be removed. Otherwise, the preceding forwarding function cannot be implemented.

Another application method is: Although the serial port server is connected to multiple network port devices as a Client, the RTU device is not the master station, but the network port device sends first, and the RTU device replies (as the slave

station). In this case, the two checkboxes of RS485 bus Conflict Prevention time and RS485 command response timeout time need to be selected, so that multiple hosts can access an RTU device at the same time.

For the new version of ZLVircom, the above Settings can be completed by directly selecting "the device does the slave station for the client" in the Modbus gateway type.

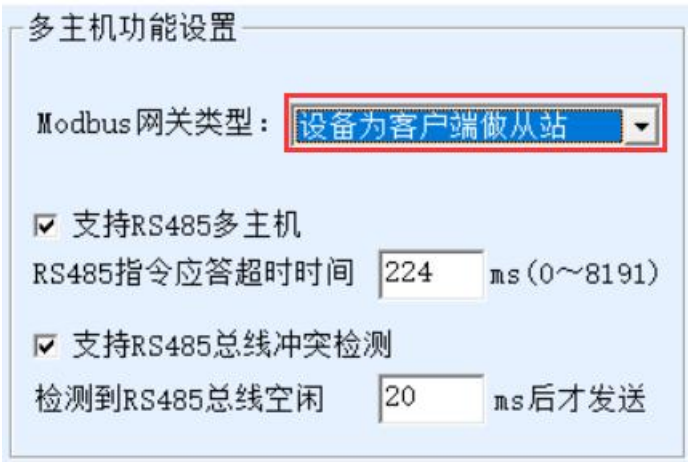

Figure 50 new version zlvircom setting

8. MQTT gateway

Please refer to the use of MQTT gateway function《MQTT gateway usage》 http://www.zlmcu.com/document/Usage_of_MQTT_Gateway.html。

《ZLAN MQTT and JSON to Modbus gateway usage》 http://www.zlmcu.com/document/MQTT&JSON_to_Modbus.html；

9. Modbus RTU/645 protocol to JSON

For Modbus RTU to JSON and related JSON usage， please take reference on 《JSON data collection gateway》 http://www.zlmcu.com/document/jsondata.html；

《ZLAN cloud and the use of acquisition equipment》 http://www.zlmcu.com/document/zlancloud.html；

《645 meter sends the method in JSON format》

http://www.zlmcu.com/document/645_Instrument_JSON.html；

《ZLAN MQTT and JSON to Modbus gateway usage》

http://www.zlmcu.com/document/MQTT&JSON_to_Modbus.html；

10. Router function

For routing functions of the 8309S, please refer to the 《9809M usage》 http://www.zlmcu.com/download/ZLAN9809M.pdf；

11. Secondary development function

ZLAN8309S is based on openwrt open source router system, version 21.02, users can go to the openwrt official website to download. However, due to the large number of errors in the compilation of native openwrt and the subsequent need for a large number of kernel modifications and Settings, in order to reduce the development time and difficulty of users, Zlan company provides a rapid development method, which allows users to directly use C language to write their own programs and use SCP protocol transmission to 8309S execution.

If there are related secondary development needs, please contact our technical personnel.

12. After sales and service

Shanghai ZLAN Information Technology Co., Ltd.

Address: Room 2001, No. 28 Yuanwen Rd., Minhang District, Shanghai, China

Phone: 021-64325189

Fax: 021-64325200

Web: http://www.zlmcu.com

Email: support@zlmcu.com