VT-LR600

VT-LR601

User Manual

Figure 1 VT-LR600

Contents

1. Overview

LORA is a long-distance wireless communication scheme. Compared with GPRS and 4G solutions, Lora does not require a monthly fee for access to the network, and it has a longer distance compared with WiFi and Zigbee. So LORA is becoming more and more widely used in small data long-distance communication.

Valtoris's LORA products adopt SX1287 chip and use Semtech's patented LORA ™ modulation technology to achieve a receiving sensitivity of -140dBm and output power of +20dBm. The outdoor line-of-sight communication distance is 8km, featuring long distance, low power consumption and anti-interference.

At present, Our Lora products are divided into two categories. One is serial port to Lora, model VT-LR600, which contains three serial port forms, namely RS232/485/422. The other type is Ethernet (TCP/IP) to Lora, the model is VT-LR601, can connect Lora and the Internet.

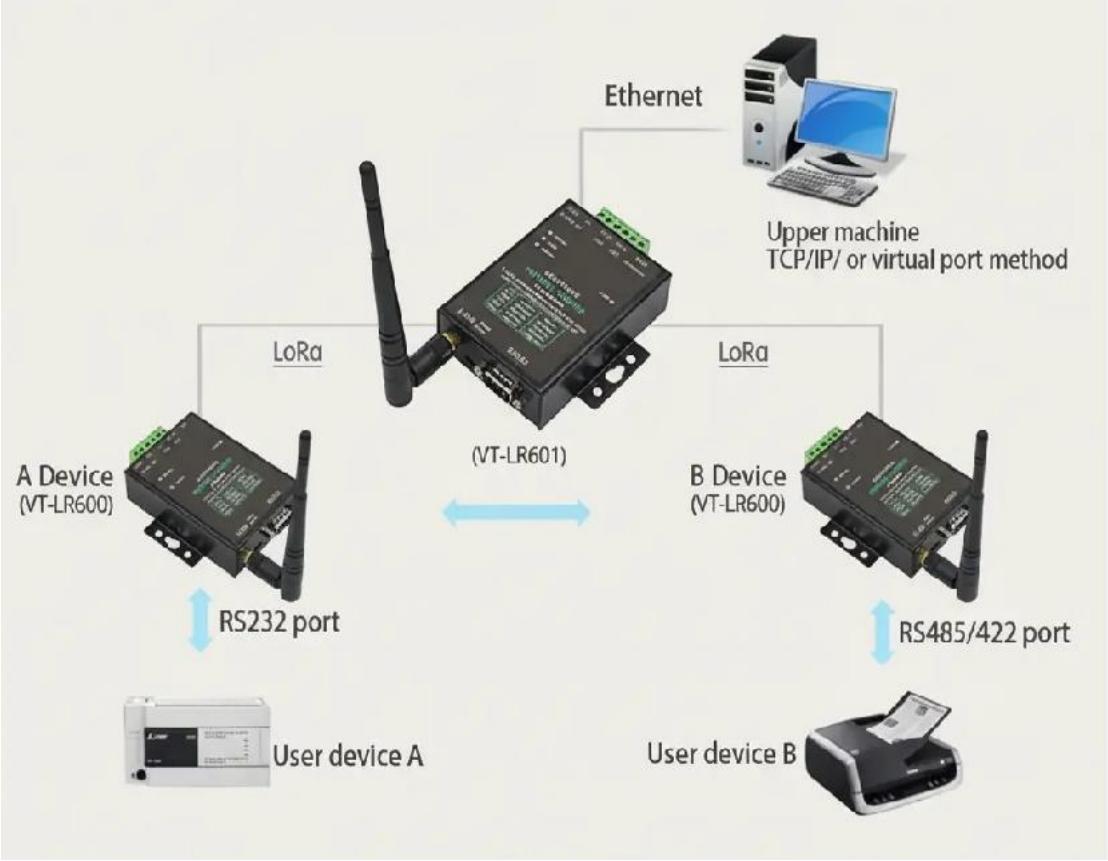


Figure 2 LoRa Using Method

Figure 2

When it is used for wireless transmission and communication of two serial port devices, connect two VT-LR600 (A and B in the figure) to the serial port of the device respectively, and then the serial port data of the two devices can be forwarded to each other through Lora network.

When collecting device data through TCP/IP of the upper computer, a network port of VT-LR601 is connected to the Ethernet network. Multiple VT-LR600 can be connected to the device end to collect data, and then the data is transferred to VT-LR601 through Lora, which is then transferred to the computer through Ethernet. Computer and VT-LR601 can adopt Modbus TCP, virtual serial port, JSON, TCP/IP protocol and other modes

LoRa Application：

- Power electronics, intelligent instruments；
- Industrial automation system；
- The Internet of things; Climate and geological monitoring
- Building/access/security control system

2. Feature

1. Communication Distance(Testing distance)：

Table 1 VT-LR600/VT-LR601 Communication Distance

Testing Environment	Testing Distance
Unobstructed communication	Around 8Km
Urban roads travel in straight lines	Around 6Km
Cities are sheltered by buildings	Around 1Km
Within the building	Through 5 floors

2. VT-LR601 contains multiple LoRa to Ethernet functions, realize LoRa To TCP/IP

2.1 Can be configured as TCP Server, TCP Client, UDP, etc.

2.2 Equipped with Windows virtual serial port & device management tool Vircom, support virtual serial port.

2.3 Support Modbus TCP to Modbus RTU mode data acquisition.

2.4 Supports Modbus RTU and 645 protocol devices to automatically collect data and send it to the server in JSON format +MQTT protocol.

2.5 LED indicator lights indicate the direction of data flow, the state of LORA communication, and the running state of the equipment, which can directly reflect the state of the equipment.

3. Technical Parameters

Table 2 Technical Parameter

Appearance	
Interface:	485/422: Terminal; 232： DB9; Ethernet: RJ45
Power Supply:	Inside positive outside negative, standard outlet
Size:	L x W x H =9.4cm×6.5cm×2.5cm
Specification Parameters	
Working Voltage	DC9~24V
Working Current	VT-LR600：30mA@12V
	VT-LR601：160mA@12V
Operating temperature	-40℃~85℃
Humidity	<95%RH
Wireless Communication	
Transmission Distance	The outdoor area has no shelter of 6km~8km, and the indoor area crosses about 5 floors
Frequency Range	410MHz~525MHz
Wireless Channel	115
Receiving Sensity	-140dbm
Transmit Power	20dbm
Modulation System	LoRa™ Patented modulation technology
Wireless Connection	External SMA male antenna, suction cup antenna 1 meters; Working frequency： 490MHz
Wire Communication	
Serial Port Data	Baud Rate：1200~115200bps；Check Bits：None, Even, Odd；Digit 8；Stop bits 1
Ethernet Protocol	（Only VT-LR601 support TCP/IP protocol）ETHERNET、IP、TCP、 UDP、 HTTP、 ARP、 ICMP、 DHCP、 DNS
Environment	
Operating temperature	-40~85℃
Storage temperature	-45~165℃
Humidity range	5~95% relative humidity

4. Instruction

4.1 Hardware specifications

The front view of VT-LR600/VT-LR601 Lora to Ethernet/serial port is shown in Figure 3. VT-LR600/VT-LR601 uses black radiation-resistant SECC plates. There are two "ears" on the left and right for easy installation.

Figure 3 VT-LR600/VT-LR601 Front View

Panel Lights：

1. **ACT：** The ACT light is green to indicate that data is being received from Lora and transmitted to the serial port/Ethernet. When the ACT light is blue, the data is being sent to Lora. If the data is relatively short, the flashing time is relatively short, you need to pay attention to check. And the blue is bright, easy to cover the green.
2. **LINK：** This indicator is only valid for VT-LR601. When the LINK light is green, it means that the RJ45 network cable has been connected. When the LINK light is blue, the TCP connection is established or in UDP mode.
3. **POWER：** When green, it indicates that VT-LR600/VT-LR601 has been powered on; If it is blue, it means that it is in the configuration mode. In the configuration mode, the device can be configured with the AT command AT VT-LR600 baud rate, but in the working mode, the LOLA parameter of the device can also be

configured with the serial port search function of the Vircom tool.

4. **LoRa**：The green flashes every second to indicate that the device has been in operation; A constant blue light indicates that data has been received from the LORA network within 10 seconds, indicating to some extent that the LORA network is in a valid communication state.

Figure 4 VT-LR601 Front Interface

The front Interface of VT-LR600/VT-LR601 is shown in Figure 4, from left to are respectively：

1. **Network port**: Standard RJ45 interface. If bit VT-LR600, this interface is invalid.
2. **R-、R+、T+、T-**：T+ is RS485A, T- is RS485B; If you need RS422, you need to connect R- and R+.
3. **Terminal type power supply +, -** : the voltage is 9 ~ 24VDC.
4. **Power socket**: can use standard plug 5.5mm (the inner core is positive), voltage 9 ~ 24VDC. The back plate of VT-LR600/VT-LR601 is shown in Figure 5, from left to are respectively：

Figure 5 VT-LR601 Back Interface

1. **LoRa Antenna**: 1 m Suction antenna.
2. **Configuration Switch**: When dialing ON, enter the configuration mode of LORA. At this time, it can be configured with AT instruction. For VT-LR601, the IP of the device is also restored to the default 192.168.1.254.
3. Serial port adopts standard DB9 male head: line sequence is shown in：

Table 3

NO.	Name	Function
2	RXD	The serial server receives pins
3	TXD	The serial server send pins
5	GND	Ground wire
7	RTS	After the flow control is enabled, the serial port server will accept data from the serial port device when the pin is 0
8	CTS	After the flow control is enabled, the serial port server will send data to the serial port device when the pin is 0

Outline Size

Length×Width×Height =9.4cm×6.5cm×2.5cm，VT-LR600/VT-LR601 size same as below：

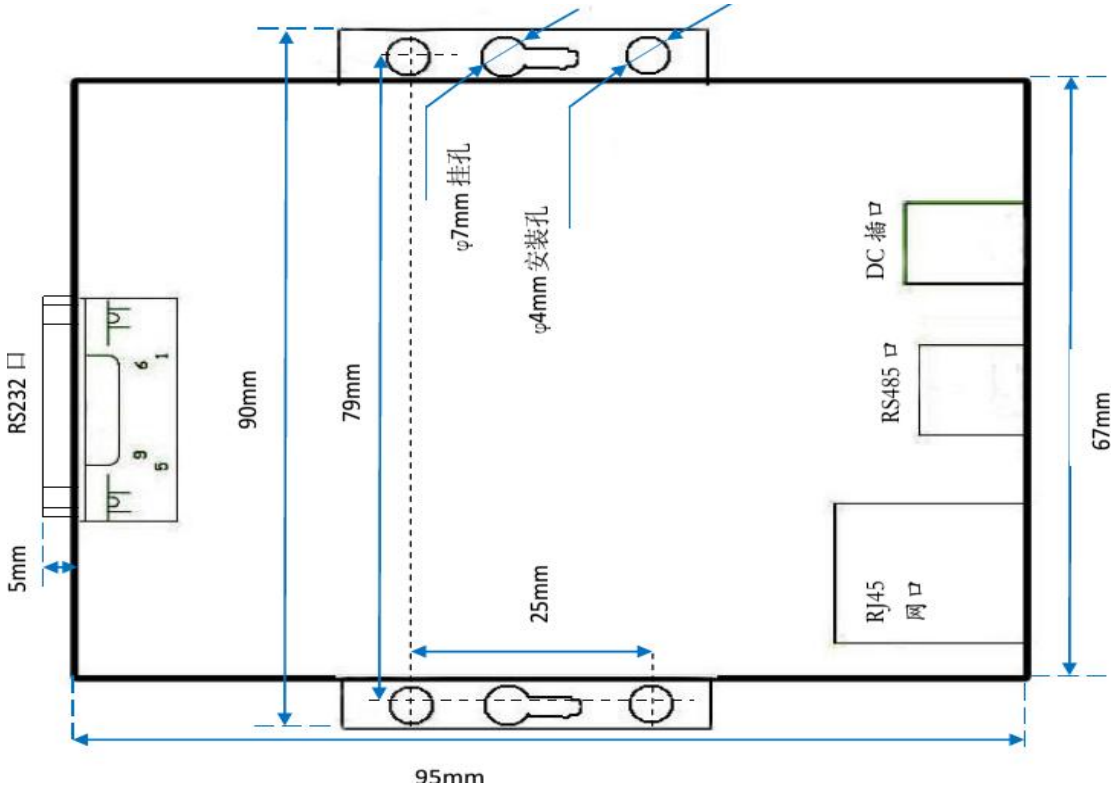


Figure 6 VT-LR600/VT-LR601 Outline Size

4.2 Software specifications

4.2.1. LoRa Configuration

LORA devices must be configured with the same LORA parameters to communicate with each other, which include: spread spectrum factor, bandwidth, encoding rate, and frequency. The Config button can be configured using the AT directive when the button is pressed On, but it is more commonly configured using the Vircom tool without the need to flip the Config button.

The baud rate of 9600bps is adopted in the default mode. If the user only needs one LORA network on site, no LORA parameter configuration is needed and the power can be used.

1.1. Configuration Steps

1. The device is connected to 9~24V DC power supply. You should see the POWER light in green at this point.
2. Connect the RS232 serial port of the VT-LR600/VT-LR601 to the serial port of the computer (it can be the serial port of the USB to serial port line).
3. Run Vircom, click on the main interface" equipment management "button, and then click" serial search "button.

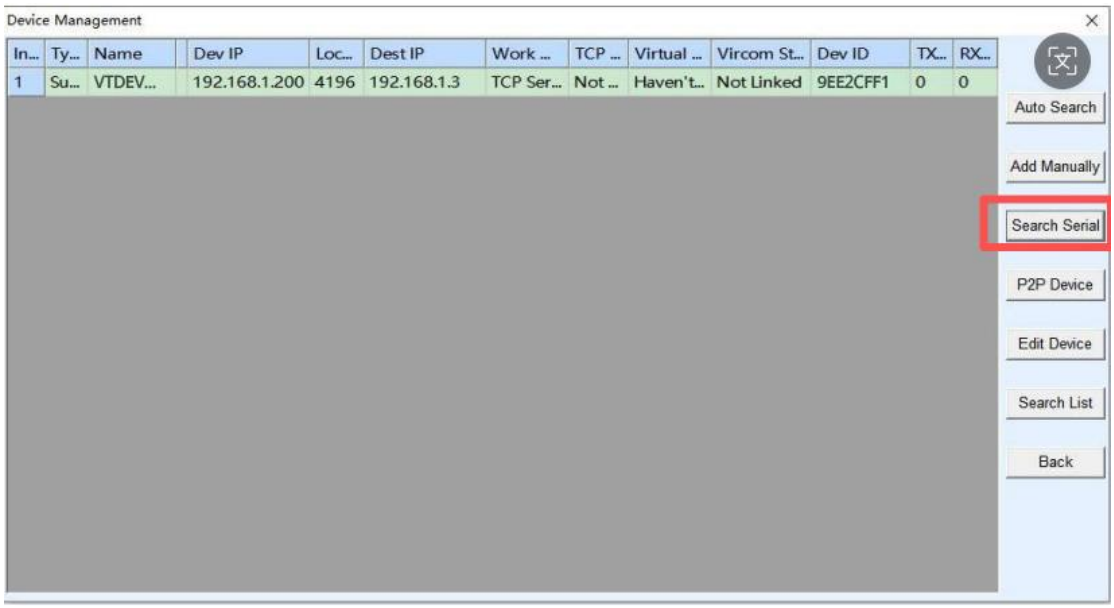


Figure 7 Serial port search

The dialog box will automatically list the serial ports existing in the computer, select the corresponding serial port and click the "Search" button. At this point, you see the

device's ACT light flashing blue, indicating that you are searching. If the hardware connection is normal, the Lora configuration screen will automatically pop up.

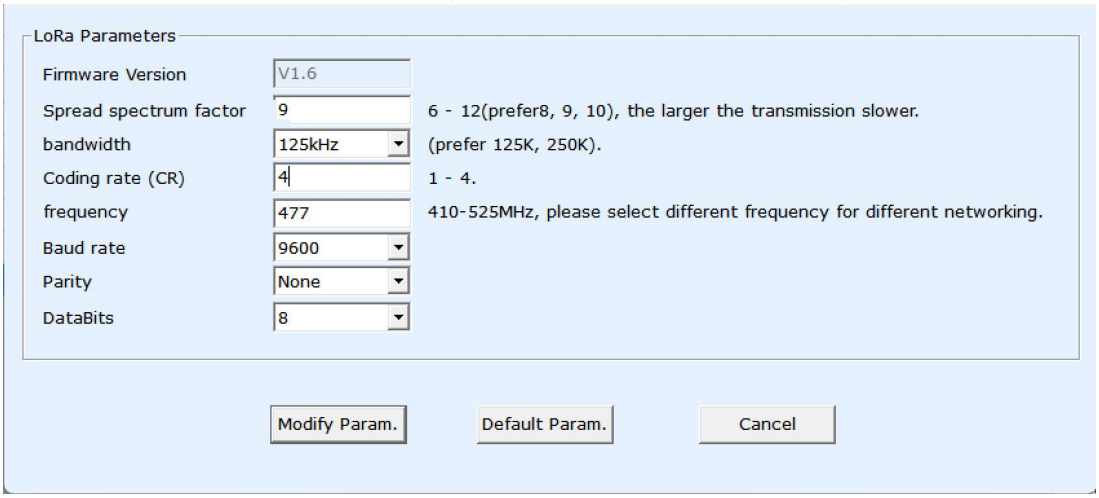


Figure 8 LoRa Configuration

Click "Default Parameters" to restore the default parameters. Click "Modify parameters" to set the parameters inside VT-LR600/VT-LR601. what the parameters mean as below.

1.2. Parameter meaning

1. Spread spectrum factor: 6~12, the larger the data transmission will be slower.
2. bandwidth：125~500KHz.
3. Encoding rate：1~4.
4. frequency：410~525，default as 477MHz，default antenna 490MHz，So try to choose a frequency between 470 and 510, so as not to affect the antenna matching. For different LORA networks, different communications are distinguished by different frequencies to prevent spoilage.
5. Baud Rate：baud rate of serial communication，1200~460800bps available.
6. Check bit：Serial communication check bit, can be zero, odd check, even check. The data bit is fixed at 8 bits, and the stop bit is fixed at 1 bit.

1.3. Attention

1. All devices in the same communication network must have the same LORA parameter.
2. In the same communication network, one module sends data and all the other modules receive data.
3. The VT-LR600/VT-LR601 communication is based on connection-less communication, so it's not like there are two modules that can communicate and the Lora Link light will come on. The Lora Link light indicates that Lora has received data within 10 seconds.

4.2.2 TCP/IP Configuration

This configuration mode is only valid for VT-LR601 and not for VT-LR600. It is configured to convert LORA data to TCP/IP data. Please note:

The network part serial port parameters should be configured to be the same as the LORA serial port parameters, in particular the baud rate. If the serial port parameters in the LORA section have not been modified, configure the serial port parameters in Figure 9 to 9600bps.

1.1 Parameter Meaning

Please use Vircom for configuration. The network parameters of VT-LR601 are configured through the Ethernet interface. When VT-LR601 is connected to the network through the Ethernet port, the computer in the same LAN can search the device through the installed Vircom tool.

After the search, a dialog pops up as shown in Figure 9. The parameters are saved in the flash space of VT-LR601. They will be loaded when the power is on and won't be lost when the power is off. The meaning of the parameter is explained as followings：

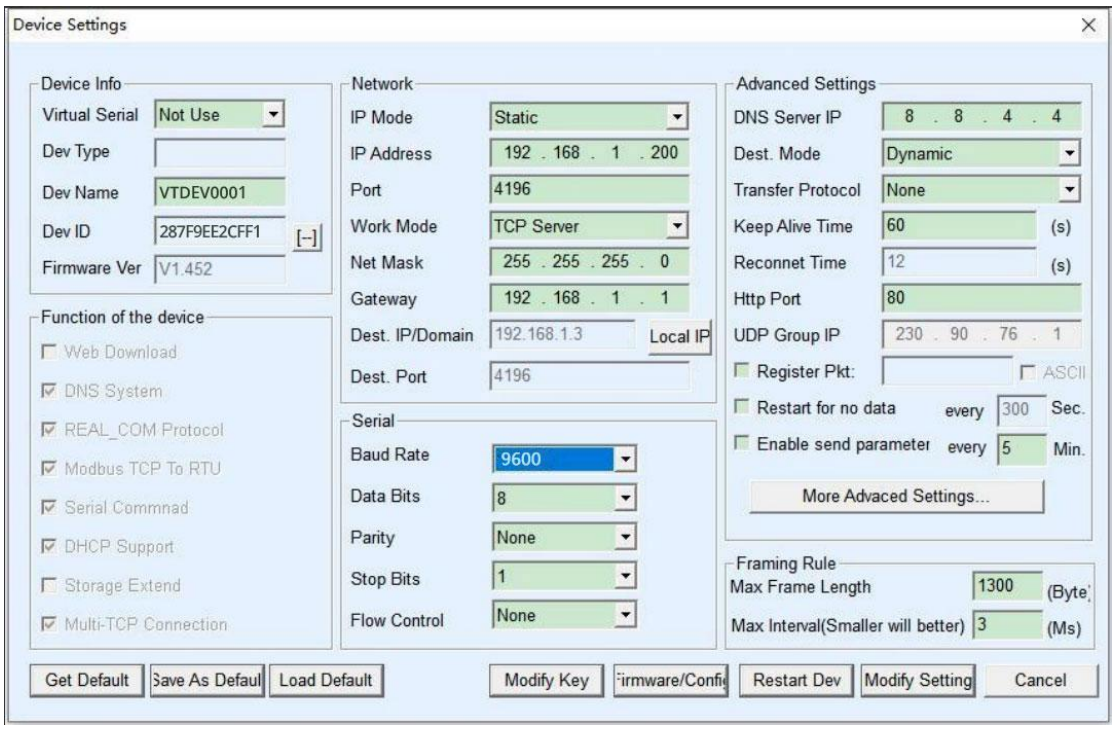


Figure 9 Network parameters

As followings：

Table 4 Parameter Meaning

Name	Value range	Meaning
Virtual serial port	No; created virtual serial port	You can bind the current device to a virtual serial port that has been created
Device Name	Any	You can give the device an easy-to-read name, up to 9 bytes, and support Chinese names
Device ID		Factory unique ID, not modifiable
Firmware version		The firmware version of the core module
IP Mode	static、DHCP	Users can choose between static or DHCP (dynamic IP acquisition)
IP address		IP address of networked products
Interface	0～65535	The listening port for networked products when they are in TCP Server or UDP mode. As a client, it is better to specify port 0 to improve the connection speed. When using port 0, the system will randomly assign a local port. (1) When the local port is 0, the module restarts with the PC and establishes a new TCP connection. The old TCP connection may not be closed, so the old TCP connection of the upper computer cannot be closed all the time. This problem is not caused by specifying the non-zero port. Generally, the upper computer wants to close the old connection when the module is restarted. (2) When the local port is 0, TCP takes faster time to re-establish the connection
Working Method	TCP Server (TCP Server mode), TCP Client (TCP Client mode), UDP mode,	When set to TCP Server, the network Server needs to actively connect to networking products; When set to TCP Client, the networked product initiates the connection to

	UDP multicast	the network server specified by the destination IP.
Subnet mask	eg：255.255.255.0	Must be the same as the local LAN subnet mask
Gateway	eg：192.168.1.1	Must be the same as the local LAN gateway. If it is not across the external network (such as network cable docking computer situation), it is best to set the gateway to the docking computer's IP address
The destination IP or domain name		In TCP Client or UDP mode, the 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.
Baud Rate	1200、2400、4800、7200、9600、14400、19200、28800、38400、57600、76800、115200、230400、460800	Serial port baud rate
Digit Bits	5、6、7、8、9	
Check Bits	None、Even、Odd、Mark、Space	
Stop Bits	1、2	
Flow Control	None、CTS/RTS、DTR/DCR、XON/XOFF	RS232 serial port available
DNS service device		When the destination computer is described by the domain name, the DNS server is required for domain name resolution. Here, the IP of the DNS server is specified. This parameter is not specified when IP mode is DHCP, and will be automatically obtained
Objective mode	Static and dynamic	This parameter is only valid for UDP working mode. If the destination computer is in static

		mode with the best choice of domain name description; If there are multiple computers in the LAN to communicate with the networked product through UDP, it is best to choose the dynamic mode. This parameter must be dynamic in both TCP server and TCP client modes
Conversion of agreement	NONE、Modbus TCP<->RTU、Real_COM	None means that data forwarding from the serial port to the network is transparent; Modbus TCP<->RTU will convert Modbus TCP protocol directly to RTU protocol for easy coordination with Modbus TCP protocol; Realcom is designed to be compatible with older versions of the REAL_COM protocol
Keep running time	0～255	(1) When 1 ~ 255 is selected, if the device is in TCP client operating mode, it will automatically send TCP heartbeat every "guaranteed time". This ensures TCP validity of the link. When set to 0, there will be no TCP heartbeat. (2) when set to 0 ~ 254, when the conversion protocol is selected as REAL_COM protocol, the device will send a length of 1 and content of 0 data every time to achieve the heartbeat mechanism in the REALCOM protocol. Set to 255 there will be no RealCom heartbeat. (3) When set to 0 ~ 254, if the device is working on the TCP client, the device will send the device parameters to the destination computer every guaranteed time. When set to 255, no parameters will be sent. This mechanism is not usually used, and the user should not be aware of it
Disconnection and	0～255	Once the networking product in TCP client mode disconnects from the server (that is, as

reconnection time		long as it is not connected), it will initiate TCP connection to the server at regular intervals. This time interval is the disconnection reconnection time, which can be 0 ~ 254 seconds. If set to 255, it means never reconnect. Note that the first TCP connection usually takes place immediately (such as hardware power on, device reboot via Vircom software, no data), and only after the first connection fails is it tried again after waiting for the "Disconnection and Reconnection Time", so the "Disconnection and Reconnection Time" does not affect the normal connection time between the network and the server
Web Access Port	1～65535	
multicast address		UDP broadcast
IO interface configuration		VT-LR601 doesn't support IO control
Packet length	1～1400	One of the serial port framing rules. After receiving the length data, the serial port of the networked product will send the received data as a frame to the network
Packet spacing	0～255	One of the serial port framing rules. When the data received by the serial port of the networked product has a pause, and the pause time is longer than this time, the received data will be sent to the network as a frame

1.2 Modify parameter methods

4.2.2 Vircom

Vircom Search through the network and edit the device parameters after finding the device. Its advantages are：

1. PC and networked products do not need to be in the same IP network segment.
2. Parameters can be modified even if there is IP conflict in networked products.
3. It is not necessary to know the IP address of the networked product in advance.
4. There are more types of parameters that can be modified.

4.2.3 Web Browser

If the user does not have the Vircom program installed on the PC, you can change the parameters through the Web login.

1. Enter the IP address of the networked product in the browser， eg. http://192.168.1.200，Website as below.

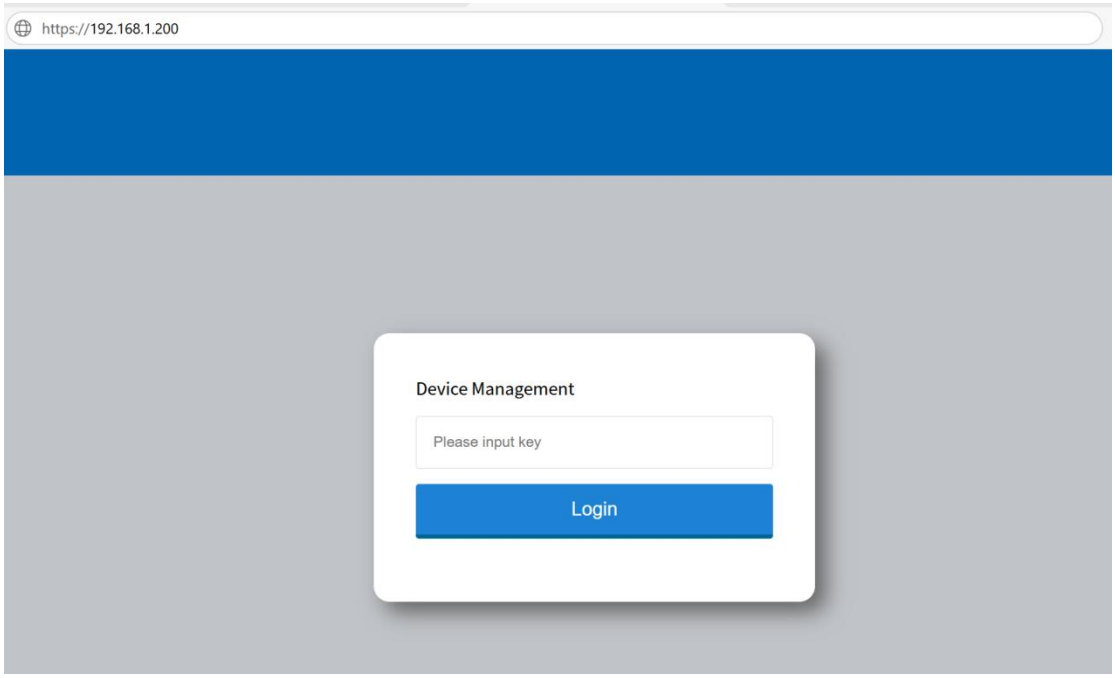


Figure 10 Web login interface

2. Enter Password: Default is no password. Click the login button to login.

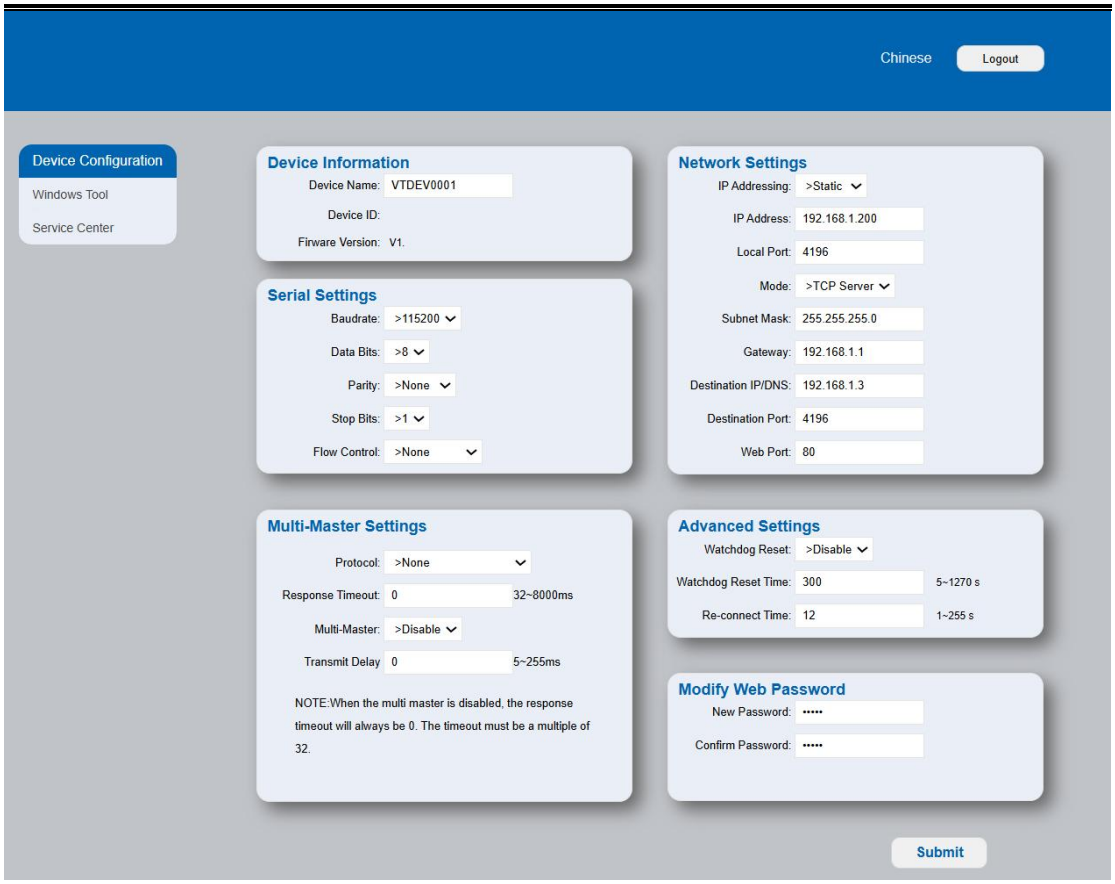


Figure 11 Web configuration interface

2. You can modify the parameters of networked products in the web page that appears. Except for the Web login password parameter, all the other parameters have been explained in the previous parameter table. The Web login password is the password that sets the login of the Web page.
3. After modifying the parameters, click "Submit Modification" button. After modification, please click the "Log out" button. If you do not log out, anyone can enter the configuration interface

4.3 How to use

4.3.1 LoRa Communication

1. By attaching the antenna to the antenna interface of the device, the suction cup antenna can be attached to the metal chassis surface.
2. If there is only one LORA communication network, no configuration is required, but to prevent interference with other users, it is recommended to configure a special frequency, which can be anywhere between 470 and 510. If the baud rate is not 9600, it also needs to be configured accordingly.
3. Connect all LORA devices to 9~24V DC power supply. You should see the POWER

light in green at this point.

4. At this point, data received from the serial port of any LORA device (RS232/485/422) will be sent to the serial port of other LORA devices.
5. In the case of VT-LR601, the only difference is that the data received by Lora will be sent to the network port (TCP/IP connection) as well as to the serial port, and the data received by the network port will also be forwarded to Lora. It is important to configure the baud rate of the network module to be the same as the baud rate of the LORA module.

4.3.2 Network communications

Since the network communication part of VT-LR601 is relatively complex, we will explain it separately here.

4.3.3 Device Search

Run the Vircom software, click "Device Management", and you'll see a list of devices.

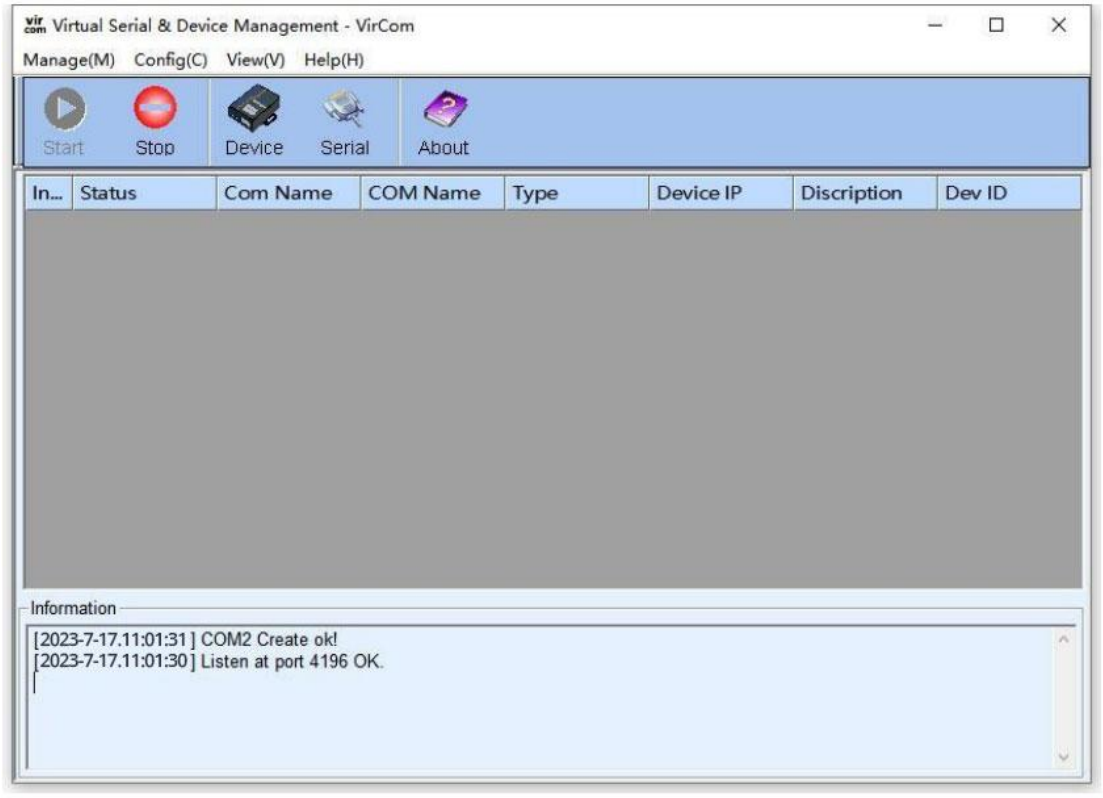


Figure 12 Vircom Main Interface

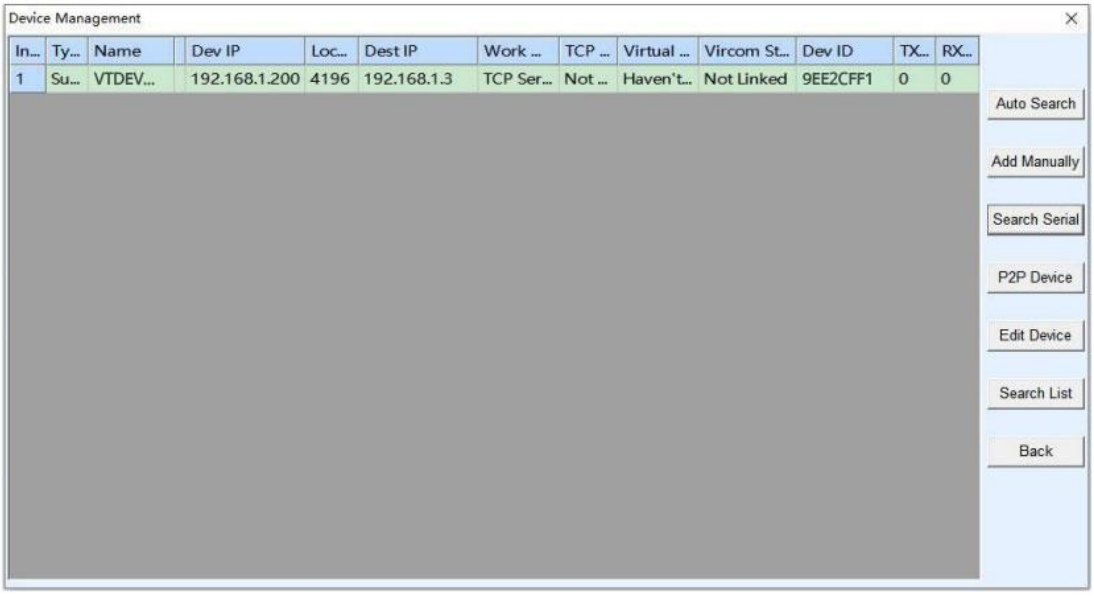


Figure 13 Device list

To see all currently online devices in the device list, you can search for devices that are not in a network segment. There is generally no need to use the "add manually" feature.

4.3.4 Parameter Configuration

Double-click on a row of devices to edit device parameters.

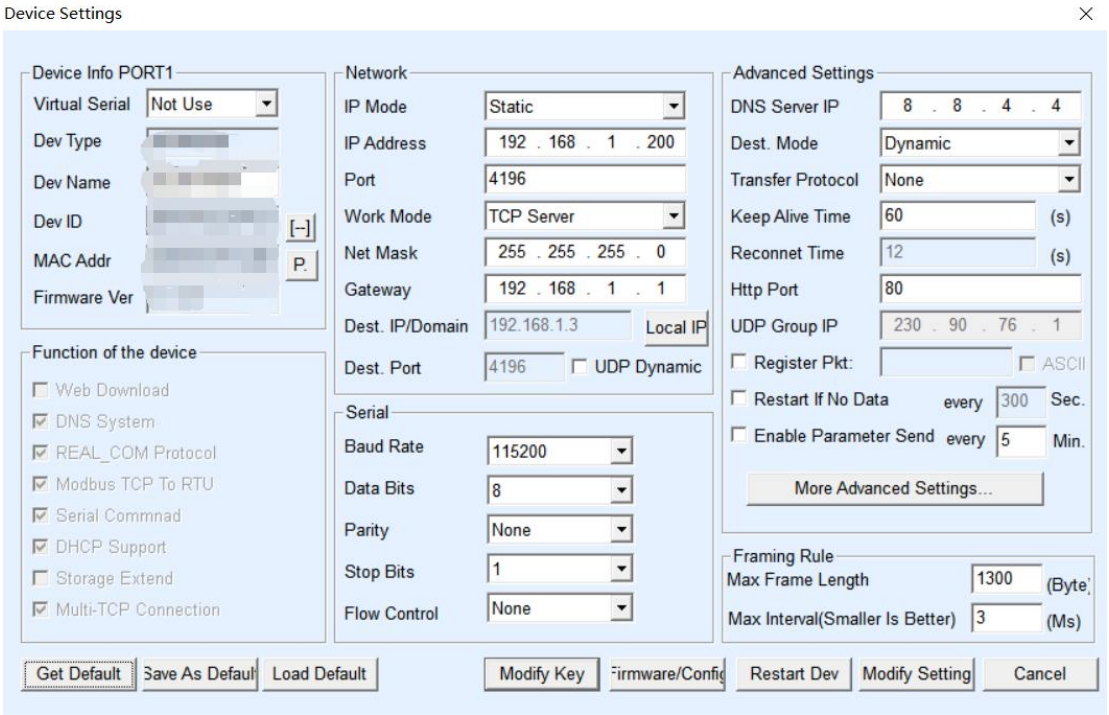


Figure 14 Device editing interface

In this interface, the user can set the parameters of the device, and then click "Modify Settings", the parameters will be set in the flash of the device, power down will not be lost.

At the same time the device will automatically restart.

4.3.5 TCP/IP Telecommunication

Now you need to test the networked product's TCP/IP pass-through communication capabilities. Lora forwards whatever data a computer sends to a networked product's port. Whereas what data Lora receives, what data does it send to the computers on the network.

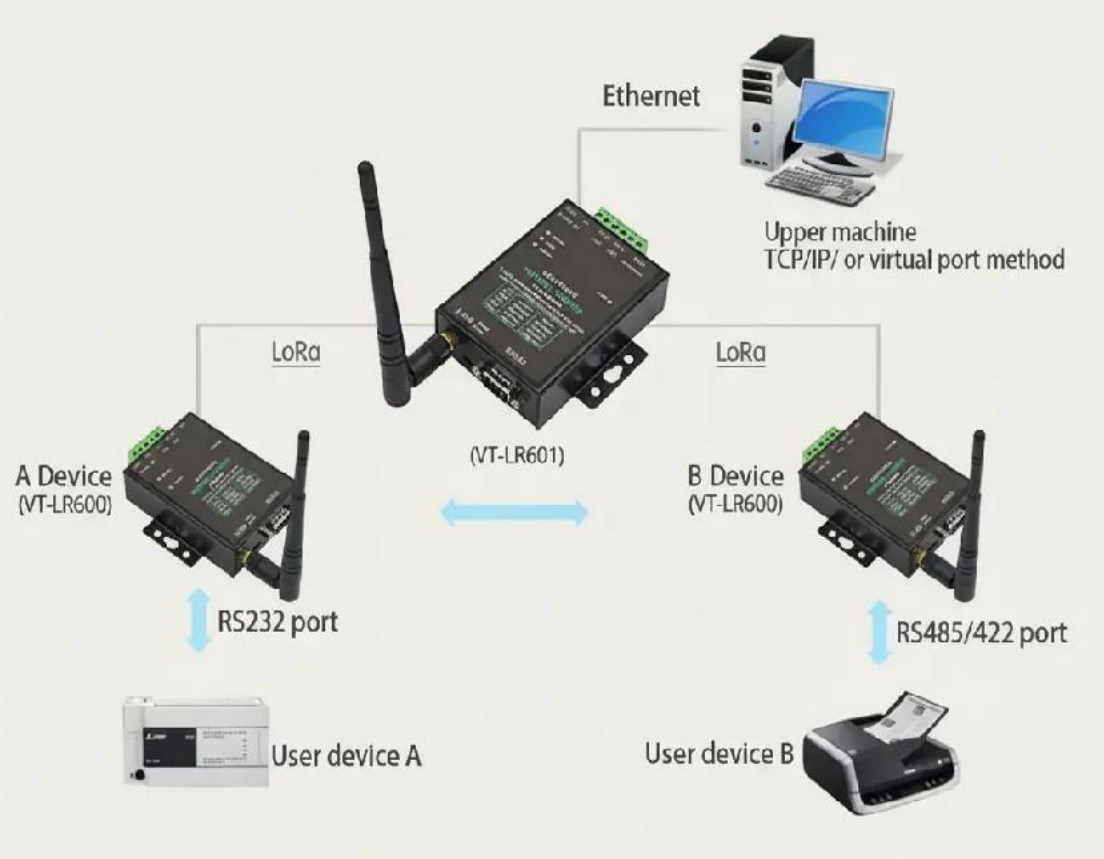


Figure 15 Diagram of pass-through communication

When the serial server is used as a client, there must be three corresponding relationships, as shown in Figure blow.

(1) Working mode correspondence: The working mode of the serial port server is the server mode of the client corresponding to the network tool.

(2) IP address correspondence: The destination IP of the serial port server must be the IP address of the computer where the network tool is located.

(3) Port correspondence: The destination port of the serial server must be the local port of the network tool. After this setting, the serial server can automatically connect to the network tool, and data can be sent and received after the connection is established.

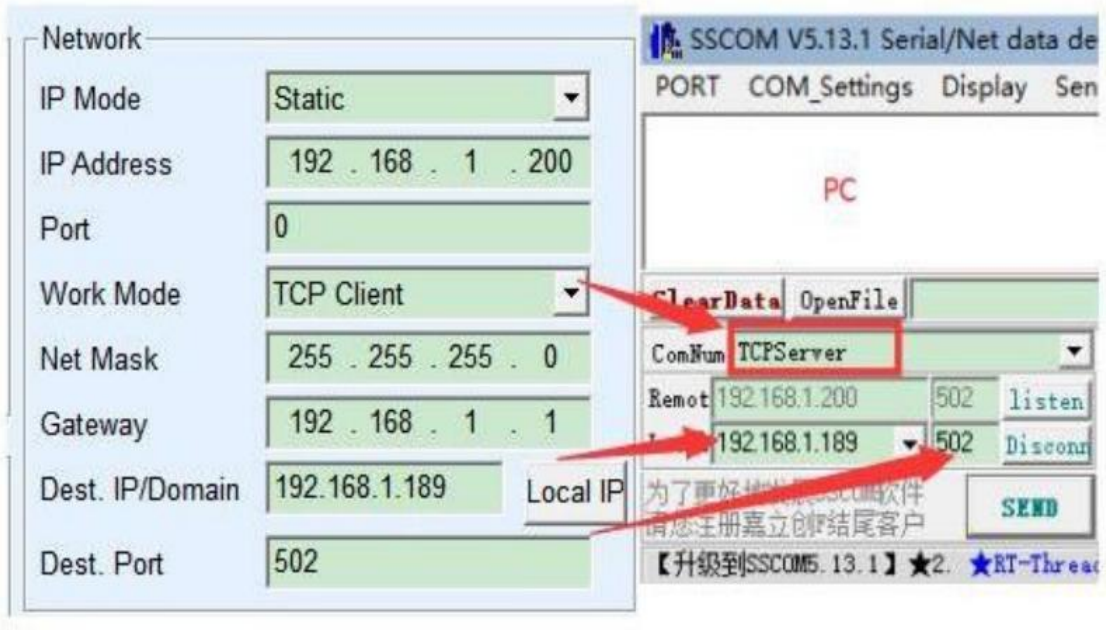
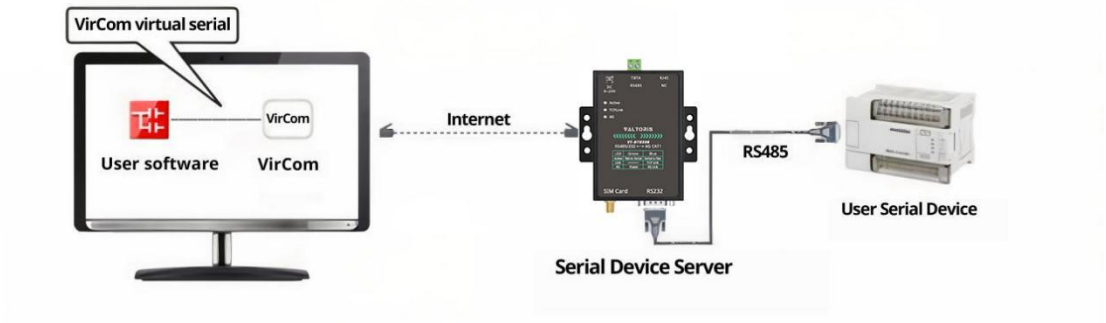


Figure 20 Serial server as a client

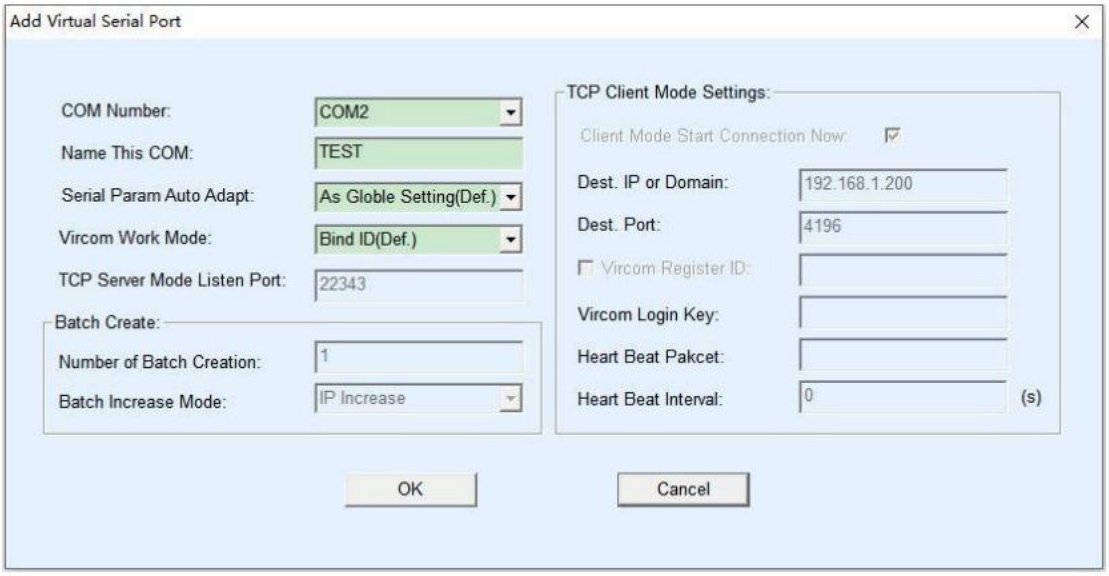
4.3.6 Virtual serial port

The SSCOM2 in the figure communicates directly with the serial server via TCP. In order to allow the serial software that has been developed by the user to communicate with the serial server, a virtual serial port needs to be added between the user's program and the serial server. As shown in the figure, Vircom and the user's program run on the same computer, and Vircom virtualizes a COM port, so that this COM port corresponds to the serial server. When the user program opens the COM communication, it can be sent to the user serial device through the Vircom serial server. The following demonstrates this operation step.



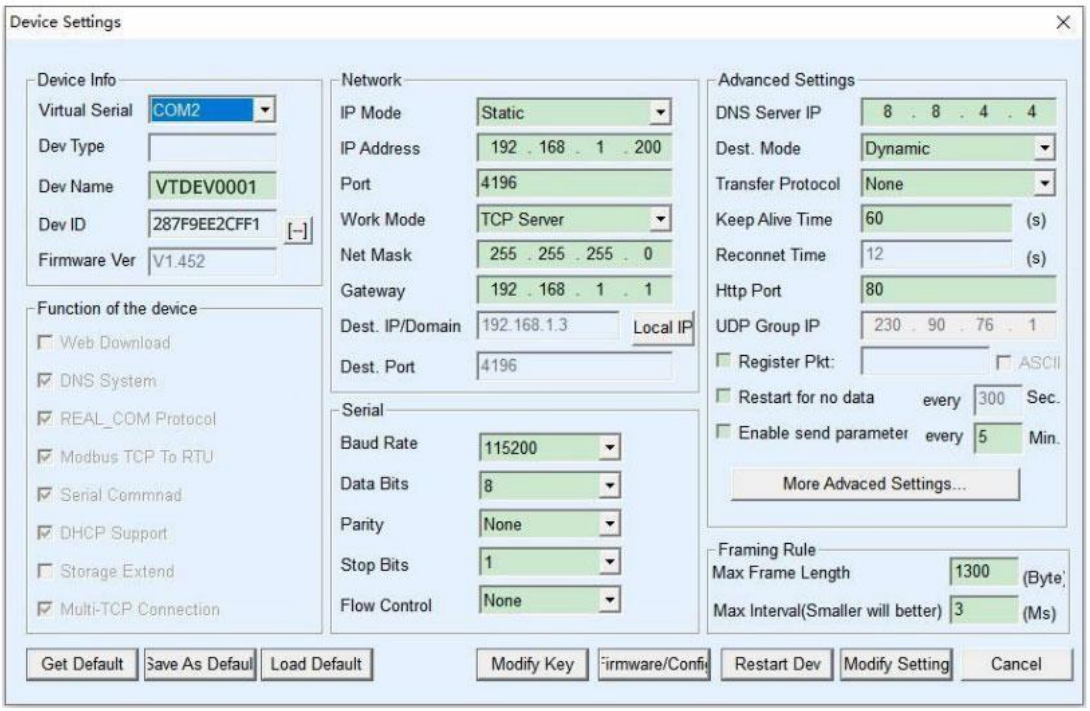
Picture 21 Virtual serial port function

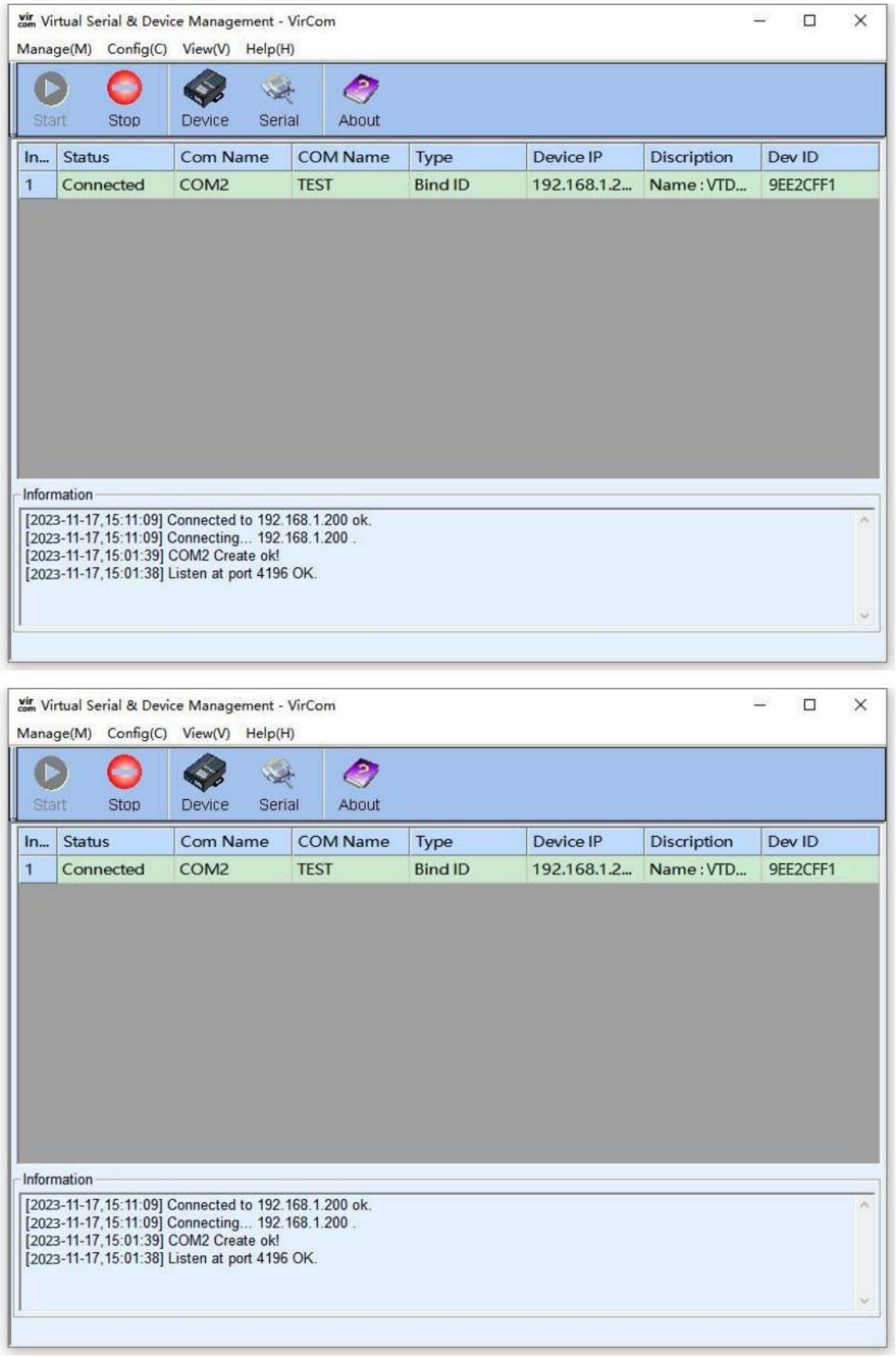
Click "Serial Port Management" on the Vircom main interface, then click "Add", and select to add COM2, where COM2 is the COM port that does not originally exist on the computer.



Picture 22 Add virtual serial port

Then enter the “device manage”, and double-click the device that you need to bind to the COM2. As shown in Figure 22, select COM2 from the "virtual serial port" list in the upper left corner. Then click "modify Settings". And return to the main interface of Vircom. You can see that the COM2 has been connected to a device with IP 192.168.1.200. You can use COM2 instead of SSCOM2 to communicate.





Picture 23 The virtual serial port has been connected

Open the SSCOM simulated user serial port program, open COM2 (the virtual serial port in the figure above), then open an SSCOM simulated serial port device, and open

COM3 (hardware serial port). At this time, the COM2 data transmission link is as follows: COM2 - Vircom - serial port server network port - serial port server serial port - COM3. Conversely, data can also be transmitted from COM3 to COM2: COM3 - serial port server serial port - serial port server network port - Vircom - COM2. The figure below shows the data transmission and reception of both parties.

If COM3 is replaced with a user serial port device, COM2 can communicate with the user device.

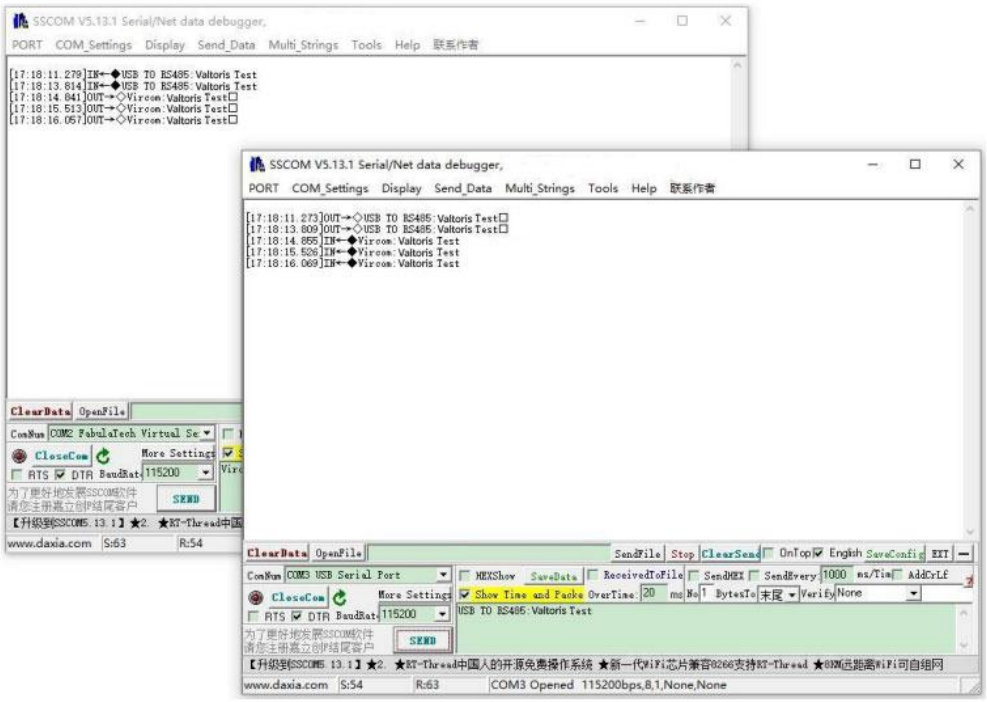


Figure 24 Communication via Virtual Serial Port

4.3.7 Modbus TCP Testing

By default, the data of the serial and network port is transparently transmitted. If you need to convert Modbus TCP to RTU, you need to select "Modbus_TCP Protocol" as the conversion protocol in the device setting, as shown in the figure 25 below.

At this time, the device port is automatically changed to 502, the user's Modbus TCP tool is connected to the 502 port of the serial server's IP, the Modbus TCP commands that have been sent will be converted into RTU commands and output via the serial port.

For example, if the serial port server receives the Modbus TCP command of 00 00 00 00 00 06 01 03 00 00 0a, the serial port outputs the command of 01 03 00 00 00 0a c5 cd.

Note: The serial port may send multiple commands of 01 03 00 00 00 0a c5 cd. This is because the default Modbus adopts the storage mode and will automatically train and query commands in turn. How to switch to non-storage mode will be explained later.

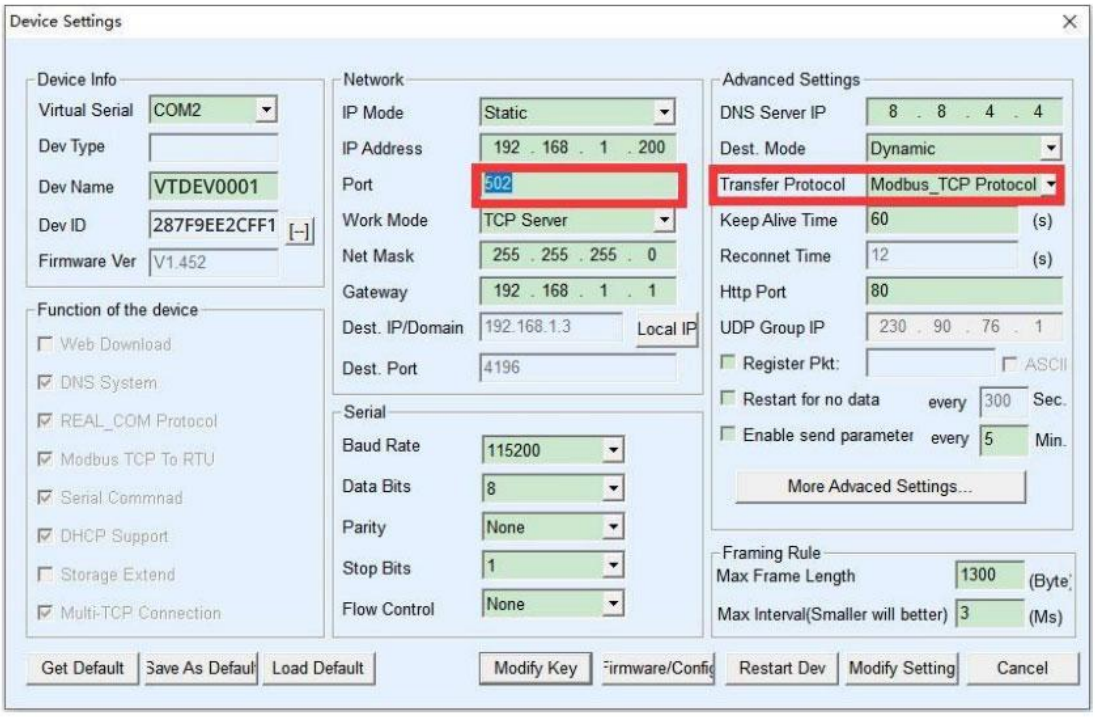


Figure 25 Enable Modbus TCP

If the user's Modbus TCP software is used as a slave, you need to change the working mode to client based on the conversion protocol, and change the destination IP to the IP of the computer where the Modbus TCP software is located, and the destination port is 502, as shown in the figure 26 blow.

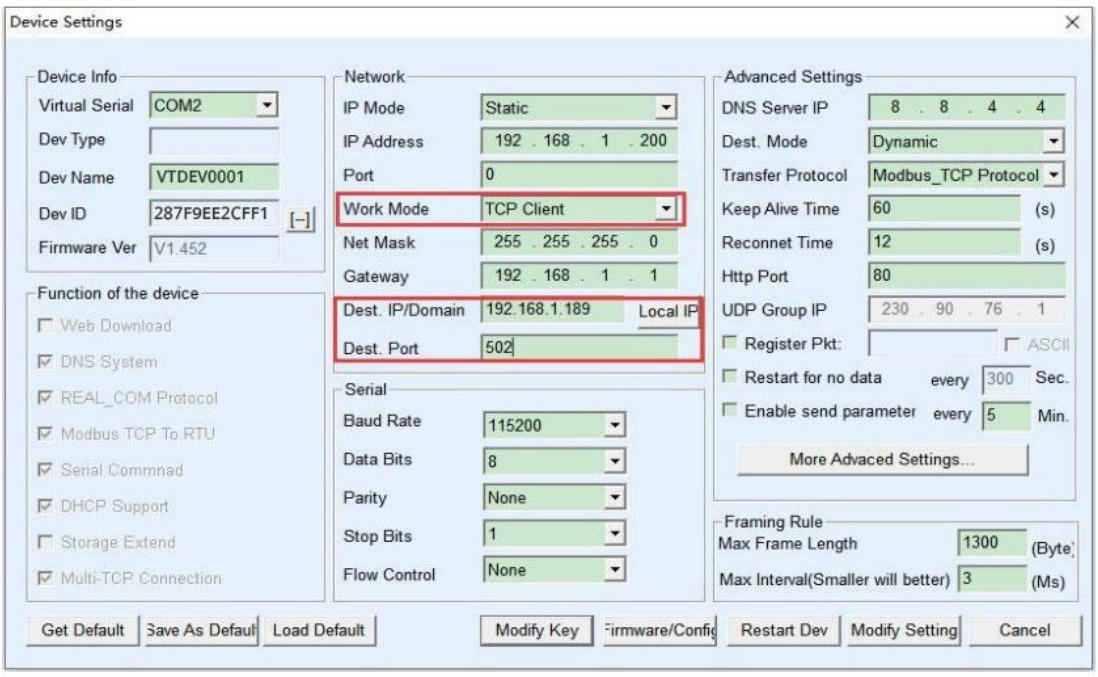


Figure 26 Modbus TCP as client

4.3.8 JSON format testing

VT-LR601 supports the formal delivery of JSON+MQTT protocol to the cloud platform, and can independently collect the data of Modbus RTU instrument and 645 instrument. The whole process can be configured visually. VT-LR601 is a LOLA form IoT gateway.

For related usage, please refer to：《 MQTT and JSON User Manual 》

5. After-sales service and Technical Support

Phone/WhatsApp: +86 18321985506

Web: www.valtoris.com

Email: support@valtoris.com