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Serial to Ethernet User Manual

USR-DR132/DR134



V2.0

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1. Introduction

1.1. Overview

USR-DR13X is an ultra-small DIN rail mounting industrial-grade serial device server launched by PUSR. It can realize two-way fast data transmission between RS232/RS485 and RJ45 Ethernet port. It integrates TCP/IP protocol stack internally and Modbus gateway function. It can be directly integrated into industry scenarios, thus quickly completing business framework construction and saving human resources investment.

This series of products support wide voltage power supply with terminal blocks connector, come with RS232/RS485 serial port, support baud rate 600~230400bps, high and low temperature resistance, can be 7×24H stable operation, no fear of any harsh environment.This series of products have been strictly tested by the market for many years, and have been recognized by users in many industries such as finance, transportation, large company networks, factory manufacturing, etc. and widely used in their own project solutions.

Table 1. Ordering Guide

Model	Description
USR-DR132	1 x RS232
USR-DR134	1 x RS485

1.2. Features

- Equipped with deeply optimized TCP/IP protocol stack. It has low latency and strong scalability, stable and reliable.
- 1.5KV built-in network Magnetic Isolation.
- Support standard MQTT protocol, can access to MQTT platform.
- Support light edge computing, up to 25 points, data reporting/writing in JSON mode.
- Support user defined web page, users can change the UI style as need.
- Wide baud rate: 600~230.4 Kbps, multiple parity bit: NONE, Odd, Even
- Supports Modbus RTU to Modbus TCP protocol conversion and multi-host polling.
- Supports keepalive mechanism to quickly detect the dead connections and reconnect.
- Supports hardware and software watchdog, automatically restarts when the device goes down.
- 10/100Mbps Ethernet port and support Auto MDI/MDIX.
- Supports a wide industrial operating temperature, -25℃~75℃.
- Versatile operation modes: TCP Server, TCP Client, UDP, HTTP client.
- Support virtual COM, COM Port Redirector USR-VCOM (windows).
- Easy to config: built-in webpage and AT command to set parameters.

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2. Get Started

2.1. Hardware interface introduction

2.1.1. Dimensions

74*24*22mm(L*W*H, not including the terminal block)

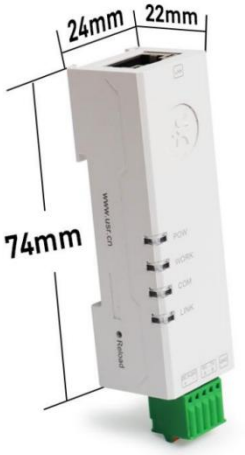


Figure 1. Dimension of USR-DR132/134

2.1.2. Serial port

USR-DR13X series adopts push-type terminal connector, which can realize wiring conveniently and quickly. Terminal wiring definitions are shown below.





Table 2. Pin description

No.	Pin	Type	Description
1	DC 5-24V +	P	Positive input of the power supply
2	DC 5-24V -	P	Negative input of the power supply
3	RX/A	I/O	Serial signal
4	TX/B	I/O	Serial signal

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5	GND	P	The digital ground

2.1.3. Ethernet port

USR-DR13X series adopt 10Base-T/100Base-TX adaptive Ethernet RJ45 interface which supports automatic MDI/MDIX connection.

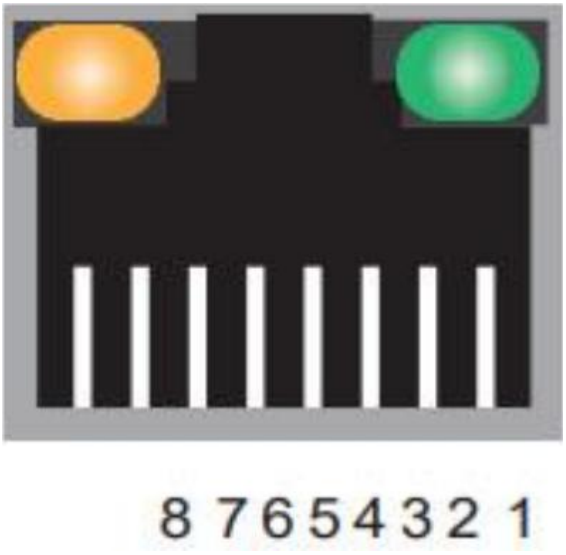


Figure 2. RJ45 with light

Table 3. Ethernet pin assignment

Pin number	Signal name
1	Send data+(TD+)
2	Send data-(TD-)
3	Receive data+(RD+)
6	Receive data-(RD-)
4, 5, 7, 8	Unused

2.1.4. LED indicators

There are 4 indicators on the device: POW, WORK, COM, LINK. The LED indicators description is in the following table.

Table 4. LED indicators description

LED name	Status	Description
Power(Red)	ON	Power supply is normal
	OFF	No power supply or abnormal power supply
Work(Green)	Blinking(Slow)	System is booted up and running

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	Blinking(Fast)	The device is upgrading the firmware
COM(Green)	OFF	The serial port does not send or receive data
	Blinking	The serial port is sending and receiving data
LINK(Green)	ON	1. The TCP socket connection has been established 2. In UDP mode, it's always be on
	OFF	The TCP socket connection has not been established

2.1.5. Reset to factory setting

Reload button: Press and hold Reload button for 3-15s to restore factory settings when powered on.

AT command: AT+CLEAR command can reset device to factory settings.

Software: Factory reset via setup software or network configuration protocol

2.1.6. Factory default setting

The USR-DR13X serial device server comes with the following default setting.

Table 5. Default parameter

Parameter	Default Values
Username	admin
Password	admin
Device IP	192.168.0.7
Subnet Mask	255.255.255.0
Gateway IP	192.168.0.1
COM port	115200, N, 8, 1
COM operation mode	TCP client

2.2. Quick test

USR-DR13X series serial server has a built-in Web server, which provides a convenient way to access and configure the serial server. Users can use Edge, Firefox or Google browser to access it. This chapter is a quick introduction to the USR-DR13X series of serial server products. It is recommended that users read this chapter and follow the instructions once for the system, and you will have a basic understanding of the product. For specific function details and instructions, please refer to the subsequent chapters.

2.2.1. Download software

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Download the software from PUSR's website:

Config software(Old version for transparent transmission):

https://www.pusr.com/support/download/Setup-Software-USR-M0-V2-2-6-1-exe.html

Config software(New for edge computing):

https://www.pusr.com/support/download/Setup-Software-EthernetTool-V1-4-Edge-computing.html

Test software: **https://www.pusr.com/support/download/usr-tcp232-test-V13.html**

After downloading, run the config software. It is strongly recommended for the users to set the Network Parameters through configuration tool first. Other device-specific configurations can later be carried out via user-friendly Web-Interface.

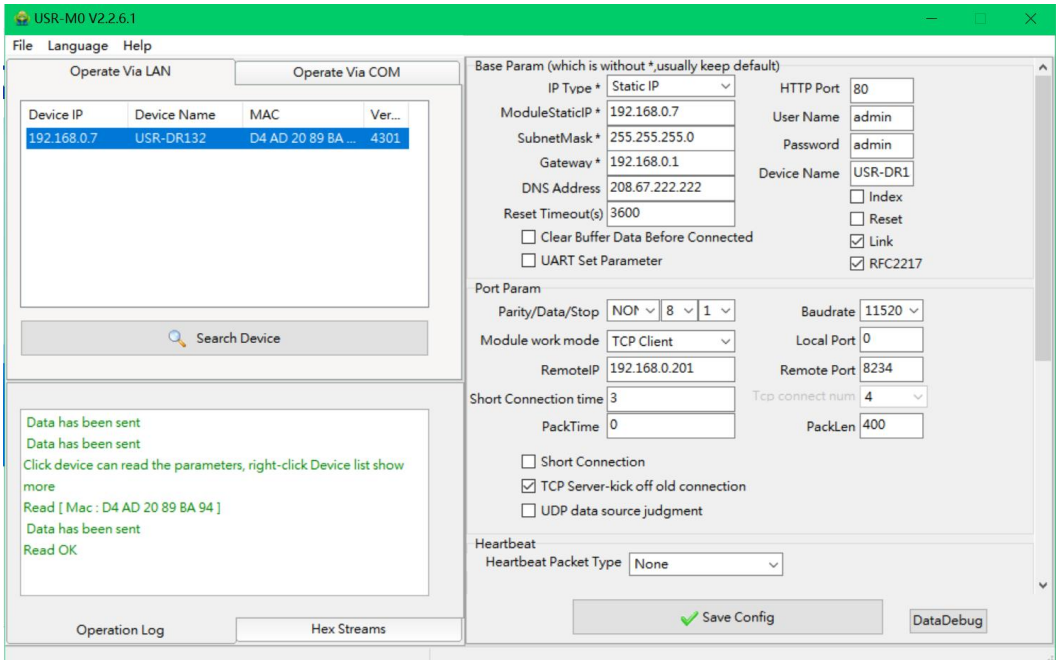


Figure 3. Config software

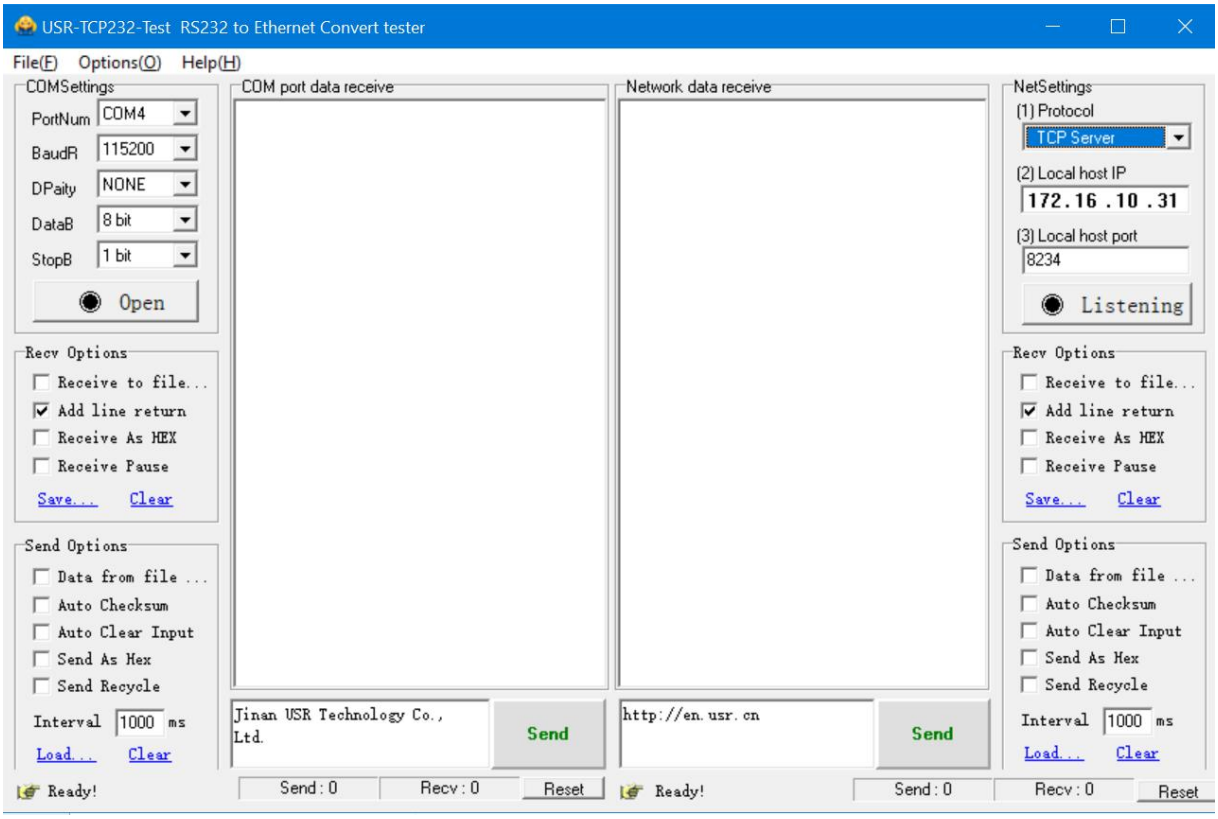


Figure 4. Test software

2.2.2. Hardware connection

For fast networking of USR-DR13X series serial server, you need to prepare a PC, a router, a serial server, a network cable, a serial cable, and a DC5V/1A power supply. The hardware connection is shown in following figure. To establish a TCP / IP network all devices must be connected to the same network either locally or via gateway connections.



Figure 5. Hardware connection

2.2.3. Parameter configuration

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Using the config software,

1.Users can search out the DR13X device,

2.Set the IP type as DHCP/Auto IP,

3.Save config,

4.Search the device again,

5.Open the webpage , the user will be navigated to the login page, the username and password are both "admin" .

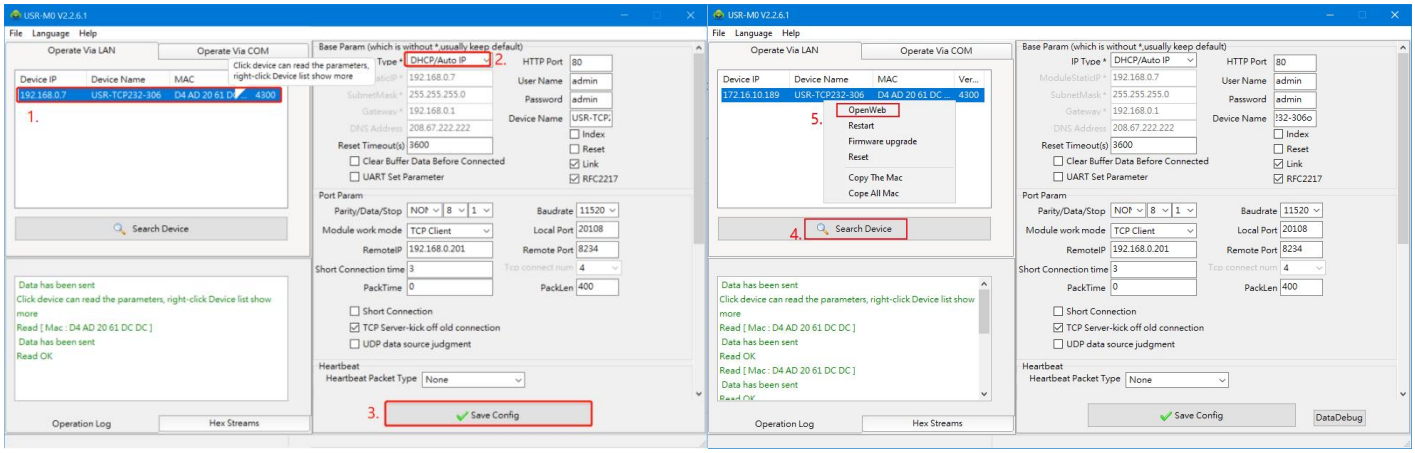


Figure 6. Search and basic settings

After entering the username and password, click "OK" and the server will authenticate. After success, you will enter the main page of the Web server, as shown in the following figure.

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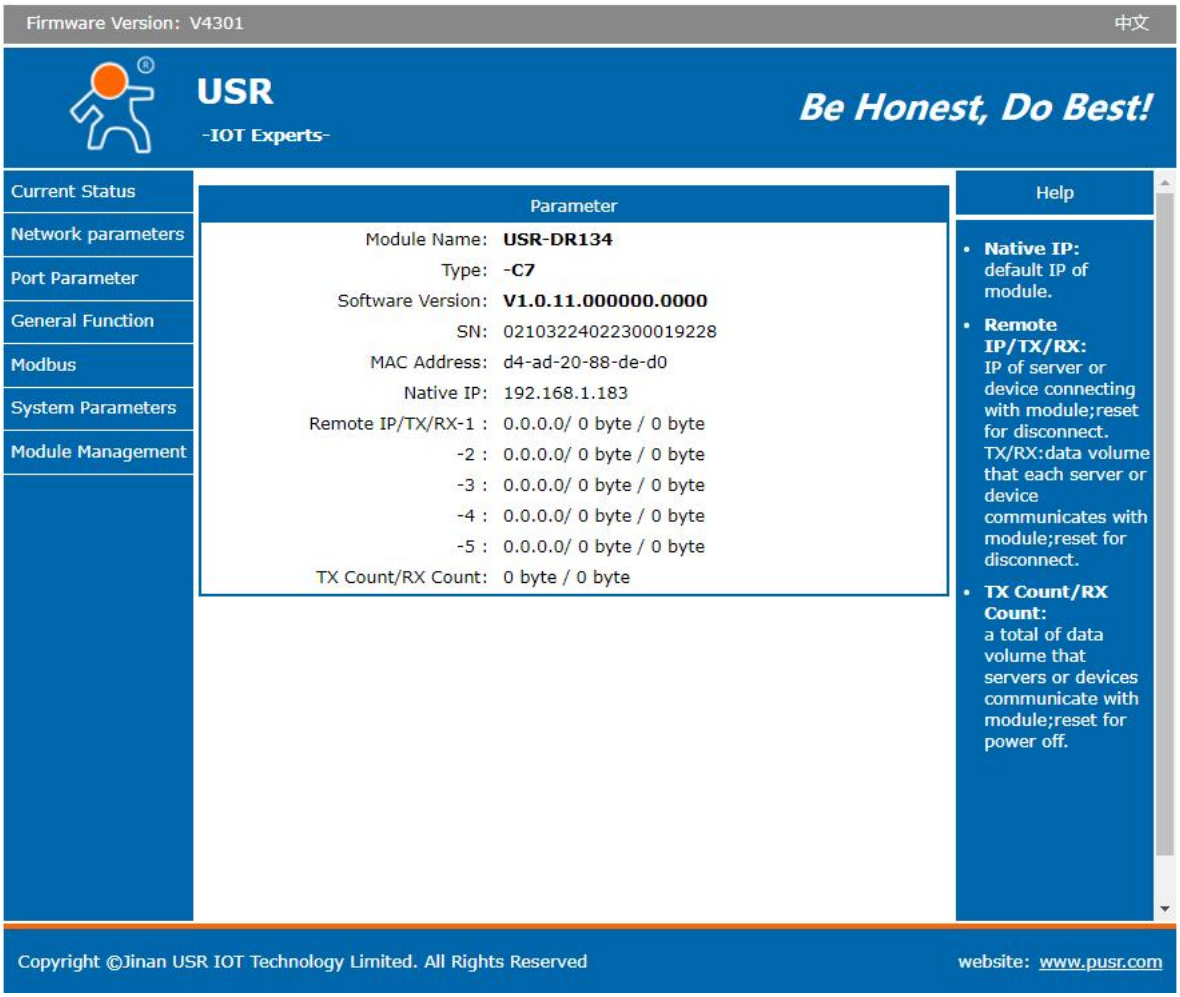


Figure 7. Current status

In serial port page, set the remote IP to 192.168.1.182, then save parameters and restart the module.

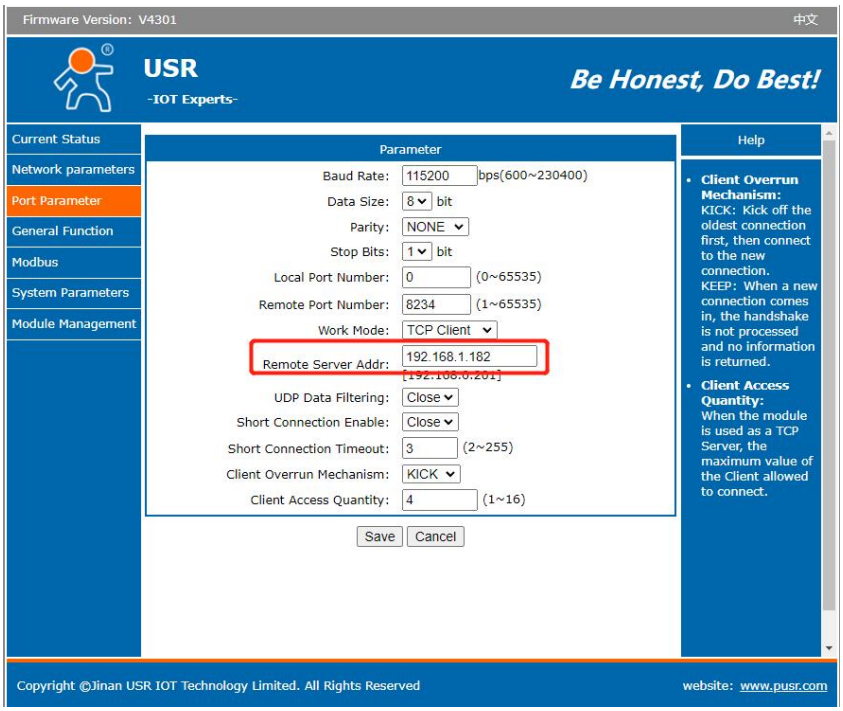


Figure 8. Serial port parameters

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After restarting, check the parameters via the config software. Form the picture, we can see the parameters has already taken effect.

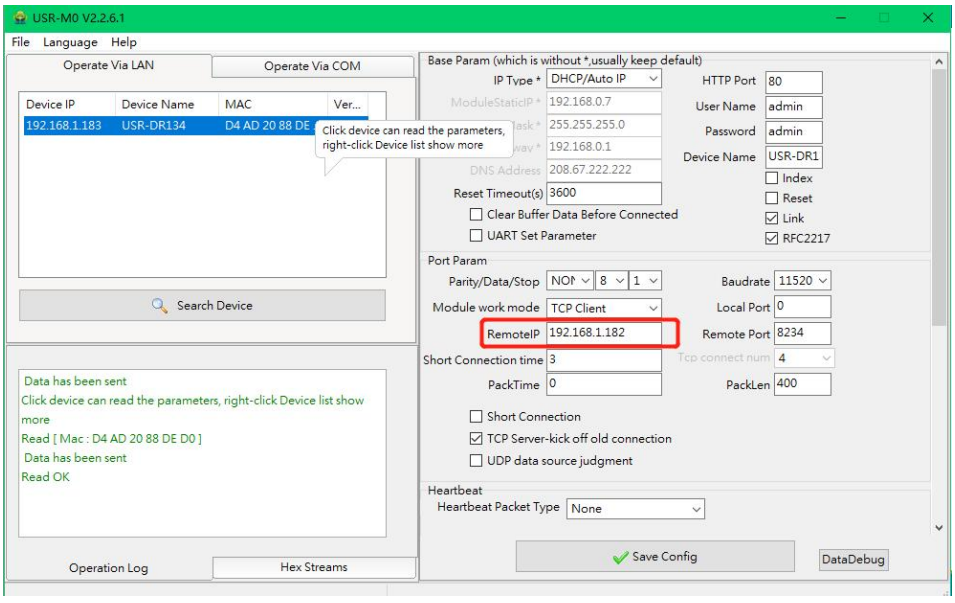
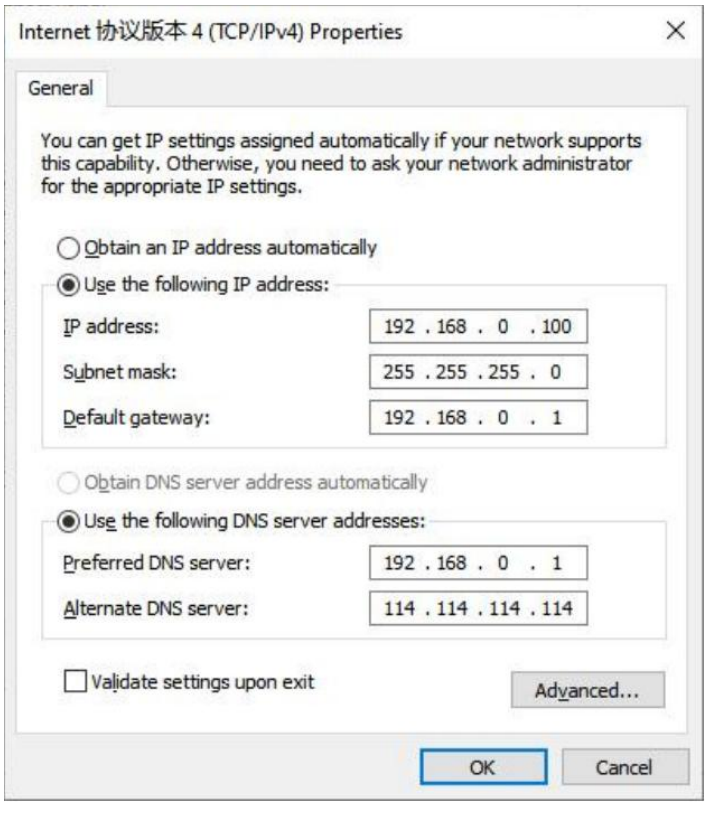


Figure 9. Parameters checking via config software

The IP address of the PC must be modified to ensure that it is in the same local area network as the IP of the serial server if you want to connect DR13X to PC directly via a net cable. The default IP address of serial server is: 192.168.0.7. Set the PC's IP address as: 192.168.0.X (X is any valid value from 2 to 253 except 7). The specific Windows system operation page is shown in the following figure. you can access the Web page of the USR-DR13X series serial server through browser as mentioned above.



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Figure 10. IP setting of PC

2.2.4. Data transmission test

Run the test software on the PC, set the protocol as TCP Server, local IP keep the same with the remote IP of 30x device, local host port keeps the same with the remote port of DR13X device. After the TCP connection is established, users can check the link indicator, it will keep steady on.

In this test, we use the default serial port parameters (115200, N, 8, 1) to test. Users can also to modify the baud rate, data bit and other parameters of the serial port via webpage or config software as needed.

The following picture shows an example of parameters setting to test transparent transmission.

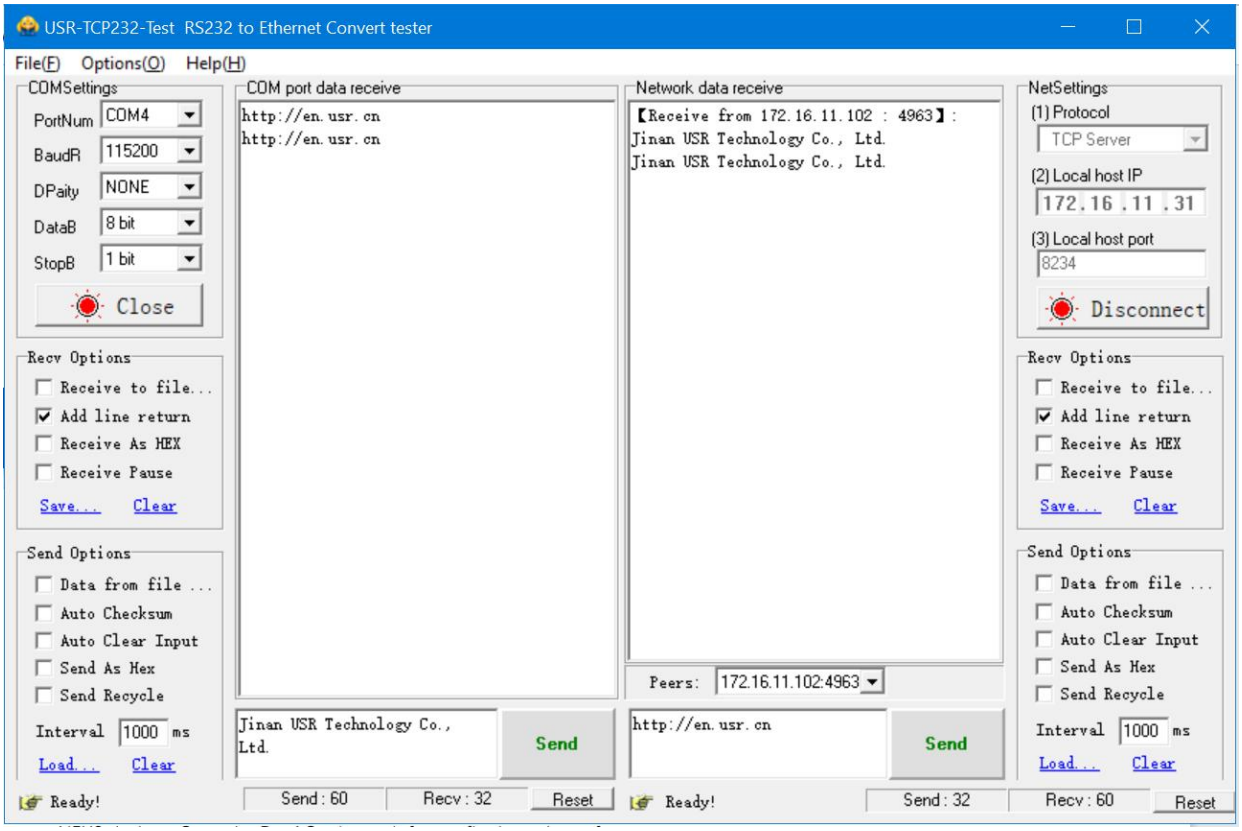


Figure 11. Data transmission test

2.2.5. Technical support and assistance

Please visit the USR IoT website: **https://www.pusr.com** where you can find the latest information about the product. Contact your distributor, sales representative, or PUSR's support center:

http://h.usriot.com/index.php?c=frontTicket&m=sign for technical support if you need additional assistance. Please have the following information ready before you submit a ticket:

- Product model

- Description of your peripheral attachments

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- Description of your software (firmware version, application, function description, etc.) - A complete description of the issue and steps to reproduce

3. Configuration and parameter details

3.1. Web interface

Every USR-DR13X Industrial Serial Device Server is equipped with a built-in web server in the firmware. Therefore, the device can be accessed by using a web browser for configuring by entering the device's IP address in the URL field of your web browser. An authentication will be required and you will have to enter the username (Default value is "admin") and password (Default value is "admin") for accessing the web interface as shown in Figure 14. This approach (web interface) for configuring your device is the most user-friendly. It is the most recommended and the most common method used for USR-DR13X Serial Device Server Series. Please go to its corresponding section for a detailed explanation

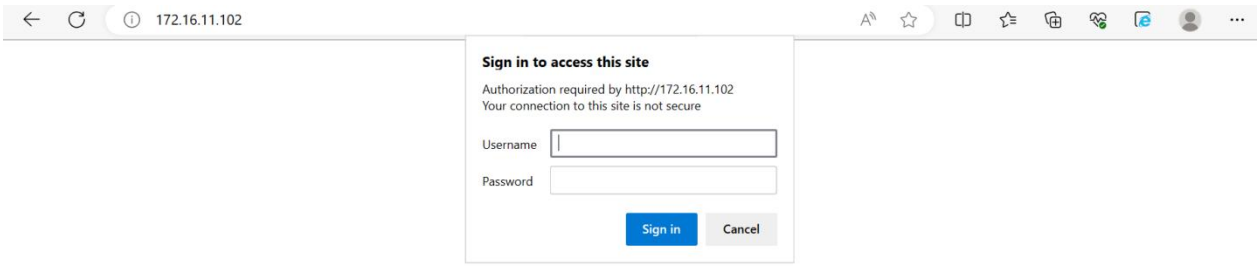


Figure 12. Login page

3.1.1. Status

After entering the correct username and password and the authentication is successful, you will enter the main page of the Web, as shown in figure 15. The main page can be roughly divided into three areas. The upper area displays the logo, the lower left area is the function menu area, the middle area is the main function display area, and the lower right area is the help document area. Figure 15 illustrates the status page of the web interface.

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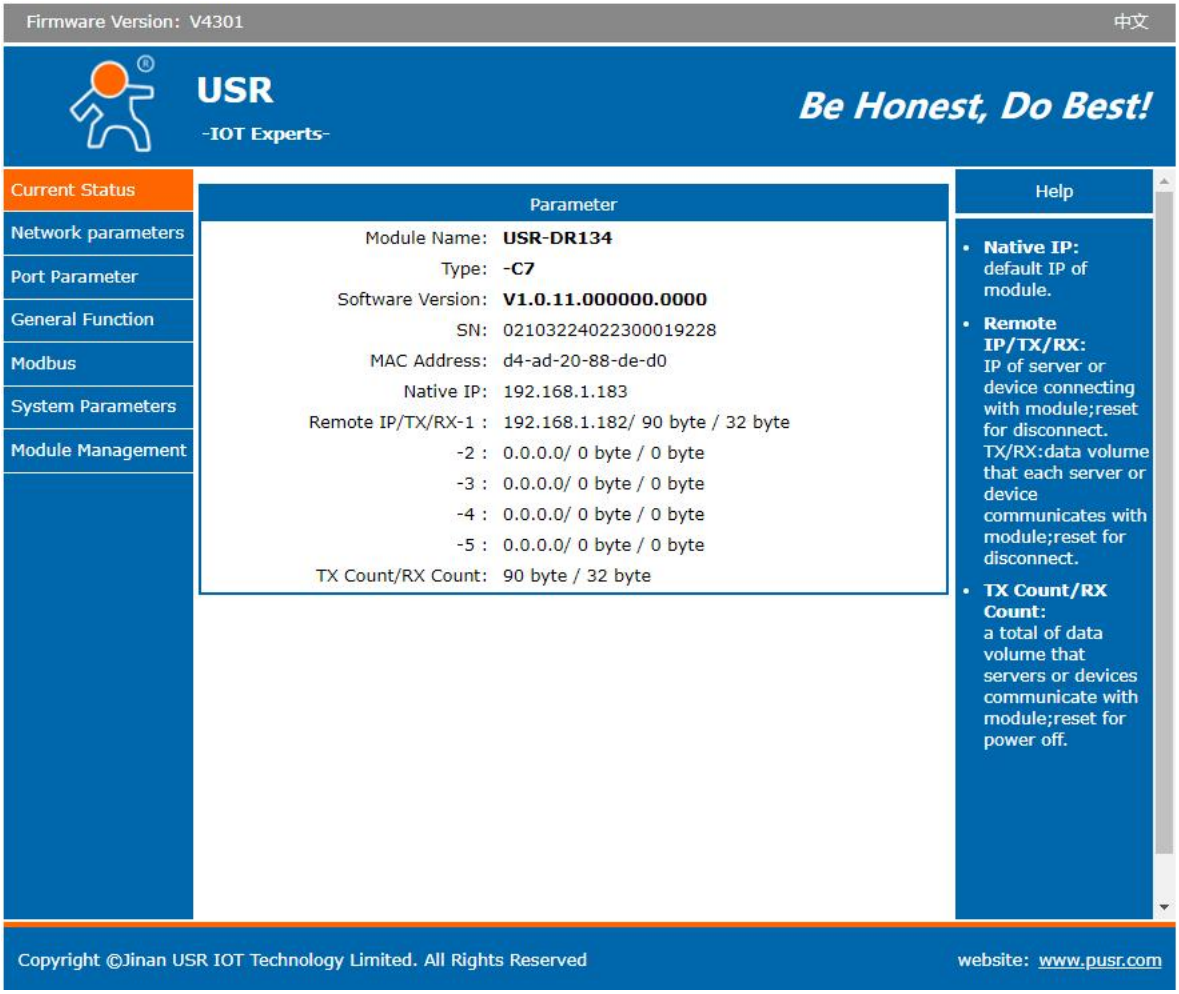


Figure 13. Current status

The function of the device status part is to display some specific information of the current device, including module name, IP address, MAC address, etc.

Table 6. Description of Current status

Parameter Item	Description
Module name	The name of the serial server, which can be customized by the user on the "Miscellaneous settings" page.
IP address	The IP address of the serial server.
SN	The identification code of the device.
MAC address	The MAC address of the serial server.
Remote IP/TX/RX	IP: The IP of remote host, it displayed once the TCP connection is established, Tx: The data count from serial to network Rx: The data count from network to serial When the TCO232-30X work in TCP server mode, the page can display up to 5 connection information.

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3.1.2. IP settings

You must assign a valid IP address to the USR-DR13X before it will work in your network environment. The IP address must be unique within the network. If the device is connected to the Internet and should connect to other servers over the Internet to get some services such as Network Time Protocol (NTP) server, you will need to configure the DNS server to be able to resolve the host name of the NTP server. The detailed description of the configuration parameters on this interface is shown in Table 7.

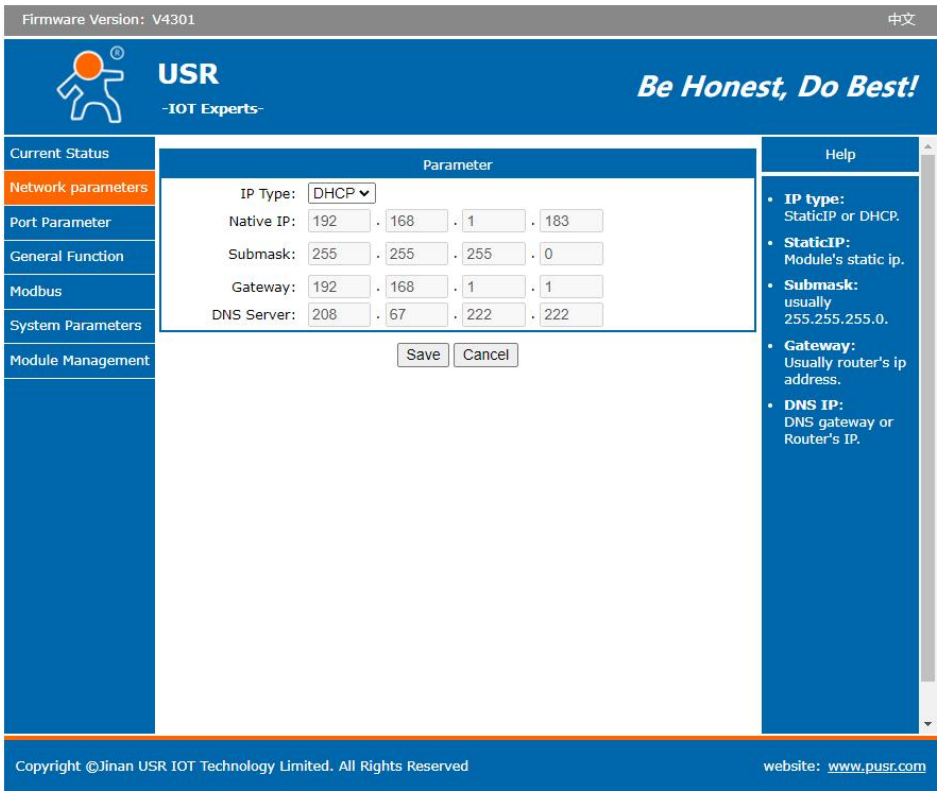


Figure 14. IP settings

Table 7. Detail description of IP settings

Parameter Item	Description
IP type	DHCP: To obtain required TCP/IP configuration information from router. Static IP: User need to set the IP information manually.
IP address	IP address is a 32-bit address assigned to devices connected to the Internet. The IP address consists of two fields: the network number field (Net-id) and host number field (host-id). In order to facilitate the management of IP addresses, IP addresses are divided into five categories: Class A, B, and C addresses are unicast addresses, Class D addresses are multicast addresses, Class E addresses are reserved addresses for future special purposes. The IP addresses currently in large numbers belong to three types of addresses: A, B, and C.

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Subnet mask	The mask is a 32-bit number corresponding to an IP address. Some of these numbers are 1, and the others are 0. The mask can divide the IP address into two parts: the subnet address and the host address. The part of the IP address corresponding to the 1 bit in the mask is the subnet address, and the other bits are the host address. The mask for class A addresses is 255.0.0.0, the mask for class B addresses is 255.255.0.0, the mask for class C addresses is 255.255.255.0.
Default gateway	The default gateway in the host is usually called the default route. The default route (Default route) is the route chosen by the router when no other route exists for the destination address in the IP packet. All packets whose destination is not in the router's routing table will use the default route.
DNS	The IP address of the DNS server. When users need to access information online through domain name, like **www.pusr.com**. DNS translates domain names to IP so browsers can load Internet resources.

3.1.3. Serial port settings

The main function of the serial device server is to carry out two-way transparent transmission of standard serial bus data (RS-232, RS-485) and standard Ethernet data supporting TCP/IP protocol to solve common serial equipment Networking problems on the Internet. The Port configuration page can configure the parameters of the serial port and socket, as shown in following picture.

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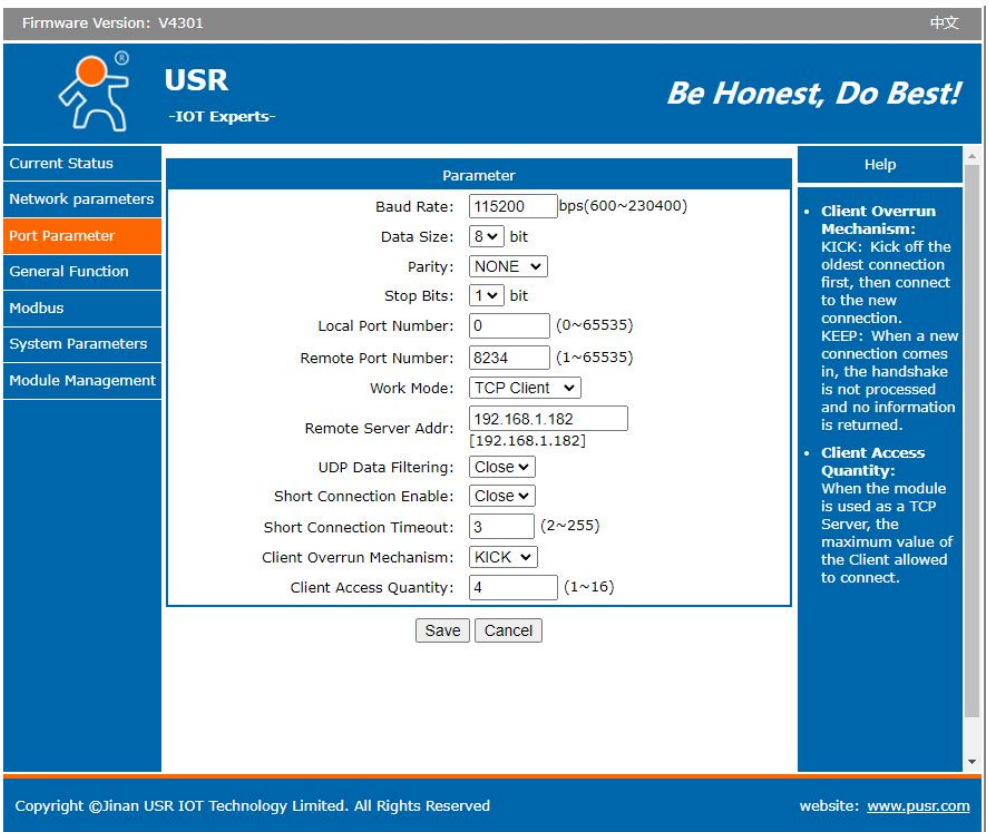


Figure 15. Settings of serial port

Details on work mode connectivity protocols and its settings of DR13X series are given in **Chapter 4** Operation modes, this section will only focus on the part of parameter description. The description of the configuration parameters on this interface is shown in Table 8.

Table 8. Detail description of serial port

Parameter Item	Description
Baud rate	This sets the port's data transfer speed. Choices are from 600 – 230400. Set this to match the baud rate setting of the connected device. Default is 115200.
Data size	This sets the number of bits used to transmit one character of data. Choices are: 7 and 8. Set this to match the data bit setting of the connected device. Default is 8 (which is the default for the majority of serial devices).
Parity bits	This bit checks the integrity of the transmitted data. Choices are: None, Odd, Even. Set this to match the parity setting of the connected device. Default is None (which is the default for the majority of serial devices).
Stop bits	This indicates that a character has been transmitted. Set this to match the stop bit setting of the connected device. Choices are: 1 and 2. Default is 1 (which is the default

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	for the majority of serial devices).
Local Port Number	When DR13X work in TCP server mode, the local port is the listening port.
Remote Port Number	When DR13X work in TCP client mode, the remote port is the target port to connect to.
Work mode	TCP client/TCP server/UDP client/UDP server/HTTP client/MQTT
Remote Server Addr	When DR13X work in TCP client mode, the remote server address is the target address to connect to.
UDP Data Filtering	This function can verify the data source when UDP Client receives network data, and filter out IP and port numbers that do not meet the conditions. Default is OFF.
Short Connection Enable	TCP short connections are mainly used to save server resources and are generally applied to multi-point to one point scenarios.Using short connections ensures that all connections that exist are useful connections and that no additional controls are needed to filter them. Default is OFF.
Short Connection Timeout	If there is no data received by serial port or network port within the set time, the connection will be disconnected automatically. The default time is 3 seconds. Range: 2~255 s.
Client Overrun Mechanism	KICK: In TCP Server mode, if the number of clients connected exceeds the set value, the new connection will kick the original TCP client . KEEP: If this parameter is set to KEEP, the old TCP client is maintained.
Client Access Quantity	The number of TCP clients allowed to connect in TCP Server mode. The default is 4.

3.1.4. MQTT Gateway

MQTT is a client-server based messaging publish/subscribe transport protocol. The MQTT protocol is lightweight, simple, open and easy to implement, which makes it suitable for a wide range of applications. In this mode, as an MQTT Client, the product can help users quickly access the private MQTT server or the public MQTT iot cloud platform. Users do not need to pay attention to the data conversion process between serial port data and network data packets, just through simple parameter Settings, you can achieve data transparent transmission between serial port and server.

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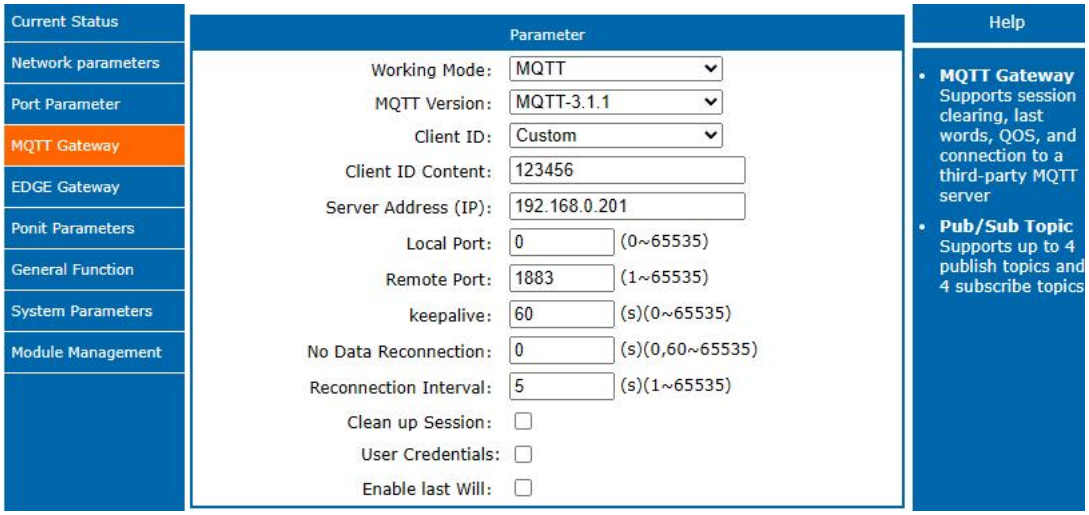


Figure 16. Basic settings of MQTT

Table 9. Basic settings of MQTT

Item	Description	Default value
Working Mode	MQTT: connect to server using standard MQTT. Alibaba: Connect to Alibaba cloud platform using MQTT.	MQTT
MQTT Version	MQTT-3.1.1: Connect to MQTT server with V3.1.1 version. MATT-3.1:Connect to MQTT server with V3.1 version.	MQTT-3.1.1
Client ID	The client ID defined the identifier of the MQTT connection. The IDs of the various MQTT clients have to be unique for the respective MQTT Broker. If two MQTT clients are using an identical ID, the connections of theses clients to the MQTT Broker are disconnected. For an individual client, there is no way to find out whether a specific client ID is already used by another client or not. Custom: users custom the client ID content. SYS_SN:set the SN as client ID. SYS_MAC: set SN as client ID.	Custom
Client ID Content	Client ID text.	123456
Server Address	IP address or hostname of an MQTT broker.	192.168.0.201
Local Port	Port number of DR13X. Range: 0-65535	0
Remote Port	Port number of the MQTT broker. Range:1-65535	1883
keepalive	The Keep Alive is a time interval measured in seconds. It is the maximum time interval that the broker permits between when a client finishes sending one MQTT packet and starts to send the next.	30

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	Range: 0-65535 seconds.	
No Data Reconnection	Automatic reconnection when there are not data flow in the MQTT session in the setting time. If the time is set 0, this function does not take effect. Time range: 60-65535 seconds	0
Reconnection Interval	Automatic reconnection interval after a fail network connection.	5
Clean up Session	Valid only for Qos1 and Qos2. When the clean session is checked, the client does not want a persistent session. If the client disconnects for any reason, all information and messages that are queued from a previous persistent session are lost. When the clean session is unchecked, the broker creates a persistent session for the client. All information and messages are preserved until the next time that the client requests a clean session.	Not enabled
User Credentials	Whether to verify the user name and password	Not enabled
User name	Username for authentication to the MQTT broker.	None
Password	Password for authentication to the MQTT broker.	None
Enable last Will	Whether to enable the last will	Not enabled

USR-DR13X support connect to Alibaba platform.

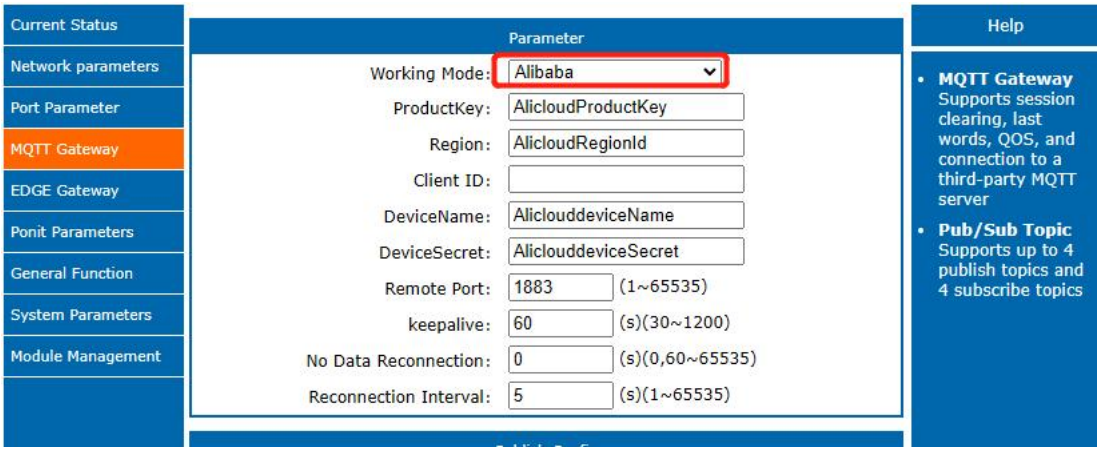


Figure 17. Settings of connecting to Alibaba

Table 10. Settings of connecting to Alibaba

Item	Description	Default value
ProductKey	One of the triplet when adding devices in Alibaba cloud	AlicloudProductKey
Region	Area code of Alibaba cloud server	AlicloudRegionId
Client ID	Client ID text.	None
DeviceName	One of the triplet when adding devices in Alibaba cloud	AlicloudeviceName
DeviceSecret	One of the triplet when adding devices in Alibaba cloud	AlicloudeviceSecret

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Remote Port	Port number of the MQTT broker. Range:1-65535	1883
keepalive	The Keep Alive is a time interval measured in seconds. It is the maximum time interval that the broker permits between when a client finishes sending one MQTT packet and starts to send the next. Range: 30-1200 seconds.	60
No Data Reconnection	Automatic reconnection when there are not data flow in the MQTT session in the setting time. If the time is set 0, this function does not take effect. Time range: 0, 60-65535 seconds	0
Reconnection Interval	Automatic reconnection interval after a fail network connection. Range: 1-65535 seconds.	5

The main purpose of publishing a topic is to allow other MQTT clients to subscribe to the topic and transfer data. Up to 4 topics can be published. Topic publishing supports transparent transmission mode, topic delivery mode, and custom mode, each theme can be configured individually.

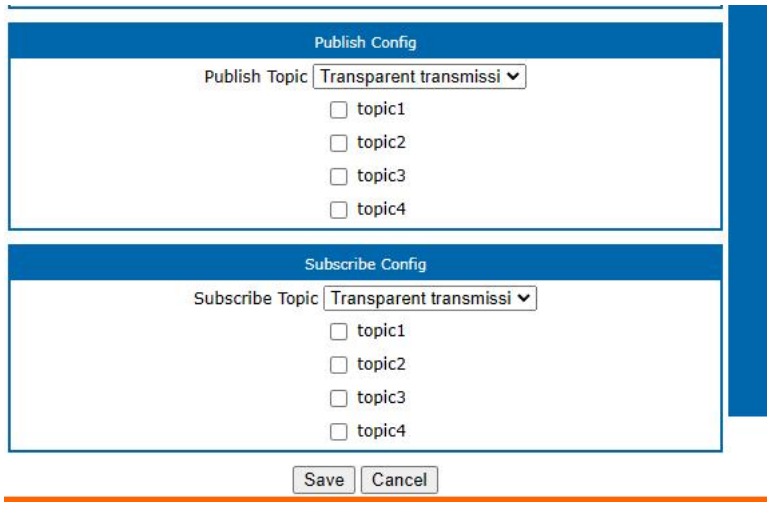


Figure 18. Topic settings

Table 11. Details of topic settings

Item	Description	Default value
Publish Topic	***Transparent transmission:*** The data received by the serial port is transparently transmitted to the associated topic. ***Topic distribution:*** When configuring a topic, you can define an identifier for the topic. After receiving serial port data, the device sends it to the associated topic based on the identifier. The device allows different topics to have the same identifier, so that data is pushed to all topics with the same identifier. The identifier and the payload are separated by commas. ***Custom mode:*** The custom mode is simple and quick to use, and users do not need to configure the relevant parameters of data release on the web	Transparent transmission

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	page. Only need to open the custom mode switch, click Save and restart the device to achieve MQTT data transparent transmission.	
Public topic text	An MQTT topic is a UTF-8 string that the broker uses to filter messages for each connected client. To receive messages, the client must subscribe to the topic.	/PubTopic1
QOS	QOS0/QOS1/QOS2	QOS0
Subscribe Topic	***Transparent transmission:*** The data received by the serial port is transparently transmitted to the associated topic. ***Subject Delivery:*** means that messages received by subscriptions are delivered with a subject in front of them and accompanied by payload. The default data format is topic,payload. The subject is separated from the data by a separator. Each theme can be configured individually and can be bound to a different serial port. After receiving data, the theme sends data to the bound serial port.	Transparent transmission
Subscribe topic text	An MQTT topic is a UTF-8 string that the broker uses to filter messages for each connected client. To receive messages, the client must subscribe to the topic.	/SubTopic1

3.1.5. Edge Gateway

3.1.5.1. Basic settings of edge gateway

In the edge computing gateway function, the gateway device, as the initiator of polling, reads, parses, and calculates the preset data from the terminal device automatically and periodically. At the same time, the device can selectively report data according to the user's preset reporting logic, and the data collection task can be completed without the active participation of the remote server, which greatly increases the number of terminal devices that the cloud server can intervene in management.

DR13X supports pre-configured slave data points. After edge computing, it supports collecting and reading data in JSON format under MQTT/TCP channels.

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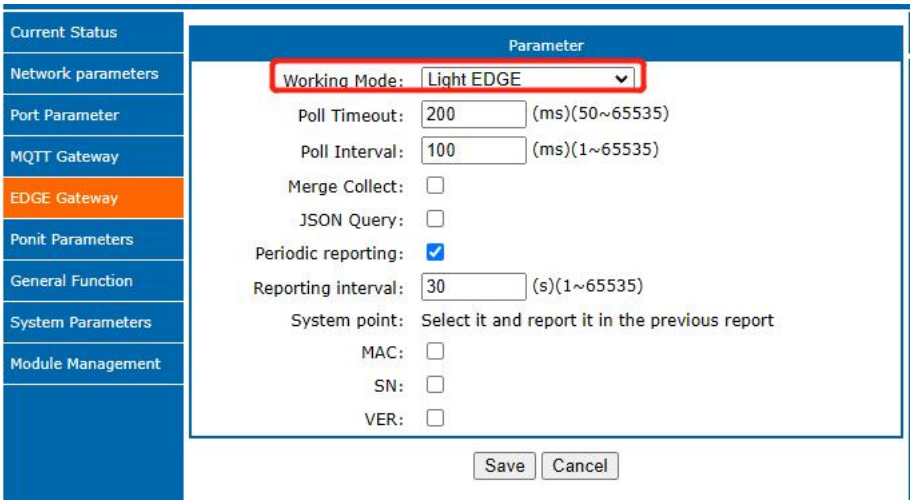


Figure 19. Light EDGE mode

Table 12. Details Settings of light edge mode

Item	Description	Default value
Working Mode	Select the working mode, including close/light edge/MSPC/MMHP/MCP. MSPC/MMHP/MCP will be introduced in the following chapter.	Light EDGE
Poll Timeout	Waiting time after sending Modbus RTU command to serial device. If no response is received, the next polling command is executed. Range: 50-65535ms.	200
Poll Interval	Time interval between 2 consecutive Modbus instructions. Range: 1-65535ms.	100
Merge Collect	After the merge collection is enabled, the point information (slave address, register type, and register address) is automatically identified. If the point information is continuous, the merge collection is reported. Note: The point information must be sequential, such as 40001, 40002, and 40003. If the sequence is not sequential, such as 40002, 40001, and 40003, the information will not be collected.	Not checked
JSON Query	If you enable JSON query, you can send JSON data packets to read and write device point information.	Not checked
Periodic reporting	After this function is enabled, the device automatically reports the collected data.	Checked
Reporting interval	The time interval between 2 reporting data. Range: 1-65535s	30
System point	Users can choose to report the MAC, SN, and firmware version of the device in the JSON reporting template.	None

3.1.5.2. Points settings

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On this page, users can set the edge acquisition points. For USR-DR13X, it supports up to 25 edge acquisition

points. The settings on this page is available when the light edge is enabled.

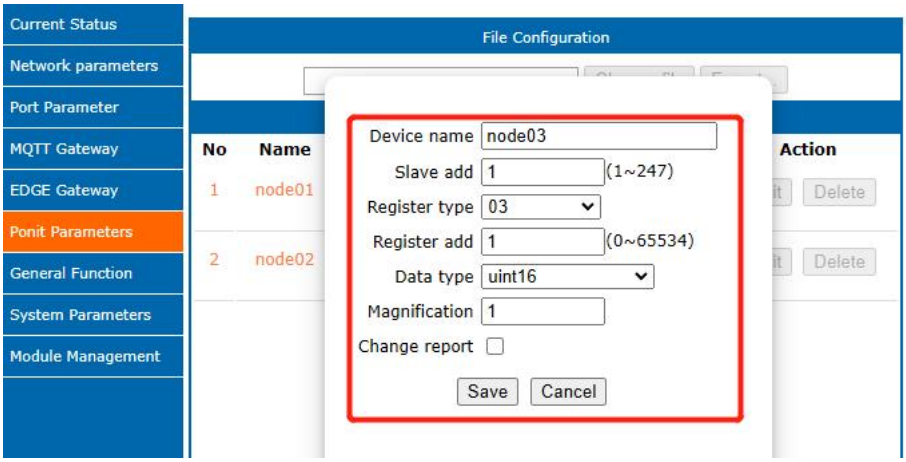


Figure 20. Edge acquisition points settings

Table 13. Details of edge acquisition points settings

Item	Description	Default value
Device name	The unique identification of a data point in a table. Device names cannot be repeated.	node01
Slave ID	ID of the Modbus slave device.	1
Register type	The type of the registers. 1: Coil status 2: Input status 3: Holding register 4: Input register	03
Register address	Address of the Modbus slave device	1
Data type	The type of data stored in the register: 8 types. uint16/int16/int32(ABCD)/int32(CDAB)/uint32(ABCD)/uint32(CDAB)/float32(ABCD)/float32(CDAB)	Unit16
Magnification	The reporting data is the actual collected data multiply by the magnification.	1
Change report	Reporting data to remote server when the collected data changed.	Not checked
Amplitude	Reporting data to remote server when the collected data changes beyond this value.	0

Users can also import/export the configured point table information to facilitate configuration.

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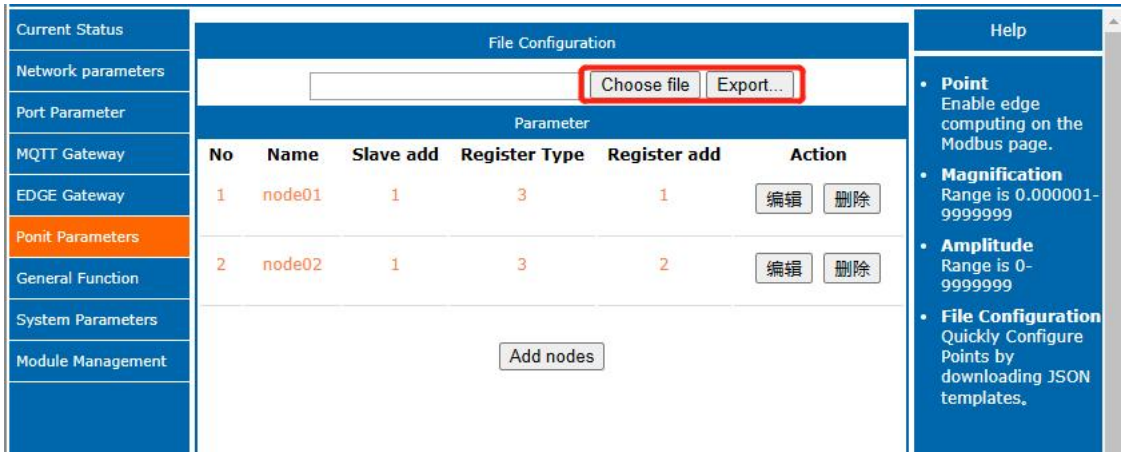
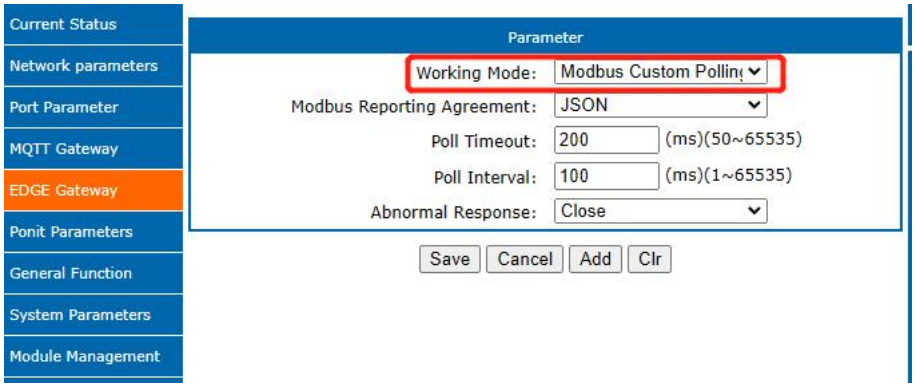


Figure 21. Import/export configured point table

3.1.6. Modbus gateway



3.1.7. General settings

USR-DR13X series provide rich additional function which is displayed in this function tab page. The function detail information will be described in the following table, some more important function is introduced in relevant chapters.

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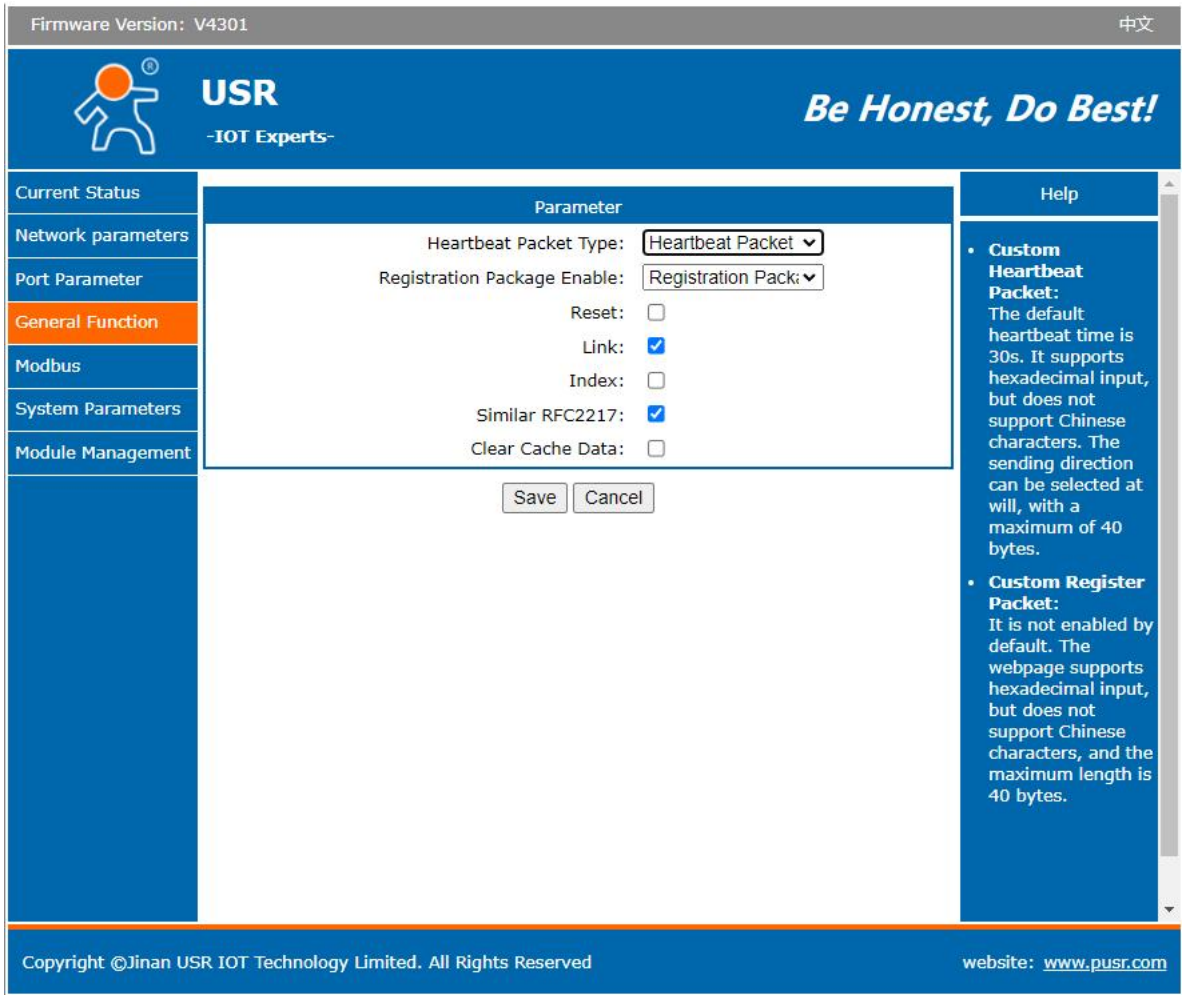


Figure 22. Settings of expand function

Table 14. Detail description of expand function

Parameter Item	Description
Heartbeat Packet	*UART Heartbeat*: DR13X sends heartbeat packet to serial device at preset interval, the content of the packet can be either hex or string. Users can use UART heartbeat to query serial device to reduce communication pressure on server. *Net heartbeat*: It's available in TCP client and UDP client mode. DR13X sends a heartbeat packet data to inform the server that it is still online, when it fails to receive data from the serial device within the set time. The heartbeat function is closed by default.
Register Packet	It's available in TCP client and UDP client mode. Users can identify different MAC: The content of the register packet is the MAC address of DR13X, Customize: User can define the content of the register packet by themselves, USR Cloud: This is used for registering to USR cloud.

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	The register function is closed by default.
Registered Direction	Connect with: DR13X sends register packet only once when the network connection is established. Data with: DR13X add register packet in front of each packet of data sent by the serial port device. Both of above: The register packet is send in both above condition.
Reset	This function is available in TCP client mode. The 30X device connect to TCP server actively when works as TCP client. The 30X device will restart if the TCP connection is not established after 30 attempts. The Reset function is mainly used to initialize the 30X device by restarting when the 30X program runs out or crashes and counter abnormal TCP connection. Then to restore the 30X to normal operation under certain conditions.
Link	The LINK indicator works only after the LINK function is enabled.
Clear Cache Data	When TCP connection is not established, the data received by serial port will be placed in buffer area. DR13X serial port receiving buffer is 1Kbyte. When TCP connection is established, Cached data can be sent via TCP connection or be cleaned up(by default). When the short connection function is enabled in Httpd Client mode or TCP Client mode, the cache data clearing function is disabled.
Similar RFC2217	Enabling this function allows users to use customized RFC2217 commands on the network to dynamically modify the serial port's baud rate, data bits, stop bits, and parity bits. This function is only allowed when the working mode is TCP Server and TCP Client. Note that this protocol is used to change the serial port parameters of DR13X. This function need be used with USR-VCOM software.
Index	See more information in Chapter 5

3.1.8. System parameters

This configuration tab includes several system level settings, such as device name, system log, username, and password. Most of these settings are optional.

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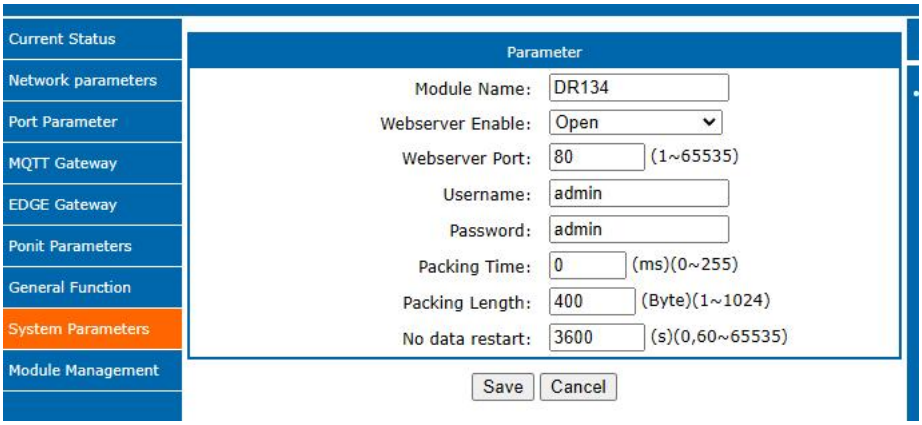


Figure 23. Settings of system parameters

Table 15. Detail description of system parameters

Parameter Item	Description
Module name	The name of the device, up to 14 characters, can’ t be null
Webserver port	Webserver listen port NO. The default is 80. Range 1-65535
Username	The username of web console and can be modified. up to 5 characters, can’ t be NULL
Password	The password of web console and can be modified. up to 5 characters, can be NULL
Packing Time	If the time between two bytes received by serial port is greater than the set value, it will be sent in two packets, otherwise it will be sent as one packet. The default value is 0 ms, the range is 0~255ms.
Packing Length	When the length of data received by serial port reaches the set value, it is sent as a packet. The default is 400 bytes, and the range is 1~1024 bytes.
No data restart	This function is used for the serial device server without any data transmission or reception for a long time, and the serial server automatically restarts. If the restart time is set between 0 - 59 seconds, this function does not take effect. Only when the time is ≥ 60 seconds, the restart function of the device without data will take effect.

3.2. Configuration software

The parameters are also can be configured by config software. The parameter function is already introduced in Chapter 3.1. In this chapter, we how to config the parameters via config software.

3.2.1. Search device

Run the config software, if the USR-DR13X Serial Device Server is already connected to the same gateway as your PC, the device can be accessed via broadcast packets. Users can search all the DR13X Series device servers

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on the network and show them on the Serial Device Server List Area of the utility.

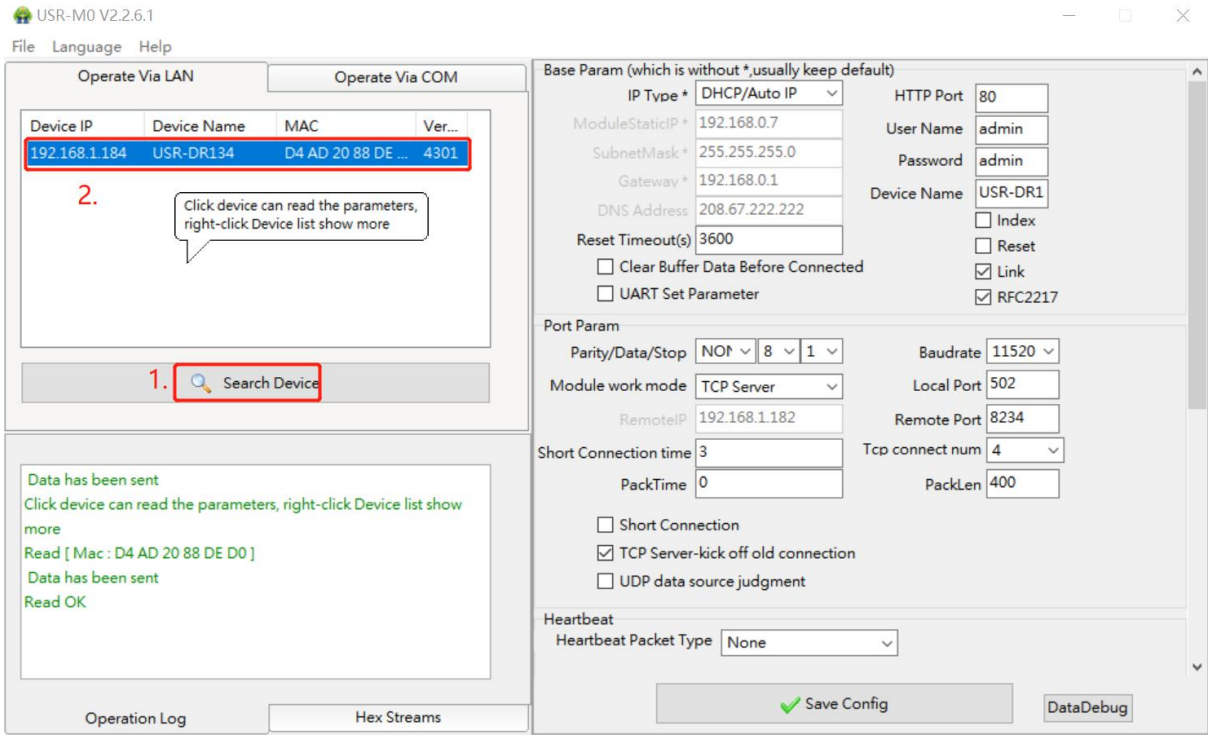


Figure 24. Search device

3.2.2. Parameter settings

Users can modify the parameters as needed, and the click “Save Config” to make the parameters take effect. More parameters can be checked by scrolling down or up.

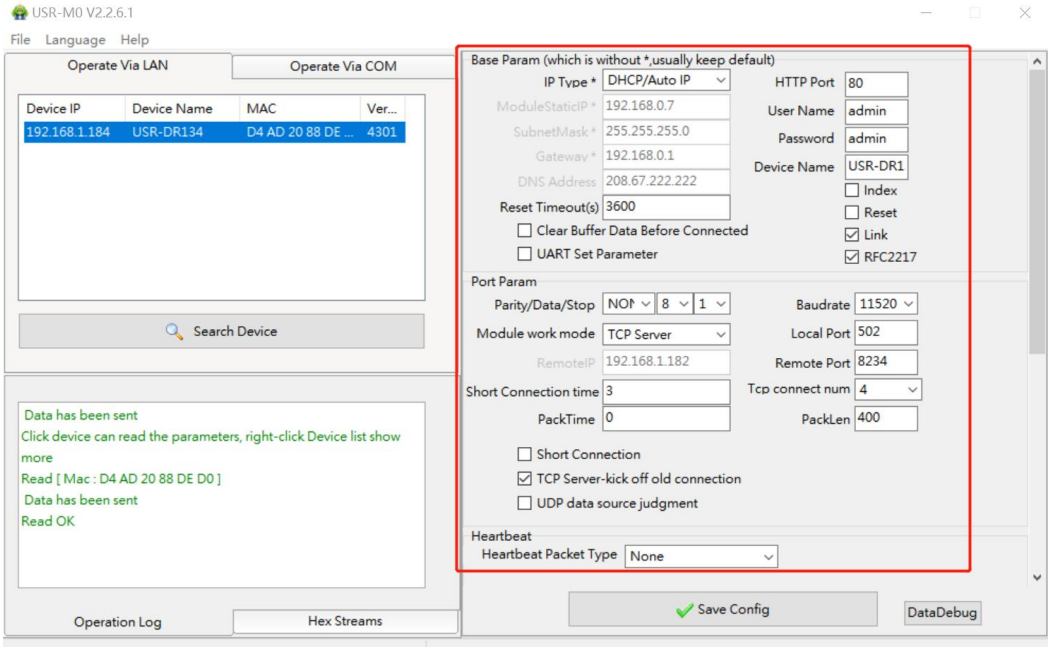


Figure 25. Parameters configuration via config sofrware

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3.2.3. Open web server

Users can visit the web server of serial device server conveniently with configuration tool. Select the device you want to visit and right click, then click External web config ,you will open the web server with default browser such as Google Chrome.

1.Right-click a desired device to display the settings menu,

2.Select OpenWeb

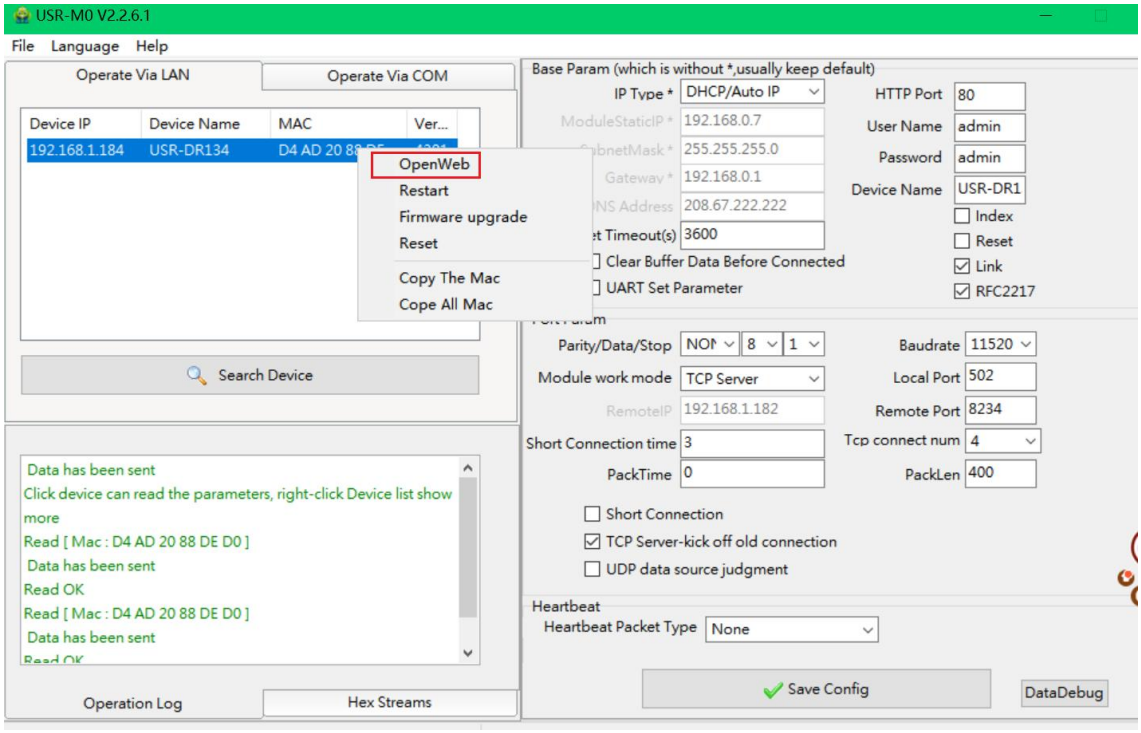


Figure 26. Open web server via config software

3.2.4. Firmware upgrade

USR IoT continually upgrades its firmware to add new features and optimize performance. Please contact the sales to obtain the latest version of the firmware. Users can upgrade the firmware by themselves. When upgrading firmware, the 30X device must be in the same LAN network with PC.

3.Right-click a desired device to display the settings menu,

4.Select Firmware upgrade

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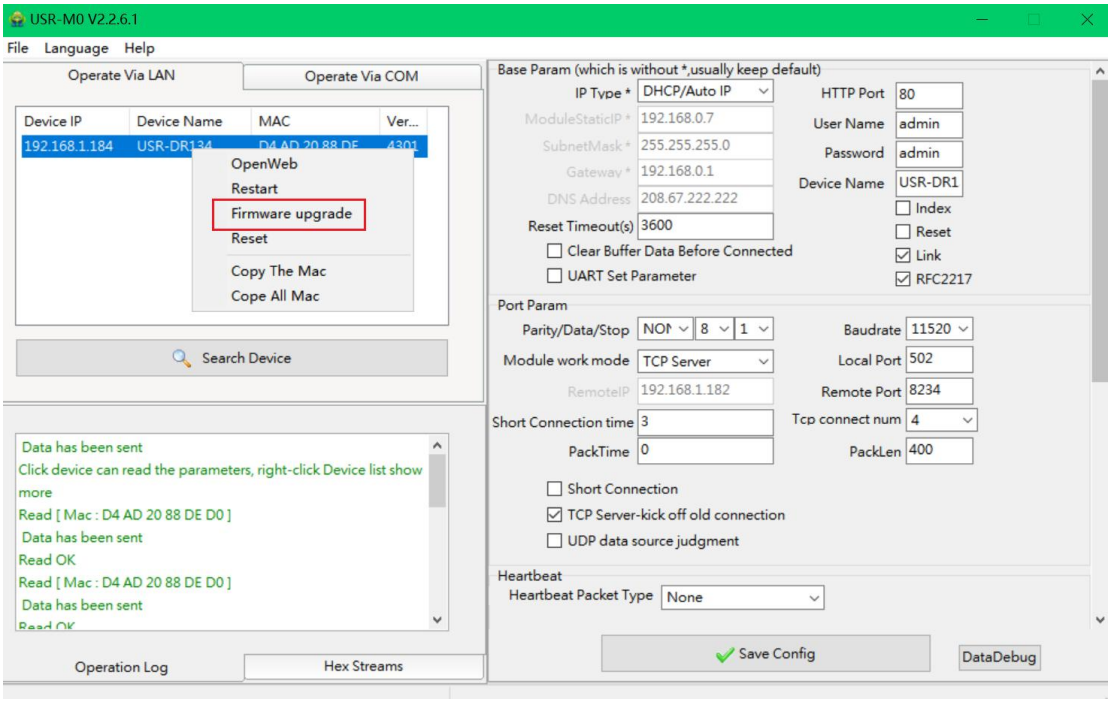


Figure 27. Firmware upgrade

3.2.5. Restart the device

This function is available to allow you to reset the serial device server. The function disconnects both the ethernet and serial connections. The function also allows the serial device server to save new configuration settings to flash memory. To reset the device:

5.Right-click a desired device to display the settings menu,

6.Select Restart

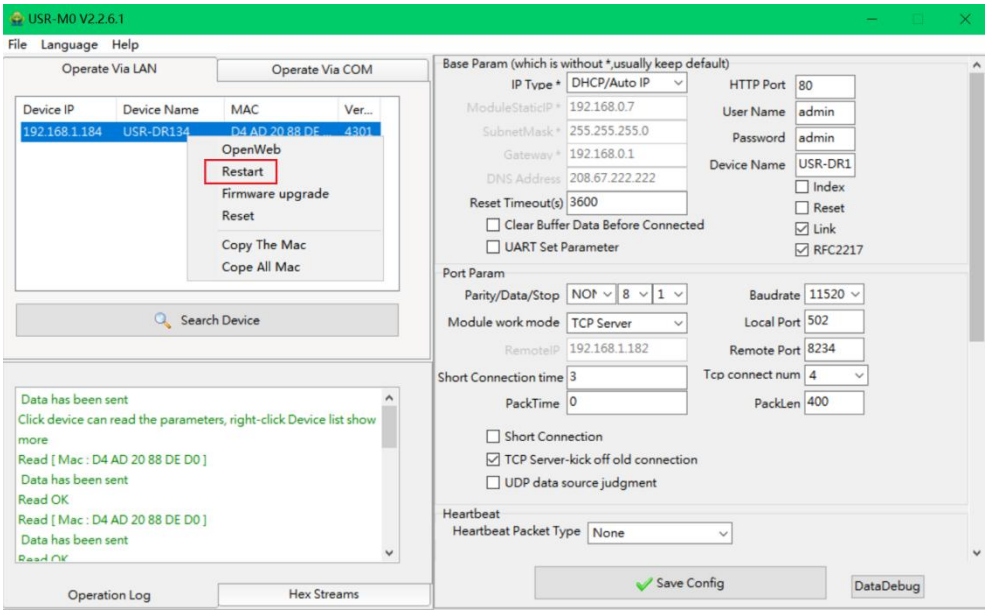


Figure 28. Restart the device

3.2.6. Restore to factory default settings

The configuration utility provides the function to restore the serial device server to factory default settings. If you really want to restore the serial device sever to factory default settings, please click reset button to continue.

1.Right-click a desired device to display the settings menu,

2.Select Reset

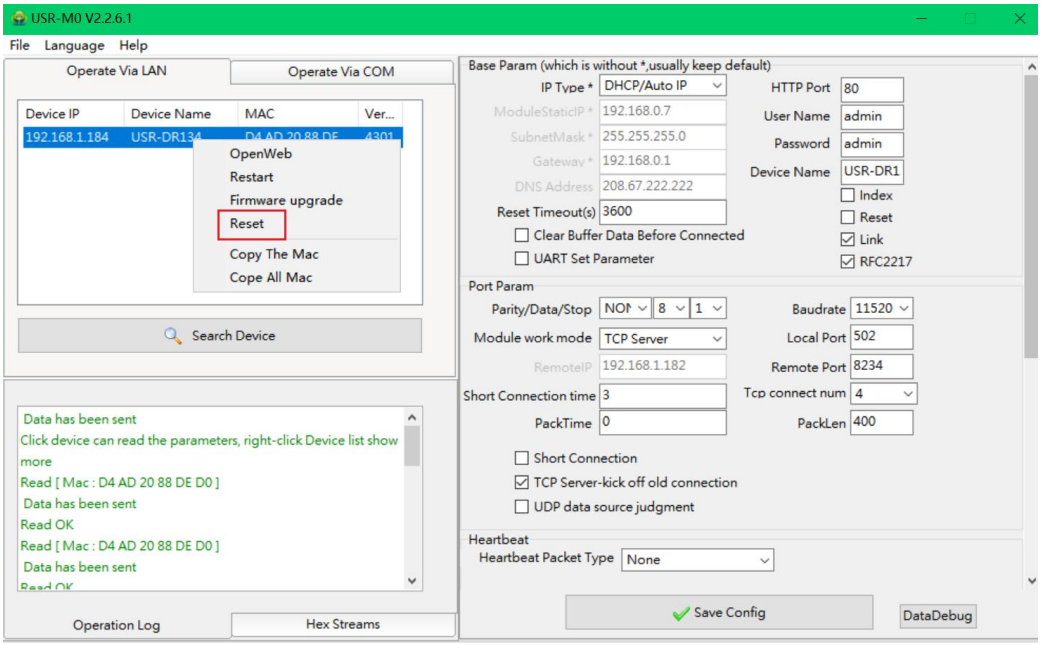


Figure 29. Restore to factory default settings

4. Modbus Gateway

In firmware version V4304 and above version, the Modubs gateway function is in edge gateway page.

After enabled the Modbus gateway, users can achieve Modbus TCP/RTU conversion, Modbus polling and etc.

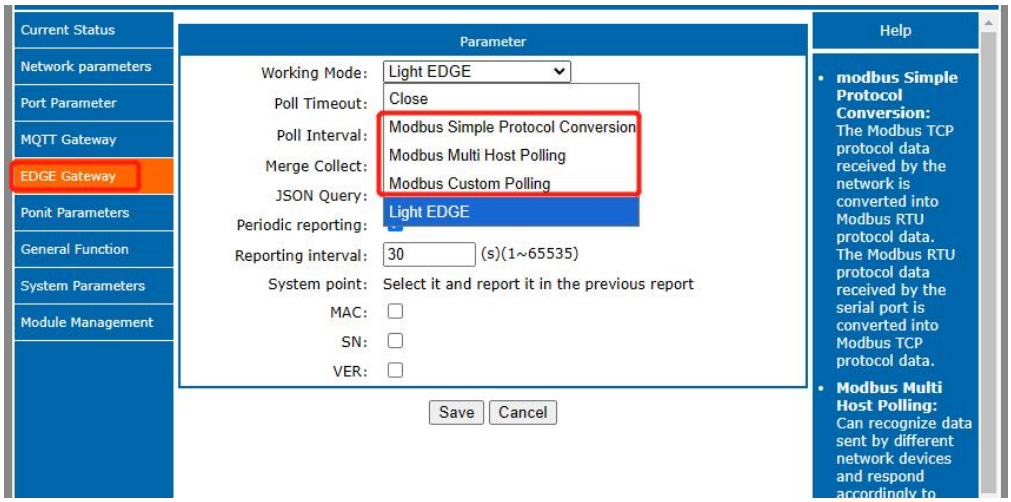


Figure 30. Modbus function

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4.1. Modbus RTU/TCP conversion

This function is to achieve Modbus RTU/TCP protocol conversion.

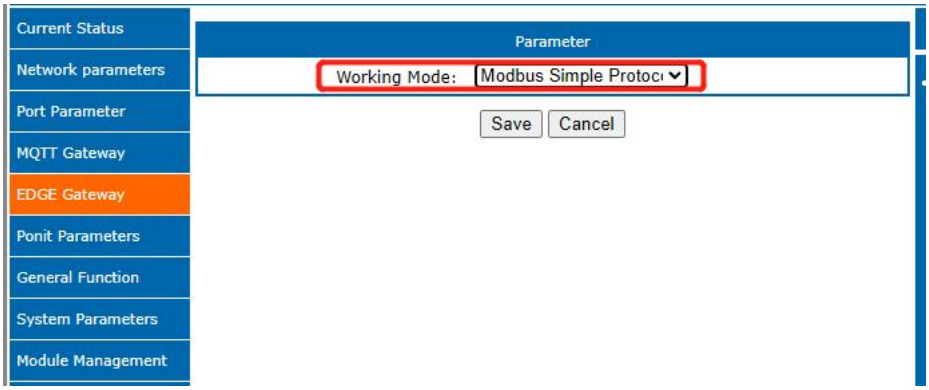


Figure 31. Modbus RTU/TCP protocol conversion

Open the Modbus Poll and Modbus Slave software, go to "Connect" -> "Connect", and the connection parameters are configured as follows.

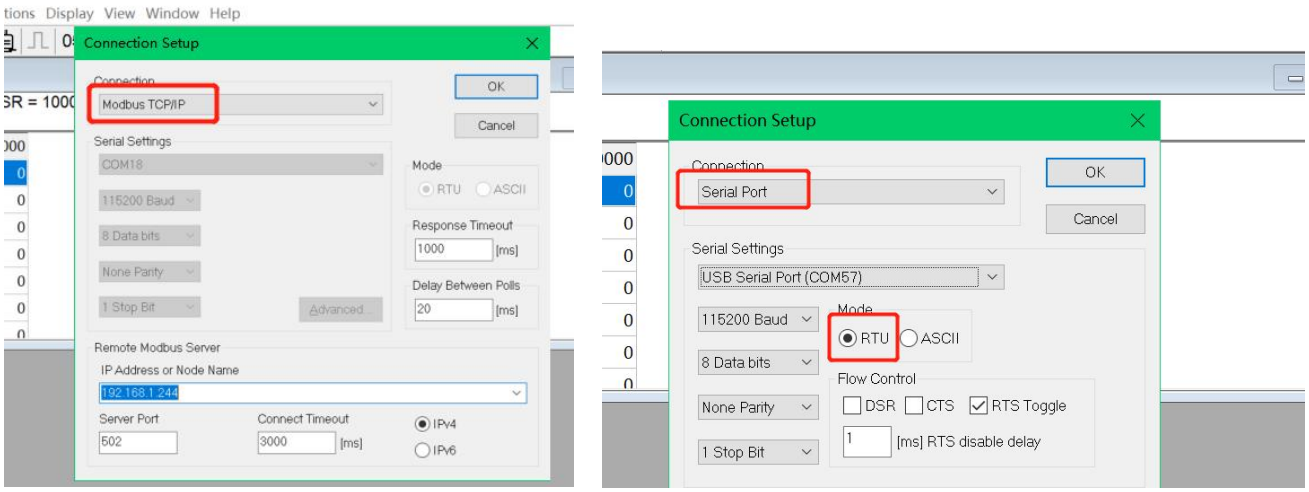


Figure 32. Modbus emulator settings(Ethernet master serial slave)

USR-DR13X support serial master Ethernet slave. In this mode, the serial device is the modbus master and the Ethernet device is the modbus slave device. When test with the Modbus tool, the setting is as follows.

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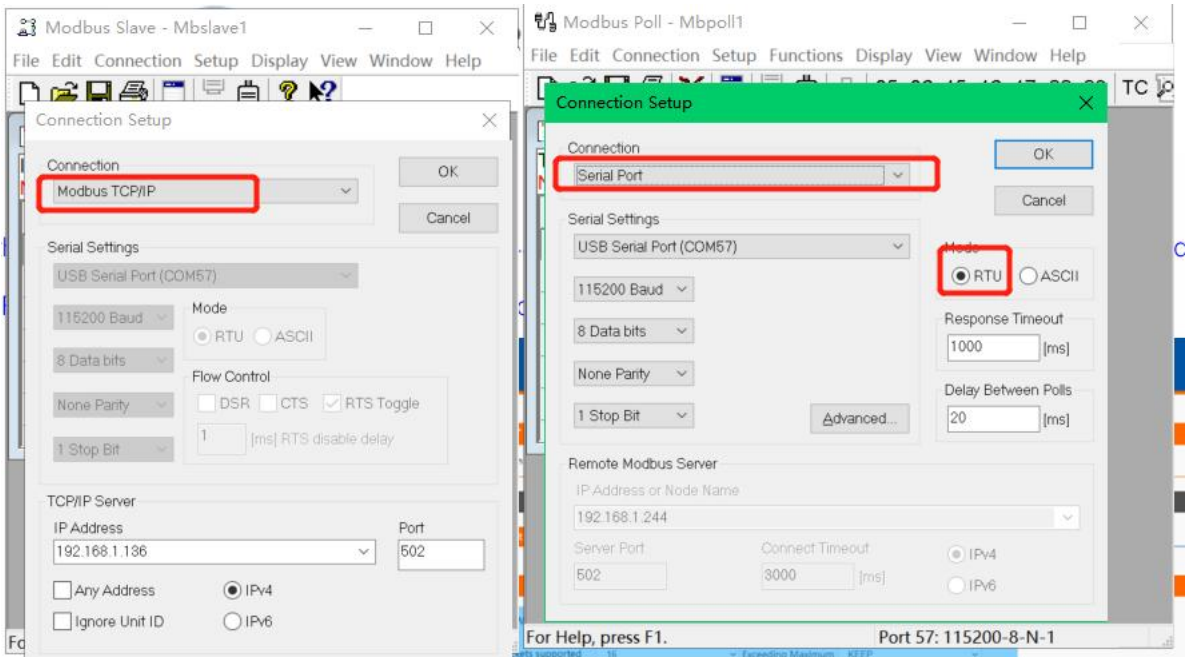


Figure 33. Modbus emulator settings(Serial master Ethernet slave)

4.2. Modbus multi host poll

When enable this function, USR-DR13X supports multiple host sending query command at the same time and will not cause data conflicts.

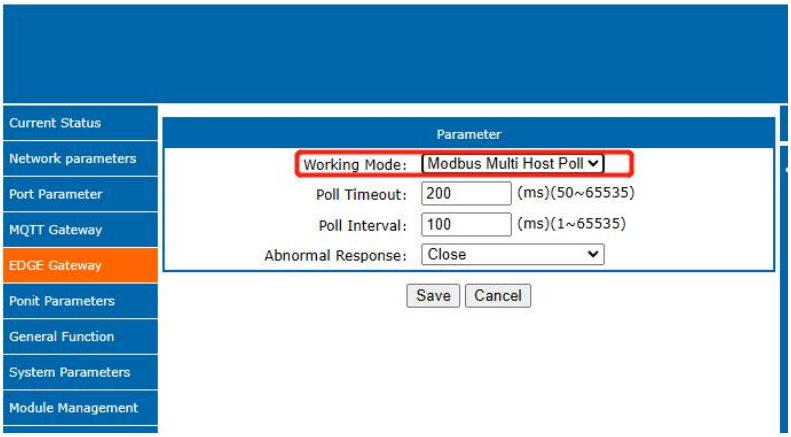


Figure 34. Multi host polling

Parameter Item	Description	Default value
Poll Timeout	After enabling the Modbus poll function, if the USR-DR13X does not receive a response from the serial device within the specified time, it will send the next Modbus query command. Range: 50~65535ms	200ms
Poll Interval	After enabling the Modbus poll function, USR-DR13X will will send Modbus query commands according to the set time interval. Range: 1~65525ms	10ms

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Abnormal Response	Open: Send abnormal response to network end Close: Not send abnormal response to network end	Open

We will test this function using Modbus slave and modbus poll software. The settings of the Modbus testing tool is like following:

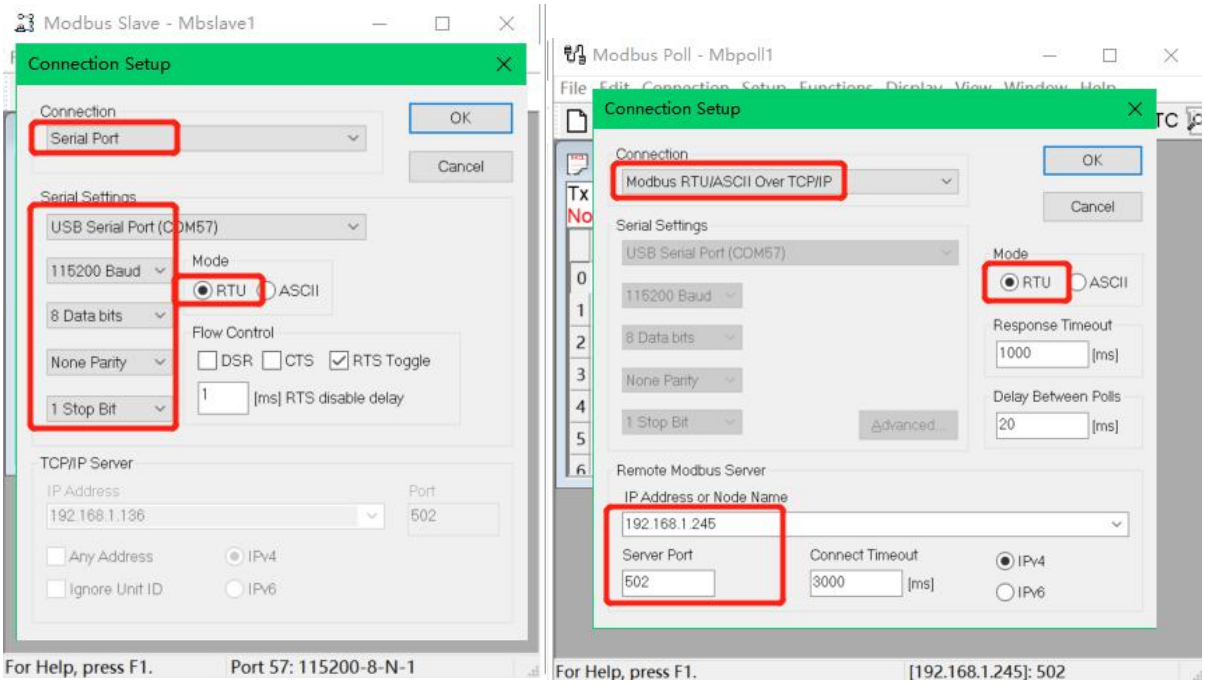


Figure 35. Settings of Modbus slave and master

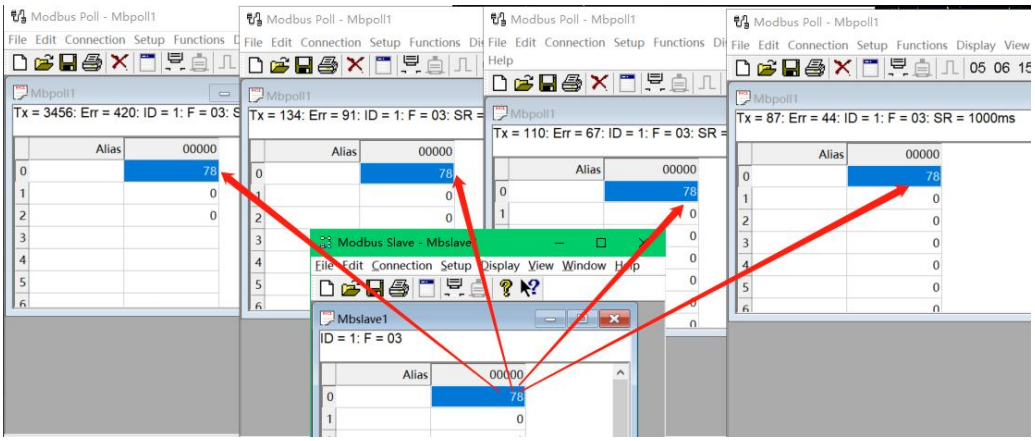


Figure 36. Test result

4.3. Modbus custom polling

When set modbus custom polling function, users can set the query command sending by the USR-DR13X, like the following picture. After power-on and enable modbus poll function, the USR-DR13X sends Modbus-RTU query commands to the serial device. After each command is sent, it will wait for a reply according to the polling timeout. If there is no reply within the timeout, it will send the next query command according to the polling interval.

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The modbus poll function only supports the setting of complete Modbus RTU commands, and a maximum of 5 acquisition commands can be set. Each command can have a maximum of 16 bytes. The acquisition commands can be set through AT commands, and the command setting format is:

AT+MODCMD=1, cmd // Where CMD is the Modbus polling command for setting and querying.

After sending AT command, the USR-DR13X should be restart(AT+Z).

Reporting Protocol: It can be selected as Modbus RTU transparent transmission reporting or Json reporting.

The Json data format is as follows:

{

"id":"Device MAC",

"cmd":"Modubs query command",

"rsp":"Modbus response data"

}

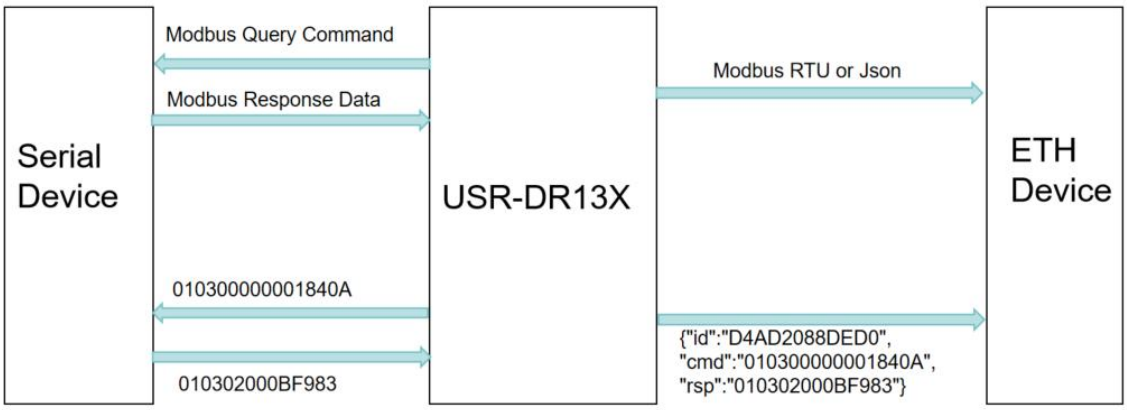


Figure 37. Modbus custom polling function

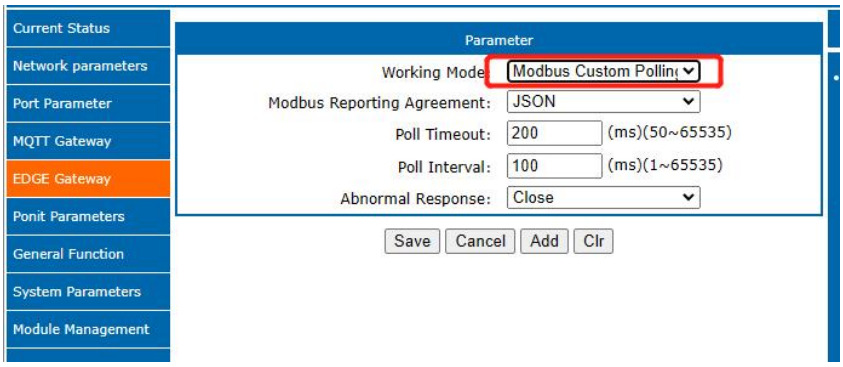


Figure 38. Parameters setting

Parameter Item	Description	Default value
Modbus Reporting	JSON: In Modbus poll mode, USR-DR13X will convert the Modbus RTU data returned by the serial port device into JSON format and reports it to	JSON

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	the network device. Penetrate: In Modbus poll mode, USR-DR13X will report Modbus RTU data to the network device in original format. This parameter is not valid in Modbus RTU/TCP mode.	
Poll Timeout	After enabling the Modbus poll function, if the USR-DR13X does not receive a response from the serial device within the specified time, it will send the next Modbus query command. Range: 50~65535ms	200ms
Poll Interval	After enabling the Modbus poll function, USR-DR13X will will send Modbus query commands according to the set time interval. Range: 1~65525ms	10ms
Abnormal Response	Open: Send abnormal response to network end Close: Not send abnormal response to network end	Close

Sending AT command to set the query command like the following picture.

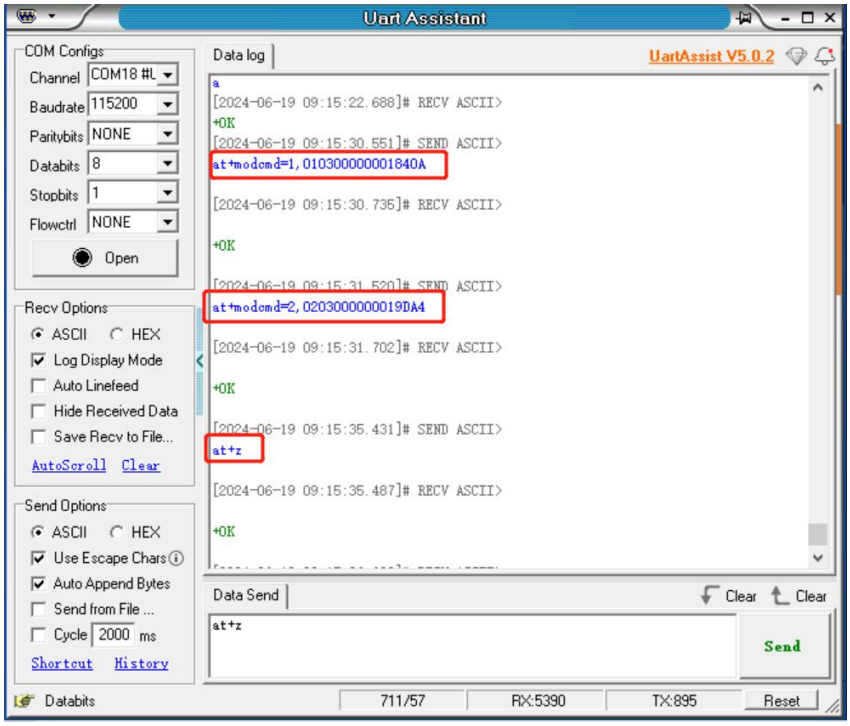


Figure 39. Query command setting

Open modbus slave tool, on the communication traffic page, users can see the received query command and the modbus slave gives response. And on the network end device, users can receive the response data as the following pictures showing.

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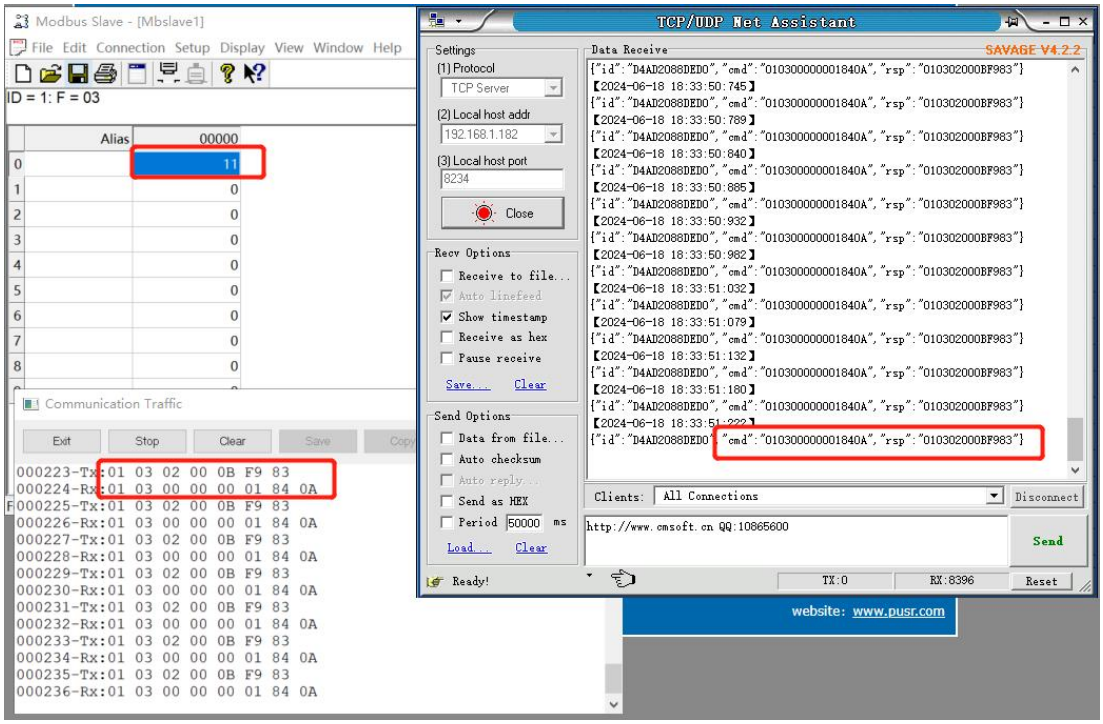
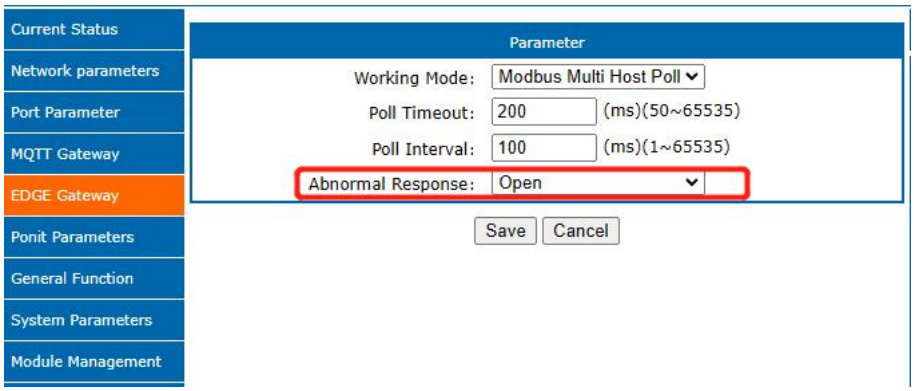


Figure 40. Test result of Modbus polling function

4.4. Abnormal Response

If DR13X fails to receive a Modbus response data from the serial device within the set time limit or the Modbus response data is incorrect, it will report an abnormal response to the network-end device.



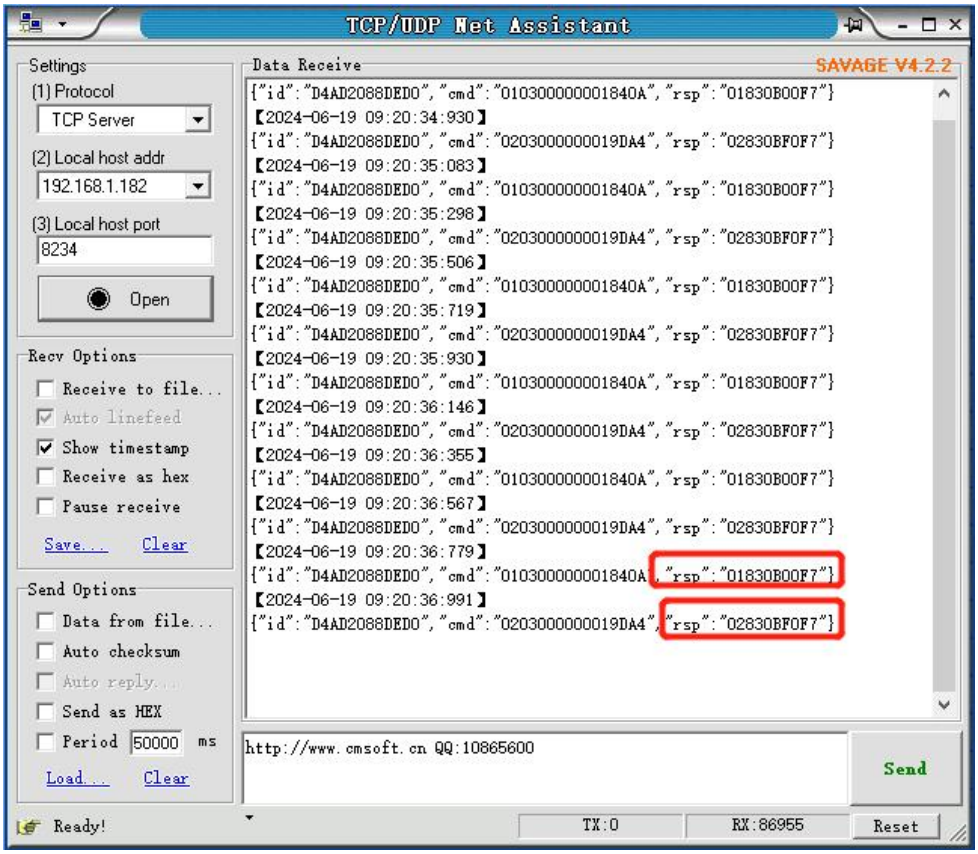


Figure 41. The abnormal response of Modbus poll function

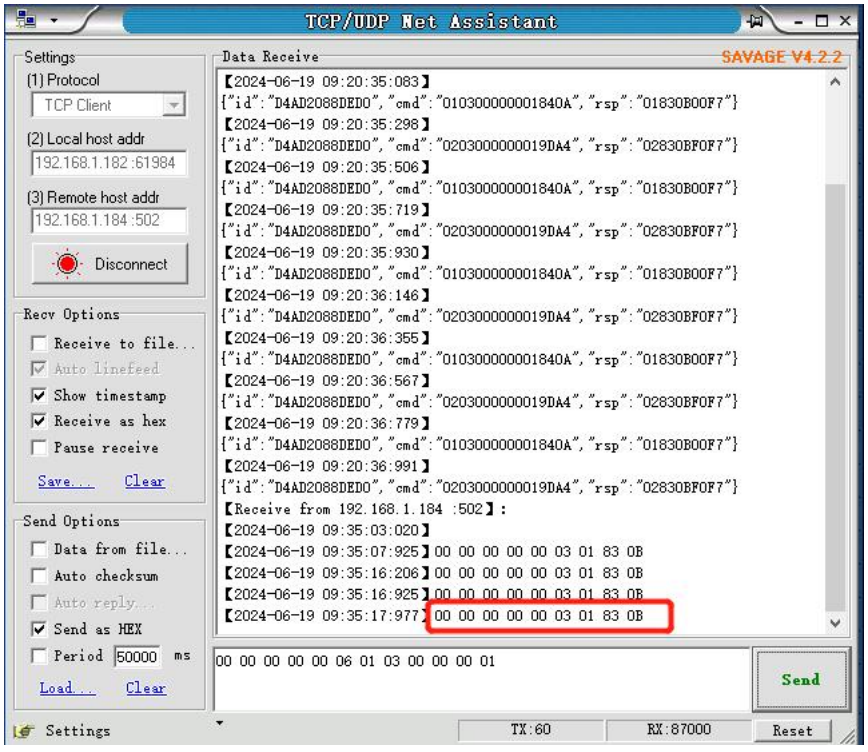


Figure 42. The abnormal response of Modbus RTU/TCP

5. Operation mode

5.1. TCP server

In TCP server mode, the TCP connection is initiated from the host (TCP client) to the USR-DR13X Series device server. This operation mode supports a maximum of 16 simultaneous connections. Once the connection is established between the DR13X series and the remote host computer (remote TCP client), data can be transmitted in both directions. The work mode can be set in "serial port" tab.

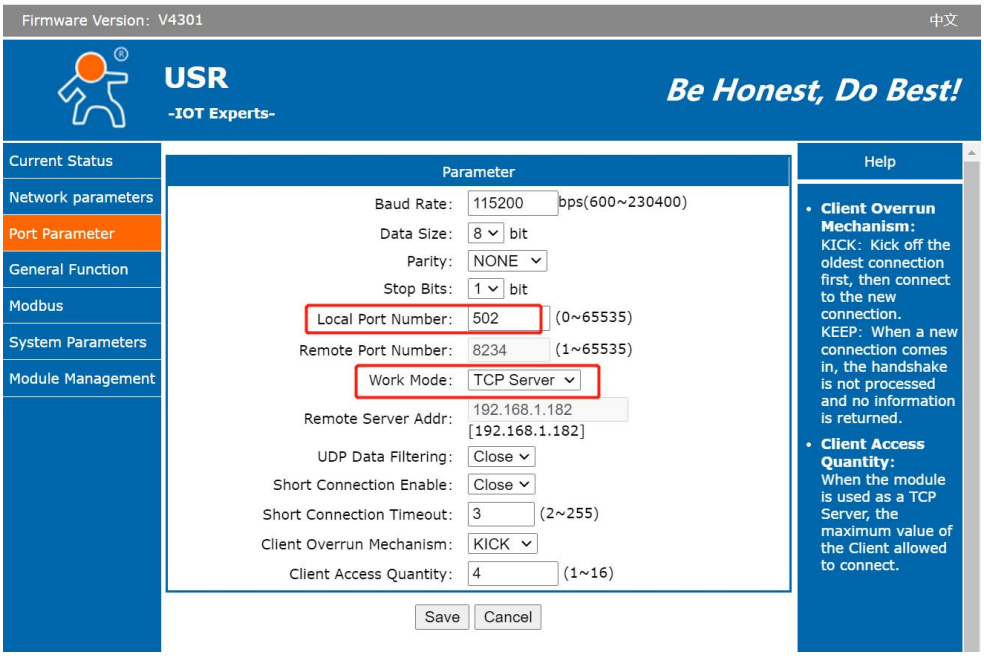


Figure 43. TCP server mode

When the device work as TCP server, it allows up to 16 clients to access. The default is 4. We can test it with test software. Setting of the software is shown in the following picture. Once the TCP connection is established, the link indicator will turn on.

Protocol: TCP Client

Remote Host Address: 192.168.1.184 (the IP of USR-DR134)

Remote Host Port: 503 (the local port of USR-DR134)

The data transmission is shown in Figure 25.

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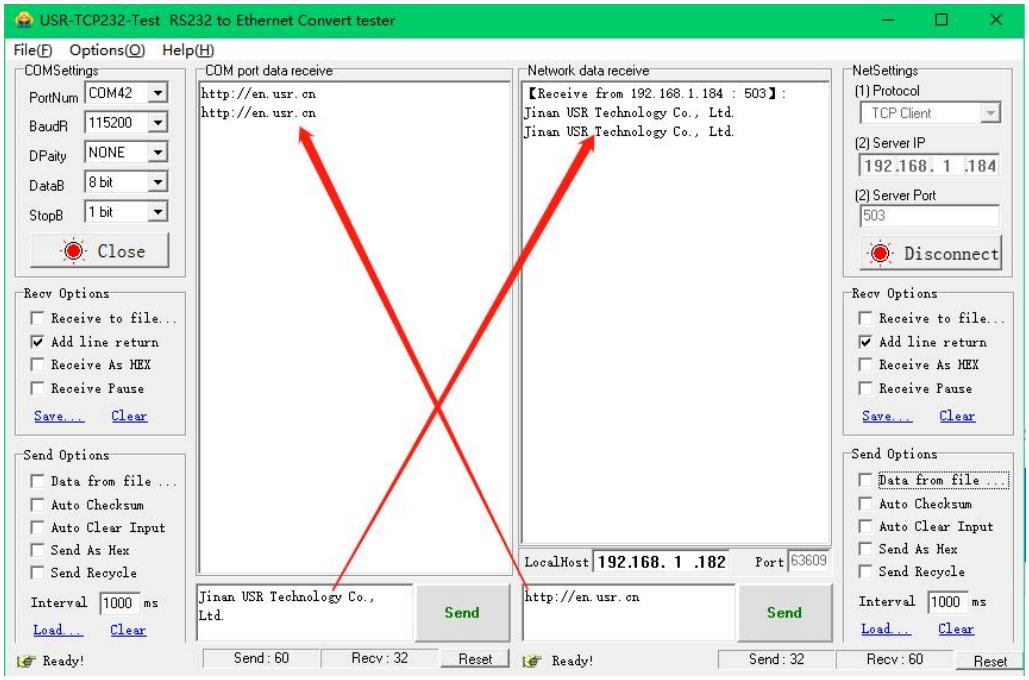


Figure 44. Test of TCP server

5.2. TCP client

When the work mode is TCP client, the remote device must work in TCP server mode. The USR-DR13X will initiate the TCP connection and the remote server IP and port should be configured.

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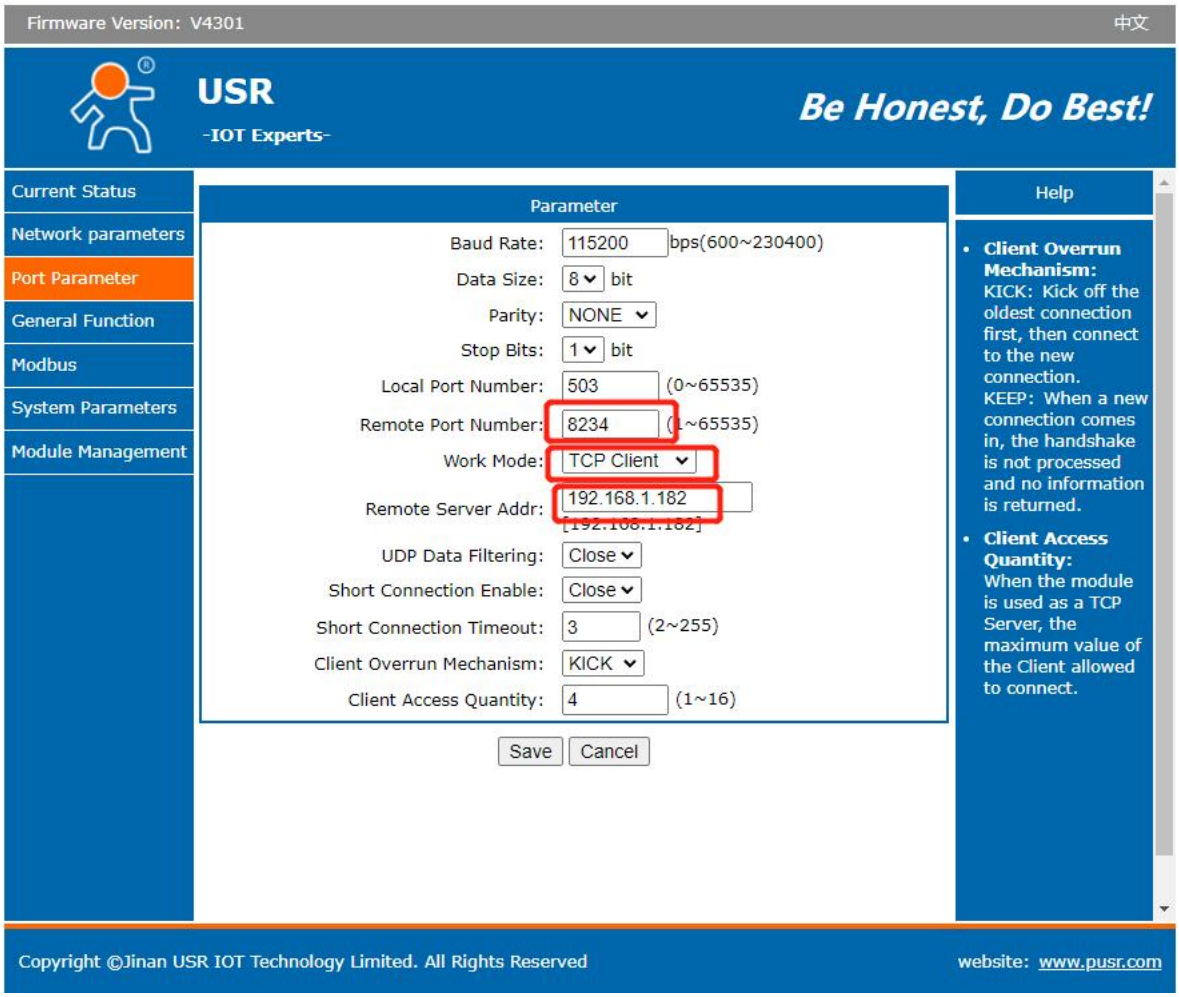


Figure 45. TCP client mode

To test this mode, the test software needs to be TCP server, and the local port should be the same with the remote port of USR-DR134. After the connection is established, we can see the IP and port of USR-TCP232-306, as shown in the red box of the following picture.

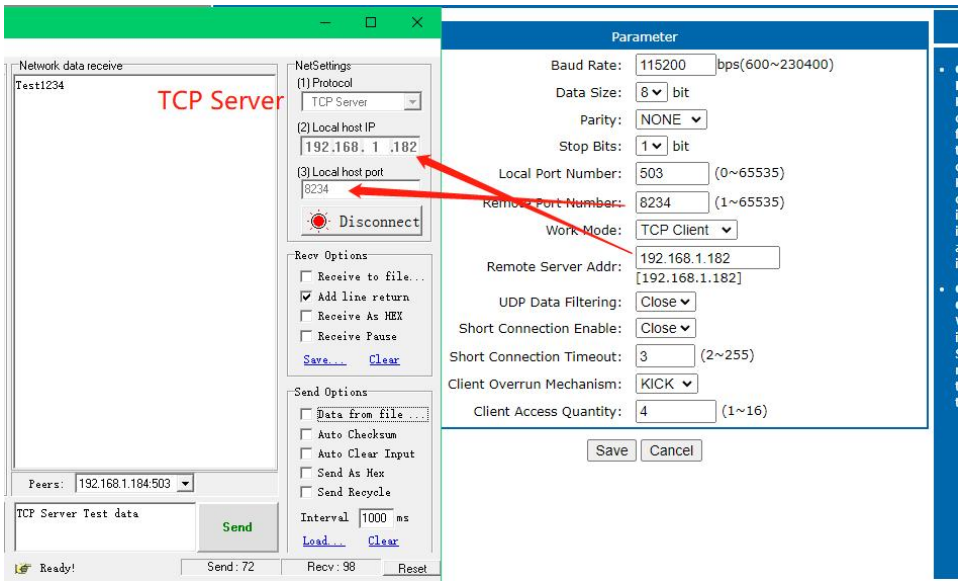


Figure 46. Setting of USR device and test software

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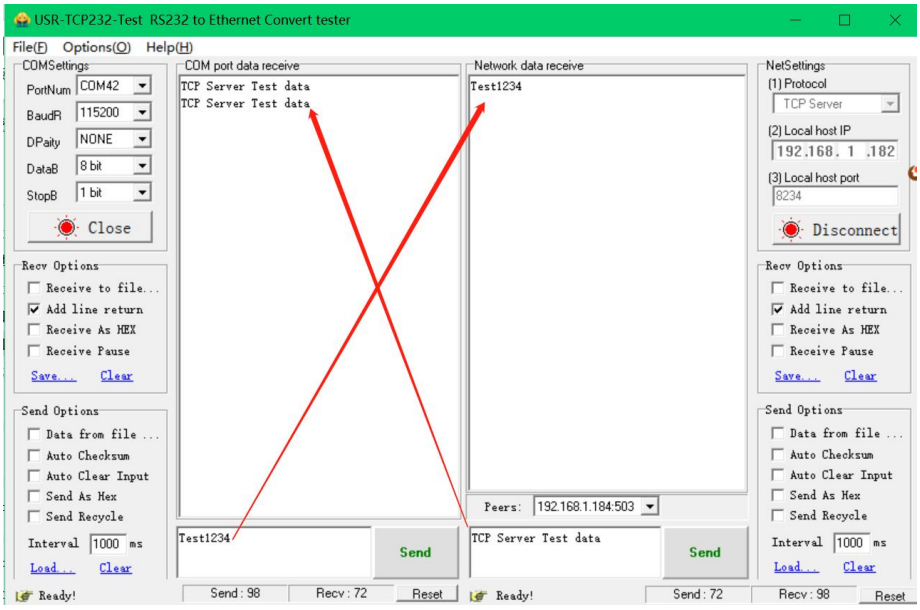


Figure 47. Test result of TCP client

5.3. UDP server

UDP is a faster and more efficient transport protocol than TCP, but it is a connection-less transport protocol. When the USR-DR134 works as UDP server, it doesn't verify the source address. After receiving a UDP data packet, the destination IP and port are changed to the one which send the UDP data to USR-TCP232-306.

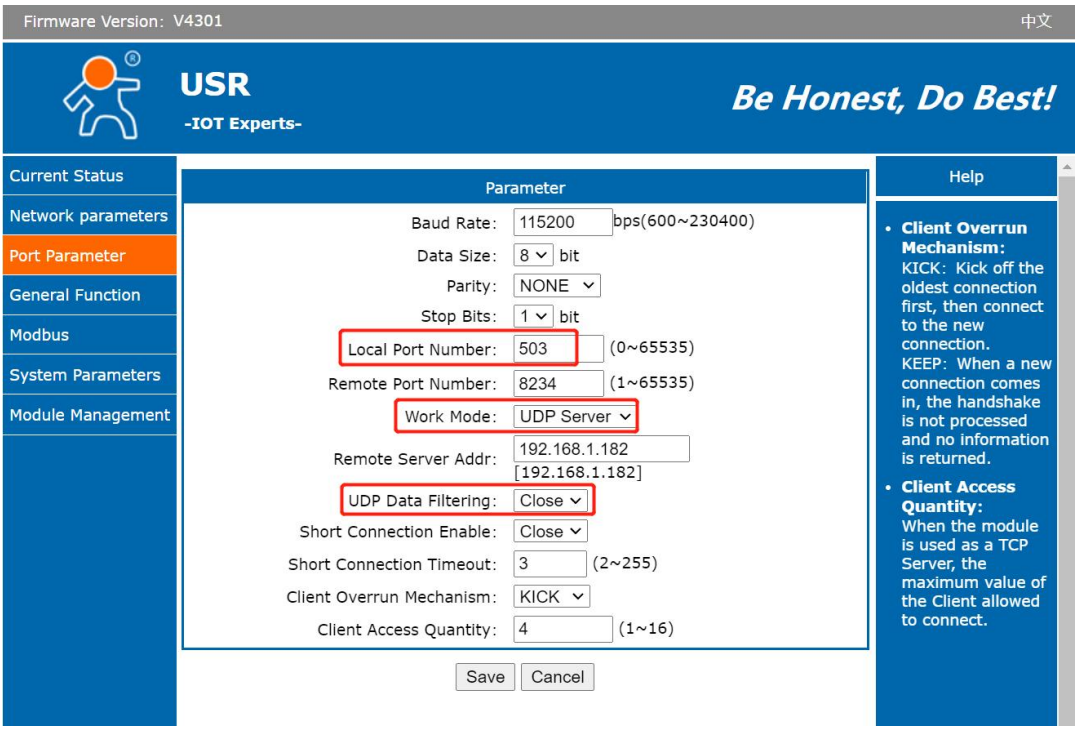


Figure 48. UDP server mode

For test software,

1.The local host port is the same with the remote port of the USR-TCP232-306,

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2.The remote host IP is IP address of USR-TCP232-306, and the remote port is local port of USR-TCP232-306,

3.Then serial device and network device can transmit data bidirectionally.

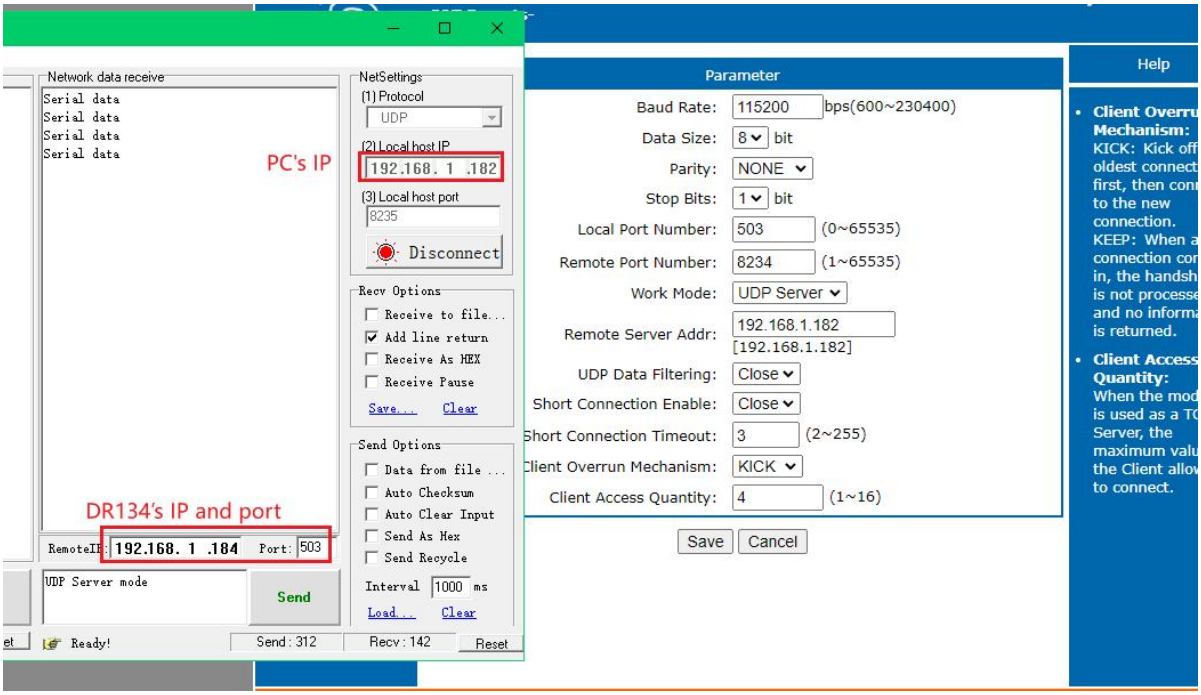


Figure 49. Settings of device and test software

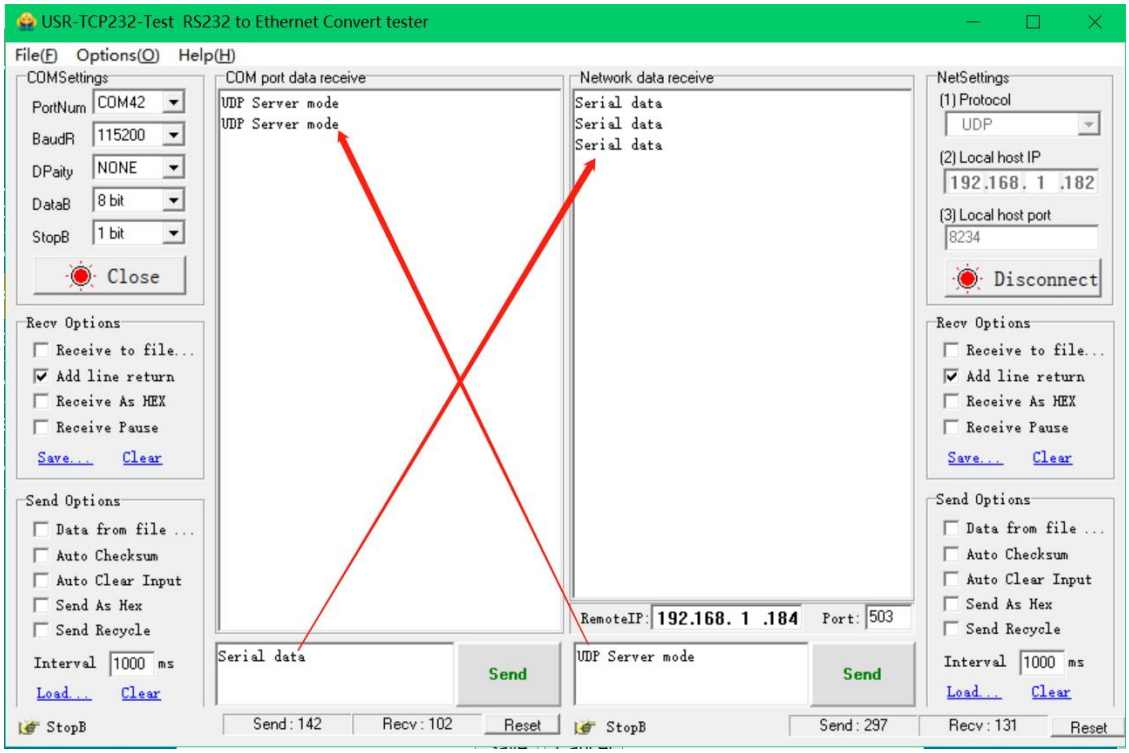


Figure 50. Test result

There is another condition, the local host port is not the same with the remote port of the USR-TCP232-306. If so, the network test software must send the first data packet to USR-DR13X(work as UDP server).

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Figure 51. Different UDP port

If we send the first data packet from serial to network, the data isn't transmitted successfully, the test result can be seen in the following picture.

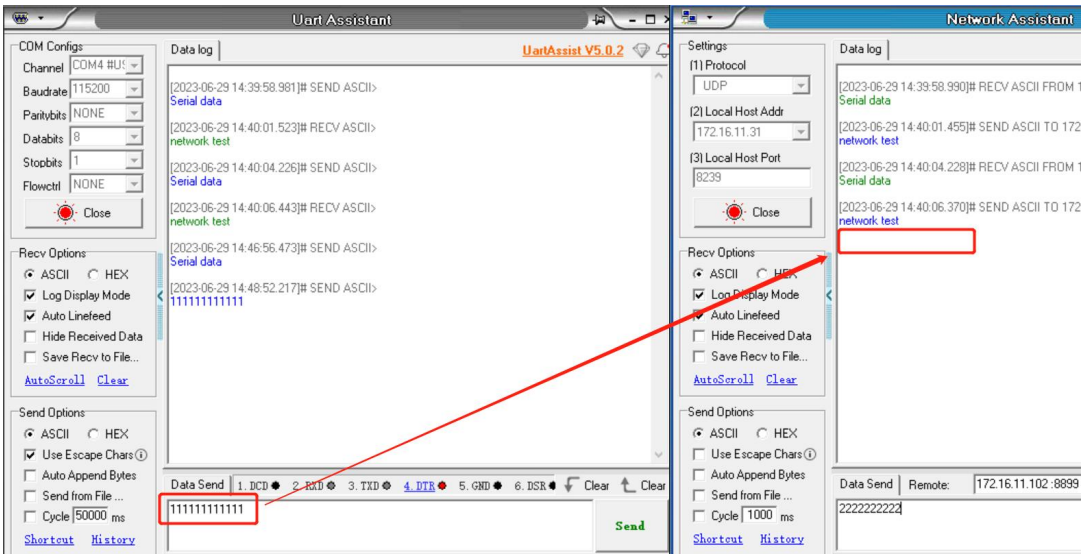


Figure 52. Test result with no data

If we send the first data packet from network to serial successfully, then we can also send the data from serial to network successfully.

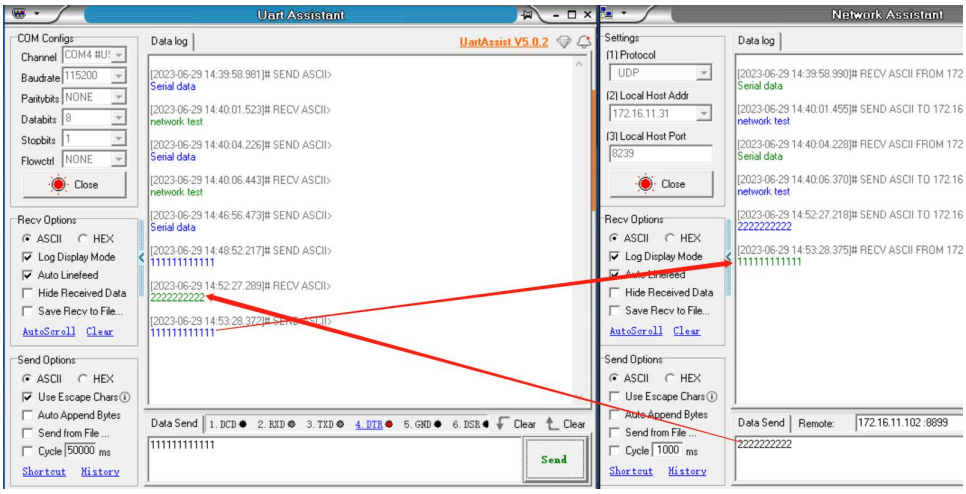


Figure 53. Test result with data transmission

5.4. UDP client

5.4.1. Transparent data transmission

In UDP client mode, DR13X will only communicate with target IP/Port. If data is not from target IP/Port, it won't be received by DR13X.

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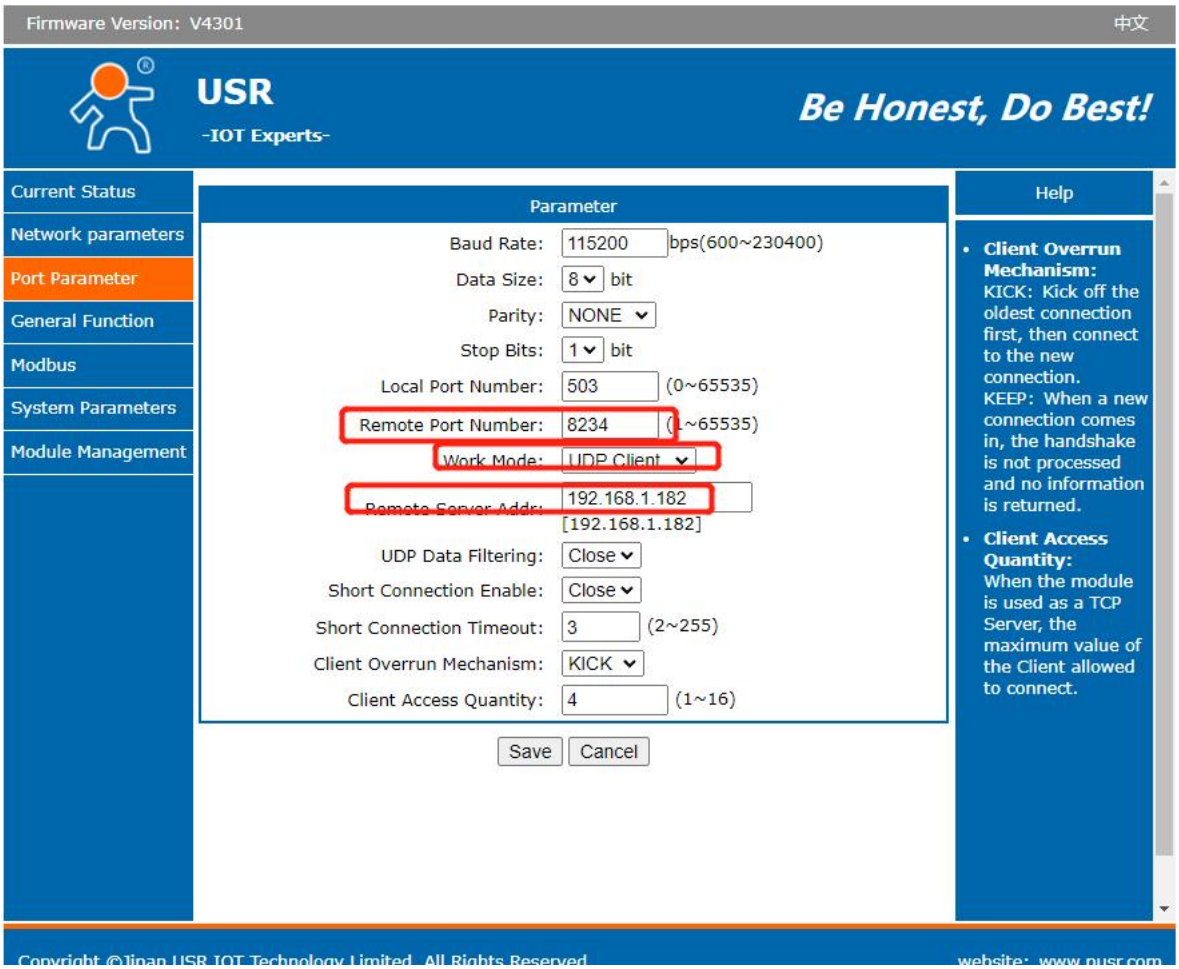


Figure 54. UDP client

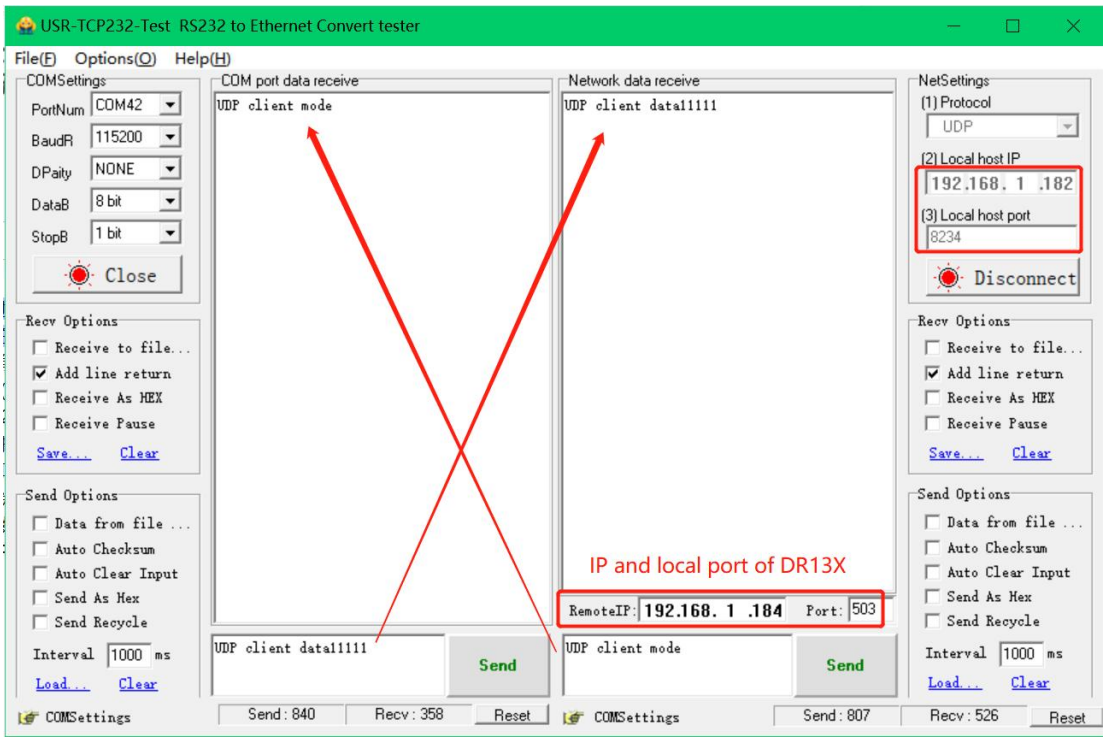


Figure 55. Test result of UDP client

5.4.2. UDP data filtering

UDP data filtering can verify the data source when DR13X work at UDP Client mode and filter out IP and port numbers that do not meet the conditions. This function can be enabled by built-in webpage, config software.The remote server address can be set as host IP , broadcast IP.

If the target IP is 255.255.255.255: USR-DR 13X only determines whether the data source port is the same as the device's destination port. If they are the same, the network data is output from the serial port. If they are different, the network data is discarded.

If the target IP is 192.168.1.255: USR-DR 13X judges whether the data source port is the same as the target port, and judges whether the IP is an IP within the segment. The qualified data is output from the serial port, otherwise it is discarded.

If the target IP is host IP like 192.168.1.182: USR-DR 13X determines whether the data source port and IP are the same as the target port and IP of DR 13X. If the data is the same, the data is output from the serial port, otherwise the data is discarded.

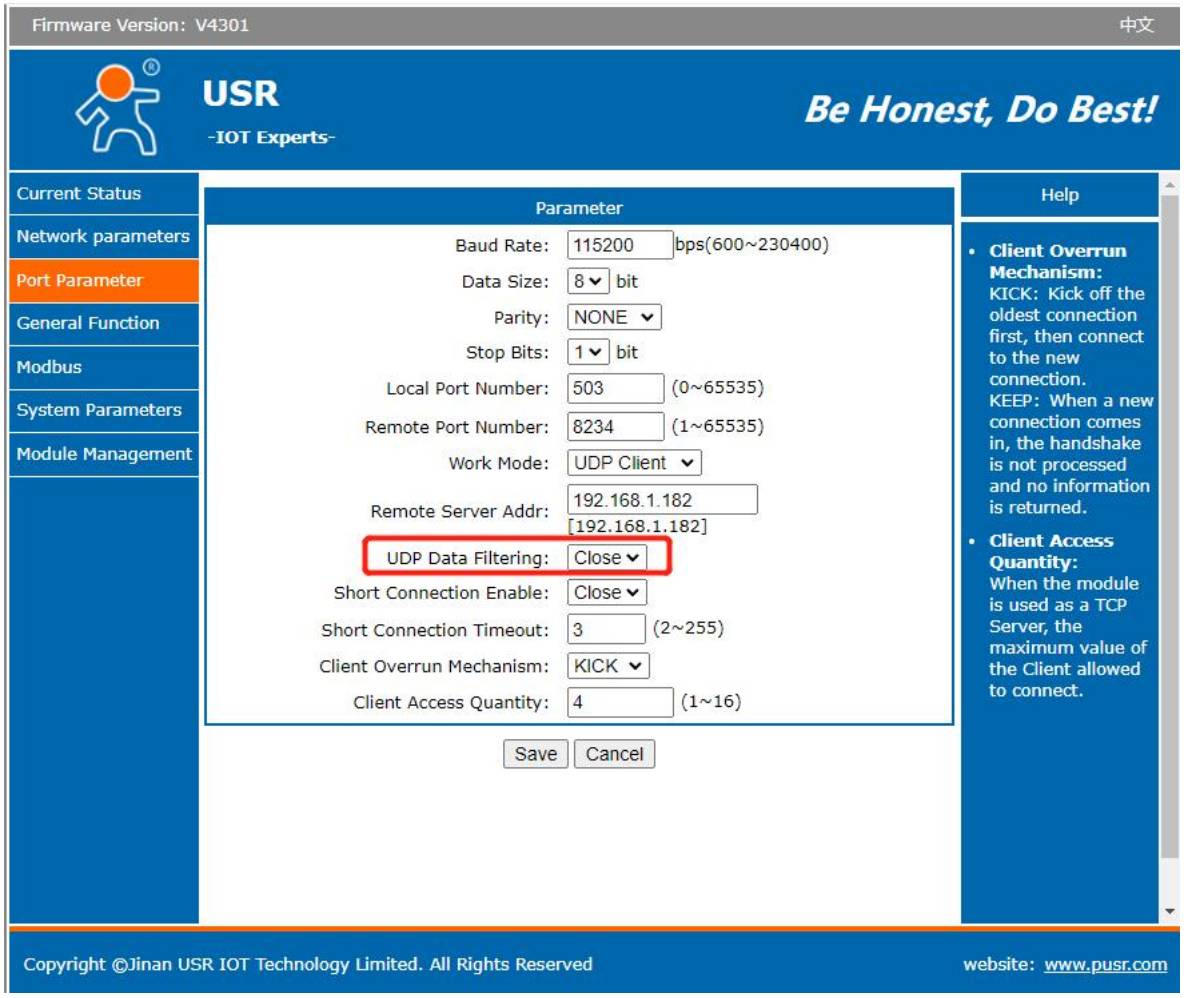


Figure 56. Settings of UDP broadcast

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5.5. HTTP client

In HTTPD Client mode, TCP232-304 can achieve data transmission between serial port device and HTTP server. User just need set TCP232-306 in HTTP client and set the HTTPD header and HTTP URL and some other related parameters, then the data can be transmitted between serial device and http server.

The http connection of DR13X is short connection, if the device does not receive the data sent by the serial port device after waiting for the pre-set time, it will actively disconnect. The default pre-set time is 3 second.

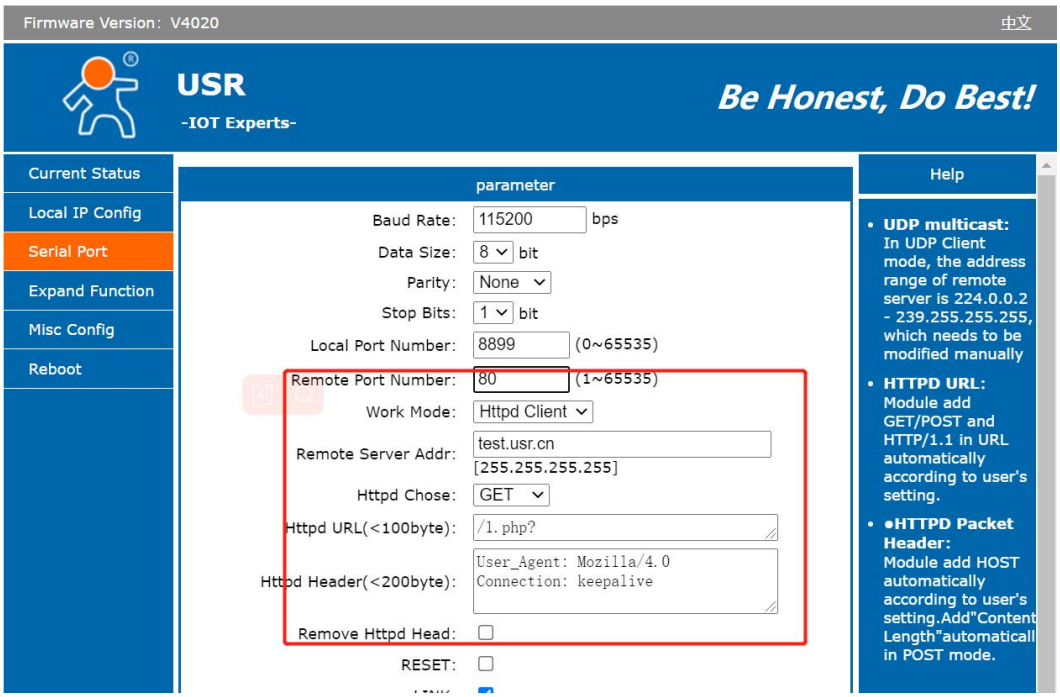


Figure 57. Settings of Httpd client

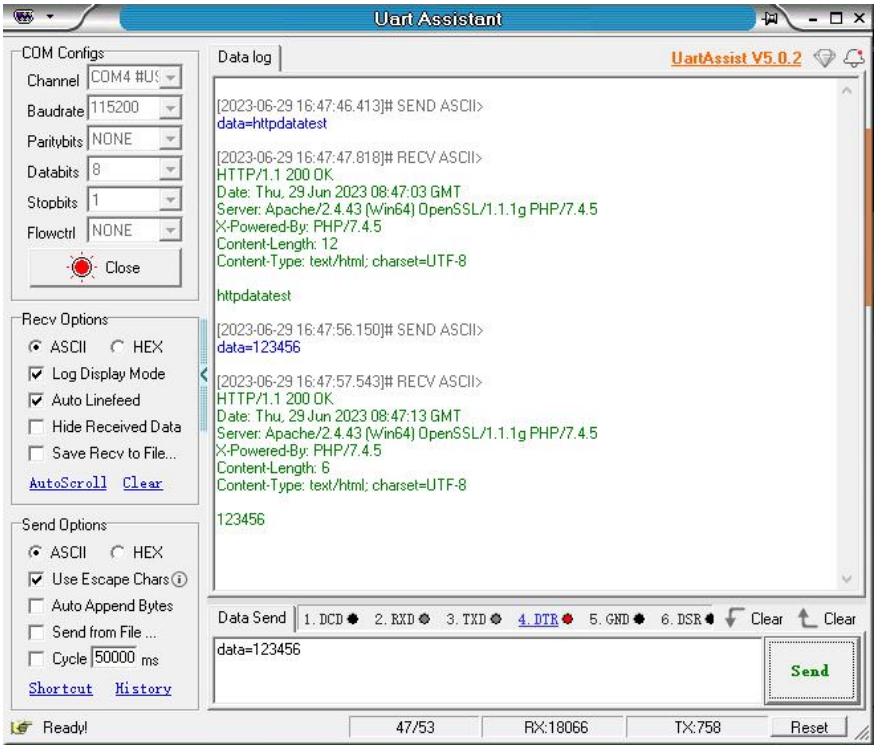


Figure 58. Test result of httpd client

6. Additional features

6.1. Index function

The Index function is mainly to solve the problem that in the TCP Server mode, when the user has multiple clients connected to the 30X and sends and receives data at the same time, the data source cannot be distinguished or cannot be sent to a specific client.

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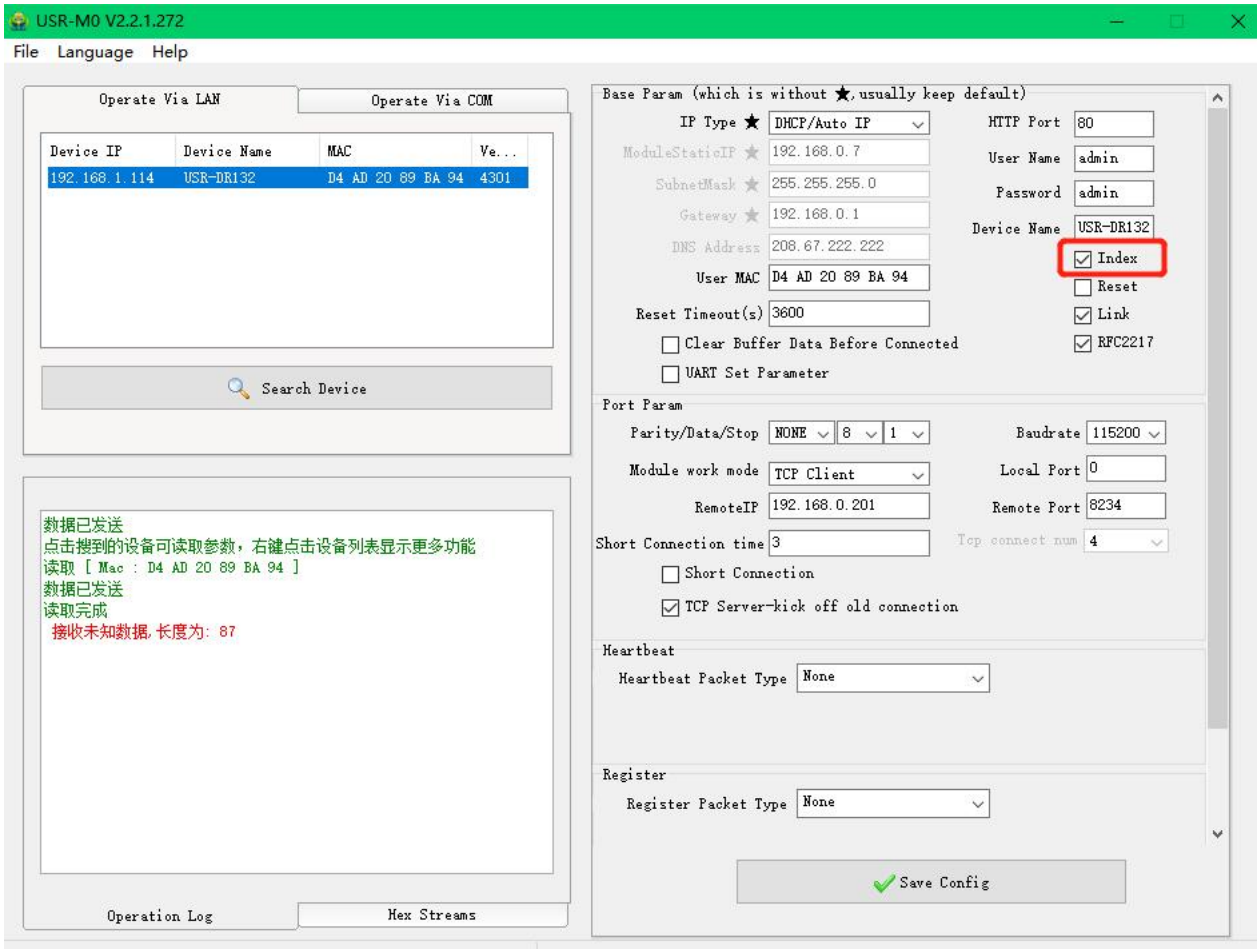


Figure 59. Settings of index function

When the TCP connection is established, the serial will out put the connection order showing in the red rectangle. And when the clients send data to serial device, the DR13X will prefixes the data with a serial number like I1, I2.

When the serial device needs to send data to a specific client, such as sending data to the first client, you can add O1 in front of the data, such as we send O1www.usr.cn meaning sending **www.pusr.com** to the first clients. We can see the result in the following picture, the data is send to the first client only as indicated by the blue arrow.

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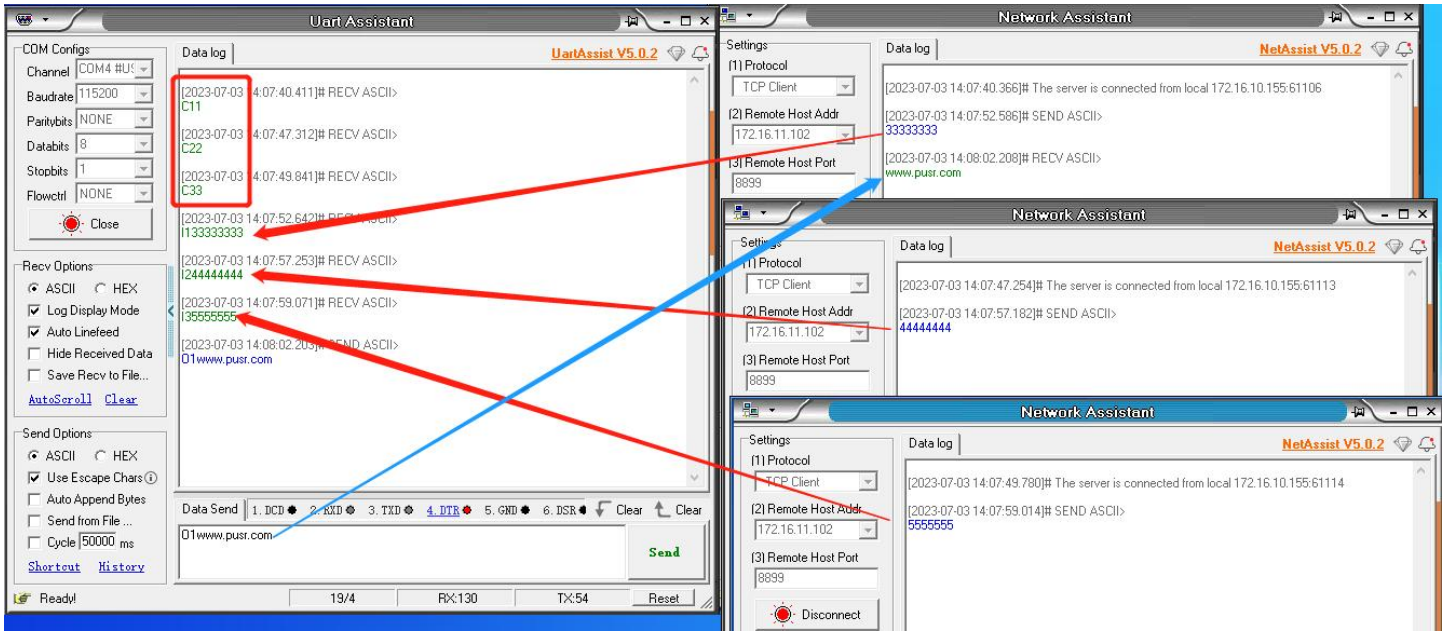


Figure 60. Test result of index function

6.2. User-defined webpage

USR-DR13X supports user-defined webpage. User can make revision as LOGO/NAME on the basis of USR-DR13x's webpage to realize the personalized applications.

Users can download the original webpage: **https://www.pusr.com/support/download/Customized-Webpage-USR-DR13X-Customized-Webpage-V2-05.html**

Search the USR device using Ethernet Tool downloaded on chapter 2.1.1, right-click the searched device, select upgrade webpage. It will navigate you to a new page, just as the following picture.

Destination IP: The IP address of USR-DR132/134.

Port: 1501(fixed).

Start address: 8046000(fixed)

Maxsize: 2B000(fixed)

Select path: the path of the user-defined webpage file.

Then click upgrade button to upgrade the webpage.

Note: the webpage file should be less than 172K bytes, or the webpage upgrading will fail.

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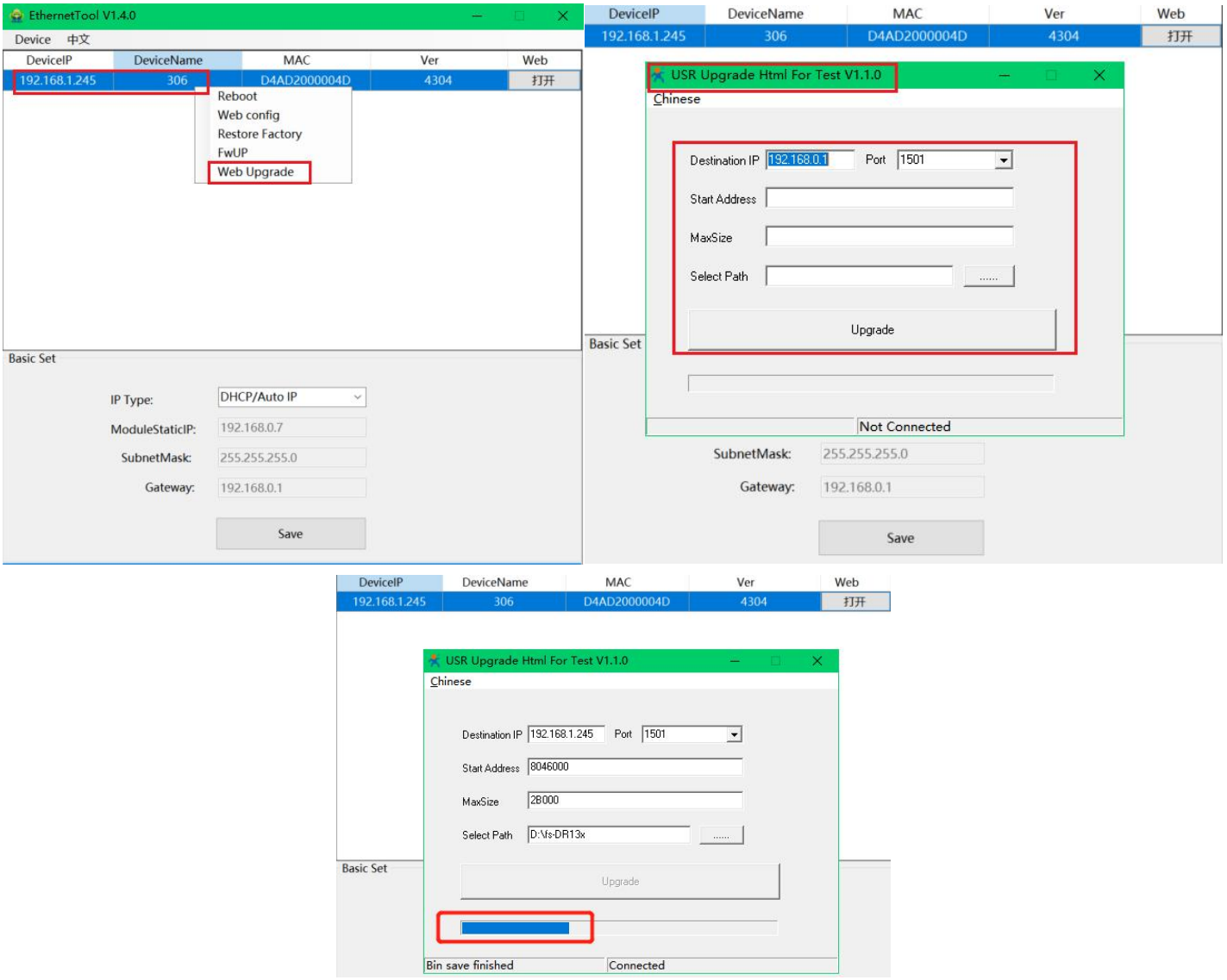


Figure 61. Webpage upgrading

6.3. Firmware upgrading

Open Ethernet tool and search the USR-DR13X device, right click the searched device and select upgrade firmware. Note that when upgrading firmware, the firewall and other network adapter should be closed, or the firmware upgrading maybe fail.

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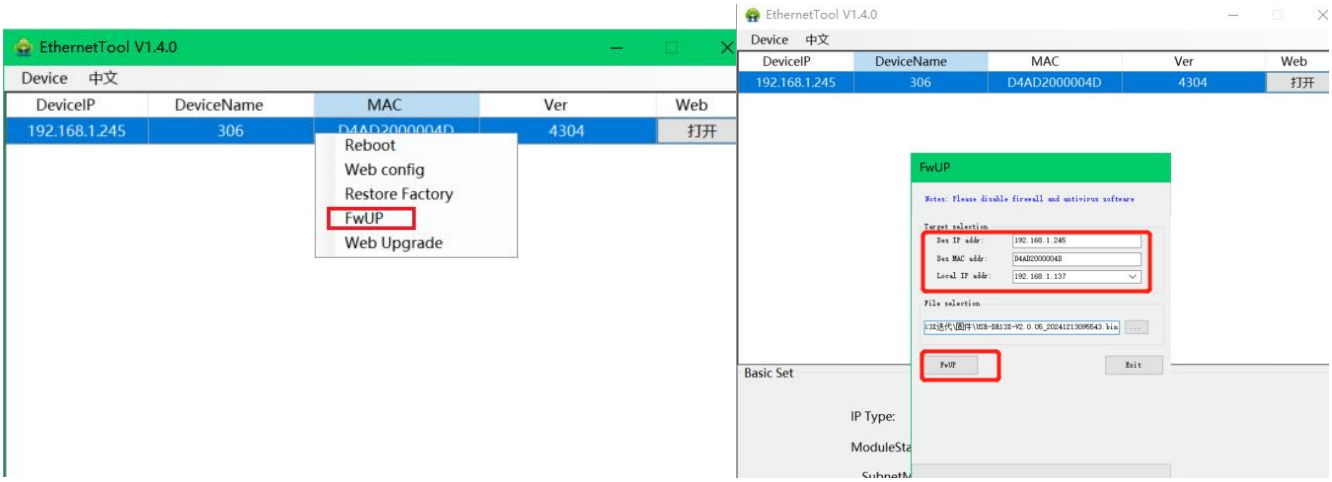


Figure 62. Firmware upgrading

7. Warranty

8. Contact Us

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10. Revision History

Version	Date	Author	Description
V1.0.3.01	2017-09-20		Established
V1.0.4	2023-07-03	May Liu	1. Add description of Modbus Gateway 2. Add description of Multicast
V1.0.5	2024-01-24	May Liu	1. Add description of MQTT gateway, edge computing, user-defined webpage and firmware upgrading. 2. Modify the description of Modbus gateway

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