ZLAN5412D
Rail type 4Serial port server/Modbus Gateway

RS485 To TCP/IP

Modbus RTU To Modbus TCP

ZL DUI 20230830.1.0

The following modifications have been made to the document:

Change log

Date	Version number	Document number	Modify content.
2023-8-30	Rev.1	ZLDUI 20230830.1.0	Release version

CATALOGUE

1. Overview

The ZLAN5412D is an industrial-grade rail-mounted 4-serial port server that integrates multiple functions such as a data collector/iot gateway, Modbus gateway, MQTT gateway, and RS485 to JSON conversion.

The device is equipped with 2 Ethernet ports and 4 485 serial ports. The two Ethernet ports of the ZLAN5412D have the function of a switch. The four serial ports of ZLAN5412D can use the same IP address, and different serial ports are distinguished by ports. It is also possible to use different IP addresses for each serial port. The parameters corresponding to each serial port can be set independently. It features rich functions, fast operation speed and stable performance.

The equipment supports a wide voltage range of 9 to 24V, with terminal power supply connection and a grounding wire for the casing.

Figure 1 ZLAN5412D serial port server

The ZLAN5412D adopts a rail-mounted design and comes with a built-in rail snap on the back. It also comes with the two installation lugs above. The lugs can be installed horizontally or vertically, respectively suitable for installation on the back panel or the desktop.

The ZLAN5412D supports 2 stop bits, supports data bits less than 8 bits (for example, 7 bits of data with 1 stop bit), and supports a baud rate as high as 921.6Kbps.

The ZLAN5412D can achieve the conversion of four TCP/IP protocols to RS485, with all four working simultaneously and configurable for different baud rates. Data collection from 485 devices can be achieved through the network. The network end can use virtual serial port to connect to serial port software or direct TCP/IP communication software. The ZLAN5412D comes with two 10M/100M network ports and can be connected to either one. The other network port can be cascaded through network cables to achieve multiple ZLAN5412Ds, which can be cascaded into 8 serial ports or 16 serial ports.

The ZLAN5412D supports the function of converting Modbus RTU to Modbus TCP and has the characteristics of a story-type Modbus gateway. Of course, it can also be used as a non-storage Modbus gateway.

ZLAN5412D can be applied to:

- Power electronics, intelligent meters and energy consumption monitoring;
- As an iot gateway, it serves as a communication bridge between devices and the cloud.
- Remote monitoring and program download of various types of automated PLCS;
- Communication interfaces for various configuration software and devices;
- Equipment networking in the field of access control and security;
- Networked information collection of medical equipment

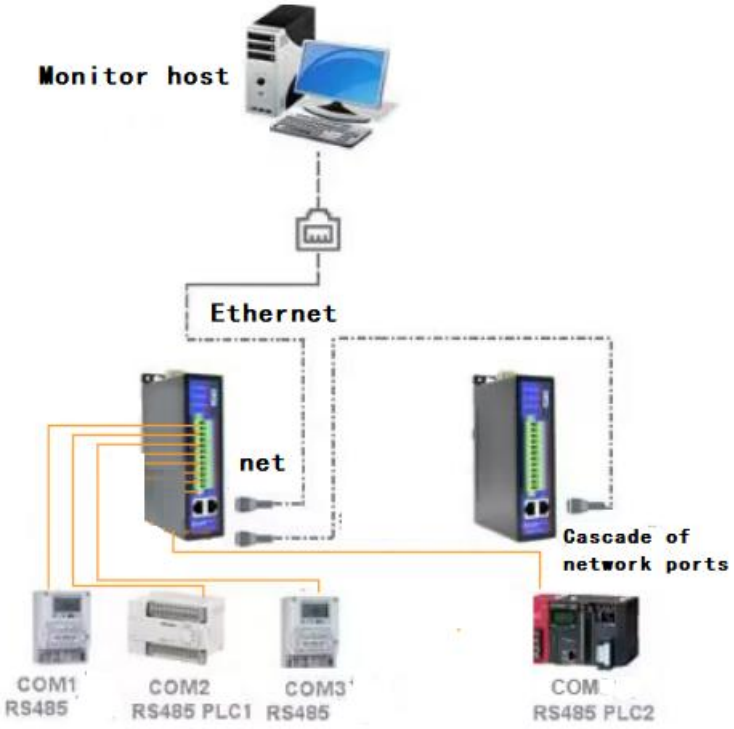


Figure 2 Connection schematic diagram

The typical application connection is shown in Figure 2. The original serial port device is connected to the serial port of the ZLAN5412D, and the ZLAN5412D is connected to the computer via a network cable. The software on the computer establishes a connection with the ZLAN5412D via TCP/IP or virtual serial port. After that, any data sent by the serial port device will be transparently transmitted to the software of the computer, and the data sent by the software to the ZLAN5412D through the network will also be transparently transmitted to the serial port device.

2. Functional features

2.1 Functional features

The ZLAN5412D has the following features:

1. Three installation methods are available for selection: rail-mounted installation, backplane hanging ear installation, and desktop hanging ear fixed installation. It is particularly suitable for the installation of industrial guide rails. Due to its narrow transverse width, it can save installation space and make installation and

disassembly more convenient.

2. Industrial-grade power supply method: Terminal block connection method, convenient for use in industrial Settings. It can be powered by a wide voltage range of 9 to 24V. Grounding wire with casing, effectively diverting interference and surges.
3. The ZLAN5412D features a dual network port design, supporting the cascading of serial port servers, and can be expanded to 8 serial ports, 16 serial ports, 24 serial ports, etc.
4. Rich panel indicator lights for convenient debugging: In terms of connection, there is not only the 100M_LINK light indicating whether the network cable is properly connected, but also the LINK light indicating the establishment of a TCP connection; For the data indicator lights, there are independent indicator lights for "serial port to network port" and "network port to serial port". It is convenient for on-site debugging.

2.2 Software Functions

1 The four serial ports can be configured for different baud rates and operate independently without interfering with each other.

2 Support IP "clone" technology: Different serial ports can be distinguished by ports or IP addresses. Port distinction: Four ips can be combined into one IP. Different ports make it suitable for networks with a shortage of ips. IP distinction: One IP becomes 2 to 4 ips, with the same ports, suitable for applications with fixed port numbers (for example, port 502 of Modbus TCP needs to be fixed).

3 Supports TCP server, TCP client, UDP mode and UDP multicast. When acting as a TCP client, it also supports the functions of the TCP server side. As a TCP server, it supports up to 30 TCP connections, and as a TCP client, it supports 7 destination ips.

4 Supports virtual serial ports and is equipped with Windows virtual serial port & device management tool ZLVircom.

5 Support the function of sending MAC addresses when devices are connected, facilitating cloud management of devices.

6 Provide a secondary development package DLL development library for searching and configuring devices on the computer end.

7 Support Web browser configuration, support DHCP dynamic acquisition of IP, and DNS protocol connection to domain name server addresses.

8 Support remote cloud search for devices, configuration of device parameters, and device program upgrades.

2.3 High-level software functions

The 5412D supports advanced software functions, including:

1 Support Modbus gateway function and support Modbus RTU to Modbus TCP conversion. It can support storage-type Modbus, automatically collect device data and store it. It also supports Modbus gateways in non-storage mode.

2 Support for multi-host function: Under the question-and-answer query mode, it supports the network port end to allow multiple computers to access the same serial port device simultaneously.

3 Supports custom heartbeat packet and registration packet functions: Facilitates communication with the cloud and device identification.

4 Supports Modbus RTU/DLT645/DLT698 to JSON conversion, and the 4 serial ports support different acquisition modes.

5 It supports MQTT connection, various public cloud data transmission and other features, and simultaneously supports different MQTT connections with 4 serial ports.

3. Technical parameters

Table 1 Technical Parameters

Shape	
Interface:	485：Terminal block
Power supply:	Terminal block method
SIZE：	L x W x H =150mm×105mm×41mm（The shell size, excluding the interface）
Communication interface	

Ethernet	10M/100M，2 KV-level surge protection		
Serial Port:	RS485×4：485A、485B		
Serial port parameters			
Baud rate	300~921600bps	Location verification:	None, odd check, even check, mark, space
Data bit:	5～9 bits	Flow control	Soft current control XON/XOFF, no current control
Software			
Agreement:	ETHERNET、IP、TCP、UDP、HTTP、ARP、ICMP、DHCP、DNS		
Configuration method:	ZLVirCOM tool, WEB browser (customizable web pages), device management function library, serial port AT command configuration, device cloud management (Zhuolan Cloud)		
Conversion Agreement:	Modbus TCP, MQTT, JSON, RealCom protocol, HTTP		
Modbus gateway	Supports multi-host mode, storage mode, and pre-configured table (ZLMB) mode		
Communication method:	TCP/IP direct communication and virtual serial port mode		
Working mode			
TCP server, TCP client (and TCP server coexist at the same time), UDP, UDP multicast			
Power supply requirements			
Power：	9～24V DC，60mA@12V（ZLAN5412D）		
Environmental requirements			
Operating temperature:	-40~85℃		
Storage temperature:	-45~120℃		

Humidity range：	5~95%Relative humidity

4. Instructions for Use

4.1 Hardware Specifications

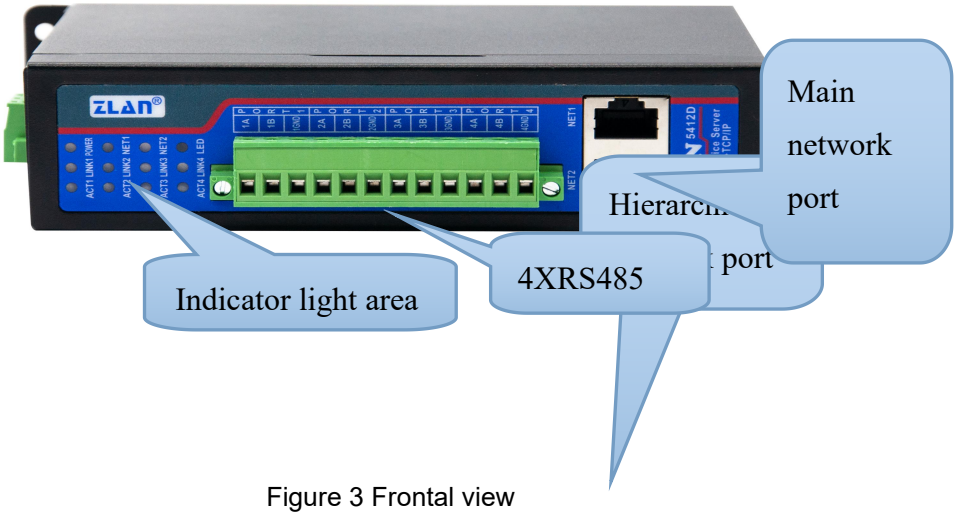


Figure 3 Frontal view

The front view of the ZLAN5412D serial port server is shown as above. The casing is made of black anti-radiation SECC metal.

1 **Power input**： The terminal block is a 5.08mm terminal, V+ is connected to 9 ~ 24V, V- is connected to GND, and there is also an enclosure ground. The required power supply capacity is 1W.

2 **RS485**： There are a total of 4 RS485 channels, among which 1A and 1B are the first group. 1A represents the positive line of 485 and 1B represents the negative line of 485. The longest communication distance is 1,200 meters. Generally, terminal resistors are only necessary when the RS485 line exceeds 300 meters. The terminal resistance of 485 is 120 ohms.

3 **Network port**： Connect 10M/100M network cables and support automatic crossover. The indicator lights corresponding to the main network port and the

level network port are NET1 and NET2 respectively. There is no difference between the two network ports in other aspects.

Figure 4 Indicator Light

4 **指示灯：** It is divided into POWER, NET, LINK and ACT lights, representing power supply, network port indicator light, connection indicator and data indicator respectively.

Table 2 Meanings of Indicator Lights

POWER	The power indicator light. Red indicates that it has been powered on.
NET1~2	（1） Not lit: There is no network cable connection between network Port 1 and Network Port 2. （2） Green: Green constantly on: Normal network access
LINK1~4	（1） Not lit: TCP has not been established. （2） Green: When a TCP connection is established (or in UDP mode), the Link is green. It can be used to determine whether the serial server has established a communication link with the upper computer software.
ACTIVE1~4	（1） Green: When the network port sends data to the serial port, the indicator light is green. The flashing time is delayed by one second compared to the actual communication time, making it more

	convenient to detect short data communications. （2） Blue: When data is sent from the serial port to the network port, both the blue and green indicator lights are on simultaneously. Since blue is relatively bright, if you see blue, it indicates that there is data returning from the serial port to the network port. This can determine whether the device responds to the commands of the upper computer. If there is no response, it indicates that the serial port baud rate is incorrect or the serial port is not properly connected.

Debugging communication method using indicator lights:

1) If the NET light is not green, it indicates that the network cable is not properly connected. Please check the network cable.
2) If the Link light is not green (only considering the TCP working mode), the upper computer software has not established a connection with the serial server. Please consider whether the IP addresses are configured in the same network segment.
3) If the Active light is green, it indicates that data is sent from the network port but no serial port device is returning data. Please check whether the baud rate is configured properly and whether the positive and negative terminals of RS485 are connected in reverse.

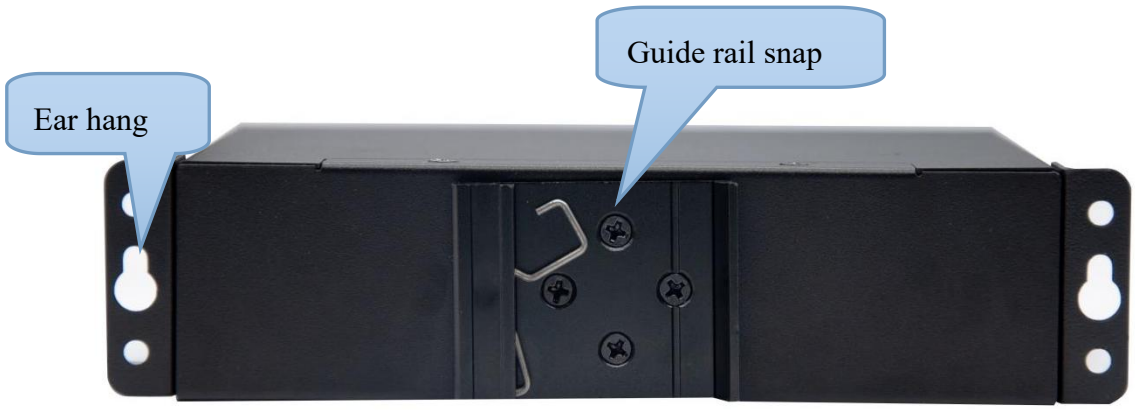


Figure 5 Rear view

The rear view of the ZLAN5412D serial port server is shown in the above picture, and it supports the installation of rail clips and lug accessories.

4.2 Hardware Connection

Generally speaking, a serial server only needs to be connected to the power supply, serial port and network cable.

Among them, the power supply can adopt the configured 12V power adapter or the on-site 2-wire power supply, which can be directly connected to the positive and negative terminals of the power supply.

Connect the positive 485 of the RS485 device to TA and the negative 485 to TB.

The network port can be connected to a regular network cable. It can be directly connected to a computer or connected to the network through a 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 1 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. 64-bit operating systems install x64, 16-bit operating systems install x86 versions.

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

The following is an introduction to how to quickly batch edit multiple serial port devices. The ZLVircom version for configuring ZLAN5412D needs to be greater than or equal to 6.41. Please pay attention to the version

Figure 6 Version confirmation of ZLVircom

After the ZLVircom is installed and the hardware connection of the device is completed, run the ZLvircom software as shown in Figure 7, and then click "Device Management" as shown in Figure 7. Using ZLVircom, it is very convenient to search for and configure device parameters within different network segments, as long as the device and the computer running ZLVircom are under the same switch.

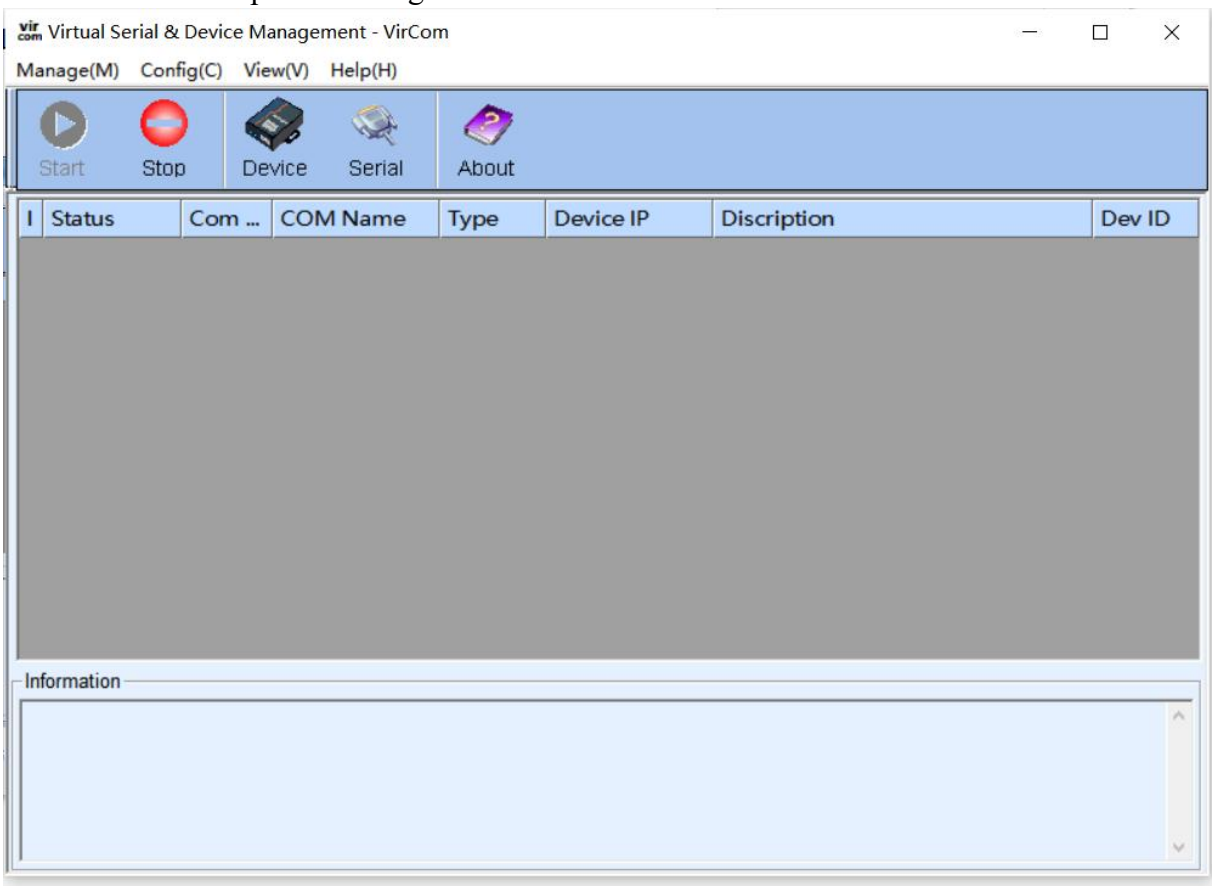


Figure 7 Main Interface of ZLVircom

The list of devices with four ports found can be seen. So it is necessary to sort by name so that different ports of the same module are in consecutive areas. The sorting

method is to click on "Device Name" in the title bar. When leaving the factory, the PORT of each device has been named ECF78C-01 to ECF78C-08. The ECF78C on the left is the ID of the device, that is, the last six digits of the ID of the first PORT. -01 to -08 indicate which PORT it is. Since the device name can also be modified, if the name has already been changed, you can see through the "PORT" list in the list that the PORT number of the device is 1 to 4.

Figure 8 List of devices

After sorting, the four ports of this module have been arranged consecutively. At this point, drag the mouse downward from the selection of the first device ECF78C-01 until all the devices of the four ports are selected. Then click "Batch Editing". "Batch editing" will enable all four ports to be modified at once and have the correct IP and ports.

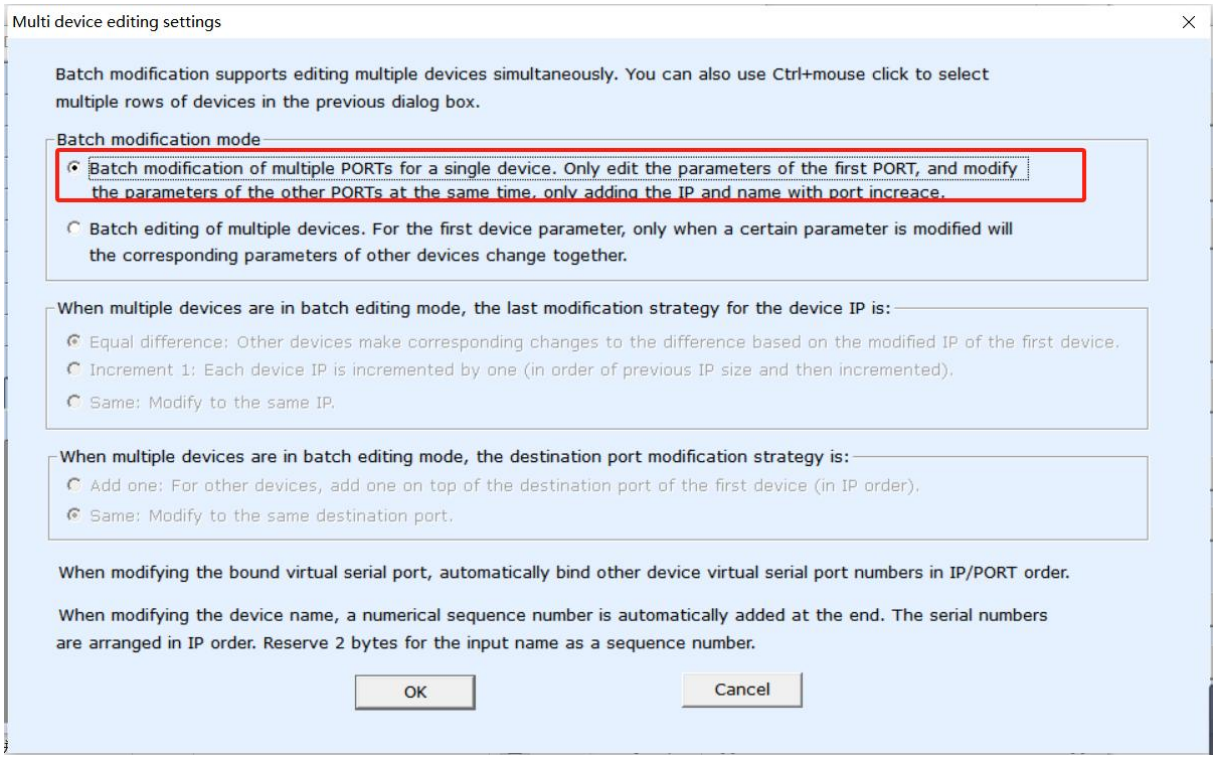


Figure 9 Batch Setting options

Since all ports from 1 to 4 were selected, the software recognizes the one-time modification of all ports of this module, as shown in the above figure. When choosing the batch modification method for the four ports of a single module, there is no need to modify the content of the parameter dialog box. You can directly click "Modify Settings" to continue the modification. At this time, although the device parameters of PORT1 have not been modified, the other 2 to 4 ports selected will be modified to the device parameters of PORT1.

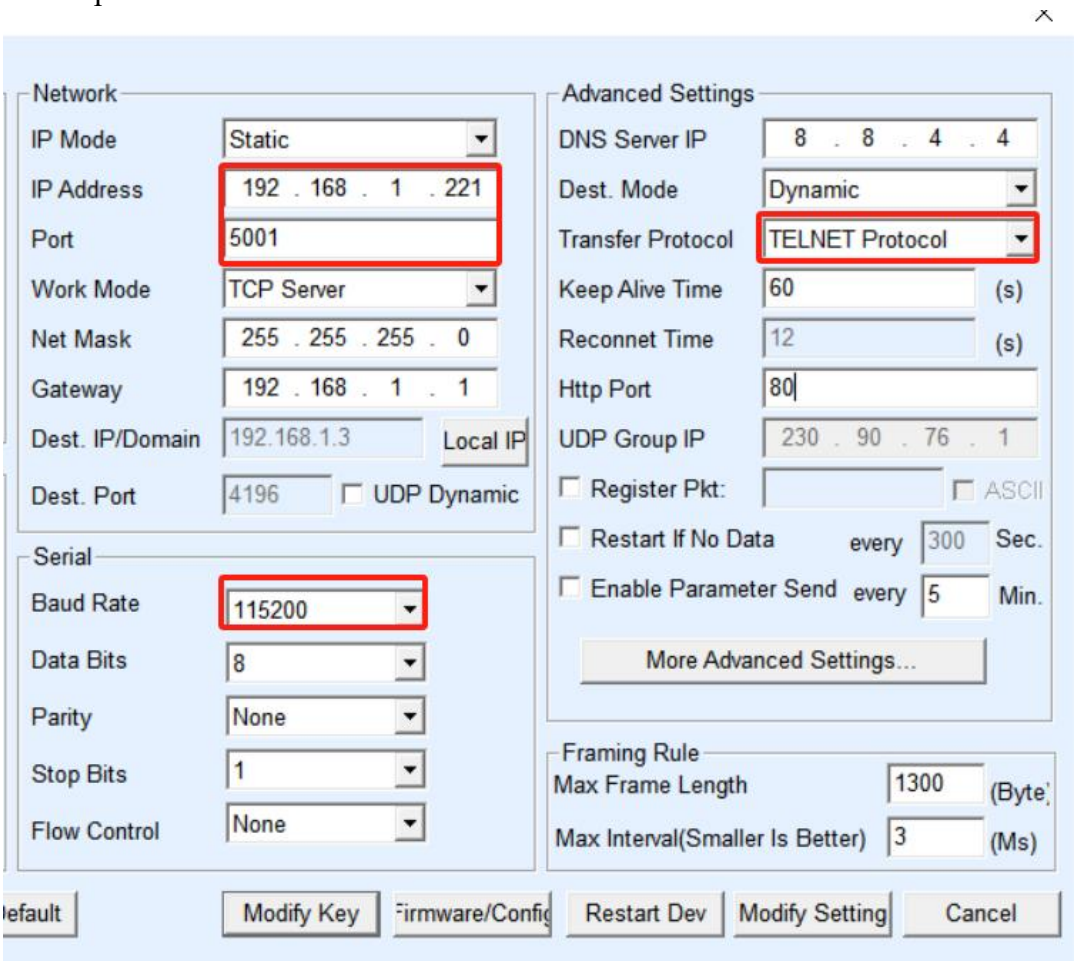


Figure 10 Parameter Dialog box

In the parameter dialog box, users can choose to modify parameters such as baud rate. If it is TELNET to serial port conversion, please select the TELNET protocol. Among them, ECF78C-01 is automatically filled in by the software based on the PORT ID and does not need to be filled in by the user. The IP address 192.168.1.221 is the first IP address, and PORT 5001 is the port number of the first port. Then click

the "Modify Settings" button. The software can modify four ports in batches at one time.

Different ports of the same module can also be set to different ips. However, if the ports are not fixed and the IP needs to be modified, it is not recommended to use multiple ips. Here is an introduction on how to change it to one PORT with multiple ips.

First, select the PORT number that needs to be modified, and then click "Batch Editing".

Figure 11 Multi-IP modification Step 1

In the batch modification configuration, cancel the "multiple ports for a single device" mode and change it to "Batch editing for multiple devices". This mode will not intelligently recognize IP addresses and ports.

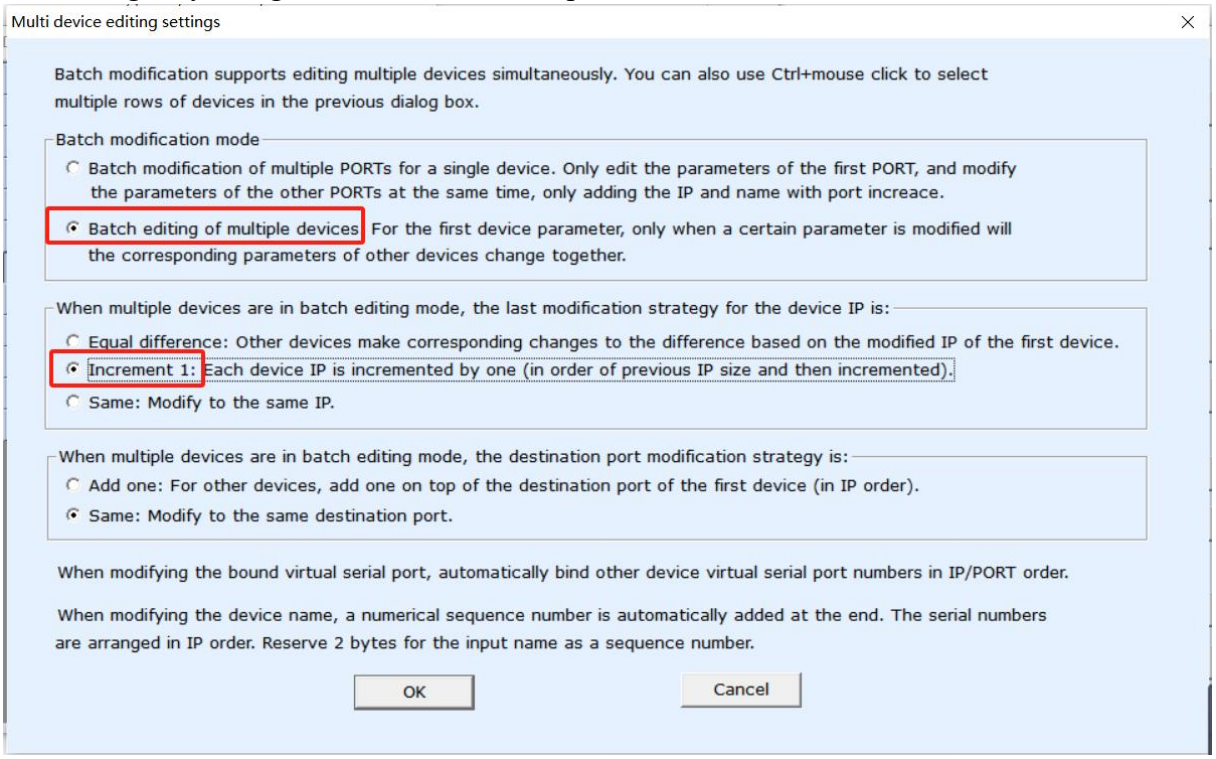


Figure 12 Multi-IP modification Step Two

In the IP mode, select "Increase by one", that is, according to the first IP set, the subsequent ips will automatically increase by one.

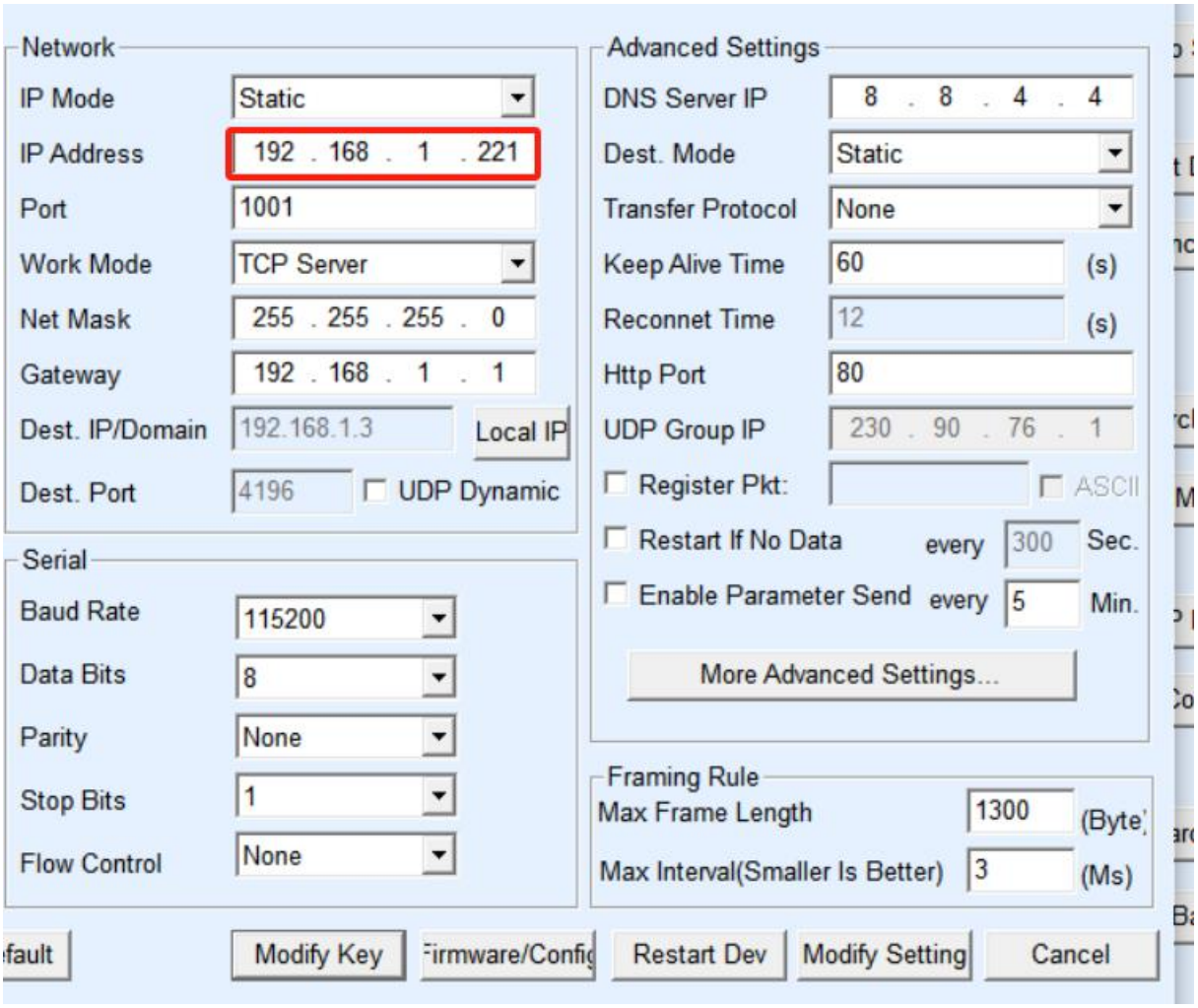
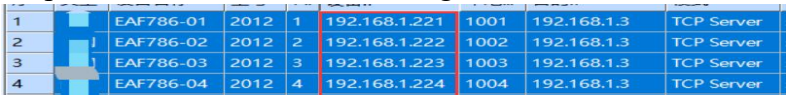


Figure 13 Multi-IP modification Step 3

In the parameter modification dialog box, be sure to modify the IP address. If not, no operation will be performed. Because this mode will only modify the changed parameters, the parameters that remain unchanged will not be affected.



1	EAF786-01	2012	1	192.168.1.221	1001	192.168.1.3	TCP Server
2	EAF786-02	2012	2	192.168.1.222	1002	192.168.1.3	TCP Server
3	EAF786-03	2012	3	192.168.1.223	1003	192.168.1.3	TCP Server
4	EAF786-04	2012	4	192.168.1.224	1004	192.168.1.3	TCP Server

Figure 14 Results of multi-IP modification

Judging from the modification results, the IP addresses have now become 4, ranging from 192.168.1.221 to 192.168.1.224.

4.5 Detailed Parameter Meanings

Since the functions and parameters of each of the four serial ports are independent and similar, the subsequent parameters will only introduce the parameters of one of the serial ports. The detailed meanings are as follows:

Table 4 Parameter Meanings

Parameter name	value range	Contents
virtual serial port	none, created virtual serial port	You can bind the current device to an existing virtual serial port. Add a COM port in Serial Port Management on the home screen.
Device model		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		factory unique ID, cannot be modified.
Firmware version		Firmware version of the core module
Functions supported by the device		See Table 3 for features 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 the TCP server to listen for incoming connections on the port. In this case, the local port number used by the TCP client to connect to the server is Port +1000.
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	For eg.：255.255.255.0	The subnet mask must be the same as that of the local LAN.
Gateway	For 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、600、1200、2400、4800 、 7200 、 9600 、14400、19200、28800、38400、57600、76800、115200 、 230400 、	Serial port baud rate

	460800、921.6K	
Digit bits	5、6、7、8、9	
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	Only available for RS232 serial port
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 , dynamic	TCP client mode: In static destination mode, the device automatically restarts after five consecutive failed attempts to connect to the server.
Transfer protocol	NONE 、 Modbus TCP<->RTU 、 Real_COM、TELNET	NONE indicates that data is transmitted 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. The TELNET protocol allows the network to log in to our device through TELNET to communicate with

		the 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, when the connection fails, the TCP connection is re-initiated to the computer at disconnection Reconnection time intervals. 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	Default is 80
Multicast address		Under 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。
Digit 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 explained as follows:

Table 5 Functions Supported by the device

Name	Specifications
Domain name system	The destination IP address can be a domain name (such as the first 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 acquisition IP	Support DHCP client terminal protocol
Multi TCP connection	The TCP server supports more than one TCP connection.
UDP broadcast	UDP broadcast
Multi purpose IP	As a TCP client, seven destination IP addresses can be connected at the same time.
P2P function	Supports the function of accessing devices in any network through P2P traversing technology. Models ending in N support this function.
TELNET function	Connect to the Zlan serial port server through Telnet to monitor the serial port of the device.

4.6 Modify the parameters without restarting

Since PORT1 to PORT4 belong to the same module, generally, modifying the parameters of one PORT will restart the entire module. However, the following modification will only restart this PORT, while other ports of this module will not be affected.

1. Just clicking the "Restart Device" button without modifying any parameters.
2. The conversion protocol switches between "none" and "TELNET protocol".
3. Only modify one or more of the following parameters:
   a) Local port, destination port
   b) Baud rate, data, check bit, flow control, stop bit
   c) Device name, data packet interval, data packet length

4.7 TCP Communication Test

Since the functions and parameters of each of the four serial ports are independent and similar, the subsequent communication introduction will only introduce the configuration of one of the serial ports.

After configuring the device parameters, TCP connection communication tests can be conducted using serial port tools and TCP debugging tools.

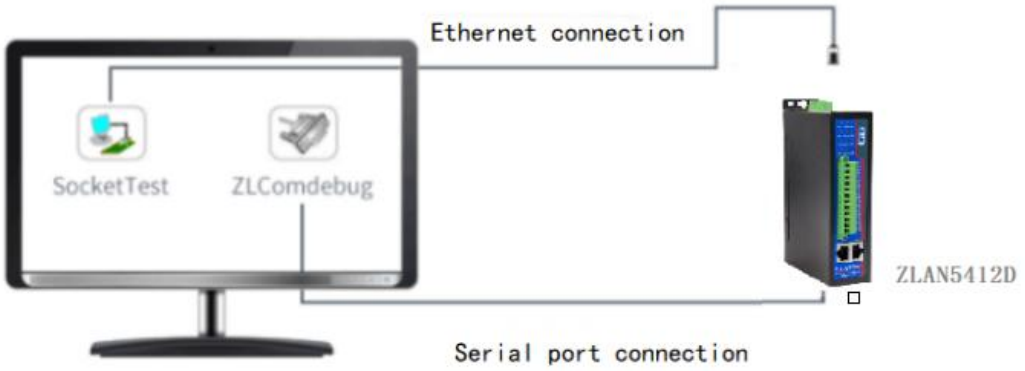


Figure 15 Schematic Diagram of TCP communication

Assuming the PC COM port (USB turn RS485 lines) and serial port serial port server connection, then open the ZLComDebug (http://www.zlmcu.com/download/Comdebug.rar) serial debugging assistant, figure 16, and open the corresponding to the COM 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 (currently 192.168.1.221), The destination port is 5001, and then click the "Open" button as shown in Figure 17. In SocketTest, enter "socket send" and click Send. Then the data will be transferred to the RS485 interface through the network port of the serial server, and then sent to ZLComDebug, and then displayed in ZLComDebug. Conversely, in ZLComDebug, enter "Comdebug send", click send, and it can also be sent to socket test and displayed.

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

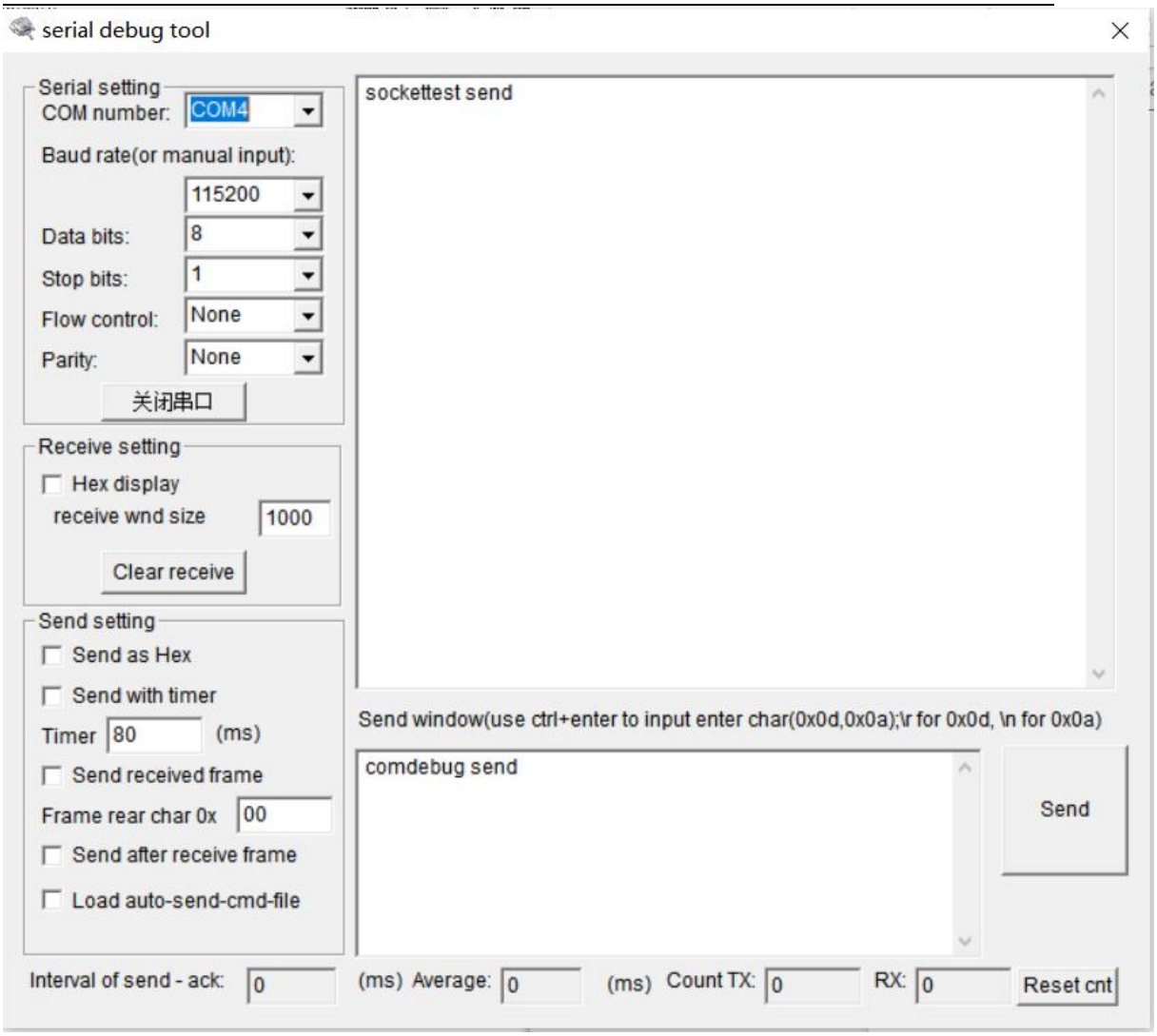


Figure 16 comdebug transceiver interface

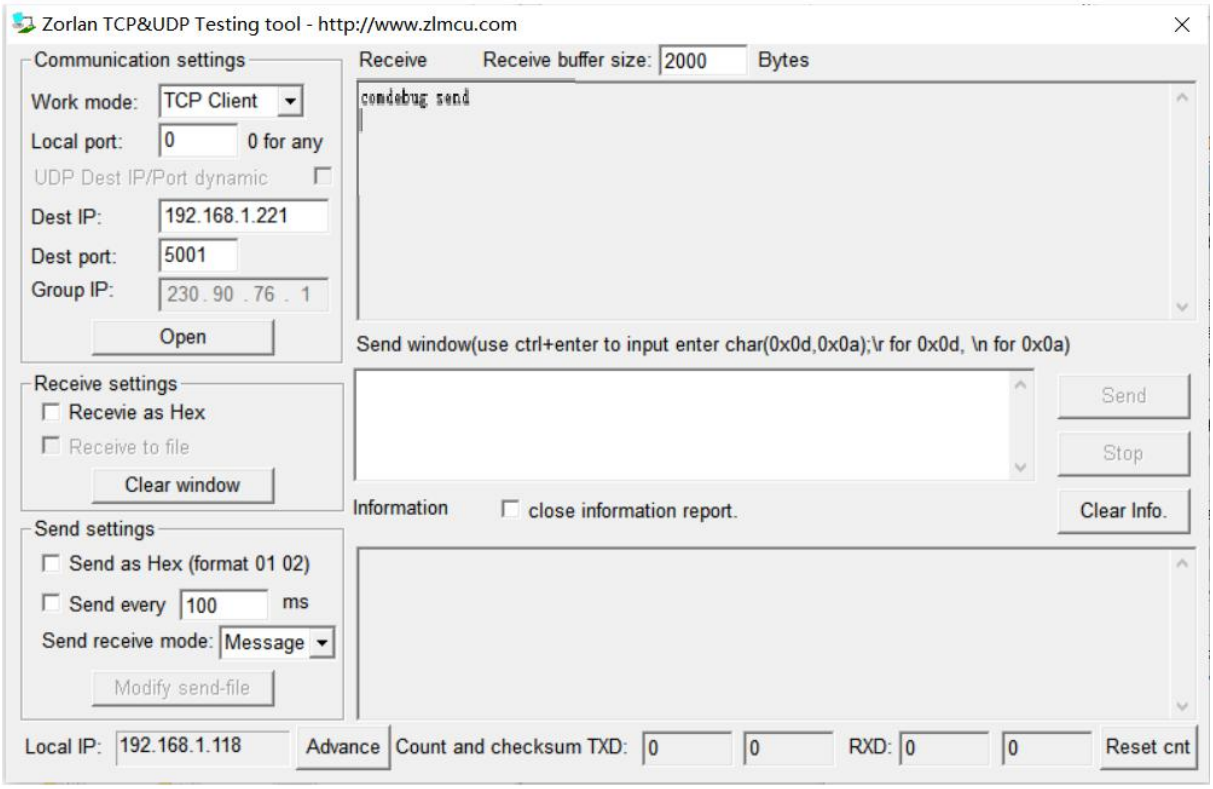


Figure 17 sockettest sending and receiving interface

4.8 Virtual Serial Port Testing

The SocketTest in Figure 15 communicates directly with the serial server via TCP. To enable the user's already developed serial software to communicate with the serial server, a virtual serial port needs to be added between the user program and the serial server. As shown in Figure 18, ZLVircom and the user program run on one computer. ZLVircom virtualizes a COM port and makes this COM port correspond to this serial server. When the user program opens COM communication, it can be sent to the user's serial port device through the ZLVircom serial port server. The following demonstrates this operation step:

Figure 18 The function of the virtual serial port

Click on "Serial Port Management" on the main interface of ZLVircom, then click "Add", and select "Add COM5", where COM5 is a COM port that did not exist on the computer originally.

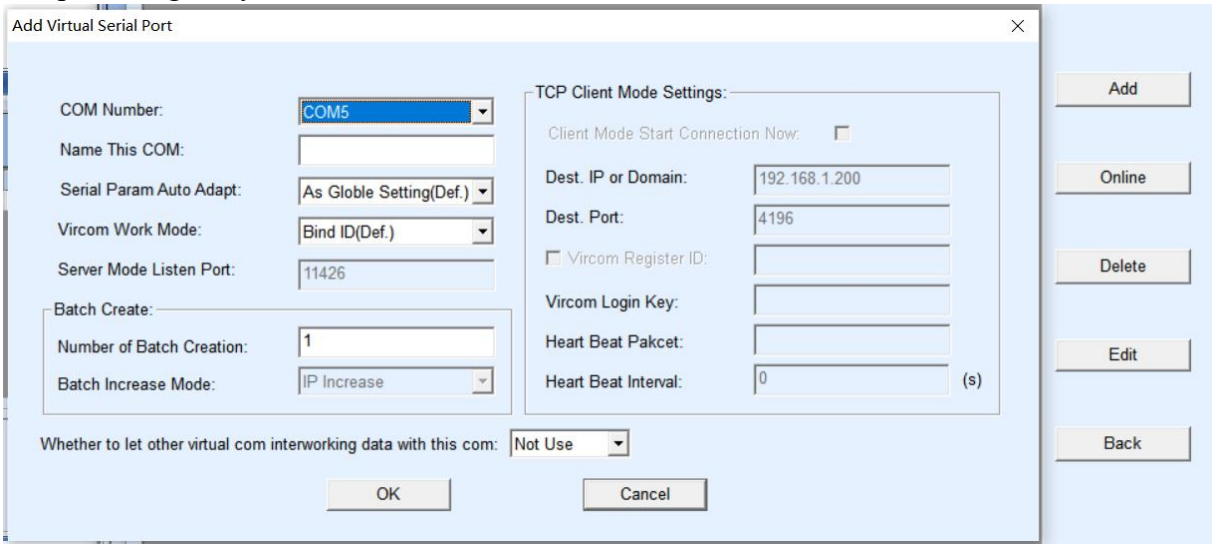


Figure 19 Add virtual serial port

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.

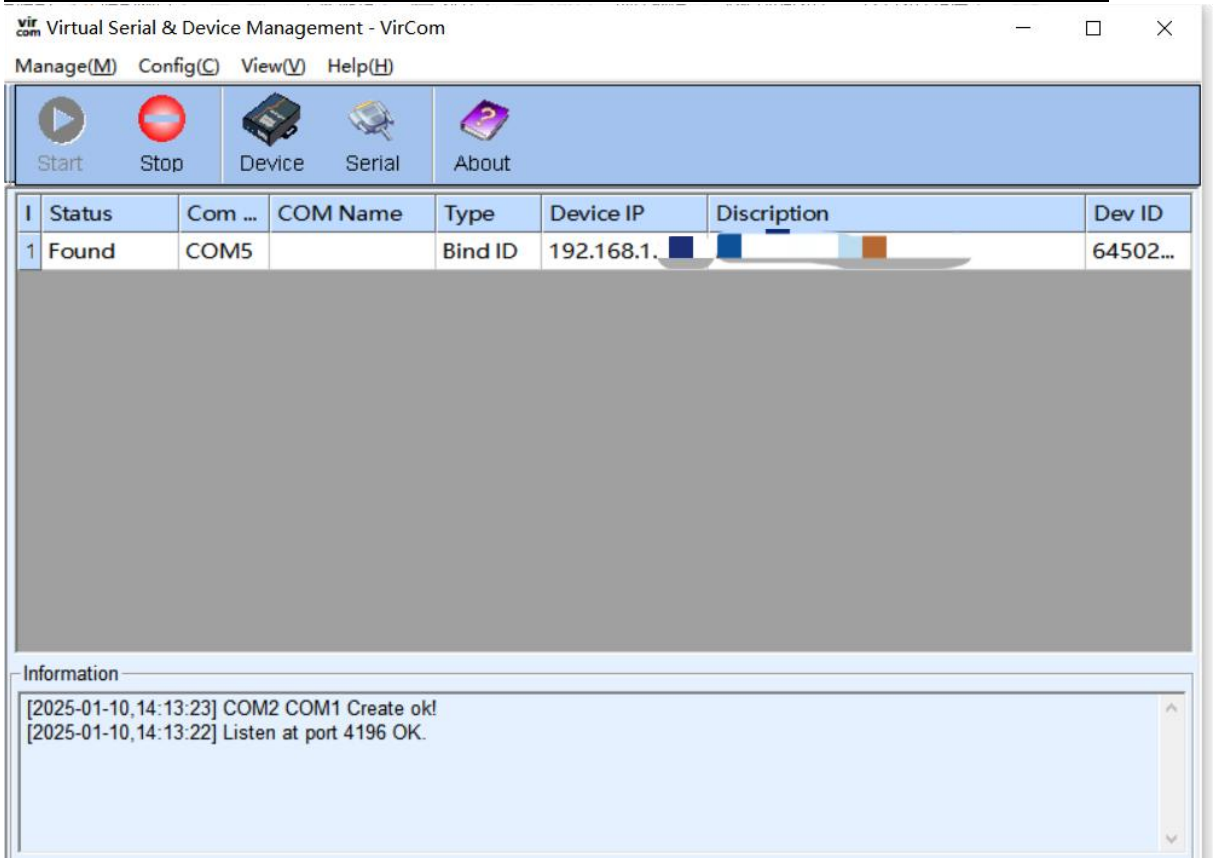


Figure 20 virtual serial port is connected

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 21 shows the two parties sending and receiving data.

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

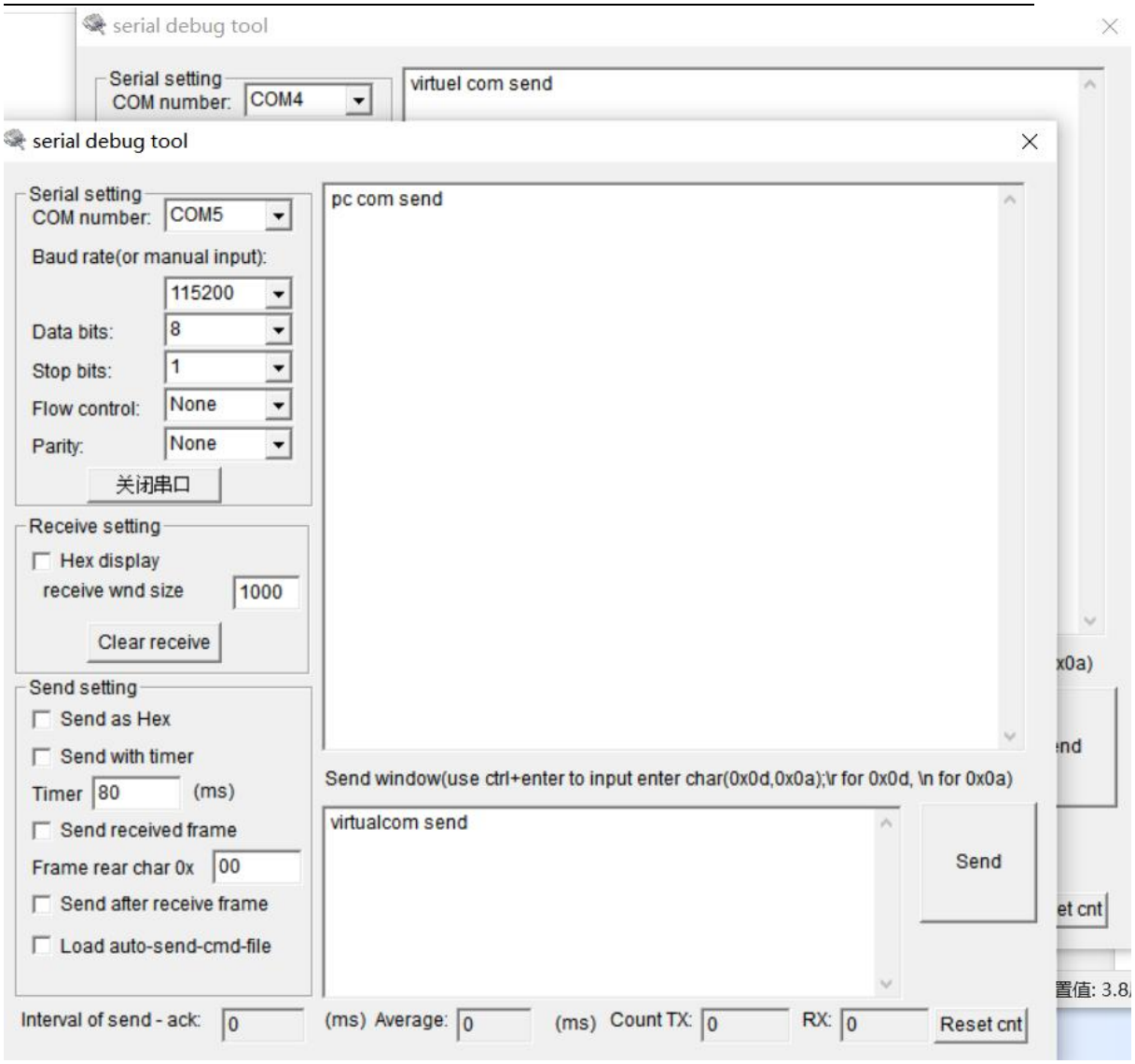


Figure 21 Communication through the virtual serial port

4.9 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 22. 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. I'll explain how to switch to non-storage mode later.

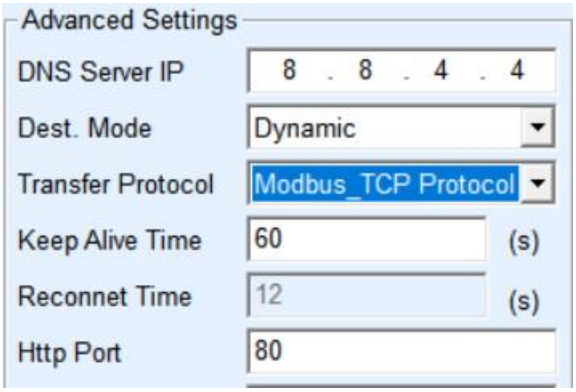


Figure 22 Enabling Modbus TCP

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 23.

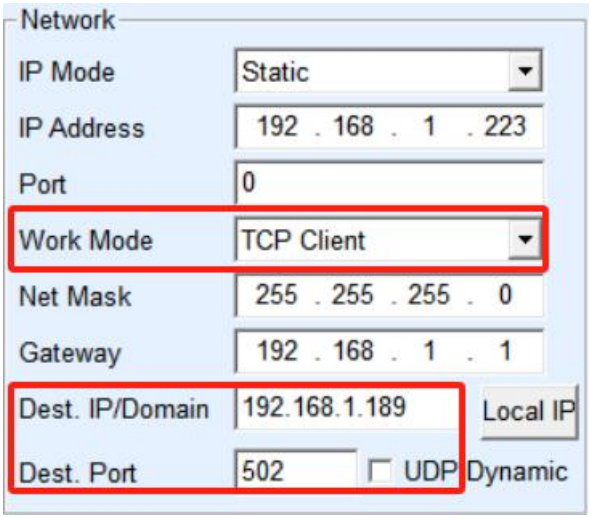


Figure 23 Modbus TCP as the client

4.10 Configuration via Web mode

Using ZLVircom, device parameters can be searched and configured within different network segments. For web-based configuration, it is necessary to first 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. However, Web configuration can be carried out on any computer without ZLVircom.

1. In the address box of your browser, enter the IP address of PORT1 of the serial port server, for example, http://192.168.1.221.

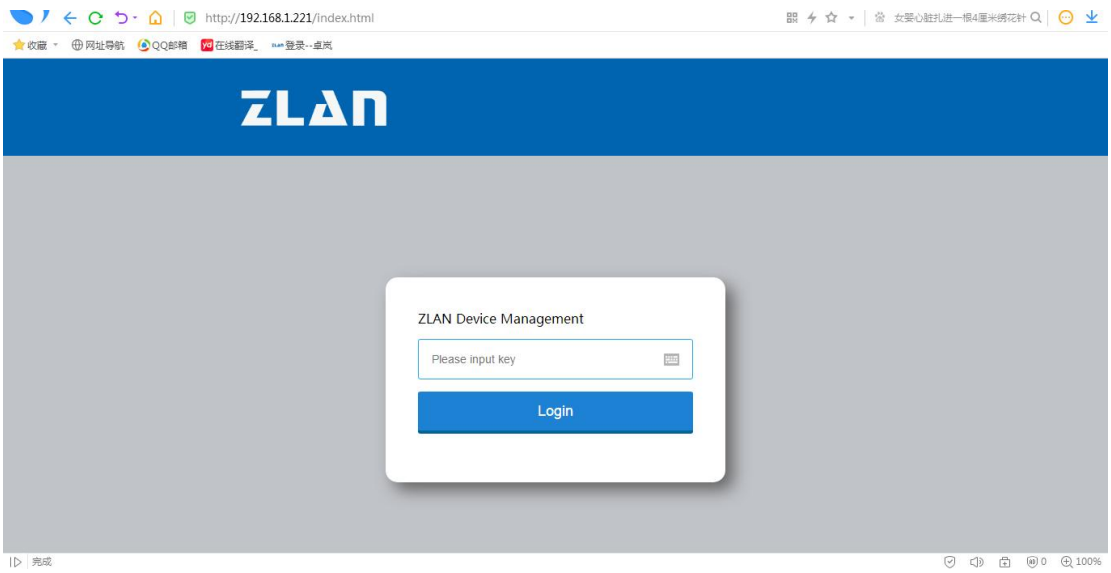


Figure 24 web login in page

2. Enter a Password in Password: there is no password by default. Click the login button to sign in.

Figure 25 Web configuration page

3. On the web pages that appear, select the ports 1-4 that you want to modify. After modifying the corresponding PORT parameters, click Submit. The relevant parameters can refer to the parameter meanings in Table 4.
4. Note: 1. The IP address of the web page is the IP of the first serial PORT (Port 1). IP addresses from other ports 2 to 4 cannot access the web page. 2. Submitting modifications will only submit the parameters of the current PORT. For example, after modifying the parameters on the PORT2 port page, clicking Submit will only modify the parameters of PORT2.

5. Working mode and conversion agreement

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 16 TCP communication diagram and Figure 19 function of virtual serial port. 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 section is divided into transparent transmission, Modbus TCP to RTU, Realcom, and TELNET. If the

user software uses the Modbus TCP protocol and the lower computer uses Modbus RTU, select Modbus TCP to RTU. Realcom is used only when a multi-serial port server serves as the TCP client to connect to a server and the virtual serial port is used on the server. TELNET is used to monitor the serial port of the device when the server is connected to the Zlan module through Telnet.

Usage is summarized as followings：

Table 6 Network configuration modes

No.	Virtual serial port usage	device working mode	Transfer 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	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 server	Telnet protocol	This mode applies to

				monitoring device serial ports when connecting to the Zlan serial port server over Telnet.
7	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.
8	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) 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 6. If multiple serial servers are used, you must select 5.

b) 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 4.

The section "3.4.6 TCP Communication Test" mainly describes how to communicate when the serial server 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 adopted, one must be the server and the other the client. Only then can the client access the server. If both are the client or the server, communication cannot be achieved.

When the serial server acts as a client, there must be three corresponding relationships, as shown in Figure 26. (1) Working mode correspondence: The working mode of the serial server is the server mode where the client corresponds to the

network tool. \ n (2)IP address correspondence: The destination IP of the serial server must be the IP address of the computer where the network tool is located. \ n (3) Port correspondence: The destination port of the serial server must be the local port of the network tool. After setting it up in this way, the serial server can automatically connect to the network tool. Once the connection is established, data can be sent and received.

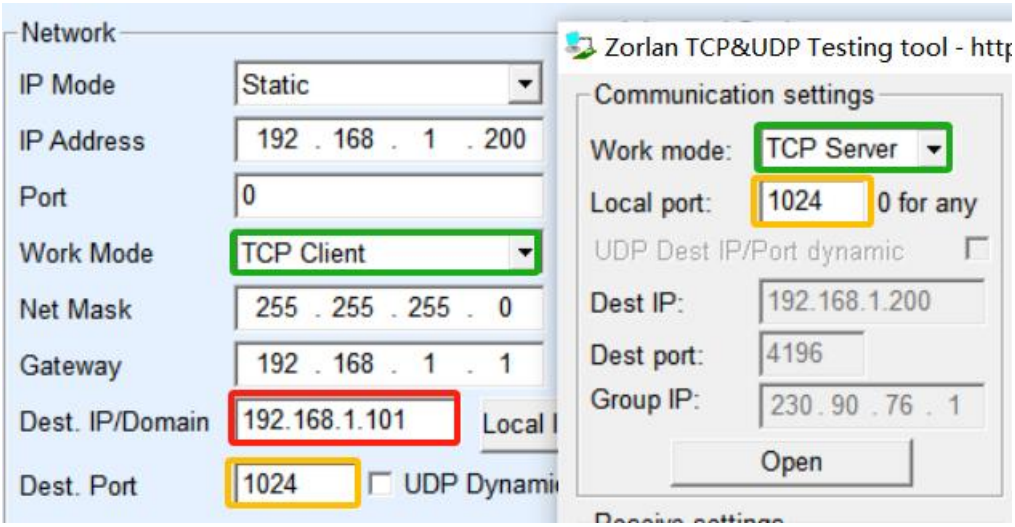


Figure 26 Serial server as client

5.2.2. The client connects to multiple servers

When the Zhuolan serial port server serves as a TCP client, it can simultaneously connect to 7 destination IP addresses, and the data sent through the serial port will be simultaneously sent to 7 destination IP addresses. If there are not that many servers, the remaining destination ips will be left vacant. Its usage method is as follows:

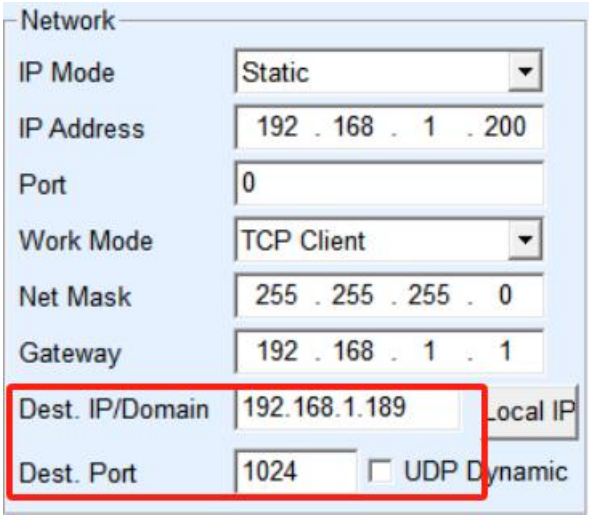


Figure 27 The first destination IP and port

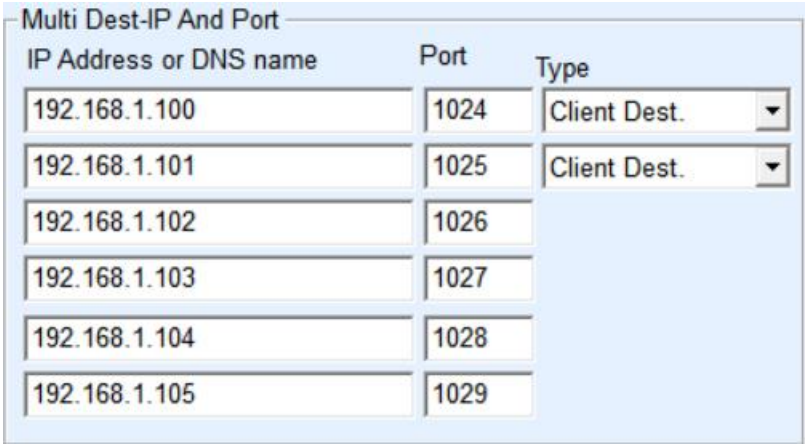


Figure 28 shows the remaining 2 to 4 ips and ports

The first IP is set in the device Settings interface as shown in Figure 27, where the first IP can be a domain name. For the remaining 2 to 7 destination ips, click the "More Advanced Options" button in the device Settings interface to open More Advanced options for Settings.

After all 7 destination ips are set up, they can be automatically connected. If the connection fails, it will wait for the "disconnection and reconnection" time and then reconnect repeatedly.

5.2.3. TCP Server Mode

When the serial server acts as the server, there are also three mappings, as shown in Figure 29, 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.

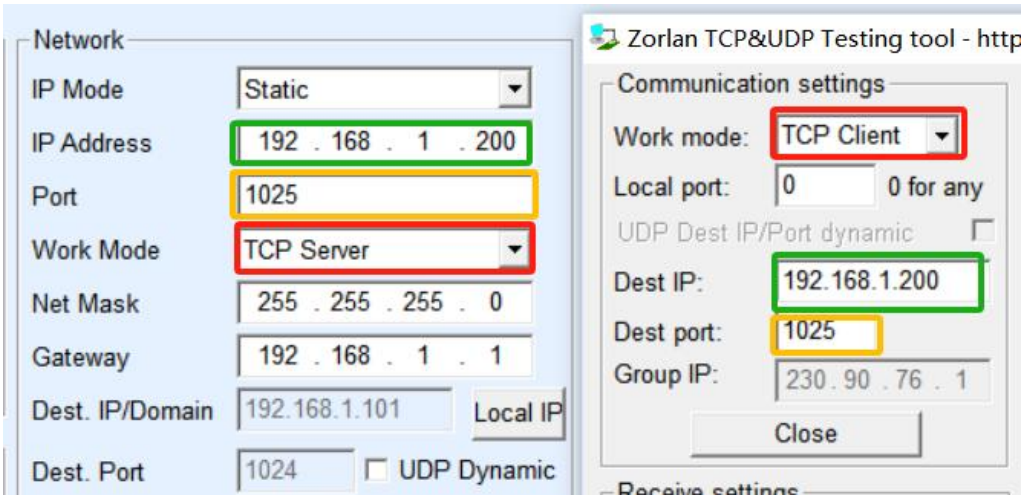


Figure 29 shows the serial server as the server side

When the serial port server acts as a server, it can accept 30 TCP connections simultaneously. The data received by the serial port will be forwarded to all the established TCP connections. If it is necessary to implement that data is sent only to TCP that has recently received network data packets, the multi-host function needs to be enabled. Please refer to 7.4. Multi-host function.

5.2.4. Act as both the client and the 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.

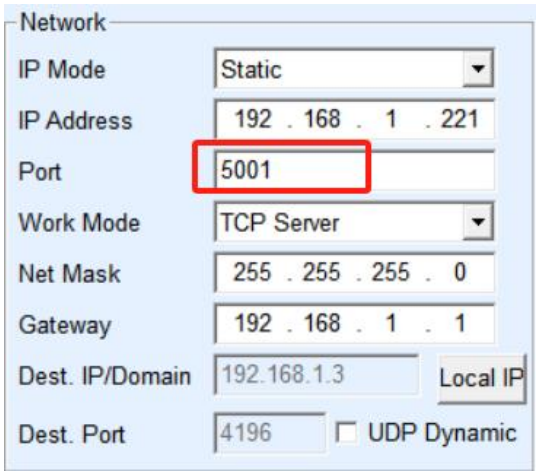


Figure 30 acts as both client and server

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 30, the computer software can now connect to port 5001 of 192.168.1.221 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 5001 is occupied by the server, the local port used by the client is port +1000, that is, the software on 192.168.1.189 sees that the incoming port of the device is 5001+1000=6001.

5.2.5. UDP Mode

In UDP mode, parameter configuration is shown in Figure 31. 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.

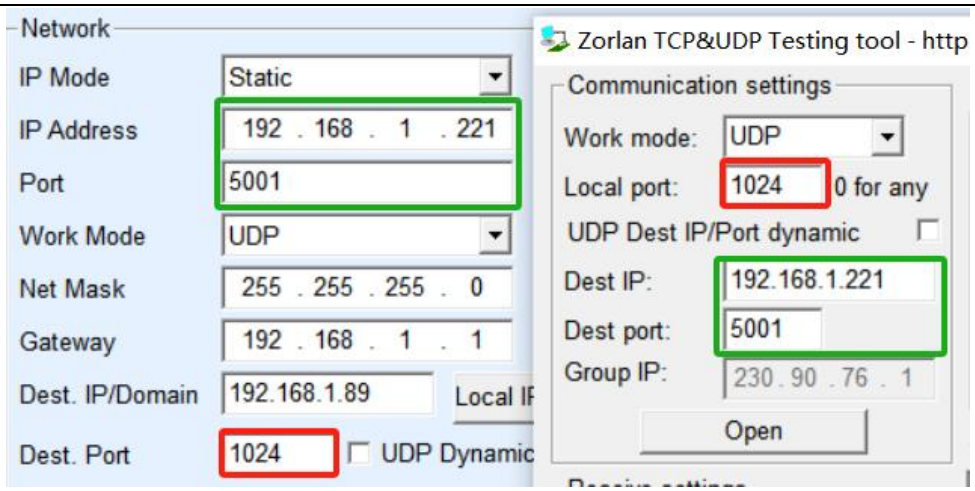


Figure 31 UDP mode parameter configuration

5.3. TELNET PROTOCOL

When you log in to the serial port server using some Telnet tools, double-characters are displayed. For example, when you log in to the system using Telnet in windows. In this case, the conversion protocol needs to be selected as the TELNENT protocol. After you log in through Telnet, there are no more double characters.

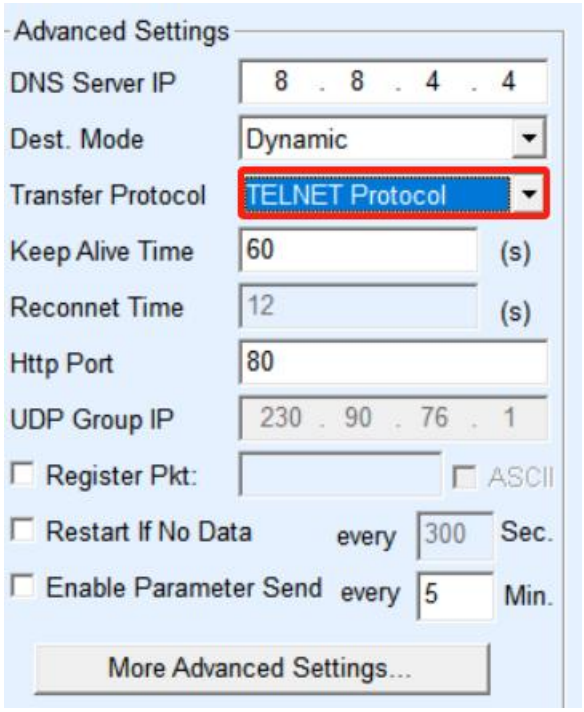


Figure 32TELNET protocol

If the TAB key fails to be associated and two characters are displayed when secureCRT is used, it indicates that secureCRT is not in one character at a time mode. In this case, you only need to change the device port to 23, because the Send SGA (Only 23 ports) function is automatically selected in secureCRT. Therefore, when our device is on port 23, it will automatically enter the mode of "one character at a time".

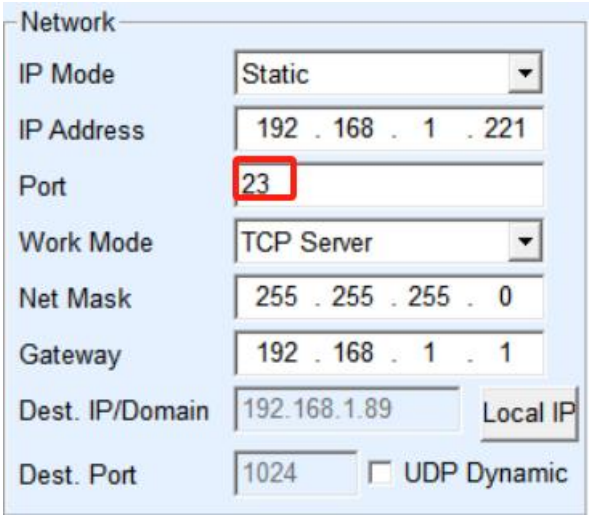


Figure 33 Terminal is 23

For details about how to modify secureCRT, kindly review file Precautions for Monitoring the Serial Port in Telnet Mode.

6. Equipment commissioning

6.1. Network physical connection

The module can be connected to the 10M/100M switch or directly connected to the computer network port using the crossover network cable or the direct network cable.

The first step after the connection is established is to check whether the 100_Link1 indicator is steady on. Otherwise, check whether the network cable is properly connected.

6.2. Network TCP connection

When the device is used as a dynamic way to obtain IP, it cannot be directly

connected to the computer network port. Because there is no DHCP server available (generally, a DHCP server is a router in a local area network). So when connecting directly, please specify the IP address. Meanwhile, the computer also needs to specify a fixed IP.

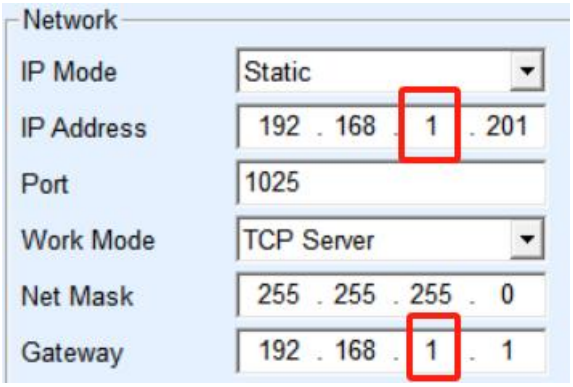


Figure 34 Configuration in the same network segment

Whether connected directly or through a switch, when configured with static IP, the device and the computer need to be on the same network segment (unless communicating across gateways), as shown in Figure 34.

Since ZLVircom supports cross-network segment search and configuration, the IP addresses that can be searched but cannot be communicated are generally not well configured. In this case, ZLVircom can be used to configure devices on the same network segment.

After the configuration is complete, you can see that the Link indicator turns green when the TCP connection is established. The green Link light can also be seen through ZLVircom. For example, in the device management list, if the TCP connection is listed as "established", the Link light is blue, as shown in Figure 35, which can facilitate remote diagnosis.

1		ECF78C-01	2012	1	192.168.1.221	5001	192.168.1.111	TCP Serv...	Esta...	Haven'...	Not Link...	9277FD63	49	7...
2		ECF78C-02	2012	2	192.168.1.222	5002	192.168.1.111	TCP Client	Not ...	Haven'...	Not Link...	29D6A3...	0	0
3		ECF78C-03	2012	3	192.168.1.223	5003	192.168.1.111	TCP Client	Not ...	Haven'...	Not Link...	29D6A3...	0	0
4		ECF78C-04	2012	4	192.168.1.224	5004	192.168.1.111	TCP Client	Not ...	Haven'...	Not Link...	29D6A3...	0	0

Figure 35 Connection status and data sending and receiving status

6.3. Data Sending and Receiving

When the Link light turns green, data transmission and reception can be carried

out between the software and the serial server. At this point, if the software sends a piece of data, the Active light will turn green, and the duration is generally at least one second. Data will also be output from the serial port of the serial server. However, whether the output data is correct still depends on whether the correct serial port parameters (baud rate, data bit, stop bit, parity bit) have been configured.

For correct instructions issued, the serial port device usually responds. Once there is a response (the serial port sends data to the network port), the Active will turn blue. Otherwise, please check the serial port parameters or whether there is a connection problem with the serial port cable.

To facilitate remote debugging, ZLVircom also supports remote viewing of data transmission and reception, as shown in Figure 35. Here, TXD represents the amount of data sent from the serial port of the serial server. When refreshing the device list, if this value changes, it indicates that data has been sent, and the Active light will also turn green. If you see the value RXD changing, it indicates that the serial port device has returned data, and "Active" is blue.

6.4. ZLVircom Remote monitoring data

In the case of using virtual serial port, ZLVircom supports real-time capture of data sent and received by virtual serial port. Convenient for users to debug the system, the use method is as follows:

Assume that the communication of the virtual serial port has been established according to the method of 4.8 Virtual Serial Port test. Now you need to monitor the data through the virtual serial port. Open ZLVircom's menu/Configuration/Software configuration/Open vircom configuration dialog box.

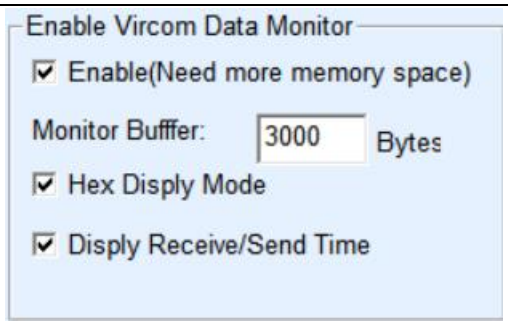


Figure 36 Enable ZLVirocm monitoring

Check the three options of enable monitoring, hexadecimal monitoring mode, and display data sending and receiving time, as shown in Figure 36. Then click OK. Assuming that data has been sent and received before, now select a virtual serial port that you want to monitor in the main interface, and then select Menu/View/Monitor, as shown in Figure 37.

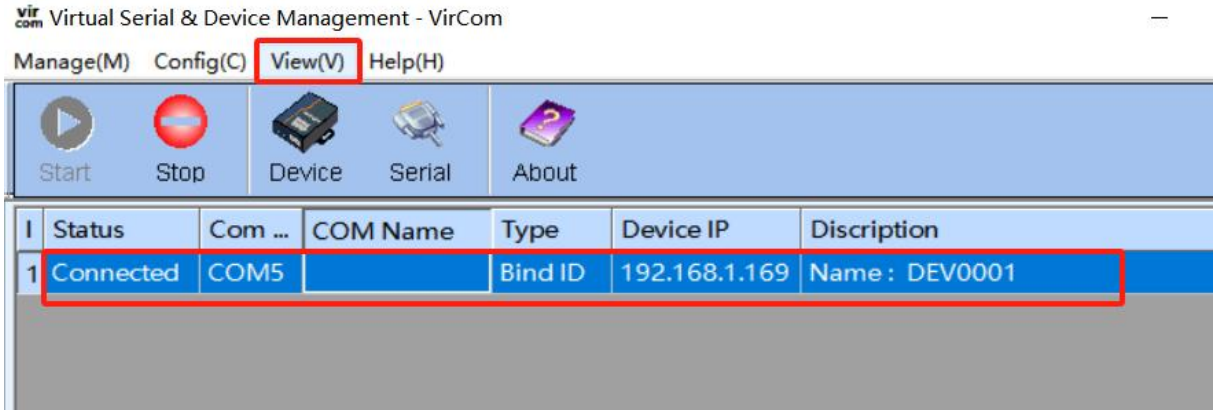


Figure 37 Open ZLVirocm monitoring

From the open dialog box, you can see the instructions sent by the host computer and the instructions returned by the device, as shown in Figure 38. This function can facilitate the field communication debugging.

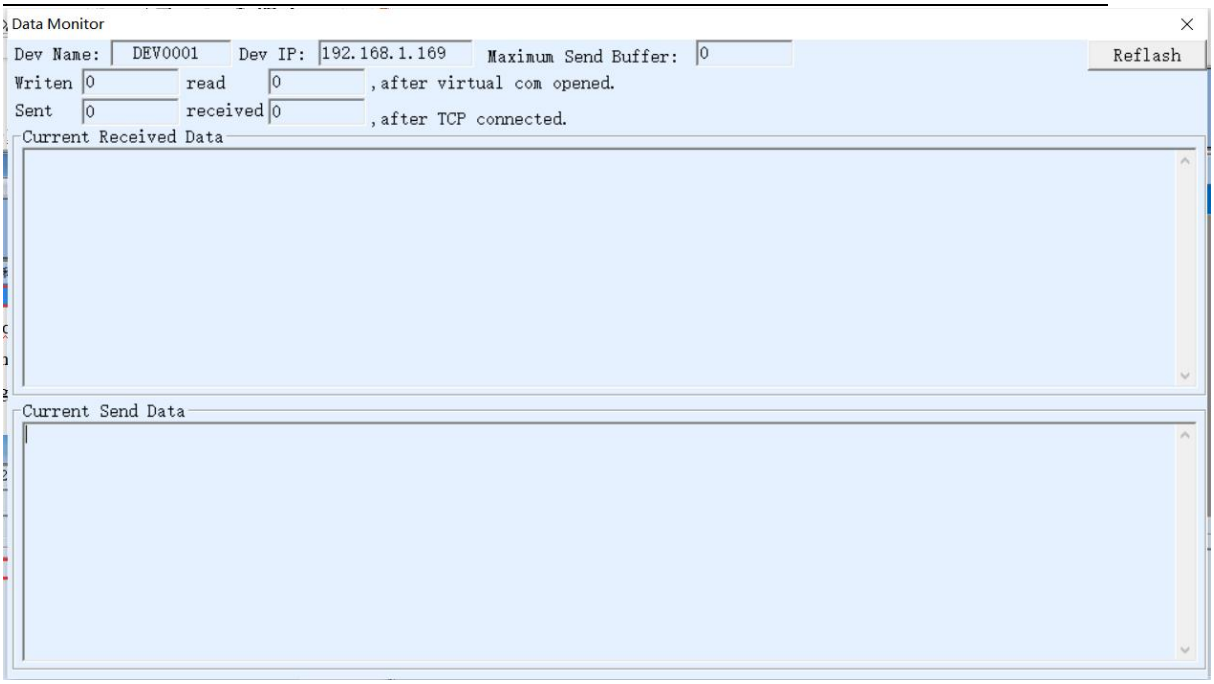


Figure 38 Monitoring the sending and receiving of data

7. Advanced Functions of Modbus

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. Enable the 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 5 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-type Modbus gateway

。The ZLAN5412D can store the contents of the read registers inside the gateway. Thus, the speed of Modbus TCP queries can be greatly improved, and its performance is more superior when supporting multi-host access.

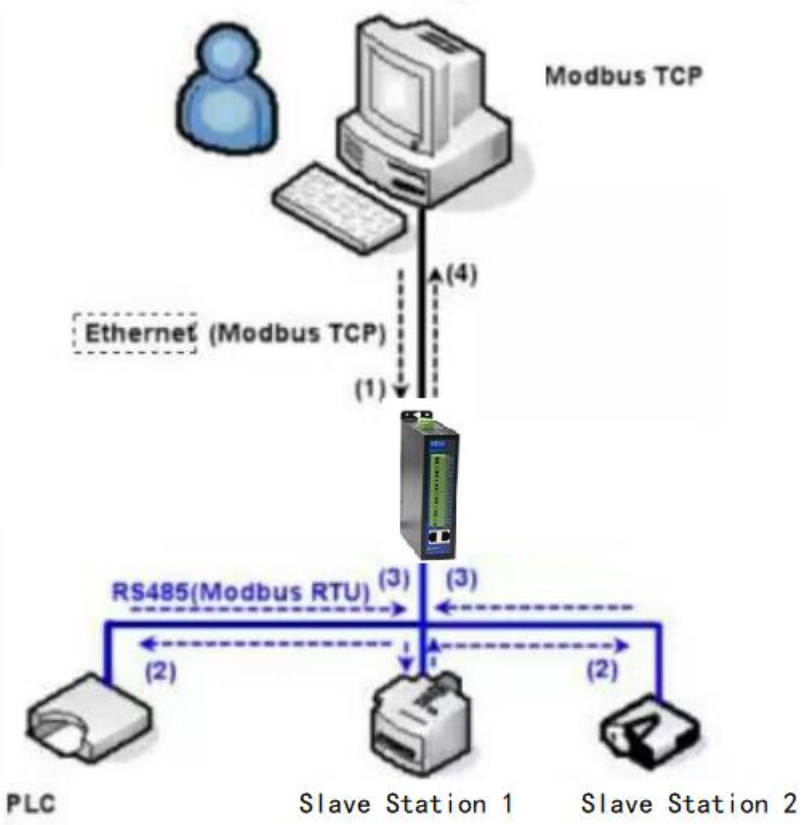


Figure 39 Working Mode of the storage-type Modbus gateway

As shown in Figure 39, 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, ZLAN5412D 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 ZLAN5412D will automatically recognize and dynamically add these registers according to the Modbus TCP command sent by the network port.

When monitored by multiple computers, ZLAN5412D can show good response speed, no matter what baud rate the serial port is, it can generally give the host the 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.
4. When multiple instructions are queried at the same time, they are sent in order of priority. The first instruction is sent and the first instruction is answered. 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 storage-type functions

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.

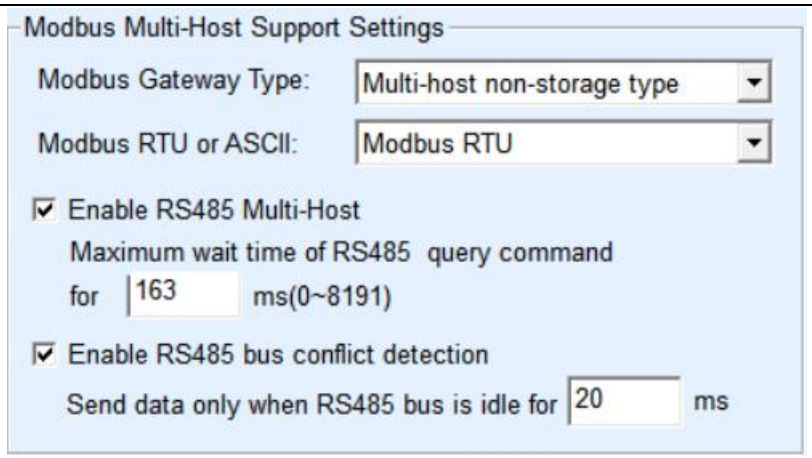
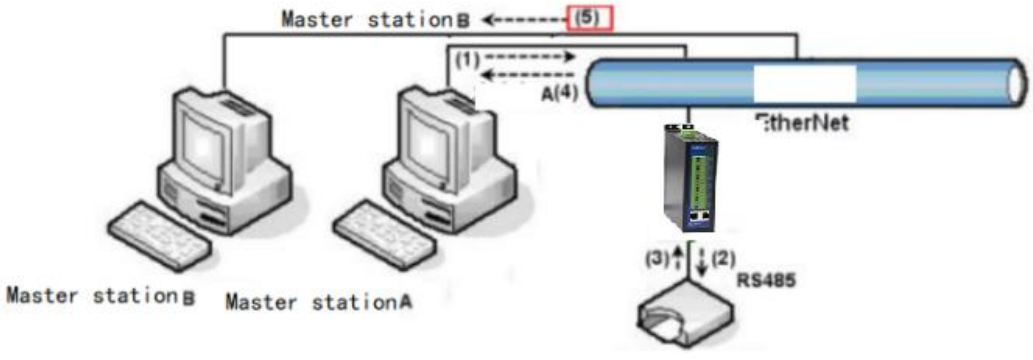


Figure 40 new version zlvircom setting

7.4. Multi-host function

As shown in Figure 40, "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.



Multi-host function demonstration

As shown in Figure 41, in ordinary mode, when two hosts: host A and host B are connected to the serial port server at the same time, host A sends (1) instruction, the RS485 device receives (2) instruction, and the 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. Multi-host parameters

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

Figure 42 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.

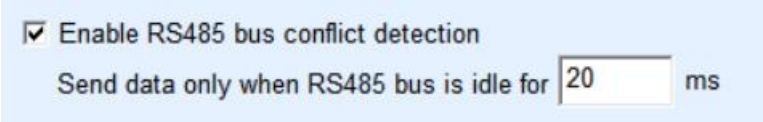


Figure 43 RS485 Conflict prevention idle time

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 43 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 42 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.

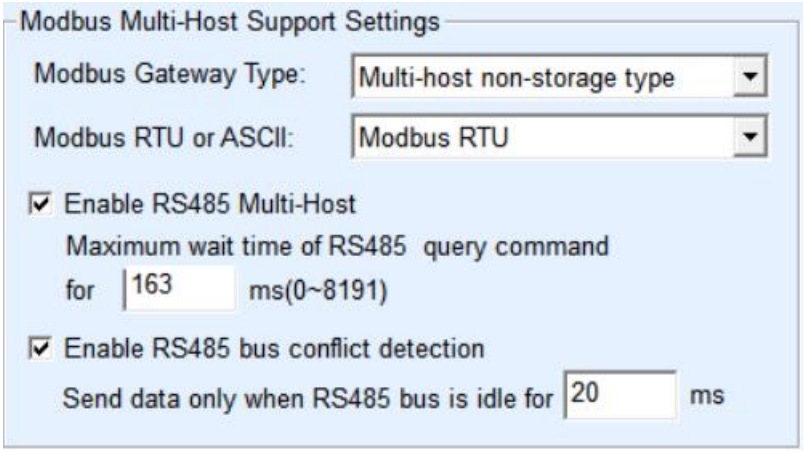


Figure 44 Multi-host non-storage setup

7.7. Modbus under Multi-destination IP

As shown in Figure 41, 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 43 and "RS485 command response timeout time" as shown in Figure 42 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.

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.

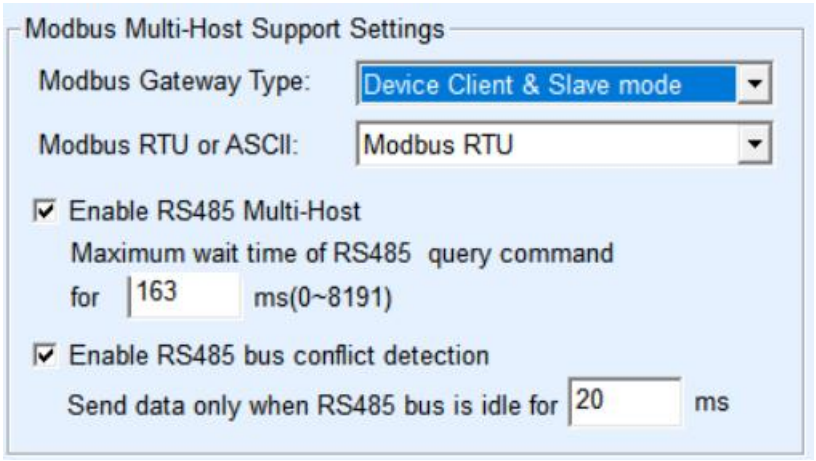


Figure 45 new version of zlvircom setting

8. Registration package and heartbeat package

Registration packets and heartbeat packets are a feature suitable for communication between devices and cloud software.

8.1. Registration Package

The definition of the registration package is that when the computer software and the serial port server module (hereinafter referred to as the module) establish a TCP connection, the module will first send a string of codes to the software, so that the software can know which module is communicating with itself. This string of codes is the registration package.

The registration package is very suitable for the monitoring of the Internet of things, because the cloud software generally runs on the public network server on the

Internet, and the modules are scattered in various collection and monitoring points. How to make the cloud software identify the module is very important, and it is necessary to achieve Internet of Things communication.

Shanghai Zlan serial server provides the following registration methods.

8.1.1. Send the MAC address when connected

Send MAC address on connection: When the module is connected to the cloud, it sends its mac address to the cloud. Since the MAC address is unique, the device can be uniquely identified. This method is simple and effective because it does not require registration package writing for each device. How to use: click "More Advanced Options" in the device Settings dialog box, find "Send MAC address when TCP is established" in the upper middle, tick in the front, and then return to the Settings interface, click "Modify Settings".

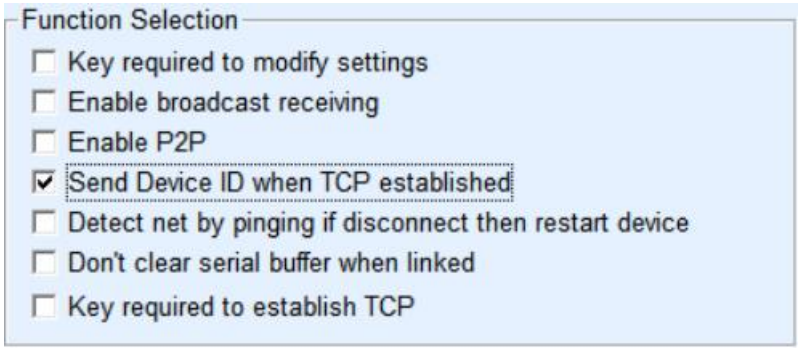


Figure 46 Connects to send the MAC address

8.1.2. Realcom Protocol

Realcom protocol is a mature protocol containing registration packets and heartbeat packets. Users can use this protocol to realize registration packets and heartbeat packets. To enable the Realcom protocol, perform the following operations: In the Device Settings dialog box, set Conversion Protocol to REAL_COM protocol. Note that the part of enabling the registration package must be left blank.

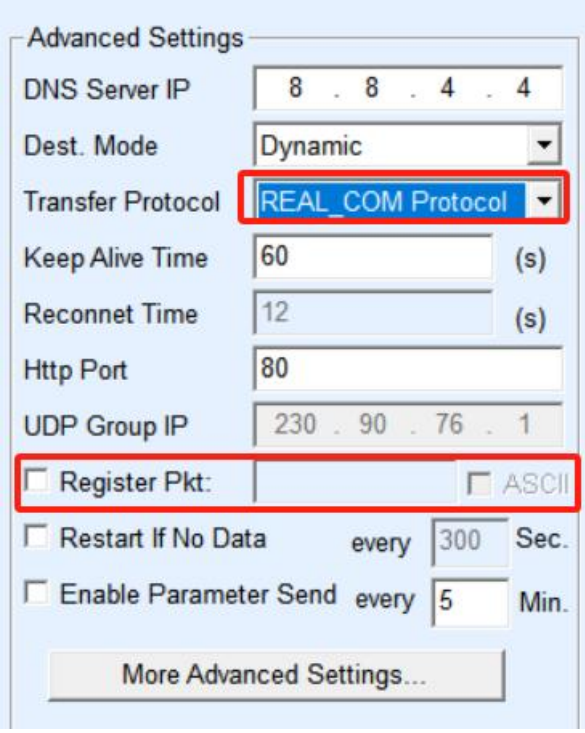


Figure 47 Enable realcom protocol

After the Realcom protocol is enabled, it will not be transparent transmission communication, which has the following characteristics:

1. After a TCP connection is established between the device and the cloud, the device automatically sends a hexadecimal registration packet FA 07 13 02 FA 02 MAC[5] MAC[4] MAC[3] MAC[2] MAC[1] MAC[0] FA FF. MAC[5] to MAC[0] indicates the MAC address of the device.

2. When the device sends data to the network, it automatically adds the three-byte prefix FA 01 01.

3. At a keepalive interval, the device sends a 1-byte heartbeat packet of 00 to the software.

The REAL_COM protocol can be used as the registration package of the device because the registration package contains the MAC address. However, due to its fixed format, only cloud software can design the REALCOM protocol to be compatible with this approach.

8.1.3. Custom Registration Package

The custom registration package mode allows the user to fill in any registration package format. The method is as follows: On the device Settings page, perform the following configurations：

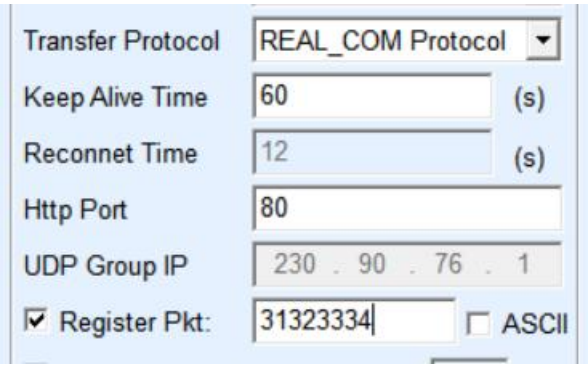


Figure 48 Setting up the registration package

The difference with the REAL_COM protocol is that the registration package is enabled and the registration package information such as 31, 16, 33, 34 is filled in. Note that this is in hexadecimal, which means that the actual data sent is the string 1234. If you want a string display, click the "ASCII" option next to it.

When the device is connected to the cloud software, it can automatically send the hexadecimal registration package of 31, 16, 33, and 34. This registration package method is more flexible, allowing the device to adapt to the existing cloud registration package format; However, there is no wildcard such as MAC in the registration package, so you need to configure a different registration package for each device, which is complicated. The above two methods of sending MAC addresses and REALCOM are the same for each device, but the registration package is naturally different due to different MACs.

The maximum registered package length is 33 bytes. This mode supports registered packets and heartbeat packets in UDP mode.

8.1.4. Configuration file

Configuration files can be used for longer registration packages.

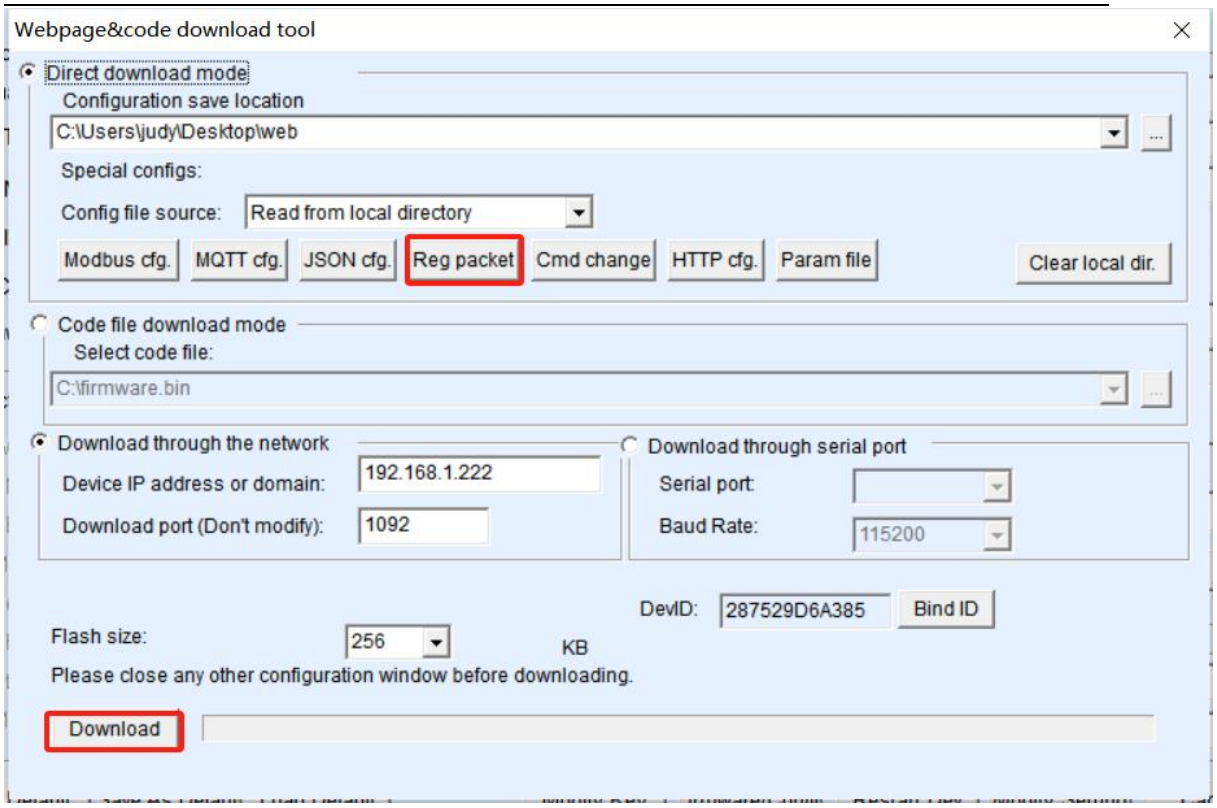


Figure 49 download register packet

Click the "Firmware and Configuration" button in the parameter setting dialog box to open the "Configure Web page/program download tool". In the dialog box that appears, select "Configure Web Page directory download" and select an empty directory as the directory for storing the configuration file. Then click the "Register Package" button.

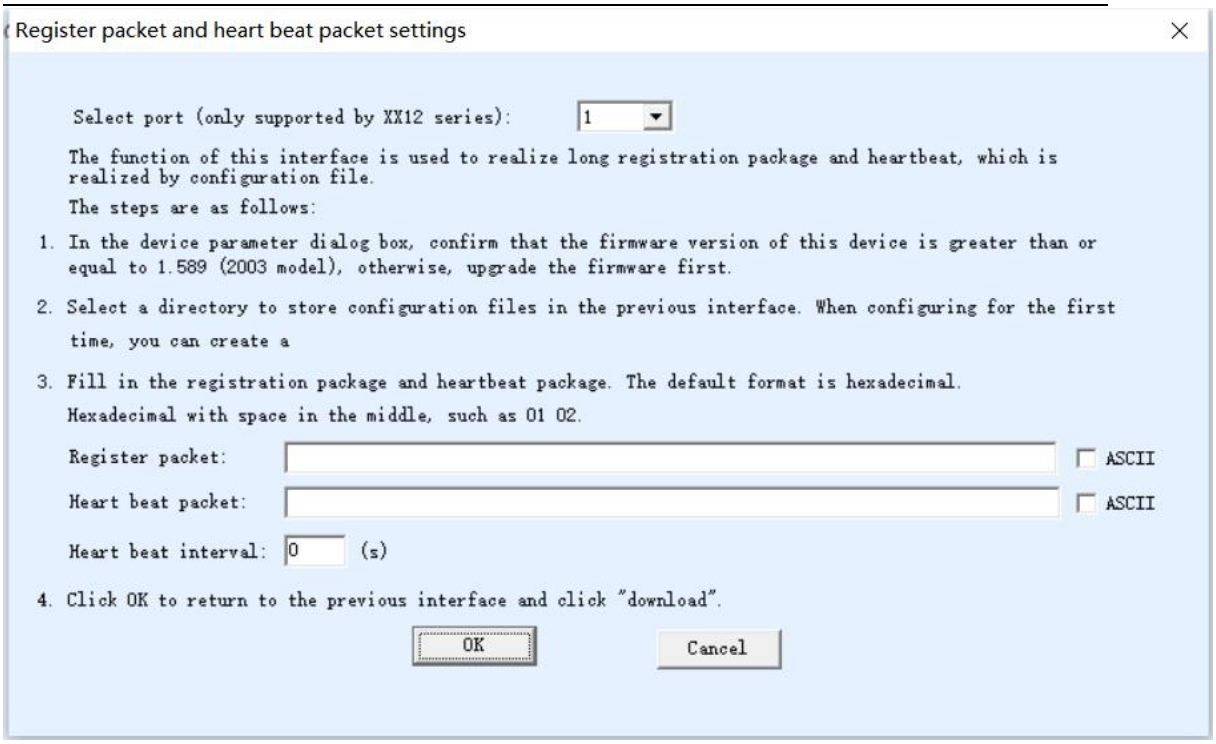


Figure 50 set up register packet

Here, set the registration packet, heartbeat packet, heartbeat packet interval and click OK. After returning to the previous screen, click the "Download" button to download the configuration file to the device.

8.2. Heartbeat Packet

The heartbeat packet is used to detect whether the communication link is down. The method of implementation is that every once in a while the device sends a heartbeat packet data to the server software, and the data will be discarded after the server receives it, and will not be regarded as valid communication data.

The heartbeat packet has two main functions: first, it can let the upper computer software know that the device is in the active state; Secondly, if the device fails to send the heartbeat, the device on the TCP client will automatically re-establish the TCP connection, so it is a means to restore network communication.

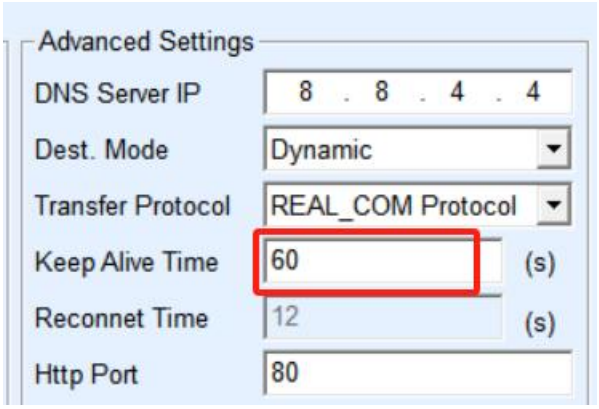


Figure 51 Keepalive timing time

As shown in Figure 51, the sending time of the heartbeat packet is set by the Keepalive Timing time.

8.2.1. Implied Heartbeat

Even if no heartbeat packets are set, the implicit heartbeat function is enabled on the Zlan device when the TCP client is deployed. Therefore, the implied heartbeat function means that the device sends data but the server does not receive the heartbeat data. Therefore, it can not play the first function of the heartbeat packet, that is, the function of the server to detect the activity of the device; However, because the device actually sends data, it can play the second function of the heartbeat packet, that is, the function of the device to detect whether the TCP connection is normal. Once the connection is detected, the TCP connection can be automatically re-established.

8.2.2. REALCOM Protocol

As described in 8.8.1.8.1.2Realcom protocol, the REALCOM protocol can send a 1-byte data of 00 at every keepalive interval. This data is the heartbeat packet of the realcom protocol.

8.2.3. Custom Heartbeat packs

Fill in the registration package by following instructions in 8.1.3 Customizing the Registration Package. Then add heartbeat packets as follows: Click the "More Advanced Options" button in the device Settings, write the hexadecimal heartbeat packet in the second line of the multi-destination IP and port, and change the option on the right to "Parameter packet Destination".

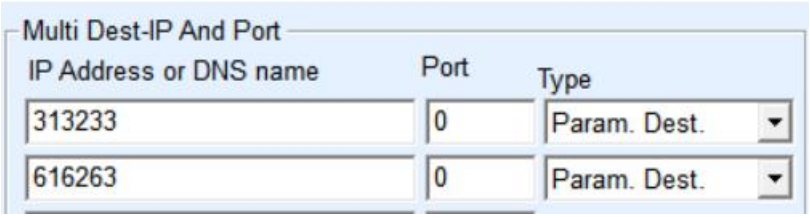


Figure 52Customize the registration package

The sum of the registered packet and heartbeat packet must be less than 33 bytes. The first line is actually the registration package.

8.2.4. Configuration file

For details, see how to use the configuration file of the registration package.

9. Modify the parameters of the network port

Modifying parameters through the network port is to achieve the function of searching for devices and modifying device parameters, just like the zlvircom software does. This is done by managing devices and changing parameters through the network port of the serial server. It is suitable for users who want to integrate the search and configuration functions into their own software.

Modifying parameters through the network port is implemented via the "UDP Management Port Protocol", for example:：

1. The computer software sends a UDP broadcast packet with the destination port set to 1092 over the network. When a device receives this packet, it sends back its information to the computer software, achieving the purpose of searching for devices.
2. The computer software sends a UDP command to modify parameters to the device's port 1092, achieving the purpose of modifying the device's parameters.

10. Device Management function Library

This feature is intended for users who need to integrate device management functions into their own software.

The "UDP management port protocol" has been integrated in the device

management function library ZLDevManage. This is a DLL windows platform development library, can be called by VC, VB, Delphi and other development tools.

Provide detailed API interface documentation and VC call Demo cases. It can realize device search, parameter modification, P2P function call and so on.

Development libraries can be obtained from the ZhuoLan's official website: http://zlmcu.com/download.htm looking for "equipment management function library" page. For details, please refer to "Zlan WinP2p and Device Management Development Library"

11. Serial port modification parameters

Users can read and set parameters by sending commands to the serial port server's serial port. This is suitable for users who need to control and configure products at the chip or module level through serial port. The parameters that can be set include: IP address, baud rate, device name, working mode, etc. After the new parameters are set, the serial port server can be restarted through serial port commands.

The serial commands of Zlan have the following features:

1. Serial port commands use a 10-byte data preamble, so there is no need to distinguish between communication data and commands by pulling down or pulling up additional configuration pins, nor is there a need to switch between command mode and communication mode, making usage more flexible and convenient.
2. The command set includes various command formats such as saving parameters, not saving parameters, and restarting the device.
3. It can implement a variety of applications, such as reading the MAC address of the serial port server, or modifying the operating mode of the serial port server. For example, when switching from TCP server to TCP client mode, it can actively connect to the server; when switching from TCP client to TCP server mode, it can disconnect from the server connection.

Please refer to "Serial Port Parameter Modification and Hardware TCP/IP Stack

Protocol" for detailed operation methods on modifying serial port parameters.

12. Remote device management

Remote device management refers to the ability to maintain and manage devices through ZLVircom software, including restarting devices, modifying parameters, and updating firmware. This feature is suitable for users who manage devices through ZLVircom.

For ZLVircom software, as long as the device can be found in the device list, remote management can be performed. Remote management of devices can be divided into the following situations:

1. Automatic search: Under the same switch, regardless of whether they are on the same network segment, the way ZLVircom searches for devices on a computer is: ZLVircom sends a broadcast query (all devices receive the query and reply with their parameters to the ZLVircom tool. This method searches for all devices at once.)

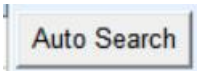


Figure 53 automatic search

2. Manually add: There are two situations:

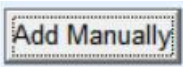


Figure 54 manually added

   a) Large routers divide the network: In some large networks, broadcast packets are divided by routers, so broadcast packets cannot reach the device end, but pinging the device IP is always through. At this point, manual addition is generally needed to solve the problem. The method of manual addition is to click "Manual Addition" in the "Device Management" dialog box to add the first and last IP for individual queries of the device.
   b) Public network server queries internal network devices: Serial servers are in the internal network and operate in TCP server mode, while zlvircom is on a server with a public IP. At this point, a UDP port mapping of 1092 needs to be set up on the router of the network where the device is located, mapping

to the IP of the device, and then zlvircom manually adds this device, with the IP being the public IP of the device end.

3. TCP Client: When the device acts as a TCP client, it will initiate a TCP connection to the destination IP (116.15.2.3) on port 4196. Once the connection is established, it will automatically send its parameter system to the destination's UDP port (not the TCP port) every keep-alive time interval, allowing zlvircom to detect the device on this computer (116.15.2.3). If the destination port is not 4196, you will need to modify zlvircom's default parameter receiving port by changing the menu/config/software configuration/default listening port. After starting zlvircom, if a TCP port conflict message appears, ignore it and continue with the execution.

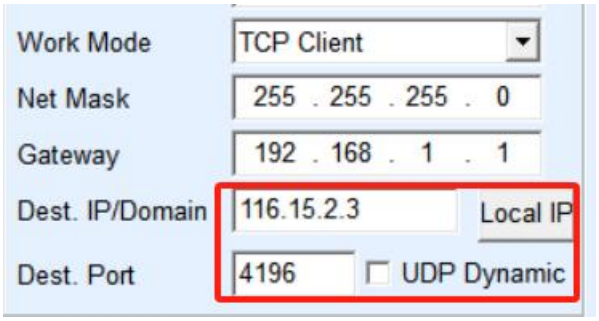


Figure 55 client

4. Scheduled transmission parameters: Even when in TCP server mode, the serial server can select the "Scheduled Transmission Parameters" feature to send parameters every 5 minutes to the destination IP (here, 116.15.2.3) on the destination port. The zlvircom on this server's port can receive parameters and manage these devices.

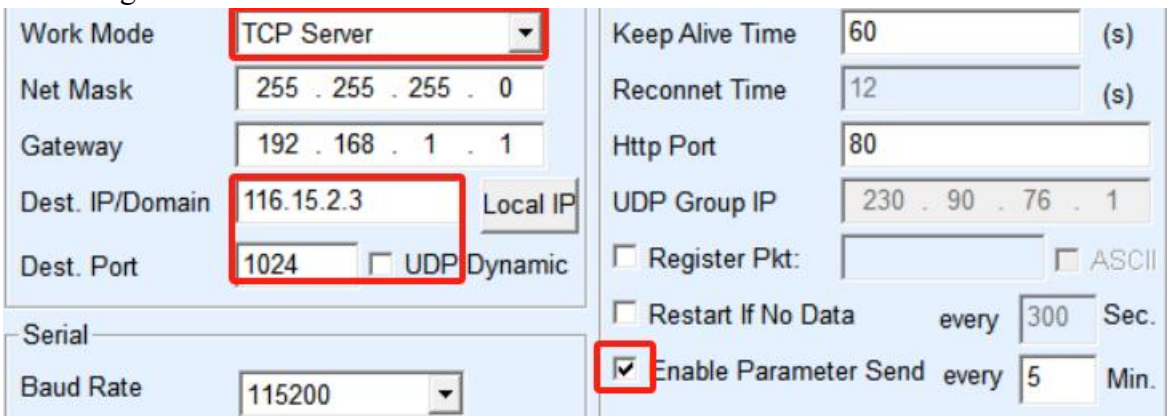


Figure 56 Timing transmission parameters

To facilitate the identification of devices, if remote management is required, please name the device something easy to remember.

5. Device Operation Management: After enabling the cloud management feature on the device side, you can see the device on the designated platform equipped with Zlan Device Cloud Management. You can perform device configuration, firmware upgrade, configuration download, and more.
6.

13. Firmware upgrade method

不 Different models can upgrade their own programs, but not each other's. You can use this method to upgrade the firmware of devices found in the device list by automatic search, manual add, or P2P search.

1 Get the firmware file for ZLAN5412D from Zlan, such as 1.445(2012).bin.

2 In the ZLVircom tool, first search the device that needs to be upgraded, and then enter the device parameter editing dialog box. First click "Restart Device" once.

Figure 59 Step 1 of Upgrade

After the device restarts, use the same method to search for the device and enter the dialog box again. Click the "Firmware and Configuration" button in the lower right corner of the dialog box.

Figure 58 Step 1 of Upgrade

3 Select the "Program File Download" option, as shown in Figure 59. In the program file, select the firmware file. The IP address of the serial port server is automatically filled in, and the module type/model is automatically selected. Then click Download.

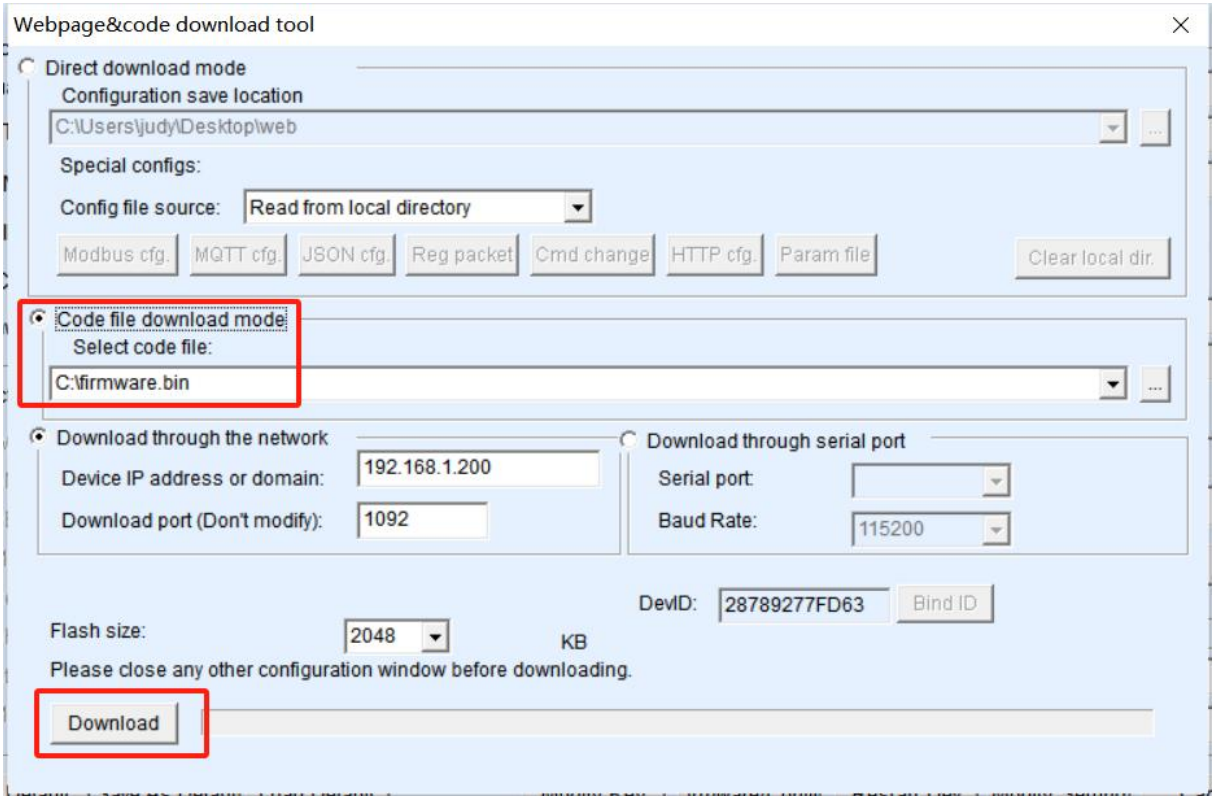


Figure 59 Firmware upgrade method of ZLAN5412D

4 At this time, the download progress bar starts to move, and the download time is about 30 seconds. During the download process, you will see the ACT light of the device blink, and at the end of the download, you will see the LINK light blink several times. Then the program pops up "transmission completed LINK light flashing device do not power off" prompt box. Note: This is only the completion of transmission, write to the flash process takes about 3 seconds, at this time the LINK light will blink, during this period please do not power off.

5 After downloading the general program will automatically restart, generally do not need to power off. If the running indicator is blinking, stop the LINK indicator blinking for more than 30 seconds and power it on again.

6 Web Configuration interface update: After the firmware upgrade, the

configuration page inside the module also needs to be updated. Otherwise, the configuration cannot be configured through the Web, but the communication will not be affected. It is also possible not to download web pages without web configuration. The method of downloading Web is: as shown in Figure 60, change the download mode of "program file" to "Web directory download". In addition, select the root directory of the local web page as the directory of the web file to be downloaded (this directory can be obtained from ZLAN), and click Download to download all files in the local web page directory to the internal file system of the device.

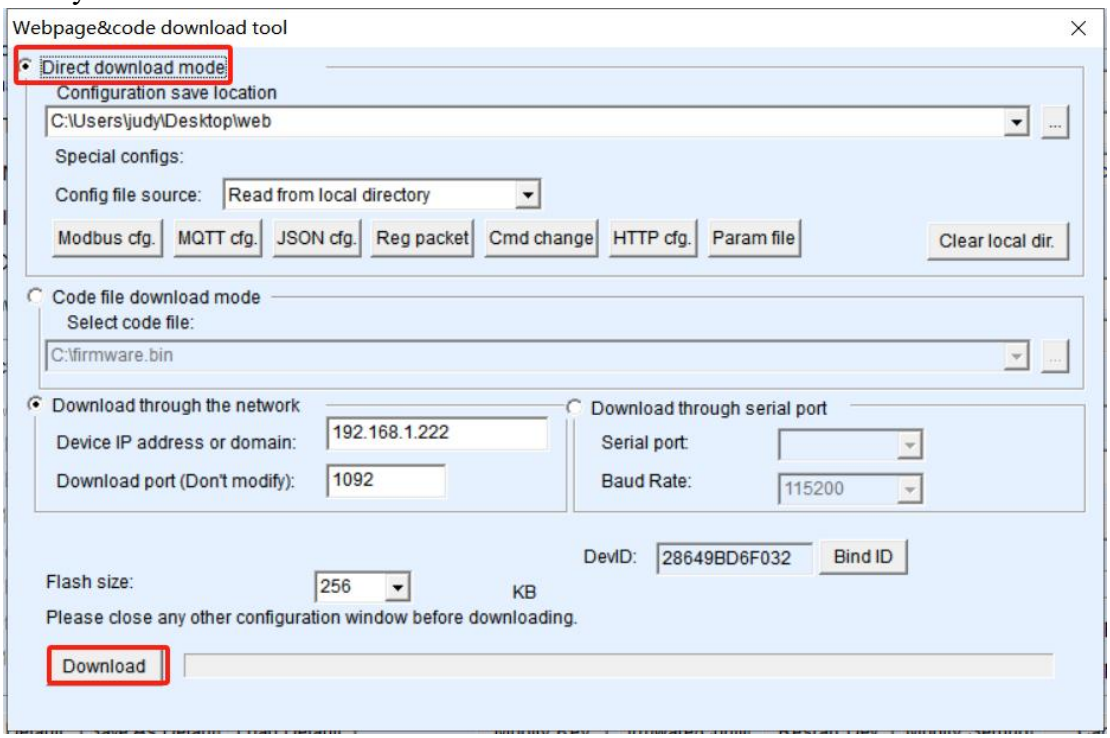


Figure 60 ZLAN5412D web upgrade method

7 Note:

7.1 If the message "Download failure" is displayed, the device will not be damaged. You can download the device again. In addition, when the LINK light blinks at the end of the download, do not power off, otherwise the device will be damaged.

7.2 Check the firmware version through ZLVircom to know whether the new firmware has been downloaded successfully.

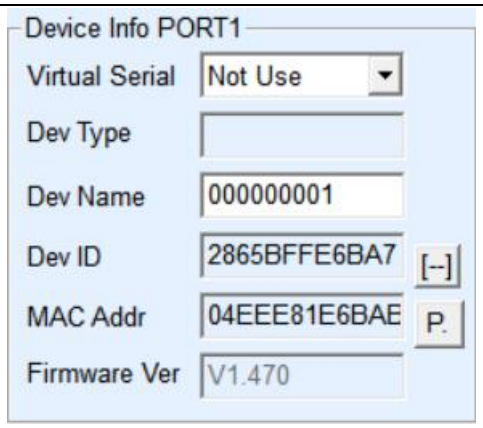


Figure 61 Checking the firmware version after the upgrade

14. Installation and packaging methods

ZLAN5412D mounting mounting ears have two mounting directions, as shown in the following figure, suitable for desktop installation or upright installation.

Figure 62 Desktop installation

Figure 63 Upright installation

ZLAN5412D is packed in a box with foam bedding. Includes a mainframe and other accessories. Accessories include: 12V power supply, 8PIN terminal *2, power terminal *1, mounting ear *2, several screws. As shown in the figure

Figure 64 Packaging

15. After-sales service and technical support

Shanghai Zlan Information Technology Co., Ltd.

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

Phone: 021-64165189

Fax: 021-64165200

URL：http://www.zlmcu.com

Email：support@zlmcu.com