ZLAN5143BI

Optocoupler Isolating-type Serial Device Server/Modbus Gateway

User Manual

RS232/485/422 to TCP/IP Converter

Modbus TCP to Modbus RTU

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Contents

1. Summary

ZLAN5143BI is a serial device server with isolation of RS485/422, which can effectively isolate the influence of interference on the work of the equipment on RS485 bus and ensure the stability of the equipment. It is suitable for use under the interference of RS485 bus. With built-in lightning protection, 9~48V wide voltage. RS485/422 supports 256 loads. At the same time, ZLAN5143BI also has RS232 interface, non-optocoupler isolation. The Ethernet port of ZLAN5143BI supports 10M/100M adaptive network. The transformation from TCP/IP protocol to RS485/422/232 can be realized to facilitate data collection of serial device devices through the network. Network side can use virtual serial port to connect serial port software or software of direct TCP/IP communication.

ZLAN5143BI supports Modbus RTU to Modbus TCP function, and has storage Modbus gateway feature. It can also be used as a non-storage Modbus gateway.

Figure 1 ZLAN5143BI

Can be applied to:

- Power electronics, intelligent instruments and energy consumption monitoring;
- As the gateway of IOT to be communication bridge between devices and the cloud;
- Remote monitoring and program download for various automatic PLC;
- Communication interfaces of various configuration software and equipment;
- Equipment networking in the field of access control and security;
- Network information collection of medical equipment;

Typical application is shown as Figure 2. The original serial port connect with ZLAN5143BI, then connect ZLAN5143BI to the network via cable. The software on PC establish connection with 5143BI through TCP/IP or virtual serial port. Any data

sent from serial device will be transparently sent to PC appointed by ZLAN5143BI, and data sent by PC to ZLAN5143BI via network also will be transparently sent to serial device.

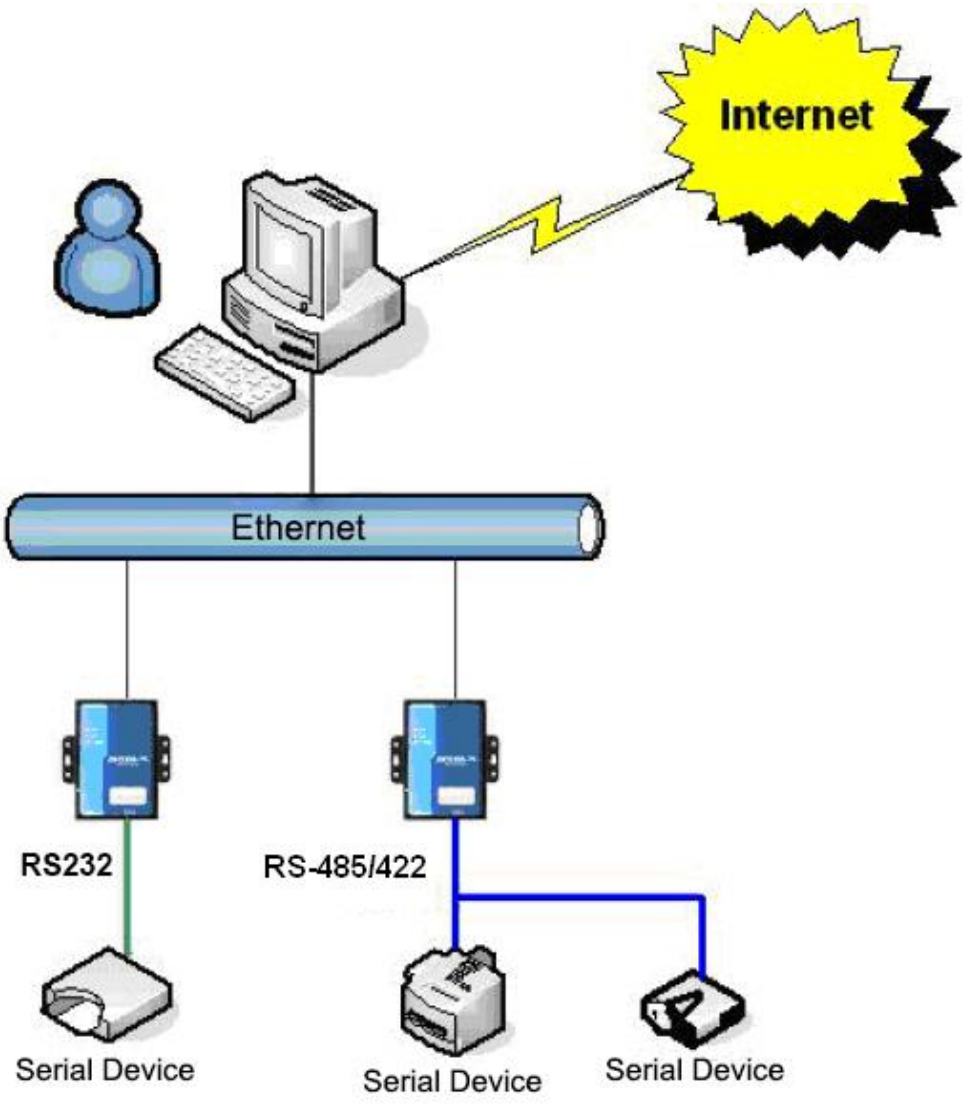

Figure 2 Connection Diagram

2. Features

2.1 Hardware characteristics

ZLAN5143BI has the following features:

1) RS485/422 serial optical coupling isolation, isolation voltage is 1500V. Apply to the strong interference environment which normal serial device server cannot work properly in. Effectively isolate the ground circuit between the serial port

device and the serial port server.

2) Built-in lightning protection of power supply: built-in pressure sensitive resistance and ceramic discharge tube can effectively protect the internal circuit of serial device server in the case of power surge.
3) Industrial power supply: it has two kinds of power supply connection modes: terminal and power plug. Can be 9~48V wide voltage power supply.
4) It has three serial port interfaces of RS232/485/422.
5) RS485/422 has capacity of 256 loads.
6) Ethernet port with 2KV surge protection.
7) Abundant panel indicator lights are convenient for debugging: in connection, there is not only a 100M_LINK light indicating whether the network line is connected, but also a LINK light indicating the establishment of TCP connection. Data indicator light has independent indicator light for "serial port to Ethernet port", "Ethernet port to serial port". Convenient for site debugging.

2.2 Software functions

1) Support TCP server, TCP client, UDP mode, UDP multicast. Support TCP server side function as TCP client. Support 30 TCP connections as a TCP server and 7 destination IP as a TCP client.
2) The baud rate supports 1200~115200bps, data bits support 5~9 bits, and parity can be None, Odd, Even, Mark, Space. CTS/RTS hardware flow control and XON/XOFF soft flow control.
3) Support the function of sending MAC address when device connecting to facilitate cloud management of devices.
4) Provide search, configure the device secondary development package DLL on PC.
5) Support Web browser configuration, support DHCP dynamic access IP, DNS protocol connect domain name server address.
6) Support remote search device, configure device parameter, device program upgrade on cloud.
7) Support remote viewing of TCP connection status, serial port data sending and

receiving status of devices through software. Virtual serial port supports data monitoring.

2.3 Advanced software features

The 4 number in 5143BI indicates that advanced soft functions are supported, including:

1) Support Modbus gateway function, support Modbus RTU to Modbus TCP. The storage Modbus can be supported, and the equipment data can be collected automatically and stored. Modbus gateway for non-storage mode is also supported.
2) Support for multiple hosts: support Ethernet port allows multiple computers to access the same serial port device at the same time in a question-answer query mode.
3) Support for custom heartbeat and registration package features: easy to communicate with the cloud and identify device.
4) Support the function of TCP needs password authentication to establish connection to ensure connection security.
5) Support "transcoding" function, which can realize the translation of protocols for specific devices and allow different devices to connect to the unified software platform.
6) Support data submission and sending function in HTTP mode, and the cloud can directly use HTTP GET instructions to interact with the serial port data of the device.

3. Technical Parameters

Figure	
Interface:	485/422: Terminal; 232: DB9
Power Supply:	5.5mm, Inside positive outside negative, standard outlet
Size:	L x W x H =9.4cm×6.5cm×2.5cm
Communicate Interface	

Ethernet:	10M/100M, 2KV surge protection		
Serial	RS232/485/422×1: RXD, TXD, GND, CTS, RTS		
Serial Parameters			
Baud rate:	1200~115200bps	Parity bits:	None, Odd, Even, Mark, Space
Data bits:	5~9	Flow control:	RTS/CTS, XON/XOFF, NONE
Software			
protocol:	ETHERNET, IP, TCP, UDP, HTTP, ARP, ICMP, DHCP, DNS		
Setting method :	ZLVirCom, WEB browser, device management library		
Net communication method:	Direct TCP/IP, virtual serial port		
Work Mode			
TCP server, TCP client, UDP, UDP Multicast			
Power Requirement			
9～48V DC，80mA@12V；40mA@24V；20mA@48V			
Environment			
Running temperature:	-40~85℃		
Storage temp:	-45~165℃		
Humidity:	5~95%RH		

4. Instructions

4.1 Hardware

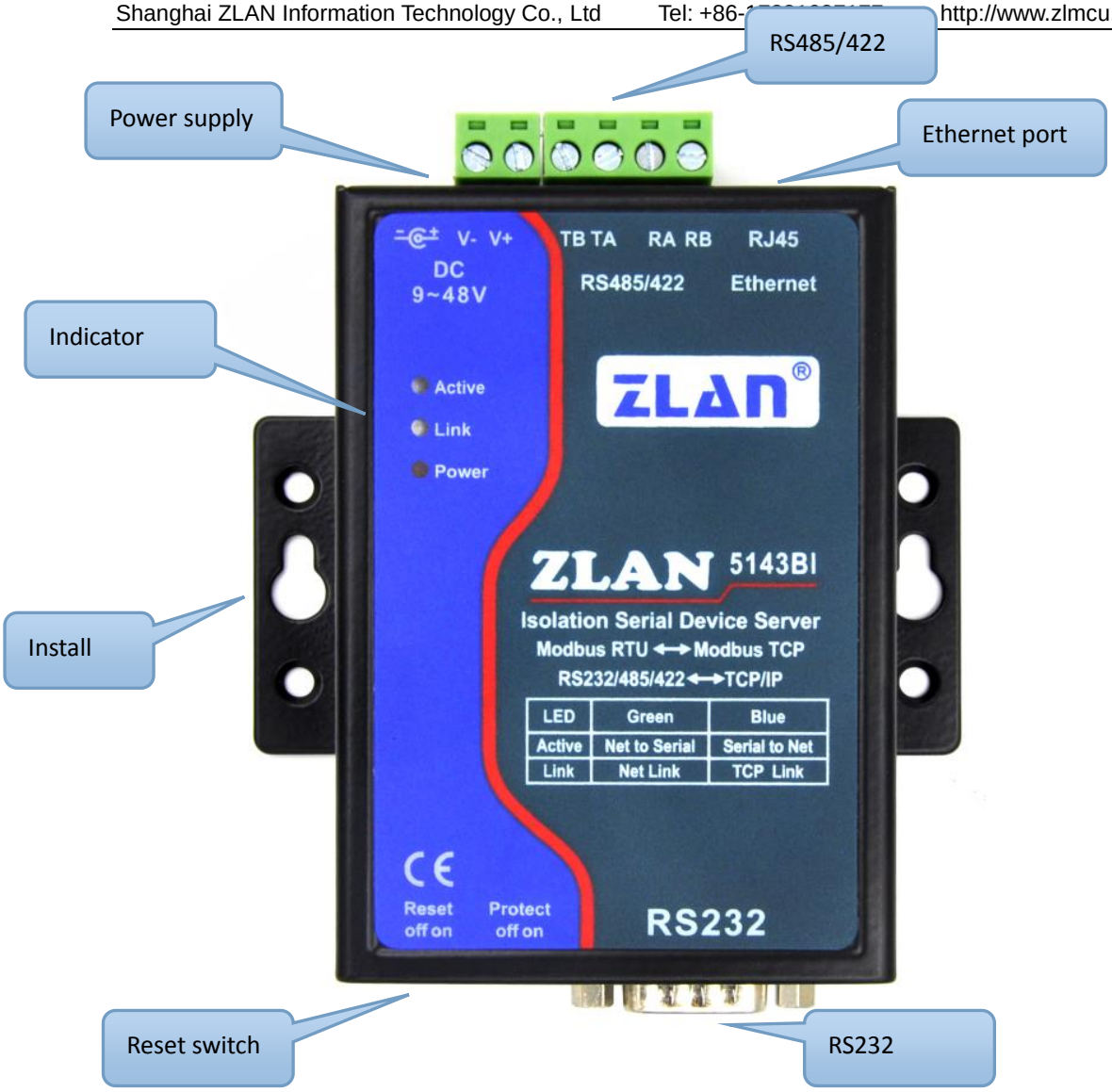

Figure 3 Front View

The front view of ZLAN5143BI serial device server is shown as FIG 3: ZLAN5143BI use black anti-radiation SECC board.

1. **Power supply:** Either DC socket or terminal input. Socket joint: the outer diameter is 5.5mm, and the inner diameter is 2.1mm. Terminal: 5.08mm terminal. Input voltage is 9~48V. 40 mA@ 24V.

Figure 4 Ethernet port, RS485/422 and Power Input

2. **RS485/422:** TB and TA are acceptable if only RS485 is used. TB is 485 B line (negative line), TA is 485 A line (positive line). If it is RS422, it needs to connect RA and RB, and connect the positive and negative lines of 422. The 485 can carry 256 loads. The longest communication distance is 1200 meters. Generally, it is necessary to use terminal resistance when the RS485 line exceeds 300 meters, and the terminal resistance of 485 is 120 ohms.

3. **Network port:** connect 10M/100M network cable and support automatic crossover.

4. **RS232:** DB9 male head is adopted, and the needle sequence of RS232 is shown in figure 5.

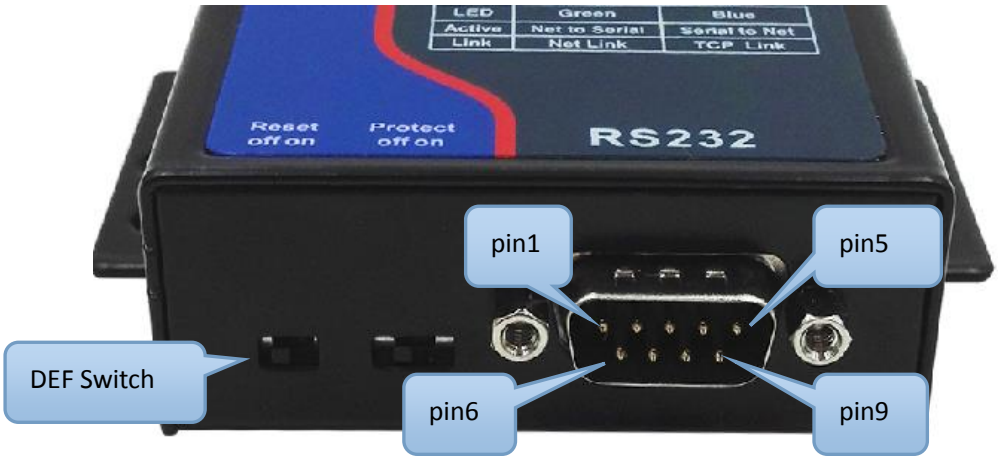

Figure 5 RS232 Interface and Dial Code

The definition of corresponding needle is shown in the following table:

Table 2 RS232 Line Sequence

Item	Name	Input / Output	Instruction
2	**RXD**	Input	receiving pin of the serial device server
3	**TXD**	Output	sending pin of the serial device server
5	**GND**	/	Ground wire
4	**DTR**	Output	Same as RTS

6	**DCR**	Input	Same as CTS
7	**RTS**	Output	After the flow control in using, the serial device server will accept the data of the serial device when the pin is 0.
8	**CTS**		After the flow control in using, the serial device server will send the data to the serial device when the pin is 0.

5. **Reset switch:** also known as DEF switch, as shown in figure 5. When the DEF switch is On (the right side of figure 5 is On), the serial device server will start loading the default parameters, and when pressed to On state for 5 seconds, the default parameters will be used to restart. The default parameters only affect the following parameters: IP mode to static, IP address to 192.168.1.254, subnet mask to 255.255.255.0, gateway to 192.168.1.1. Other parameters such as baud rate will not be reset. If all parameters need to be reset, please use the "system default parameter" of ZLVircom configuration tool for modification. The DEF switch is mainly used to make it easy to enter 192.168.1.254 in the browser to reconfigure the device when the IP is forgotten. The Protect switch is for future use.

6. **Indicator light:** it is divided into Power, Link and Active lamps, which respectively represent Power supply, connection indicator and data indicator.

Table 3 Meaning of Indicator Light

Power Indicator	**Instruction**
Link Indicator	1) Link lamp is green when the network line is connected. 2) When the TCP connection is established (or in UDP mode), the Link is blue (actually with faint green light). Can be used to determine whether the serial device server establish a communication link with the upper computer.

Active Indicator	1) The Active lamp is green when the Ethernet port sends data to the serial port. The shining time is one second longer than the actual communication time, and it is more convenient to find short data communication. 2) When the serial port sends data to the Ethernet port, the indicator light is blue and green at the same time. Because the blue color is brighter, if you see blue indicates that there is a serial port to return data to the network port. This can determine whether the device responds to the upper computer's command, and if it does not, it indicates that the baud rate of the serial port is not correct or the serial port is not well connected.

Method of using signal lamp to debug communication:

1) If the Link light is not green, the network cable is not well connected. Please check the network cable.

2) If the Link light is not blue (only TCP working mode is considered), the upper computer 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 Active lamp is green, there is a network port to send data, but no serial device to return data. Please check whether the baud rate is properly configured and whether the RS485 + or - is inversely connected.

7. **Installation method:** use the "mounting hole" shown in figure 4 to install the serial port server onto the plane or hang it on a screw. For the occasions where there are guides, it is suggested to purchase additional guide accessories to facilitate the installation of the guides, as shown in figure 6.

Figure 6 DIN RAIL

4.2 Hardware connection

Generally speaking, the serial device server only needs to connect power supply, serial port and network cable.

The power supply can adopt configured 12V power adapter or 2-wire power supply on site, which can be directly connected to plus or minus terminals of the power supply.

The serial port needs to be connected according to the user's serial device. If the user RS232 device is used, the DB9 male or female head shall be considered. If the male head is used, the standard RS232 female to female crossover line can be adopted to connect the serial port server and the device. If the user device is an RS485 device, connect the positive 485 to TA and the negative 485 to TB.

The Ethernet port connects with normal network cable, can directly connect to the computer or connect to the network through the switch.

4.3 Software Installation

ZLVircom can be used to configure the device IP and other parameters, also can create virtual serial port. If no need the virtual serial port function, you can download the free-installation version.

Table 4 ZLVircom Version

Software	Description
ZLVircom Device Management Tool (free-installation version)	This version no have the virtual serial port function
ZLVircom Device Management Tool (installation version)	This version has the ZLVircom_x64.msi and ZLVircom_x86.msi. The 64 bit operating system install x64, 32 bit system install x86 version.

Just follow the default prompt when installing. Upon completion of the installation, ZLVircom will be started each time the computer is started, which is used to boot up to create a virtual serial port.

4.4 Parameter Configuration

After installing ZLVircom, the hardware also connecting, run ZLVircom software as figure 7, and click "Device Manage" as figure 8. Use ZLVircom can search and configure the device parameter in different segment, which is very convenient as long as the device and computer of running ZLVircom are under the same switch.

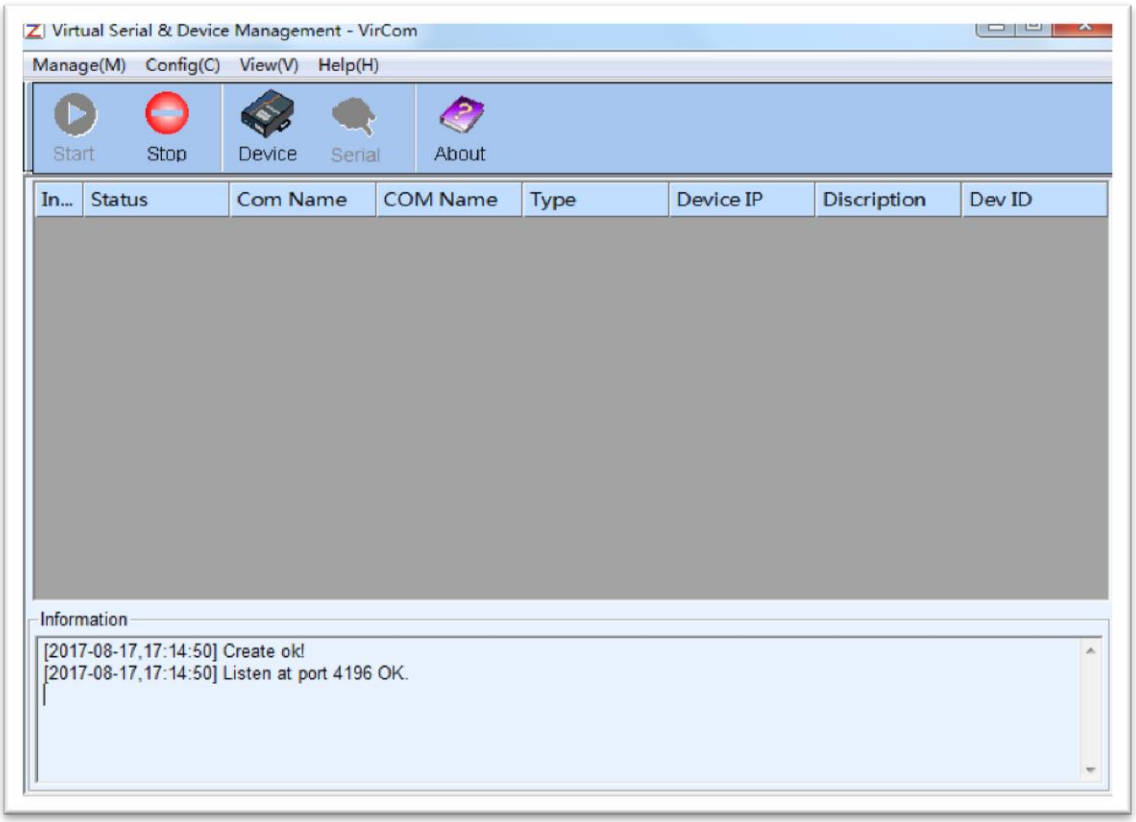

Figure 7 ZLVircom Main Interface

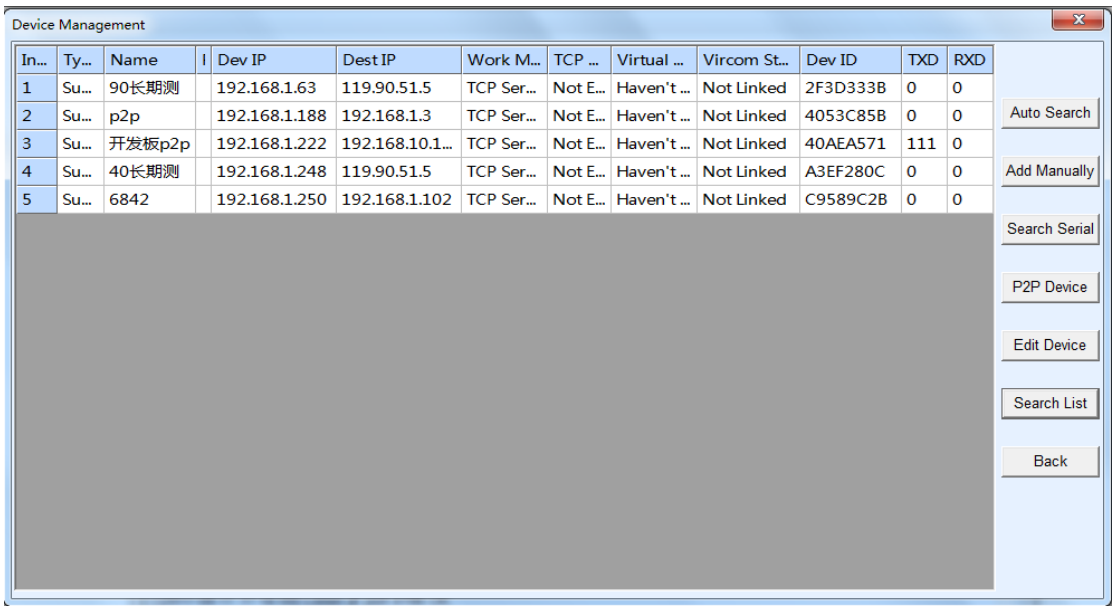

Figure 8 Device List

From the device list, you can see all of the current online devices, and you can search for devices that are not in one network segment. There is no need to use the "Add Manually" function.

Click the “Edit Device” to configure the device parameters.

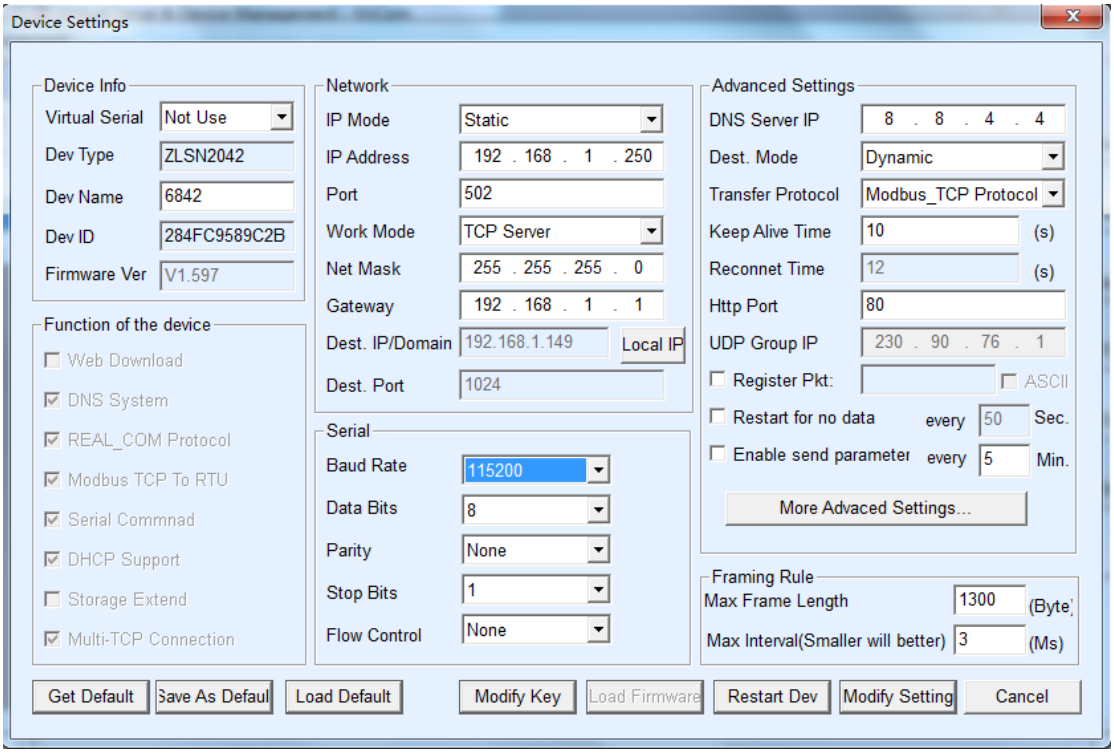

Figure 9 Device Parameters

In this interface, the user can set the parameters of the device, then click "Modify Setting", and the parameters are set to the flash of the device, with power-off no lost. The device will restart automatically.

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

The meaning of the parameters is described as follows:

Table 5 Parameter Meaning

Parameter Name	**Value Range**	**Instruction**
Virtual Serial	Non-in use, created virtual serial port	You can bind the current device to a created virtual serial port.
Dev Type		Show only the model of the core module
Dev Name	Any	You can give the device a readable name, with a maximum

		of 9 bytes, and support the Chinese name.
Dev ID		The factory's sole ID, cannot be modified.
Firmware Version		The firmware version of core module
Supporting Function		Please refer to the Table 4 “support functions”
IP Mode	Static, DHCP	The user can choose Static or DHCP (Dynamic acquisition of IP)
IP Address		The IP Address of networking products
Port	0～65535	The monitoring port of Networking products when in the TCP Server or UDP mode. As a client, it is best to specify that the port is port 0, which is good for increasing the connection speed, and the system will randomly assign a local port when using the 0 port. At this time the difference from specifying the non-zero port are: (1) local port is 0, module sets up a new TCP connection with PC when restarting, old TCP connection may not be closed, so that the old TCP connection of the host has been unable to close, specify the non-zero port does not have the problem. Generally host wants to close the old connection when the module is restarted. (2) the local port is 0, the time of TCP rebuilding connection is faster.
Work Mode	TCP Server(TCP Server Mode),TCP Client(TCP Client Mode),UDP Mode, UDP Multicast	When set to TCP Server, the network Server needs to actively connect the networking products; When set to TCP Client, the networking product initiates the connection to the network server specified by the destination IP.
Net Mask	Eg: 255.255.255.0	Must be same as net mask of local LAN.
Gateway	Eg: 192.168.1.1	Must be the same as the local LAN gateway. If it is not crossing outer network (such as the cable connecting computer), it is best to set the gateway as the IP address of the connected computer.
Dest. IP/Domain		In the TCP Client or UDP mode, the data will be sent to the destination IP or the computer of domain name instruction.
Dest. Port		In the TCP Client or UDP mode, the data is sent to the destination port of the destination IP.
Baud Rate	1200, 2400, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200, 230400,	Serial baud rate

	460800	
Data Bits	5, 6, 7, 8, 9	
Parity	None, Even, Odd, Mark, Space	
Stop Bits	1, 2	
Flow Control	None (no flow control), CTS/RTS, DTR/DCR, XON/XOFF	RS232 port valid
DNS Server IP		When the destination computer is described by a domain name, DNS server is required to resolve the domain name, which specifies the IP of this DNS server. When the IP mode is DHCP, the parameter is not specified and will be automatically acquired.
Dest. Mode	Static, Dynamic	UDP working mode: if the destination computer is described by a domain name, it's best to choose the static mode; If there are multiple computers in the LAN communicating with networking products through UDP, it is best to choose dynamic mode. TCP server mode: this parameter must be dynamic. TCP client mode: when IP mode is dynamic, the destination IP is reconnected after the device is restarted, so that the correct IP address can be obtained again. Otherwise, it will do direct connection without automatically restarting the device.
Transfer Protocol	NONE, Modbus TCP<->RTU, Real_COM	NONE indicates that the data forwarding from the serial port to the network is transparent; Modbus TCP<->RTU will convert Modbus TCP protocol directly into RTU protocol to facilitate coordination with Modbus TCP protocol; RealCOM is designed to be compatible with the old version of REAL_COM.
Keep Active Time	0～255	(1) Choose 1~255, if the device is in the TCP client working mode, the TCP heartbeat will be sent automatically for every "keep alive time". This can guarantee the TCP availability of links. When set to 0, there will be no TCP heartbeat. (2) Set to 0~254, when transformation protocol choose REAL_COM protocol, the device will send a length of 0 to 1 content data for every " keep alive time " to implement the heartbeat mechanism of Realcom. When set to 255, there will be no Realcom heartbeat.

		(3) Set to 0~254, if the device is working on the TCP client, the device will send the parameters to the destination computer every " keep alive time ". When set to 255, no have the parameter sending function. This mechanism is not normally used, users are not required to pay attention.
Reconnect Time	0～255	Once the networking products in a TCP client mode disconnect with the server (as long as in the non-connection status), it will initiates a TCP connection to the Server every while, can be 0~254 seconds, if set 255, never for reconnection. Note first TCP connection would immediately (such as hardware on electricity, through zlvircom software restart equipment, no data), only after the first connection failure will try again after waiting for the "break time", so "break time" will not affect the network and server connection setup time under normal circumstances.
Http Port	1～65535	
UDP Group IP		UDP multicast
Max Frame Length	1～1400	One of the rules of serial. The connected product serial port sends the received data to the network as a frame after receiving the length data.
Max Interval (Smaller will better)	0～255	One of the rules of serial. When there is a pause in the data received by the connected product, and the pause time is greater than that time, the received data is sent to the network as a frame.

The functions supported by the device are explained as follows:

Table 4 Device Supported Function

Name	**Instruction**
Webpage download	Support to control the serial output command through the web page, only the product with the trailing W has this function.
Domain name system	The destination IP can be the domain name (such as the beginning of the WWW server address).
REAL_COM protocol	It is a non-transparent transmission serial device server protocol, which is suitable for the binding of virtual serial port through Internet. Because the protocol contains the device MAC address, it is helpful for the upper computer to identify the device. In general, it can be without use.

Modbus TCP to RTU	Only the models that the third bit is 4 support this function. Modbus TCP to RTU can be implemented. It also supports multi-host capabilities.
Serial port modify parameters	The serial port modification parameter supports the serial port AT instruction to configure and read the device parameters.
Automatic acquisition of IP	Support for DHCP client protocol
Storage extension EX function	Extended later
Multiple TCP connections	Support more than one TCP connections as a TCP server.
IO port control	Model No. 3 of 4 supports arbitrary custom instructions to control 8 IO outputs.
UDP multicast	UDP multicast
Multi-destination IP	As a TCP client supports simultaneous connection of 7 destination IP.
Proxy server	Support the proxy server functionality (a specific model is required).
SNMP function	Support SNMP to Modbus RTU protocol. Only those with -snmp tails support this feature.
P2 function	Support the ability to access devices in any network through P2P across technology. This feature is supported in model N with trailing patches.

4.5 TCP communication test

After the device parameters are configured, TCP connection communication can be tested with serial port tools and TCP debugging tools.

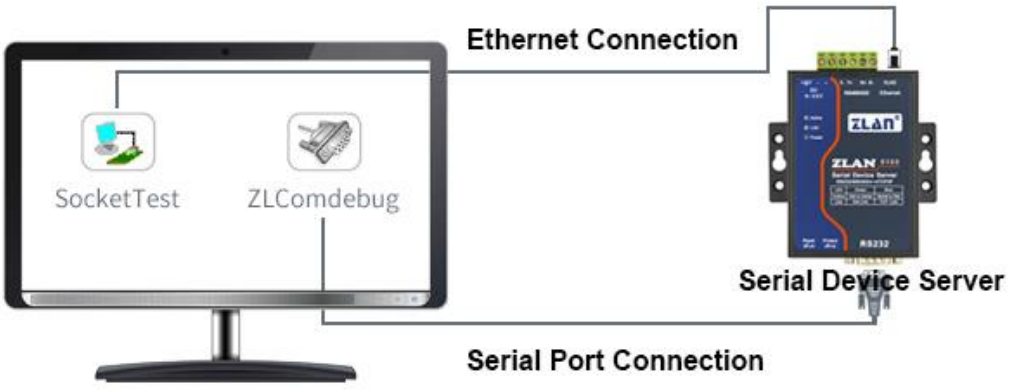

Figure 10 TCP communication diagram

Now suppose the PC COM port (USB to RS232 line) connect with serial port of serial device server, then open the serial debugging assistant ZLComDebug, and open the corresponding COM as figure 11; Open TCP&UDP debugging assistant SocketTest, and as TCP client, fill in the destination IP for the serial port server IP (currently 192.168.1.200), destination port is 4196, and then click "open" button in figure 12. Enter "socket send" in SocketTest and click send, then the data is transferred to RS232 interface through the network port of the serial port server, and then sent to ZLComDebug, which is then displayed in ZLComDebug. Conversely, type "Comdebug send" in ZLComDebug, and clicking send can also be sent to socket test and displayed.

The demonstration demonstrates the data transparent forwarding function from serial port to network port, network port to serial port.

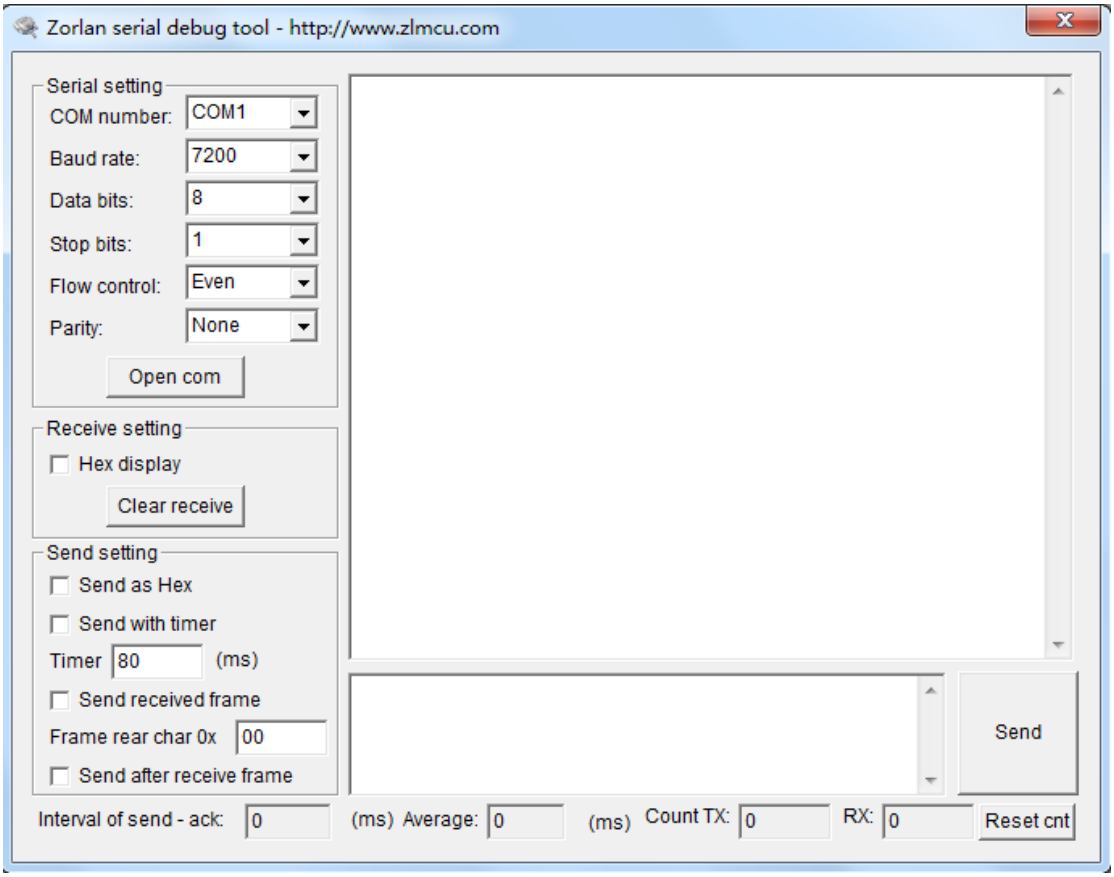

Figure 11 ComDebug Send-receive Interface

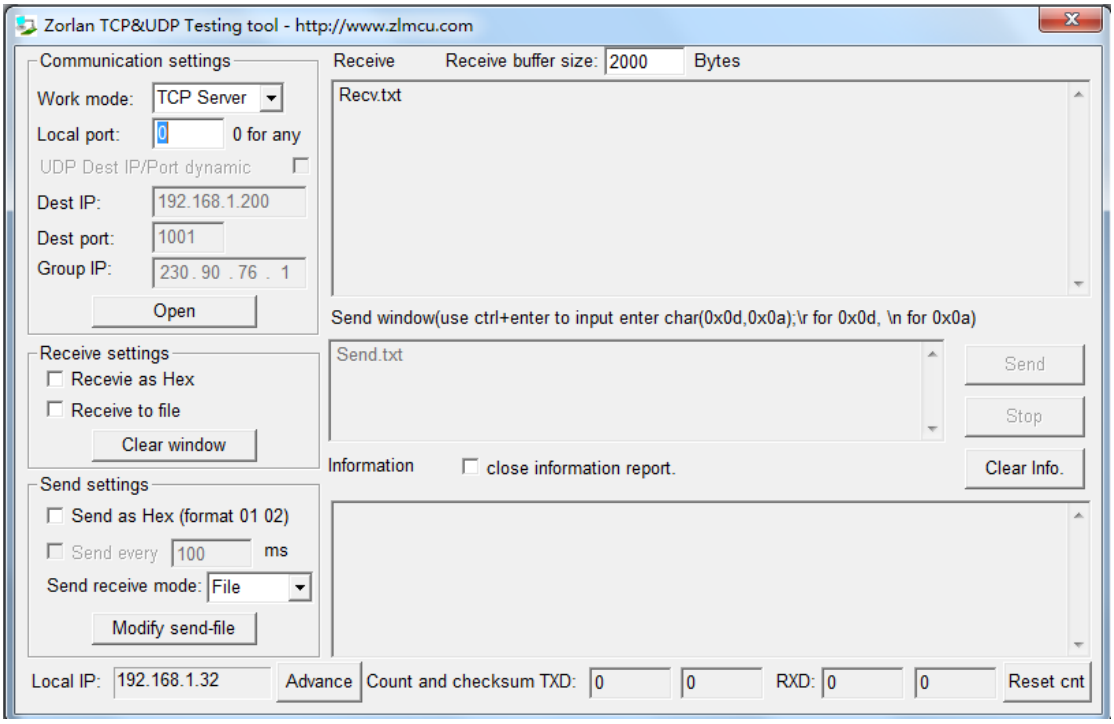

Figure 12 SocketTest Send-receive Interface

4.6 Virtual serial port test

SocketTest in figure 10 communicates directly with the serial port server through TCP. In order to enable users to communicate with the serial port server with the developed serial port software, it is necessary to add a virtual serial port between the user program and the serial port server. As shown in figure 16, ZLVircom and the user program run on a computer, and ZLVircom virtual a COM port, so that the COM port corresponds to the serial port server. When the user program opens the COM to communicate through ZLVircom → serial device server → to users. Here's how to do this:

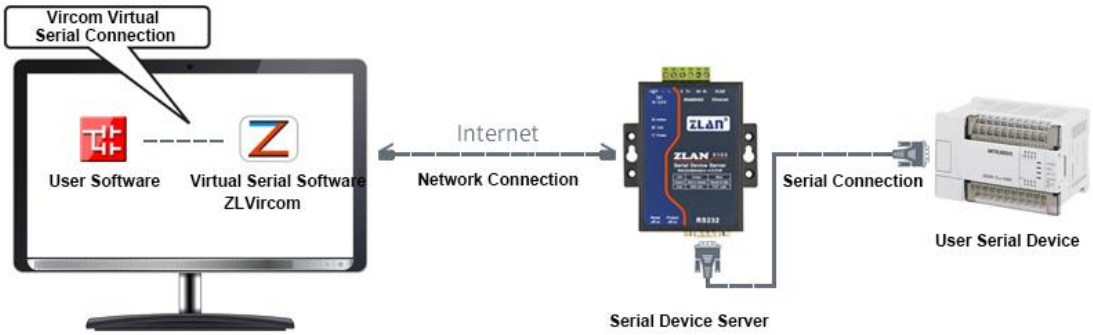

Figure 13 Virtual serial port

Click on the "Serial Manage" of the main interface of ZLVircom, then click "Add", and select COM5, where COM5 is the COM port that didn't exist on the computer.

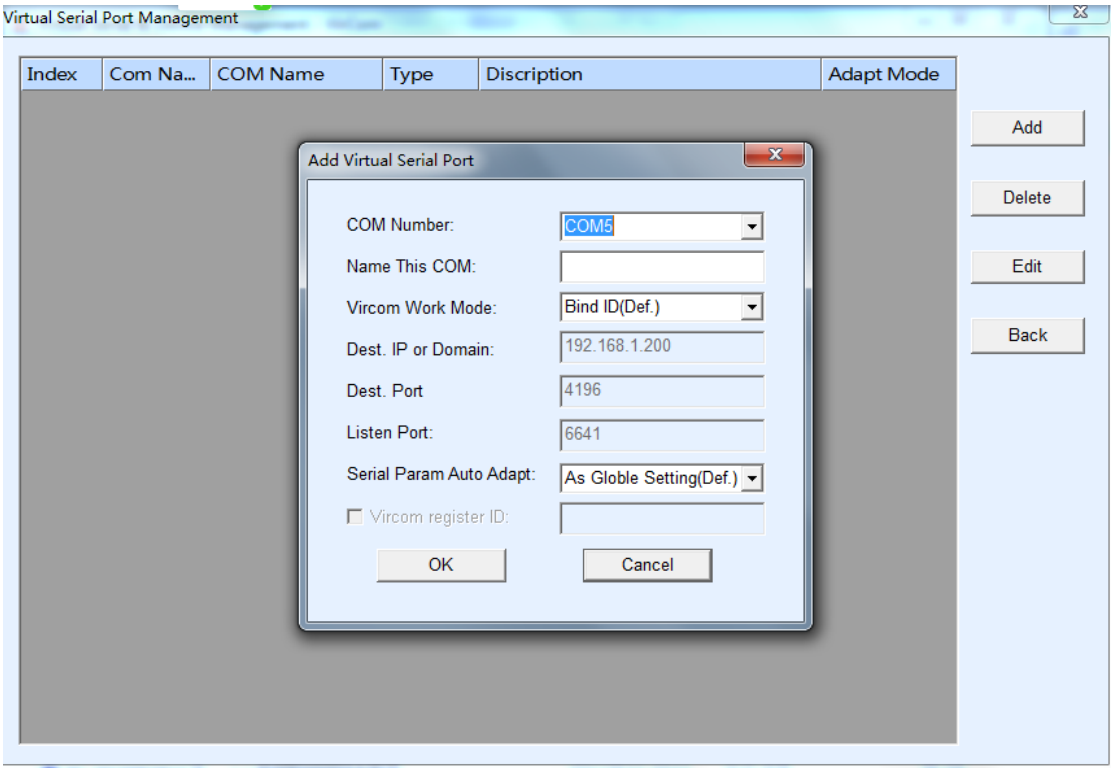

Figure 14 Add Virtual Serial Port

Then enter the "device manage", and double-click the device that you need to bind to the COM5. As shown in FIG. 9, select COM5 from the "virtual serial port" list in the upper left corner. Then click "modify Settings". And return to the main interface of ZLVircom. You can see that the COM5 has been connected to a device with IP 192.168.1.200. You can use COM5 instead of SocketTest to communicate.

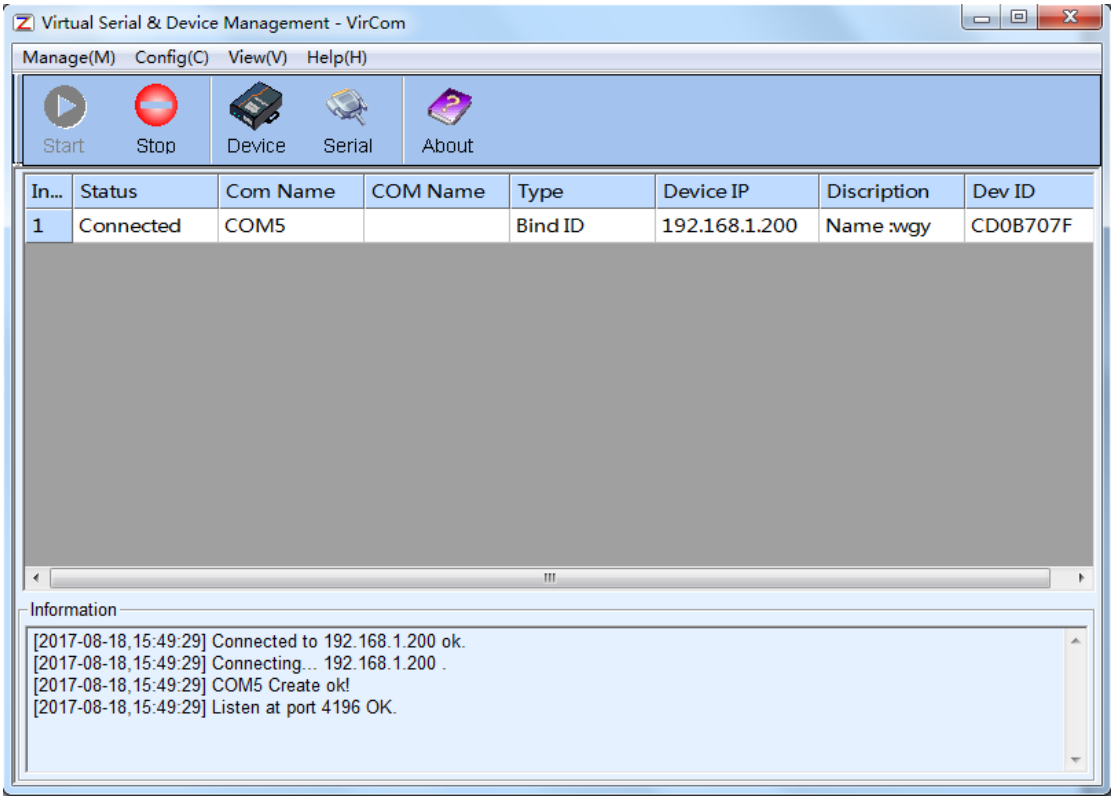

Figure 15 Virtual Serial Port has been connected

Now close the before SocketTest and open a new ZLComdebug as the user's serial port program, now open COM5. At this point, COM5 (virtual serial port) and COM4 (hardware serial port) can send-receive data through networking products. If the serial port of the connected product is not connected to the COM port of PC, but a serial port device, then the COM5 can be opened to communicate with the device. And it's just use the network way now.

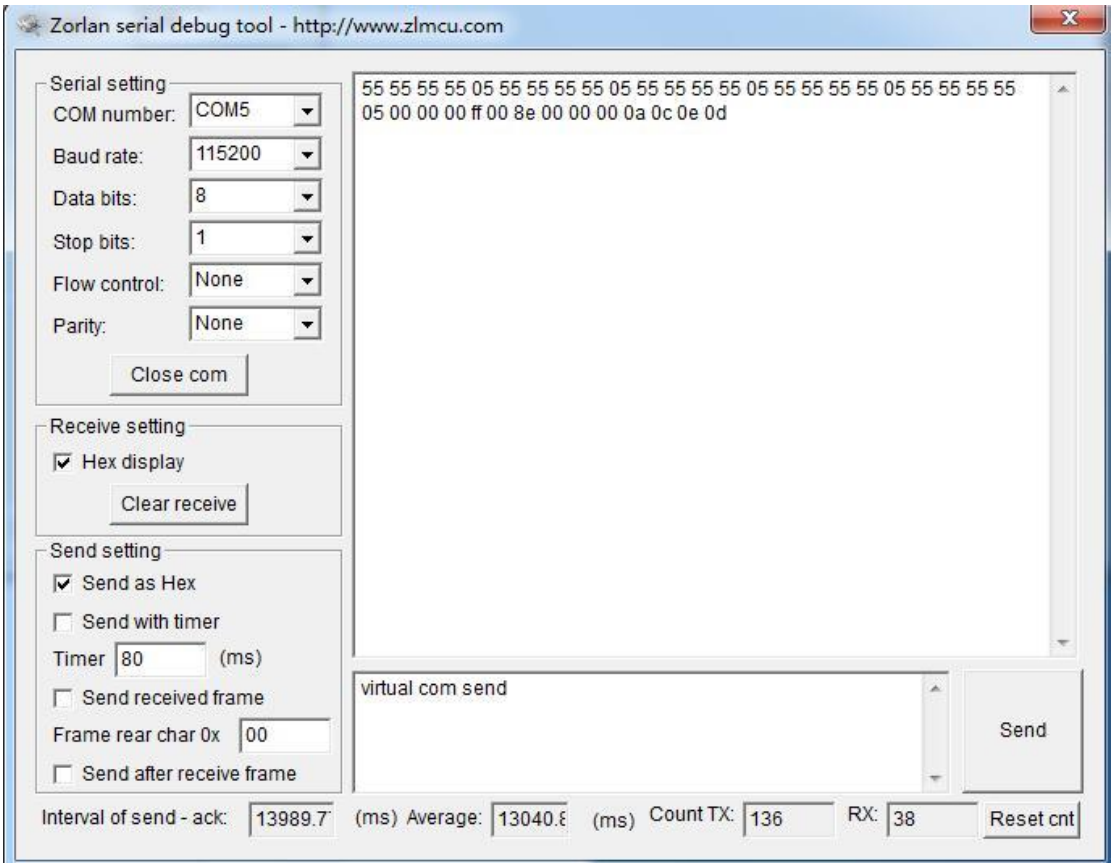

Figure 16 Communication via Virtual Serial Port

4.7 Modbus TCP test

By default, serial and network data is transmitted transparently. If you need to implement the Modbus TCP to RTU, requires selecting “transfer protocol” for "Modbus TCP ←→ RTU" in the Settings dialog, as shown in figure 20. At this point, the device port is automatically changed to 502. At this point, the user's Modbus TCP tool is connected to port 502 of IP of serial port server, and the Modbus TCP instruction sent will be converted into RTU instruction output from the serial port. For example, the serial port server network port receives the Modbus TCP instruction of 00 00 00 00 00 06 01 03 00 00 0a, then the serial port outputs the instruction of 01 03 00 00 00 0a c5 cd. Note: the serial port may send several 01 03 00 00 00 0a c5 cd instructions, because the default Modbus adopts the storage mode, which will automatically poll to query. It'll show you how to switch to non-storage.

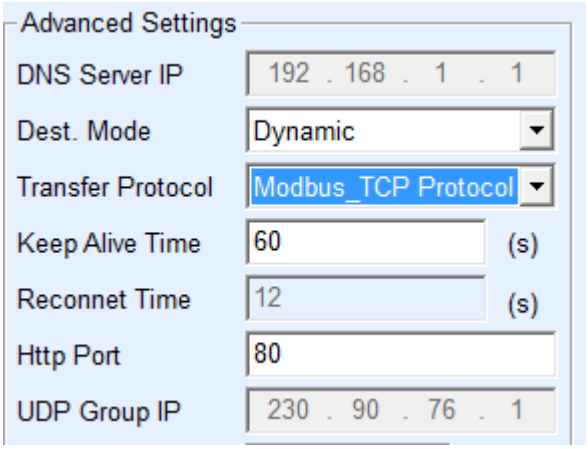

Figure 17 Enable Modbus TCP

If the user's Modbus TCP software is used as Slave, it is necessary to change the working mode to client based on the transfer protocol selection, and the destination IP change to the computer IP of Modbus TCP software, and the destination port is 502, as shown in figure 18.

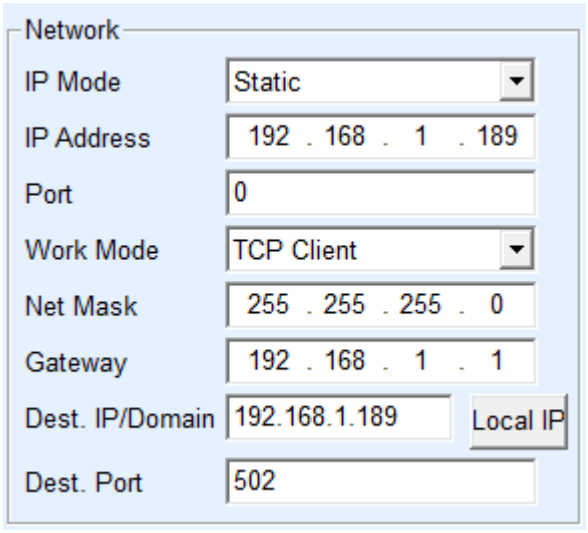

Figure 18 Modbus TCP as Client

4.8 Web Configuration

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

1) Enter the IP address of the serial port server in the browser, such as

http://192.168.1.200, to open the following page.

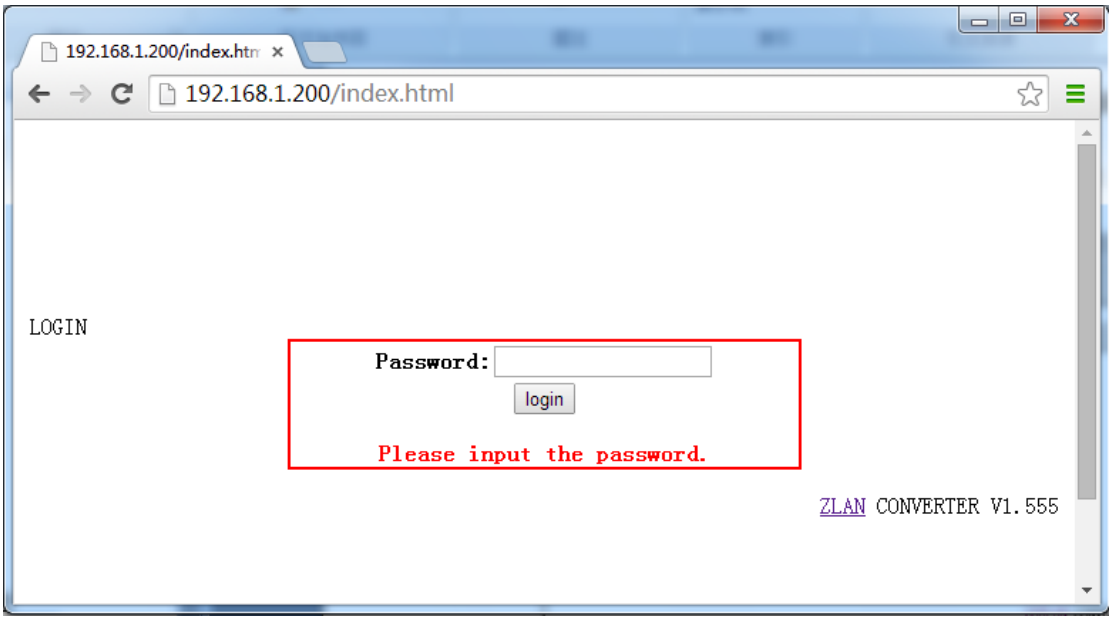

Figure 19

2) Enter Password in Password: default is 123456. Click the login button to login.

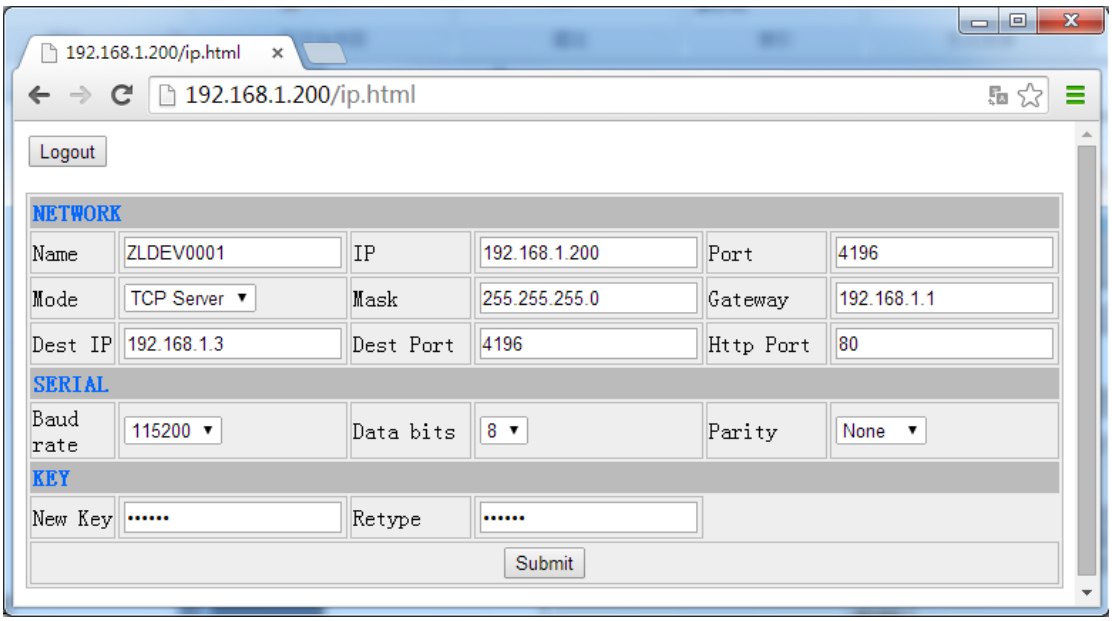

Figure 20 Web configuration interface

3) The serial port server parameters can be modified in the web page that appears, and the related parameters can refer to the meaning of the parameters in table 3.

4) After modifying parameters, click the "submit" button.

5. After-service

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