

# **Protocol Converter ODOT-S1E1/S2E1**

## **User Manual**

V1.00

2020.07.21

**ODOT Series ODOT-S1E1/S2E1**



## ODOT Automation System Co., Ltd.

2020-02

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Please log on the official website: [www.odotautomation.com](http://www.odotautomation.com) and click on the corresponding product page to download.

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# 1. Product Overview

## 1.1 Product Functions

Protocol converter is a converter developed by Sichuan Odot Automation System Co., LTD between RS232/485/422 and TCP/UDP. This protocol converter can easily connect serial port devices to Ethernet and realize network upgrade of serial port devices.

Protocol converter supports the function of "data transmission", which can be set as a client or a server. This function can easily realize the data communication between PLC, server and other Ethernet devices and the underlying serial port devices.

Modules that support this feature are ODOT-S1E1 and ODOT-S2E1.

## 1.2 Functional Characteristics

- ◆ 9-36V wide voltage input, anti-reverse connection protection. DC-DC isolation power supply, 3000V isolation voltage.
- ◆ 2KV network port isolation protection, 10M/100Mbps rate adaptive, automatic MDI/MDIX reversal.
- ◆ Support TCP server pure transparent transmission, support two client access.
- ◆ Support TCP client pure transparent transmission, support to connect 1 server.
- ◆ Support UDP pure transparent transmission.
- ◆ Support with and without protocol transparent transmission, protocol transparent transmission supports MODBUS RTU/ASCII.
- ◆ Support for WEB browser configuration parameters.
- ◆ It has three interfaces of RS485, RS422 and RS232.
- ◆ Serial port baud rate support 1200 ~ 115200bps.

- ◆ Support DHCP, more convenient to use.
- ◆ Support one-key reset function to restore factory Settings.
- ◆ 35mm standard DIN-rail installation.
- ◆ EMC meets EN 55022:2010 & EN55024:2010 international standards.

### 1.3 Technical parameters

The technical parameters of this product are shown in Table 3.1. Please use this product within the parameters of this product to obtain better performance.

Table 3.1 Technical parameters

	ODOT-S1E1	ODOT-S2E1
<b>Environmental parameters</b>		
Working temperature	-20~70°C	
Storage temperature	-55~125°C	
Operating humidity	5%~95% (No condensation)	
<b>The power supply parameters</b>		
Number of power ports	1	
Input voltage	9-36V (DC)	
Power consumption	700mW	1200mW
<b>Ethernet parameters</b>		
Working mode	TCP server, TCP client, UDP	
Number of Ethernet ports	1	
Network protocol	TCP, UDP, HTTP	
Number of TCP connections	TCP server pure transparent transmission, supports 2 client accesses. TCP client pure transparent transmission, support to connect 1 server.	
<b>Serial port parameters</b>		
Quantity of serial port	1	2
Serial communication mode	RTU mode and ASCII mode are optional.	
Serial terminal resistance	120 Ω external resistance	
Supported Baud rate	2400-115200bps	

Supported validation mode	No check, odd check, even check
Number of slave stations supported	31(RS485)

## 2. Hardware description

### 2.1 Product appearance



### 2.2 Indicator light description

The equipment has five LED status indicator lights, whose symbol definition and status description are shown in "Table 2.1".

Table 2.1 Description of indicator light

Symbol	Definition	State	Instruction
PWR	Power Light on/off	ON	Power on
		OFF	Power off
DST	Fault light	ON	Out of order
		OFF	Normal operation
TX1	Serial port one send indicator light	ON	Serial port one data is being sent.

		OFF	The serial port sends no data.
RX1	Serial port one receiving indicator light	ON	Serial port one data is being received.
		OFF	The serial port receives no data.
TX2	Serial port two sending indicator light	ON	Serial port 2 has data being sent.
		OFF	Serial port two no data sent.
RX2	Serial port two receiving indicator light	ON	Serial port 2 has data being received.
		OFF	Serial port 2 receives no data.

**Caution: ODOt-S1E1 has only one serial port, while ODOt-S2E1 has two serial ports.**

## 2.3 Terminal definition

The equipment connection adopts 10Pin 3.81mm distance unplugging terminal. The RS485 interface terminal is defined as follows.

ODOT-S1E1 Terminal definition

serial number	Terminal	RS485	RS422	RS232
1	RX			RS232 receiving
2	TX			RS232 transmission
3	SGND			RS232 grounding
4	TB-	RS485 B-	RS422 Send negative	
5	TA+	RS485 A+	RS422 send positive	
6	R-		RS422 receiving negative	
7	R+		RS422 receiving positive	
8	SGND	RS485 grounding	RS422 grounding	
9	NC			
10	NC			
11	NC			
12	NC			
13	NC			
14	NC			
15	NC			
16	NC			

ODOT-S2E1 terminal definition

Number	Terminal	RS485	RS422	RS232
1	1RX			Serial interface 1 RX
2	1TX			Serial interface 1 TX
3	SGND			Serial interface 1 ground
4	1TB-	Serial interface	Serial interface 1	

		1 B-	TX-	
5	1TA+	Serial interface 1 A+	Serial interface 1 TX+	
6	1R-		Serial interface 1 RX-	
7	1R+		Serial interface 1 RX+	
8	SGND	Serial interface 1 ground	Serial interface 1 ground	
9	2RX			Serial interface 2 RX
10	2TX			Serial interface 2 TX
11	SGND			Serial interface 2 ground
12	2TB-	Serial interface 2 B-	Serial interface 2 TX-	
13	2TA+	Serial interface 2 A+	Serial interface 2 TX+	
14	2R-		Serial interface 2 RX-	
15	2R+		Serial interface 2 RX+	
16	SGND	Serial interface 2 ground	Serial interface 2 ground	

## 2.4 Reset switch



The paper clip can be used to click the reset button, and all the indicators blink once to indicate a successful reset. Gateway reset successfully, the technical parameters of the gateway are as follows:

Name of parameter		Default
Ethernet configuration parameters	MAC address	
	IP address	192.168.1.254
	Subnet mask	255.255.255.0
	LAN gateway IP	192.168.1.1
	Watchdog enablement	Enable signal
	Watchdog time	30s
	DHCP enabled	Not enable signal
	Local port	502
	Protocol type	MODBUS
	TCP/UDP	TCP_SERVER
	Remote IP	192.168.1.201
	Remote port	6000
	DNS server address	114.114.114.114
	DNS domain name	0
Serial port configuration parameters	Baud rate	9600bps
	Data bits	8
	Check digit	Nothing
	Stop bit	1
	Transfer mode	RTU_MODE
	Character space	3.5T
	The slave response timed out	500

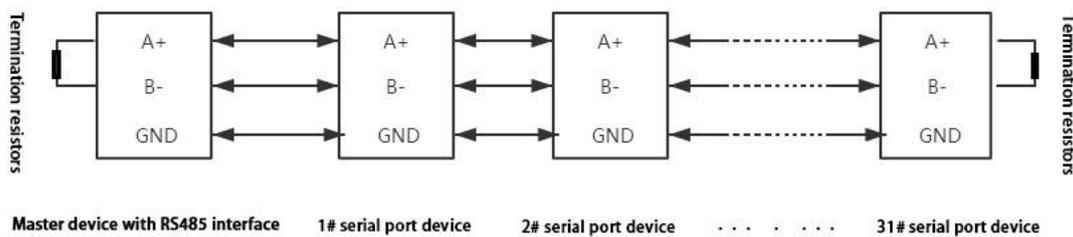
## 2.5 External terminal resistance

According to the actual situation, a serial port side need external gateway 120 Ω terminal resistance. RS485 bus in the case of no trunk to support a maximum of 32 nodes, node and node between the "Daisy chain" connection mode, in the communication cable at both ends need to add terminal resistance, the resistance

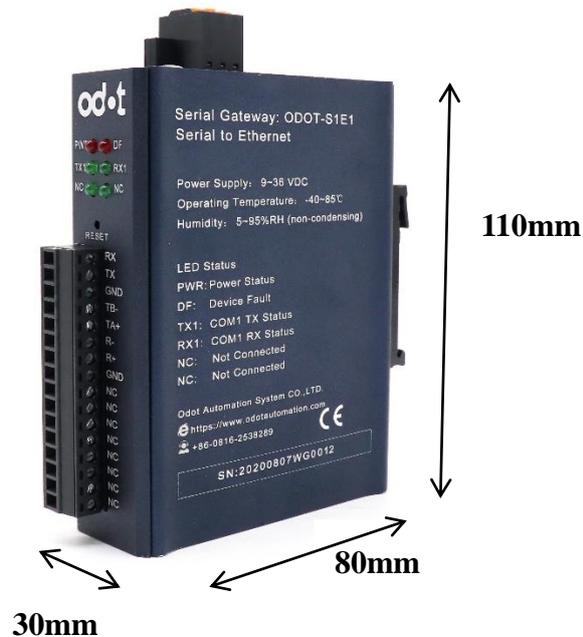
value is required to be approximately equal to the transmission cable characteristic impedance. In short distance transmission, no final resistance is required, that is, no final resistance is generally required below 300 meters. The final resistance is connected at the ends of the transmission cable.

Gateway in field application, if the RS485 bus distance, big field interference will need to add 120 Ω on both ends of the RS485 bus terminal resistance, in order to prevent the reflection of serial signal.

Note: 120 Ω resistance attached to the package, pay attention to check.



## 2.6 Installation dimension



### 3. Typical application

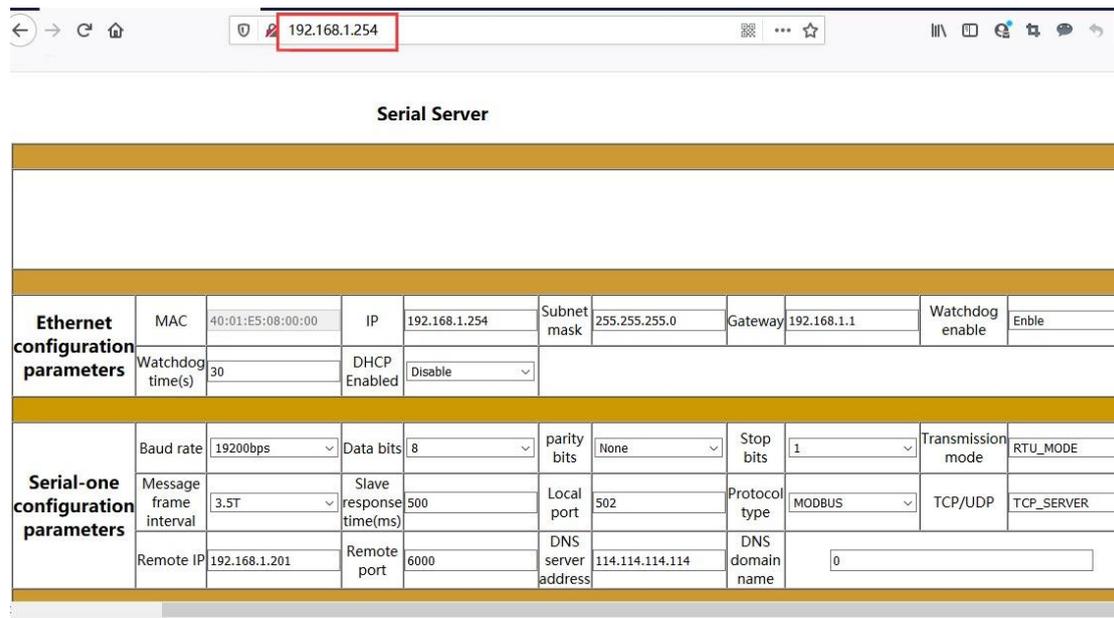
S1E1 supports TCP server, TCP client, UDP pure transparent transmission mode. The transparent transmission mode supports transparent transmission with and without protocol. The S1E1 supports browser configuration and it directly forwarding data without storing.

#### 3.1 Transparent transmission with protocol data

Example: ODOT-S1E1 was used for testing. On-site RS485 device (MODBUS RTU communication protocol is adopted for communication, serial port parameters: ID=1,19200 BPS, N81). Modbus Slave test software was used to simulate the field device.

##### 3.1.1 TCP\_SERVER pattern

1. Open Google browser and enter 192.168.1.254 to login to the page configuration interface:



Main nouns of configuration page Function description:

Baud rate:

Serial port Baud rate, optional range 1200~115200bps, default 9600bps, please

set this parameter to be consistent with the device connected to the serial port.

Parity checking:

No check, odd check, even check can be selected, default no check, please set this parameter to the serial port.

The connected devices are consistent.

Stop bits:

1 bit, 2 bit stop is optional, default is 1 bit stop. Set this parameter to match the device to which the serial port is connected.

Received character interval:

The detection time of frame interval when receiving a message,  $1.5t \sim 200t$  optional, default  $3.5T$  ( $T$  is the time of single character transmission, which is related to baud rate). In general, you do not need to change this parameter.

Local port number:

When TCP\_SERVER mode is selected, the port number is 502 by default. Two serial ports need to be used at the same time, please set serial port 1 and serial port 2 to different port Numbers.

Remote port:

When Ethernet connection type TCP\_CLINET port number is selected, set to different port number when serial port 1 and 2 are used together.

Protocol Type:

Choose MODBUS communication or no protocol communication (NONE).

Transmission mode:

Select RTU protocol or ASCII protocol under MODBUS.

Remote IP:

When the Ethernet connection type is selected TCP\_CLINET, as the IP address of the server device.

Ethernet Connection Type:

Choose a different Ethernet connection.

TCP\_SERVER: TCP server mode, TCP\_CLINET: TCP client mode,

UDP\_CONNECT: UDP connection mode.

2. In the webpage setting interface, the configuration parameters of the protocol converter are set according to the serial port parameters of the serial port device.

**Serial Server**

<b>Ethernet configuration parameters</b>										
MAC	40:01:E5:08:00:00	IP	192.168.1.254	Subnet mask	255.255.255.0	Gateway	192.168.1.1	Watchdog enable	Enable	
Watchdog time(s)	30	DHCP Enabled	Disable							
<b>Serial-one configuration parameters</b>										
Baud rate	19200bps	Data bits	8	parity bits	None	Stop bits	1	Transmission mode	RTU_MODE	
Message frame interval	3.5T	Slave response time(ms)	500	Local port	502	Protocol type	MODBUS	TCP/UDP	TCP_SERVER	
Remote IP	192.168.1.201	Remote port	6000	DNS server address	114.114.114.114	DNS domain name	0			

Note: There are two modes available for transmission: RTU\_MODE and ASCII\_MODE. Select RTU\_MODE here. Ethernet connection mode has TCP\_SERVER, TCP\_CLINET, UDP\_CONNECT three ways to choose. Select the TCP\_SERVER mode here.

3. After setting the parameters, click Submit configuration to download to the module, and the parameters will take effect after the module restarts.

**Serial Server**

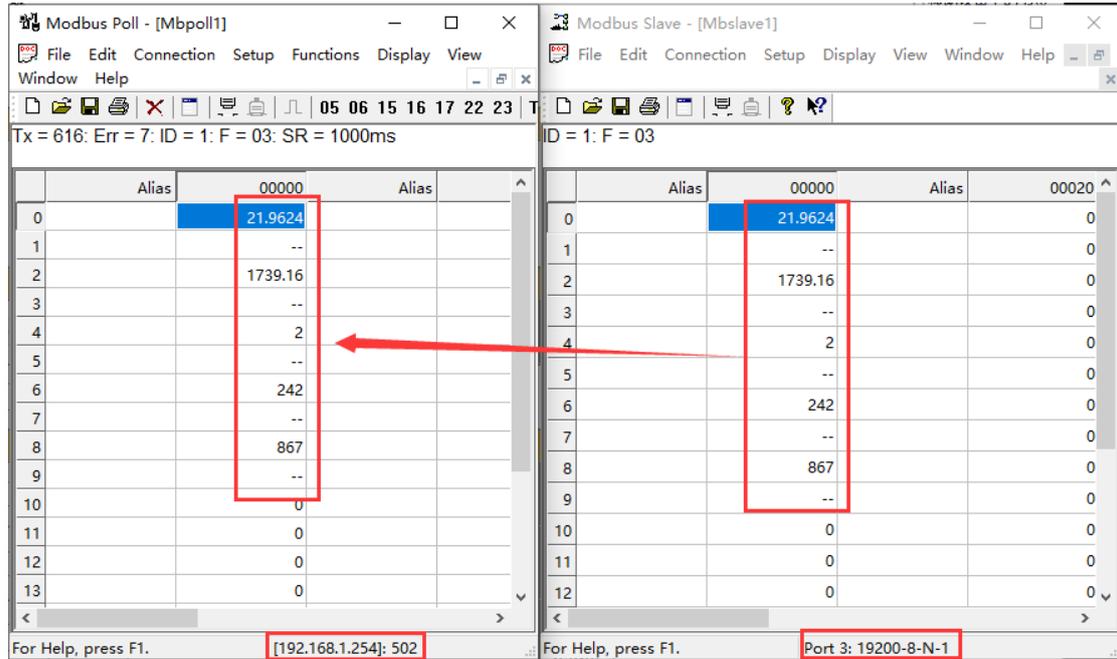
<b>Ethernet configuration parameters</b>										
MAC	40:01:E5:08:00:00	IP	192.168.1.254	Subnet mask	255.255.255.0	Gateway	192.168.1.1	Watchdog enable	Enable	
Watchdog time(s)	30	DHCP Enabled	Disable							
<b>Serial-one configuration parameters</b>										
Baud rate	19200bps	Data bits	8	parity bits	None	Stop bits	1	Transmission mode	RTU_MODE	
Message frame interval	3.5T	Slave response time(ms)	500	Local port	502	Protocol type	MODBUS	TCP/UDP	TCP_SERVER	
Remote IP	192.168.1.201	Remote port	6000	DNS server address	114.114.114.114	DNS domain name	0			

After the configuration has been submitted, you can log in to the configuration page again to check if the configuration parameters have taken effect.

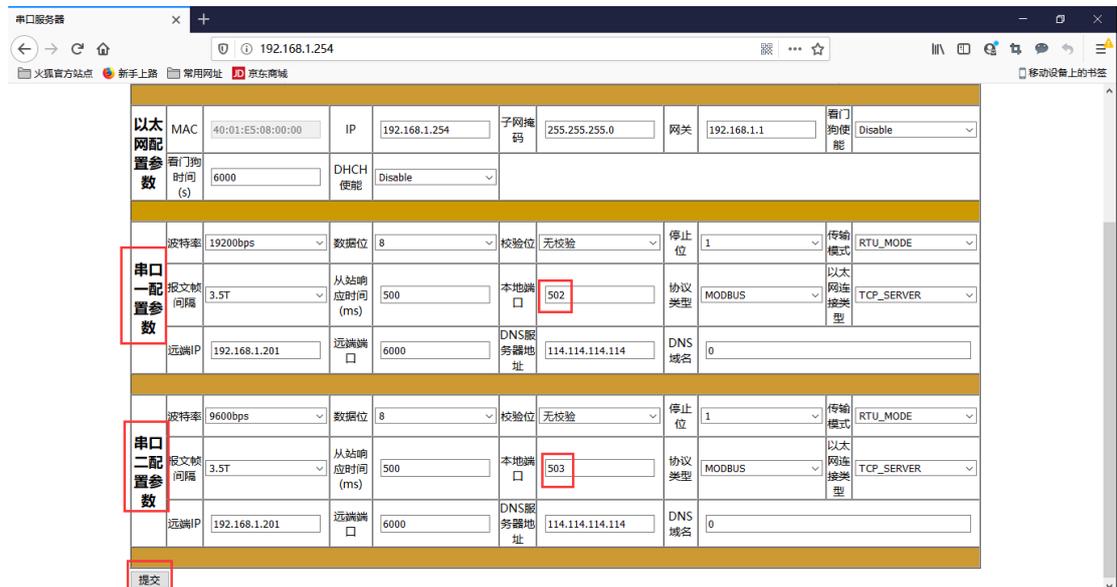
Note: When the configuration page cannot be logged in or the configuration page displays an exception, please disable the computer wireless network card and log in

again. If you forget to log in IP, you can press the reset key to restore factory Settings by logging in gateway through 192.168.1.254 and reconfigure parameters before using.

4. After setting, open MODBUS POLL software to test whether the data is collected normally.

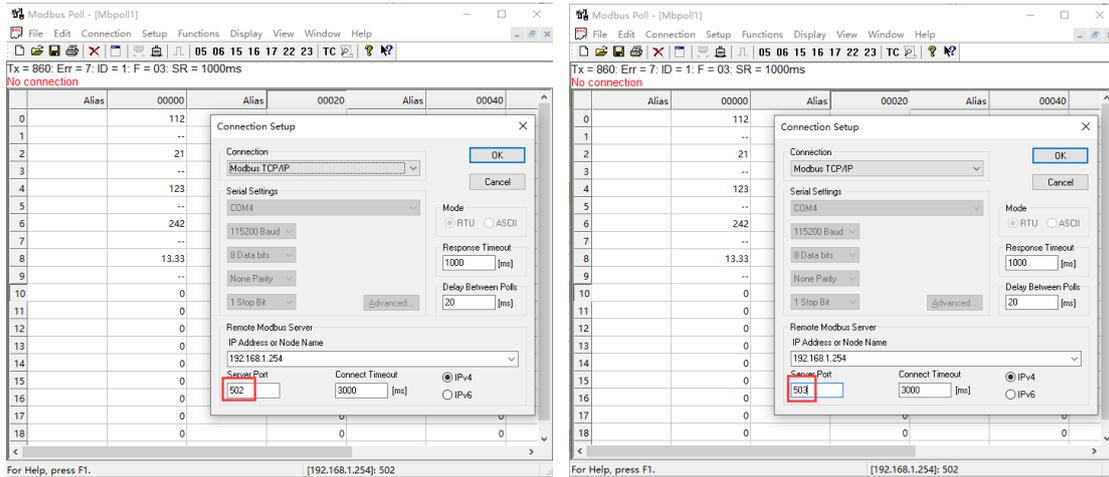


5. When testing ODOt-S2E1, there are two serial ports. When serial port 1 and serial port 2 are used at the same time, please set different local port Numbers, otherwise the module will recognize COM1 and COM2 as the same port. The diagram below:



The data of serial port 1 or serial port 2 are distinguished by the port number at MODBUS TCP. For example, to read data of serial port 1, set the host computer software port number of Modbus TCP/IP terminal to 502, and set the port number of serial port 2 to 503 when reading data of serial port 2.

Modbus poll read serial port 1 data: Modbus poll read serial port 2 data:



### 3.1.2 TCP\_CLIENT pattern

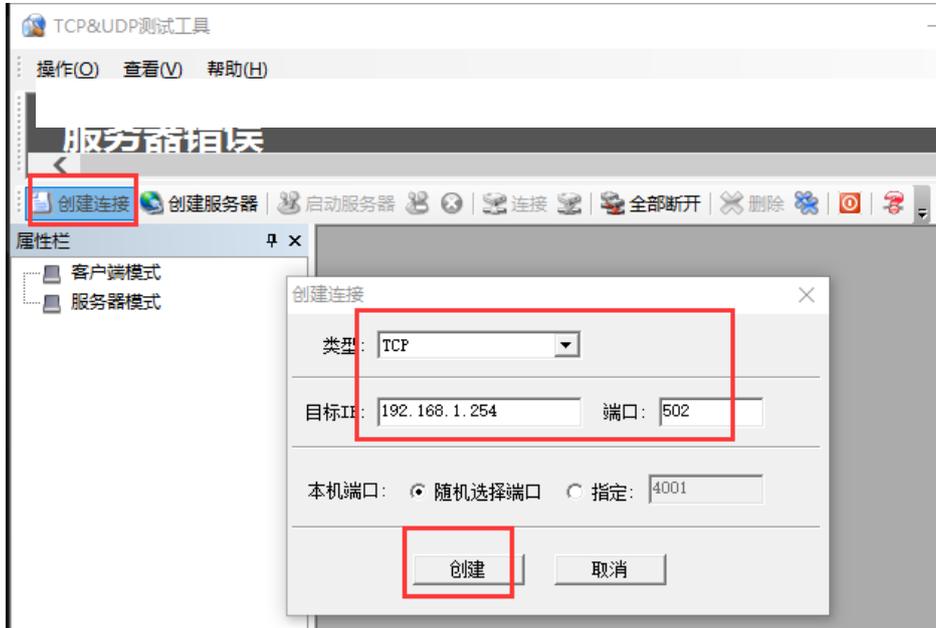
1. Open Google browser, and enter 192.168.1.254 to log in to the webpage configuration interface. Serial port device parameters: 19200bps, N81.Modbus Slave was used to simulate serial port equipment.

Change the Ethernet connection type to TCP\_CLINET mode, set the remote IP to the SERVER (SERVER) IP to connect, and click submit after setting the remote port number.

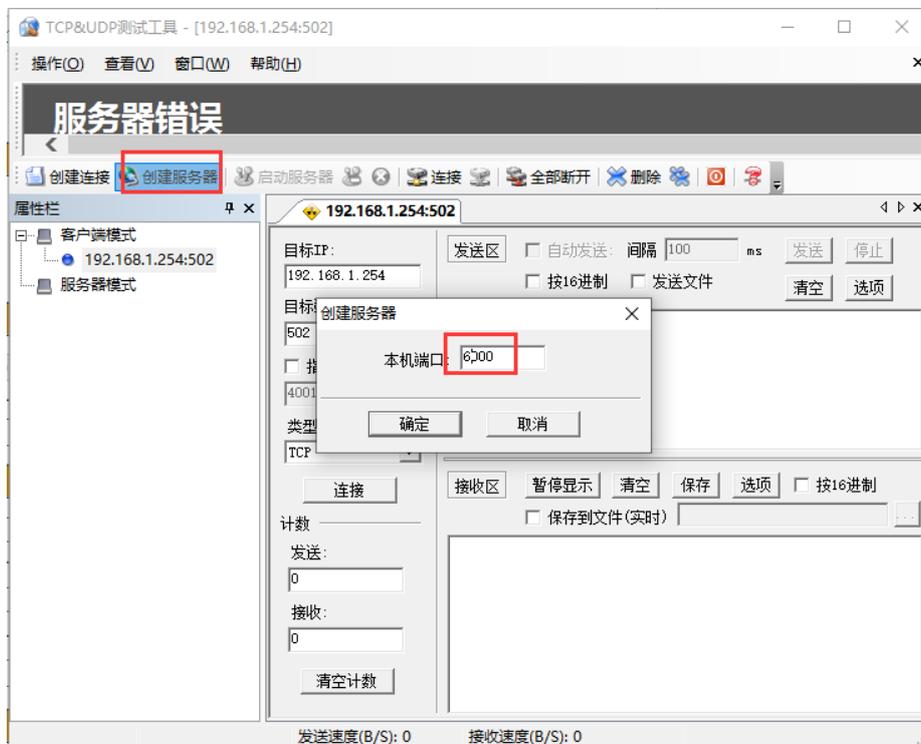
**Serial Server**

<b>Ethernet configuration parameters</b>	MAC	40:01:ES:08:00:00	IP	192.168.1.254	Subnet mask	255.255.255.0	Gateway	192.168.1.1	Watchdog enable	Enable
	Watchdog time(s)	30	DHCP	Enabled	Disable					
<b>Serial-one configuration parameters</b>	Baud rate	9600bps	Data bits	8	parity bits	None	Stop bits	1	Transmission mode	RTU_MODE
	Message frame interval	3.5T	Slave response time(ms)	500	Local port	502	Protocol type	MODBUS	TCP/UDP	TCP_CLINET
	Remote IP	192.168.1.50	Remote port	6000	DNS server address	114.114.114.114	DNS domain name			
<input type="button" value="submit"/>										

2. Open the TCP&UDP test tool, click Create connection, input the connection type, IP address, port number and other parameters of the protocol converter in the popup window, and click Create.

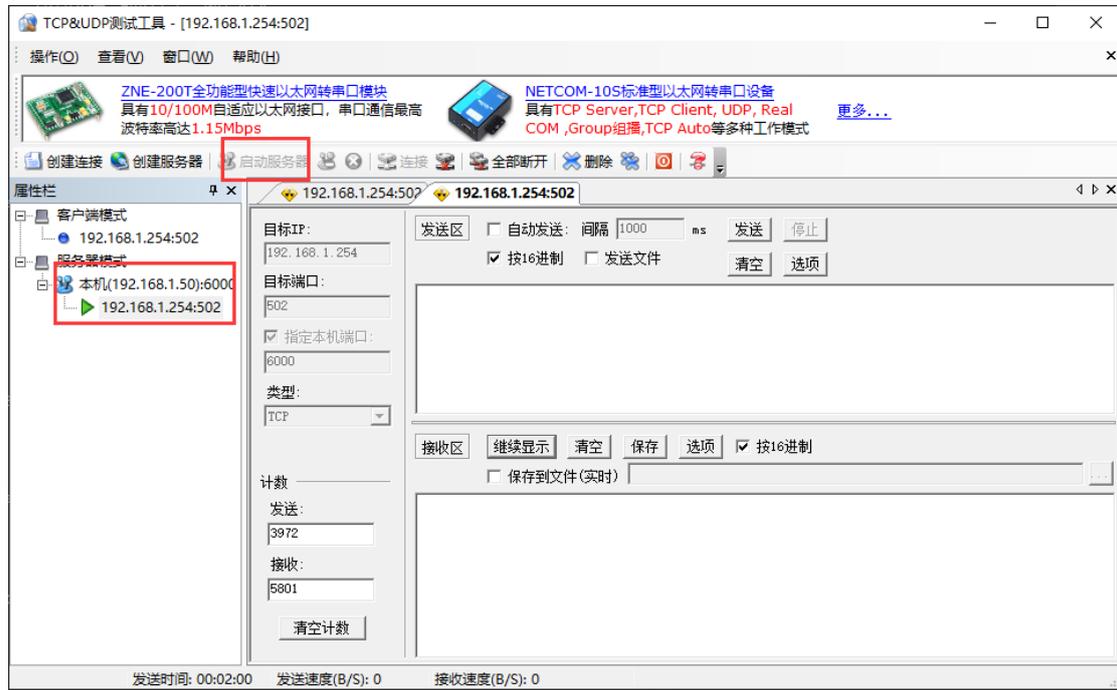


3. Click to create the server and set the native port (to be consistent with the remote port of the module to be connected to) : 6000 click OK.

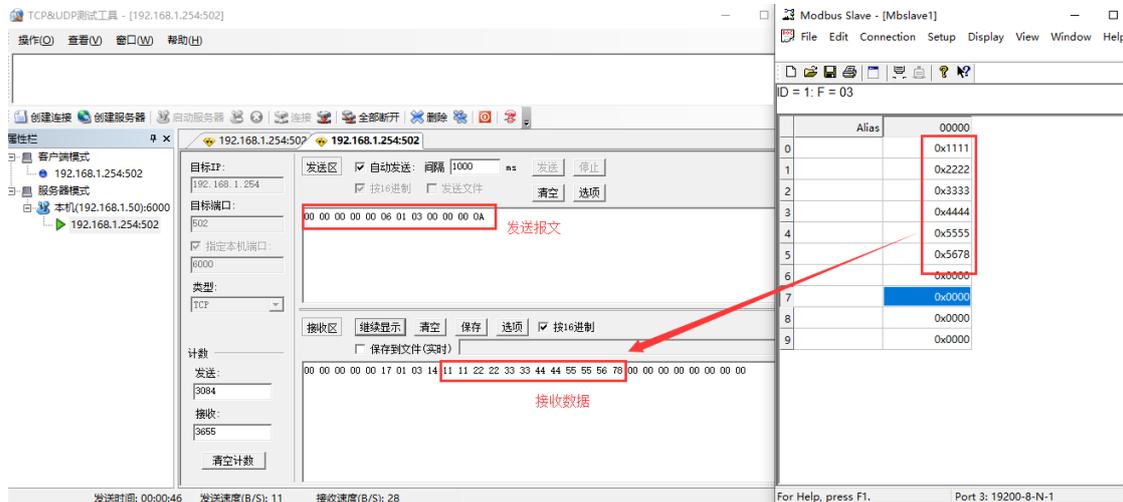


Mouse over the server mode to confirm the native, and then click to enable the server. The protocol converter IP and port number will be displayed after successful

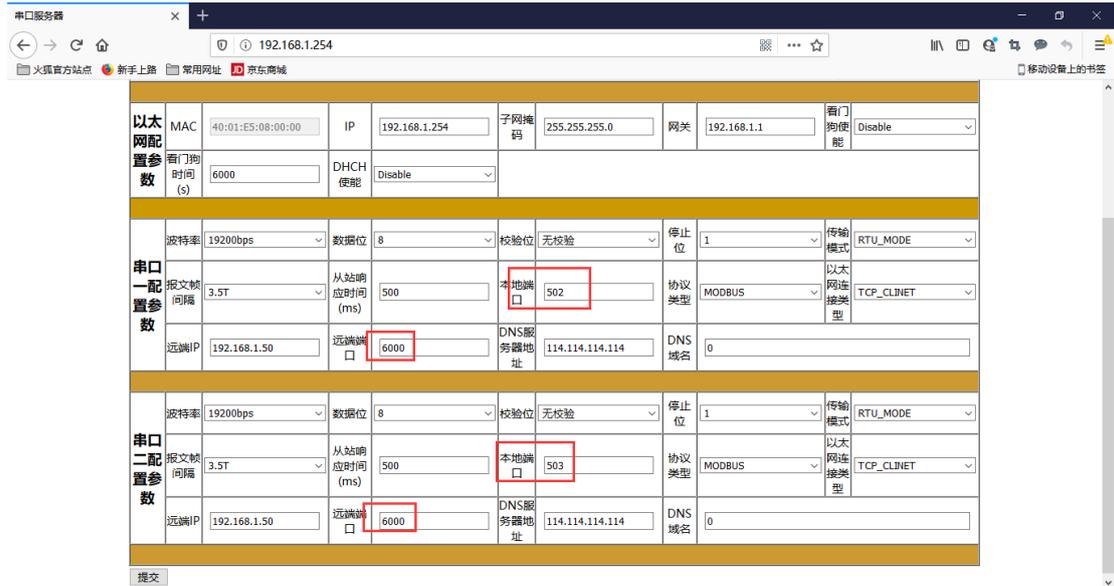
connection.



4. Select the port number to connect to and fill in the sending message in the sending area of the software. The data test results are shown in the figure below:



5. When testing ODOT-S2E1, if the protocol converter USES TCP\_CLINET mode (only one server is supported) and communicates with COM1 and COM2 at the same time, set the remote port number of COM1 and COM2 to the same port number 6000 and the local port number to a different port number 502/503 on the configuration page.

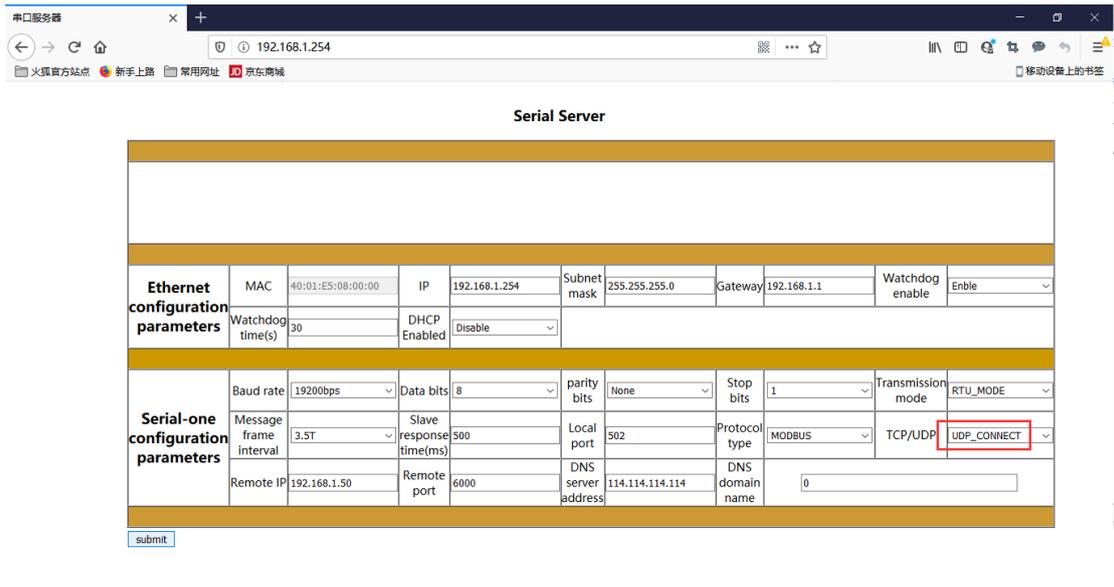


### 3.1.3 UDP\_CONNECT pattern:

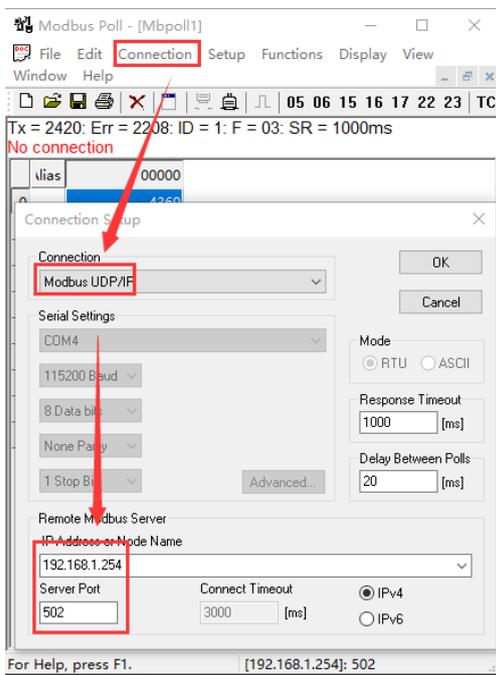
UDP is a unlinked protocol that does not establish a connection between the source and the terminal before transferring data. When it wants to transfer data, it simply grabs the data from the application and throws it onto the network as quickly as possible. At the sending end, the speed at which UDP delivers data is limited only by the speed at which the application generates data, the capacity of the computer, and the transmission bandwidth. At the receiving end, UDP puts each message segment into a queue, and the application reads one message segment at a time from the queue.

1. Open Google browser, and enter 192.168.1.254 to log in to the webpage configuration interface. Serial port device parameters: 19200bps, N81.Modbus Slave was used to simulate serial port device.

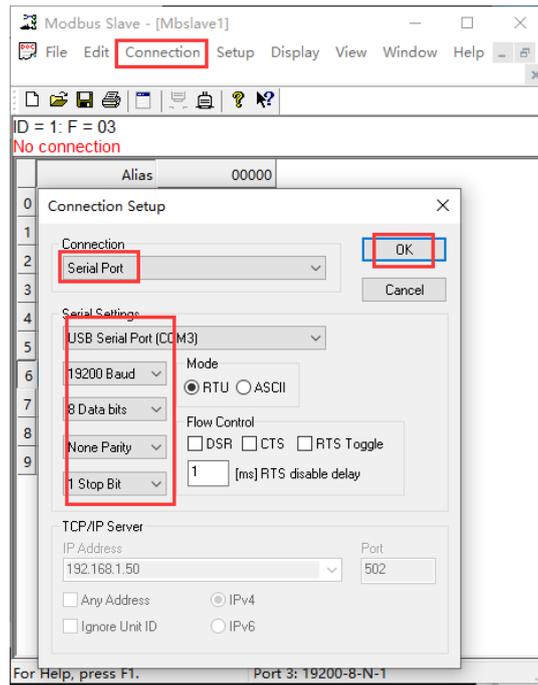
Commit the configuration after changing the Ethernet connection type to UDP\_CONNECT mode.



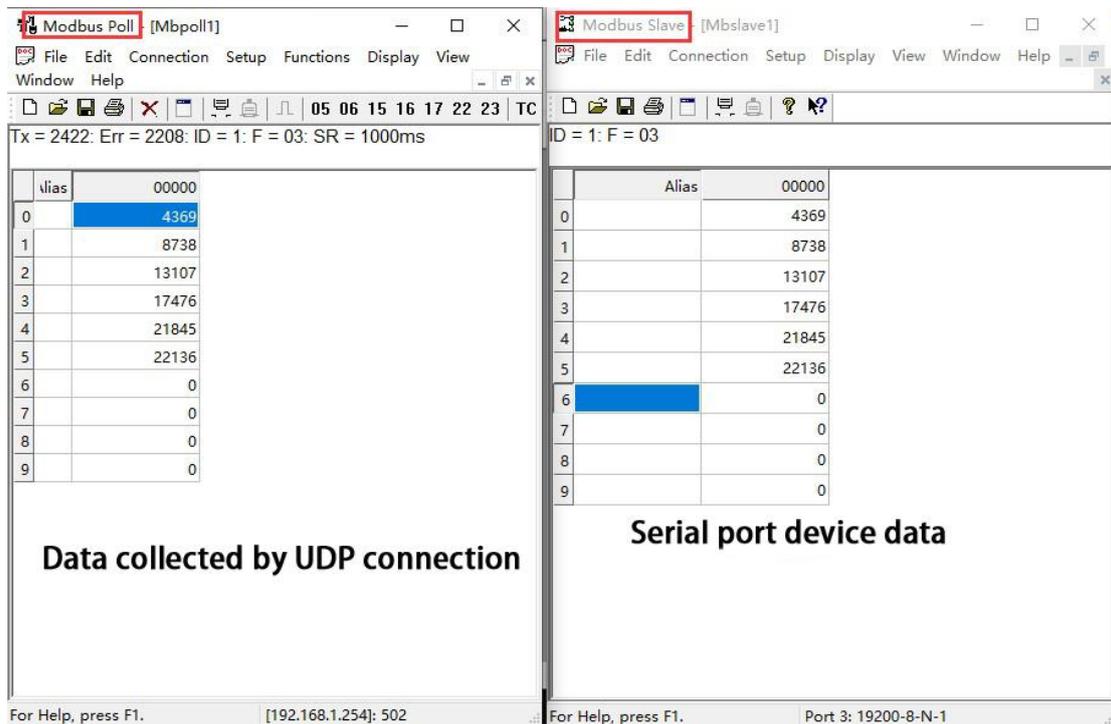
- Modbus poll was used to simulate UDP\_CONNECT, Modbus Slave was used to simulate serial port device, and S2E1 serial port was connected with USB to 485 converter through computer serial port.
- Open Modbus Poll, click Connection or press F3 shortcut key, select Modbus UDP/IP in the popup small window under Connection (Connection Settings), then fill in the correct gateway IP address and port number, and click OK.



Open Modbus Slave (simulated serial port device), click Connection or press F3 shortcut key, set the correct serial port number and communication parameters in the pop-up window, and click OK.



Modbus poll reads data and Modbus Slave sends data screenshot after setting:



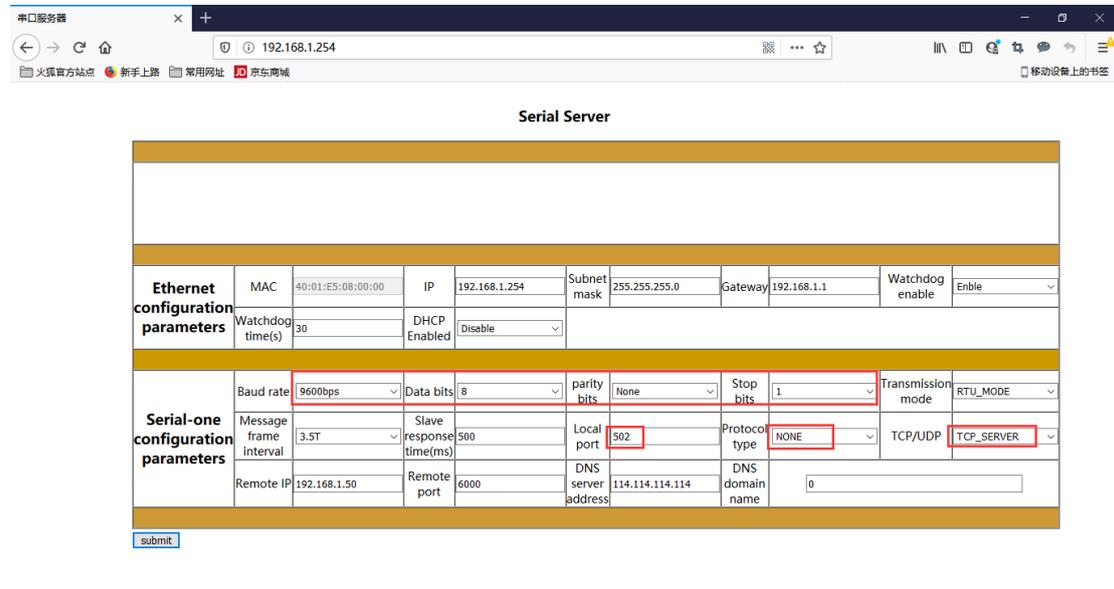
## 3.2 No protocol data transmission

### 3.2.1 TCP\_SERVER pattern

1. Open Google browser and enter 192.168.1.254 to log in to the webpage

configuration interface. Serial port parameters of serial port device: 9600bps, N81. Simulate a Serial Port device with the Serial Port Utility.

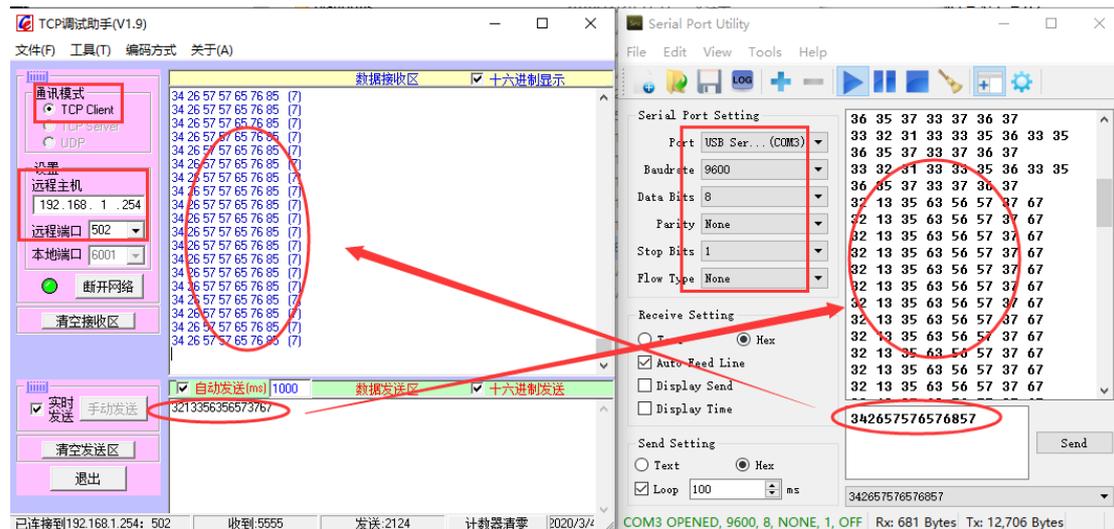
The module protocol type is selected to NONE mode, and the Ethernet interface type is selected to TCP\_SERVER before the configuration is submitted.



Open the TCP debug assistant, simulate the TCP Client, and access the protocol converter 192.168.1.254 port 502.

Open the Serial Port Utility to simulate the underlying Serial Port device.

The following figure shows the screenshot of normal communication of data:

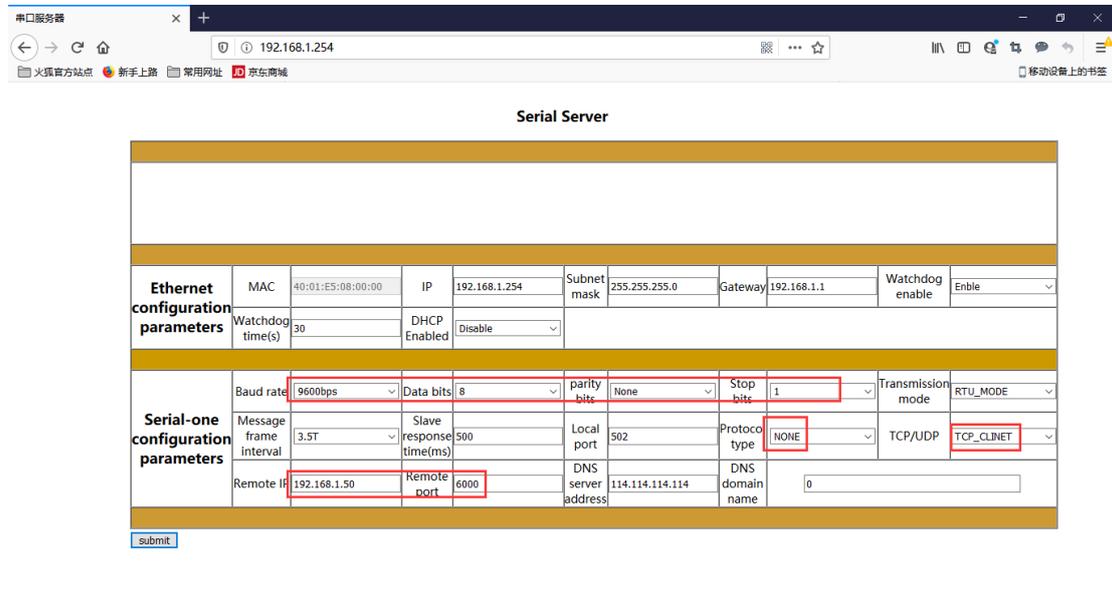


### 3.2.2 TCP\_CLIENT pattern

1. Open Google browser and enter 192.168.1.254 to log in to the webpage

configuration interface. Serial port parameters of serial port device: 9600bps, N81. Simulate a Serial Port device with the Serial Port Utility.

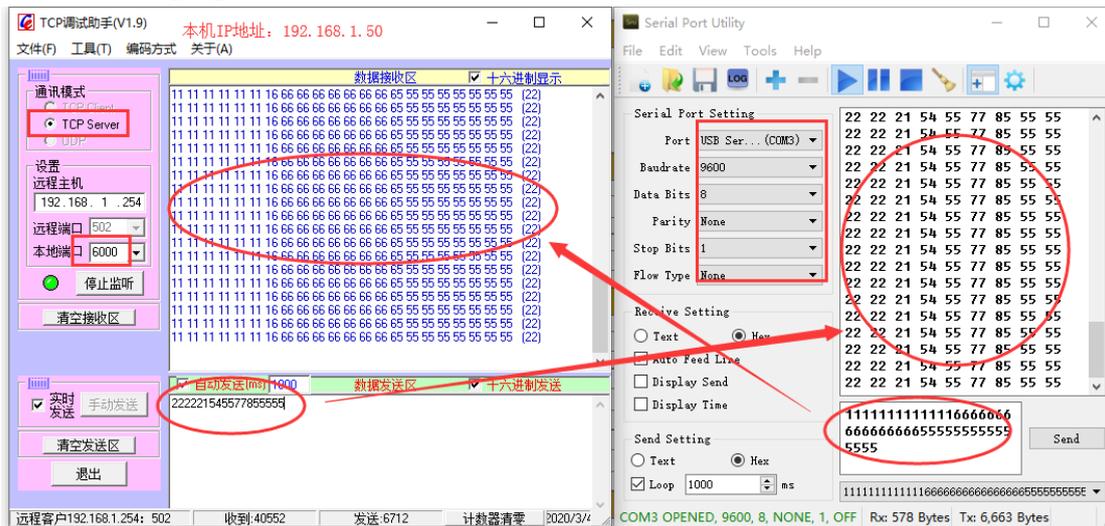
The module protocol type is selected to NONE mode, and the Ethernet interface type is selected to TCP\_CLIENT before submitting the configuration.



Open the TCP debugging assistant, simulate THE TCP Server (native IP address 192.168.1.50, port number 6000), and wait for the protocol converter to actively connect.

Open the Serial Port Utility to simulate the underlying Serial Port device.

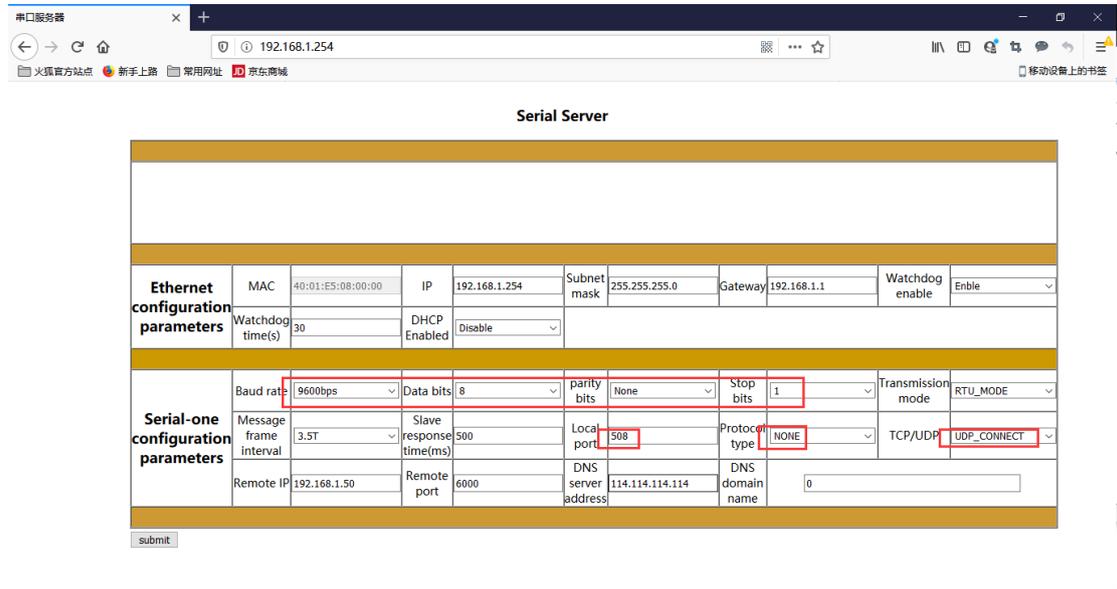
The following figure shows the screenshot of normal communication of data:



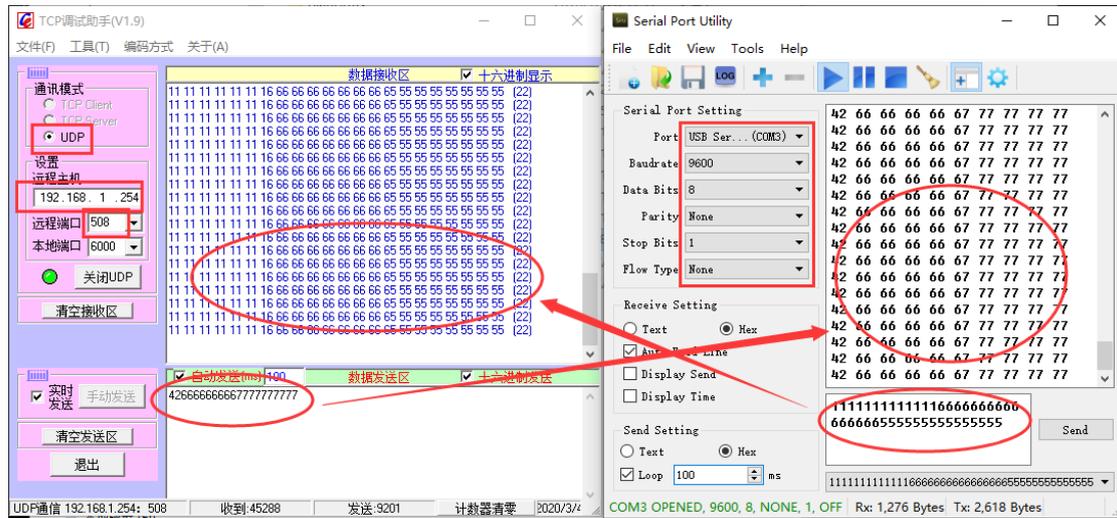
### 3.2.3 UDP\_CONNECT pattern

1. Open Google browser and enter 192.168.1.254 to log in to the webpage configuration interface. Serial port parameters of serial port device: 9600bps, N81. Simulate a Serial Port device with the Serial Port Utility.

Select NONE mode for the module protocol type, change the Ethernet interface type to UDP\_CONNECT port number to 508, and click Submit to submit the configuration.



Open the TCP debugging assistant to simulate the UDP connection protocol converter. Open the Serial Port Utility to simulate the underlying Serial Port device. The following figure shows the screenshot of normal communication of data:



## 4. Supplement

### Brief introduction of serial port network topology

#### 1. RS232

RS232 is one of serial communication interfaces controlled by industry. It is

widely used to connect computer serial interface with peripherals. RS232 using a signal and a signal transmission form, return lines were in the land of the three wire connection mode, can realize full-duplex communications, the transmission signals for single ended, the total transmission of easy to generate common-mode interference, so the noise resistance is weak, the transmission distance is limited, RS232 interface standards stipulated in the code element distortion maximum transmission distance is less than 4% under the condition of standard values of 50 feet (15 meters) (more than 15 m long distance communication, need to adopt modem), the maximum transmission distance is also associated with communication baud rate, in the process of practical application, if the transmission distance is far, Please reduce the baud rate. In order to reduce the electromagnetic interference from the outside during the signal transmission, please use the shielded cable as the communication cable.

RS232 interface standard specifies that TXD and RXD:

RS232 USES negative logic to transmit signals and takes the signal of -(3~15)V as logic "1". Take the signal of +(3~15)V as logical "0"; Voltages between -3 and +3V are meaningless, as are voltages lower than -15V or higher than +15V.

RS232 Interface Classification:

DB9 header interface



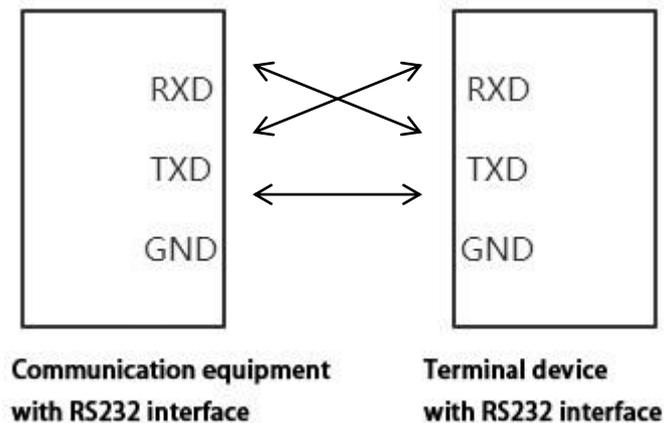
The top left corner is 1, the bottom right corner is 9

9-pin RS232 serial port (DB9)		
Pin	Name	Function
1	CD	Carrier detect
2	RXD	Receive data
3	TXD	Send data
4	DTR	Data terminal ready

5	GND	Signal ground
6	DSR	Data ready
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring alert

As the RS232 interface has the above electrical characteristics, it can only realize point-to-point communication.

RS232 communication wiring diagram is shown in the figure below:



## 2. RS422

The full name of RS422 interface standard is "Electrical Characteristics of Balanced Voltage Digital Interface Circuit", which defines the characteristics of the interface circuit. RS422 adopts four-wire plus ground wire (T+, T-, R+, R-, GND), full-duplex, differential transmission, multi-point communication data transmission protocol. It USES a balanced transmission line that is unidirectional/non-reversible, with or without an enabling end. Because the receiver USES a high input impedance and the sending driver is stronger than RS232, it is allowed to connect multiple receiving nodes on the same transmission line, up to 10 nodes. That is, one Master device (Master), the rest are slave devices (Salve), and the slave devices cannot communicate with each other, so RS-422 supports point-to-many two-way communication.

The RS-422 has a maximum transmission range of 4,000 feet and a maximum transmission rate of 10Mb/s. The length of the balanced twisted pair is inversely proportional to the transmission rate, and the maximum transmission distance can be reached only if the rate is below 100KB /s. The highest rate of transmission can be obtained only over very short distances. Generally, the maximum transmission rate obtained on 100 meters long twisted pair is only 1Mb/s.

The RS-422 requires a terminal resistance that is approximately equal to the characteristic impedance of the transmission cable. In short distance transmission, no final resistance is required, that is, no final resistance is generally required below 300 meters. The final resistance is connected to the farthest end of the transmission cable.

In a master multi-slave network connection, all the sending terminals of the slave connect to the receiving terminals of the master station by daisy-chain. All the receiving ends of the slave stations are connected by daisy-chain to the sending end which is finally connected to the master station.

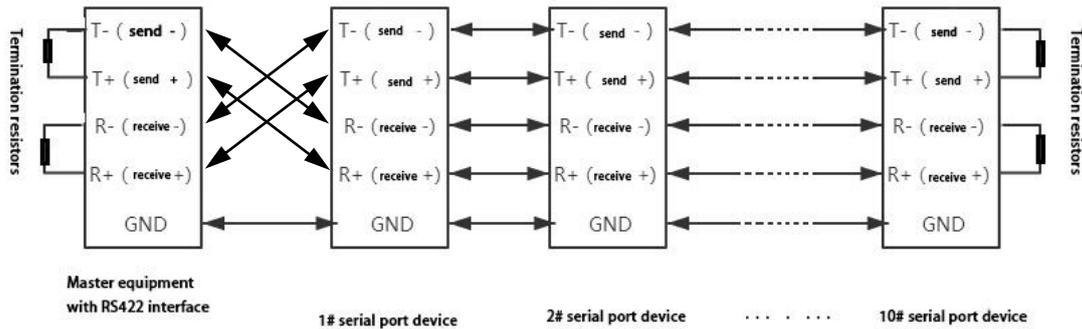
The RS422 pin definition:

RS422 (9 Pin)		Function	Remark
3	R-	Receive negative	Must connect
2	T-	Send negative	Must connect
7	R+	Receiving positive	Must connect
8	T+	Send positive	Must connect



The upper left corner is 1, the lower right corner is 9.

The RS422 communication wiring diagram is shown in the figure:



### 3. RS485

Since the RS-485 is developed from the RS-422, many electrical provisions of the RS-485 are similar to those of the RS-422. If they all adopt the balanced transmission mode, they all need to connect the final resistance on the transmission line, etc. The RS-485 can adopt two-wire and four-wire mode, and the two-wire system can realize real multi-point two-way communication.

RS485 is a standard for defining the electrical characteristics of drivers and receivers in a balanced digital multipoint system, using a combination of balanced drivers and differential receivers for enhanced common-mode dry resistance, i.e., good noise interference resistance. Because the semi-duplex network composed of RS485 interface generally adopts the wiring mode of two-wire system and adopts differential signal to transmit data, the voltage difference between the two lines is  $-(2-6)V$  to represent logic "0", and the voltage difference between the two lines is  $+(2-6)V$  to represent logic "1".

RS485 signal transmission distance is related to communication baud rate, the higher the baud rate, the shorter the transmission distance, under the condition of the baud rate is not higher than 100 KBPS, theory of the maximum communication distance is about 1200 meters, in the process of practical application, Due to electromagnetic interference and other factors, often cannot meet the maximum communication distance, if in a long-distance communication, please reduce the baud rate, to reduce the signal during transmission by external electromagnetic interference, please use twisted-pair shielded cable as a communication cable.

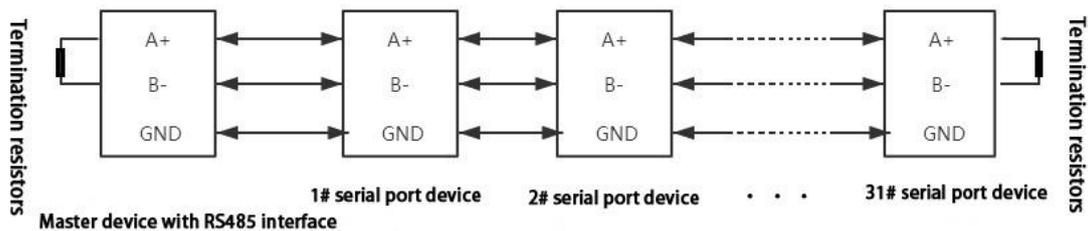
RS485 bus in the case of no trunk to support a maximum of 32 nodes, node and

node between the "Daisy chain" connection mode, in the communication cable at both ends need to add terminal resistance, the resistance value is required to be approximately equal to the transmission cable characteristic impedance. In short distance transmission, no final resistance is required, that is, no final resistance is generally required below 300 meters. The final resistance is connected at the ends of the transmission cable.

RS485 9 pin definition:

Pin	Name	Function	Remark
1	Data-/B-/485-	Send positive	Must connect
2	Data+/A+/485+	Receiving positive	Must connect
5	GND	Ground wire	

The RS485 communication wiring diagram is shown in the figure:



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