Protocol Converter
ODOT-S1E1V2.0

User Manual

V2.00

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ODOT Series ODOT-S1E1V2.0

ODOT Automation System Co., Ltd.

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1. Product Overview

1.1 Product Functions

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

The protocol converter supports the function of "data transparent 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.

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 10 clients 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	
Environmental parameters	
Working temperature	-20~70℃
Storage temperature	-55~125℃
Operating humidity	5%~95% (No condensation)
The power supply parameters	
Number of power ports	1
Input voltage	9-36V（DC）
Power consumption	700mW
Ethernet parameters	
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 10 clients accesses. TCP client pure transparent transmission, support to connect 1 server.
Serial port parameters	
Quantity of serial port	1
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	None, odd check, even check
Number of slave stations supported	31(RS485)

2. Hardware description

2.1 Product appearance

2.2 Indicator LED description

The converter has 5 LED status indicators, of which symbol definition and status description are shown in "Table 2.1".

Table 2.1 Description of LED indicators

Symbol	Definition	State	Instruction
PWR	Power LED	ON	Power supply is connected
		OFF	Power supply is not connected
STA	Converter status LED	Flash	The converter is running properly
		OFF	The converter is not running properly
NC	Not used	OFF	Not used
DAT	Serial port transceiver indicator	Flash	The serial port is sending and receiving data
		OFF	No data is being sent or received through the serial port
NC	Not used	OFF	Not used
NC	Not used	OFF	Not used

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 receive
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 receive negative	
7	R+		RS422 receive positive	
8	SGND	RS485 grounding	RS422 grounding	
9	NC			
10	NC			
11	NC			
12	NC			
13	NC			
14	NC			
15	NC			
16	NC			

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:

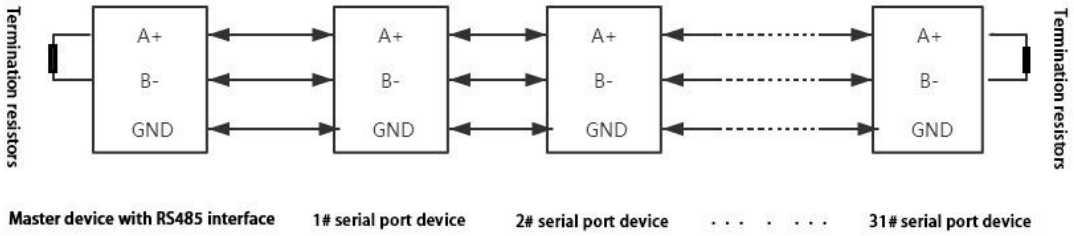
Device Info	
Device name	S1E1
Firmware version	V1.452
Device ID	
Network Configuration	
Device IP	192.168.1.254
Device Port	502
Web access port	80
Operating mode	TCP server（default）, TCP client, UDP mode, UDP multicast
Subnet mask	255.255.255.0
Gateway	192.168.1.1
Destination IP/DNS	192.168.1.2
Destination port	1024
IP mode	Static (default), dynamic
Serial Port Configuration	
Baud rate	1200-115200, default； 115200
Data bit	5, 6, 7, 8; default: 8
Parity bit	None, odd check, even check; default: None
Stop bit	1,2; default:1
Flow Control	None
Advance Level	
None data restart	Disabled (default), Enabled
None data restart time	5-1270ms, default:300
Disconnection and reconnection time	1-255 Second, default: 12
Multiple Host Settings	
Conversion Protocol	Modbus TCP to RTU(default), None
Timeout time for command response	32-8000ms, default:192
Multiple host setting	Enabled (default), Disabled
RS485 Idle time interval	5-255ms,20
Change the web login password	
New password	
Retype new password	

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.

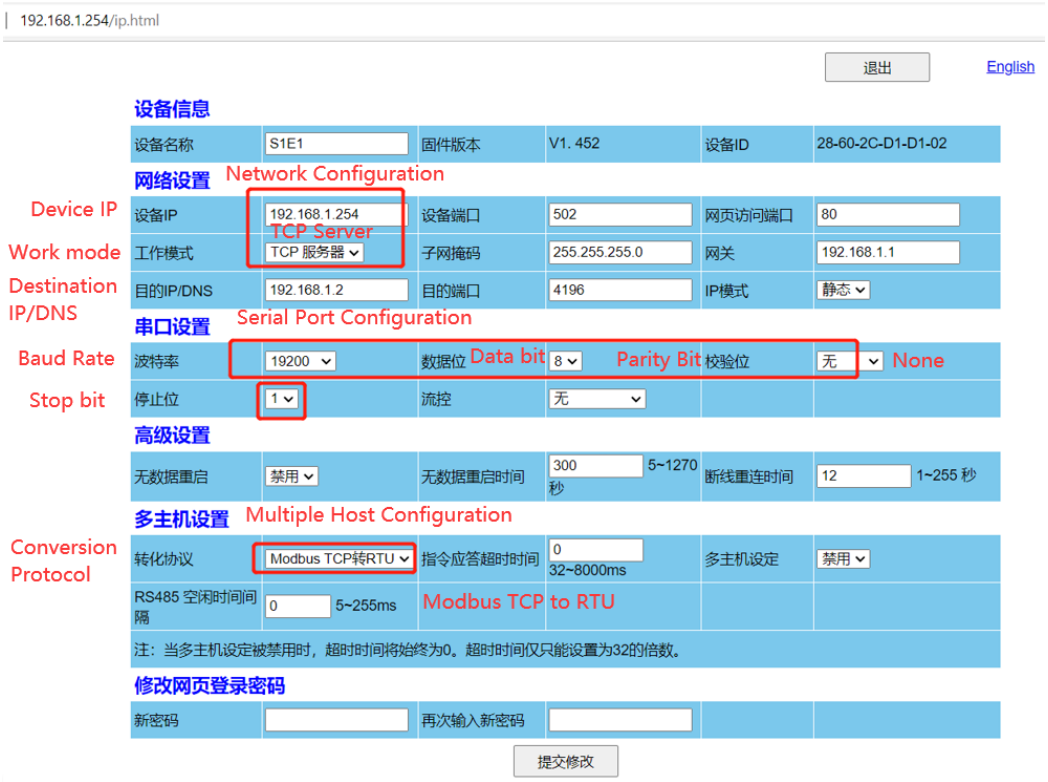
Stop bits:1 t, 2 bit stop is optional, default is 1 bit stop. Set this parameter to match the device to which the serial port is connected.

2. Network Settings: IP address 192.168.1.254, device port: 502, working mode: TCP server.

Serial port Settings: Serial port parameters: 19200bps, N81. The Serial Port test tool Serial Port Utility is used to simulate Serial Port devices.

Multi-master setting: Select Modbus TCP to RTU mode as the conversion protocol.

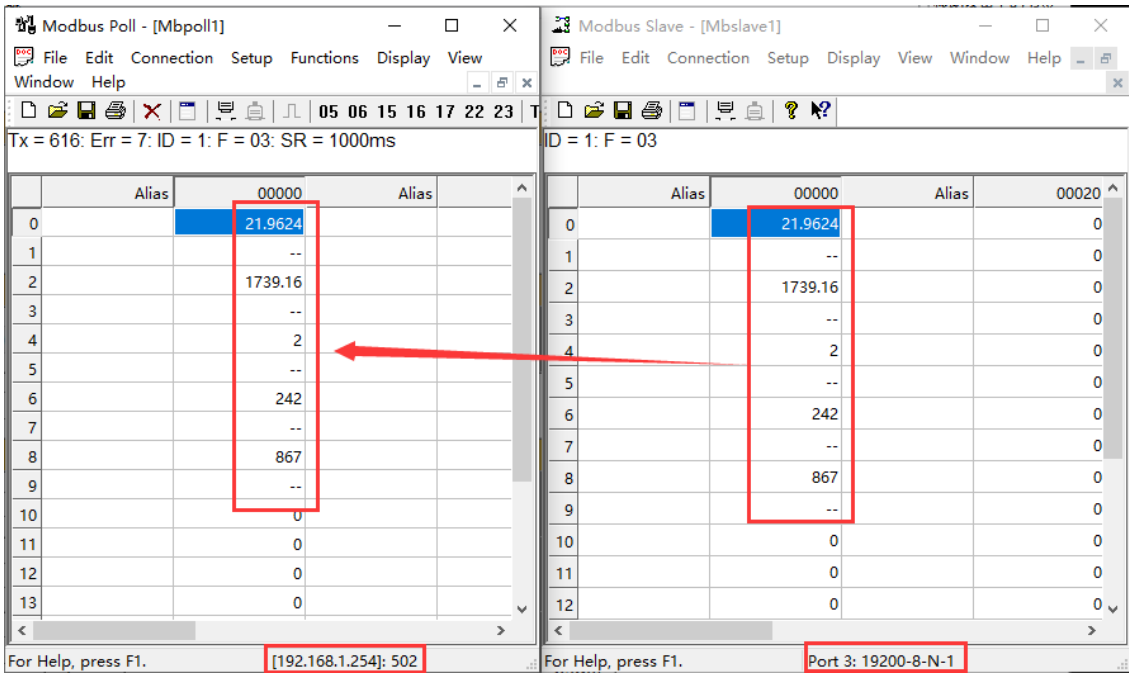
Click Submit when the Settings are completed.



After the parameter settings are submitted, log in to the web page again to check whether the Settings take effect.

Note: If the config page could not be logged in or the config page is displayed abnormally, pls disable the wireless network card and log in again. If the login IP address is forgotten, it could press the reset key to restore the factory Settings and log in the converter through 192.168.1.254. And reconfigure the parameters before using.

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



3.1.2 TCP_CLIENT pattern

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

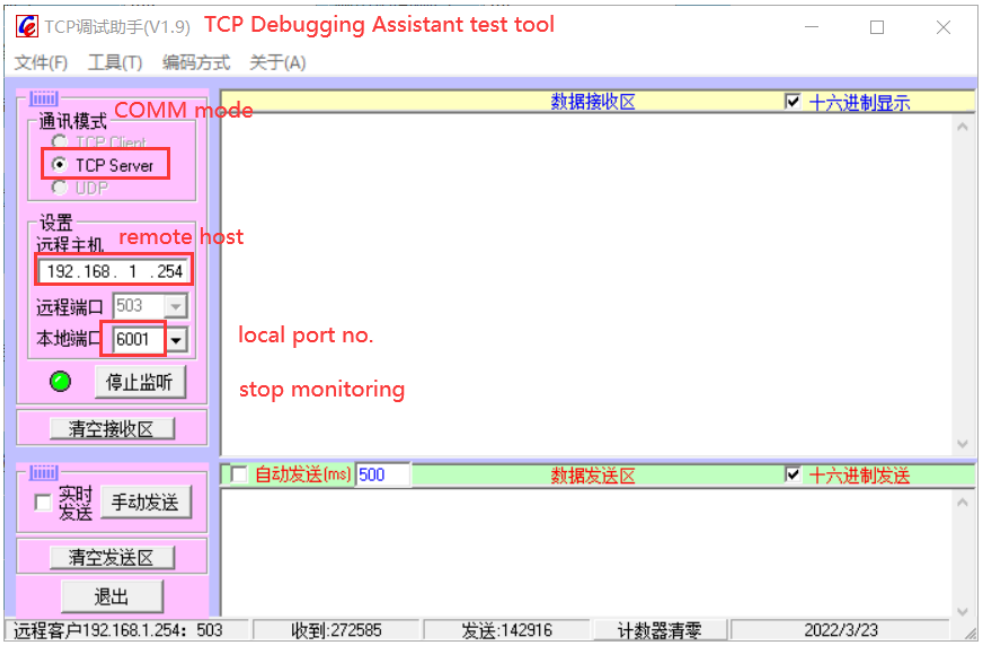
Network Setting: IP address 192.168.1.254, Device port: 502, Wok mode: TCP client, set the Destination IP/DNS to the server IP address to be connected: 192.168.1.51 (IP address of the local NIC), and remote port number: 6001.

Serial port device parameters: 19200bps, N81.The Serial Port test tool Serial Port Utility is used to simulate Serial Port devices.

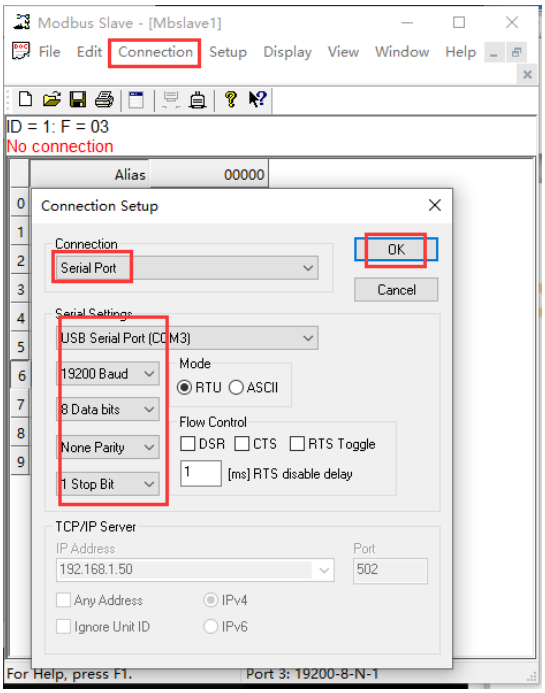
Multiple Host Config: Select Modbus TCP to RTU mode as the conversion protocol.

Click Submit when the Settings are completed.

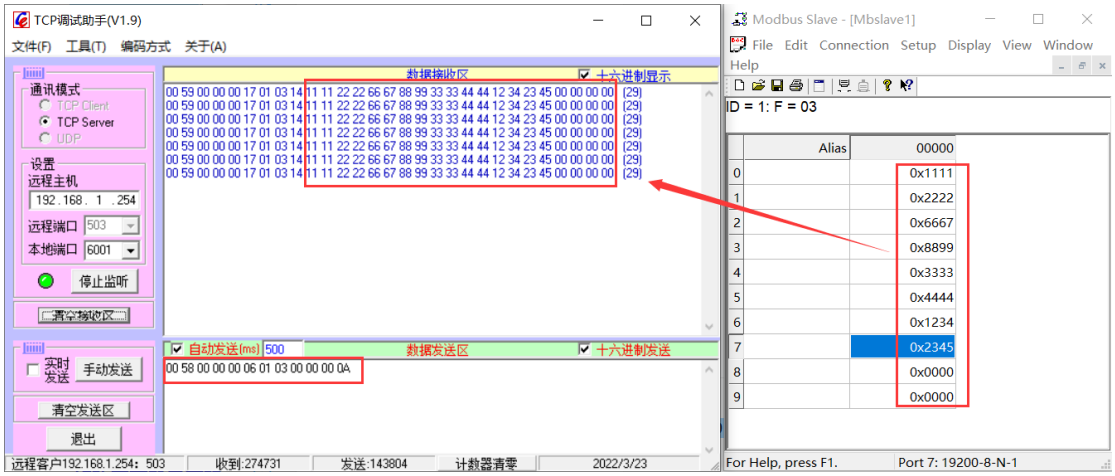
2. Open the TCP Debugging Assistant test tool, select TCP Server, set the remote host IP address to 192.168.1.254, local port no: 6001, and click Start monitoring.



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



After the Settings, MODBUS master message is sent in the TCP debugging Assistant sending window, and Automatic Sending is selected to collect MODBUS Slave data.



3.1.3 UDP_CONNECT pattern:

UDP is an 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.

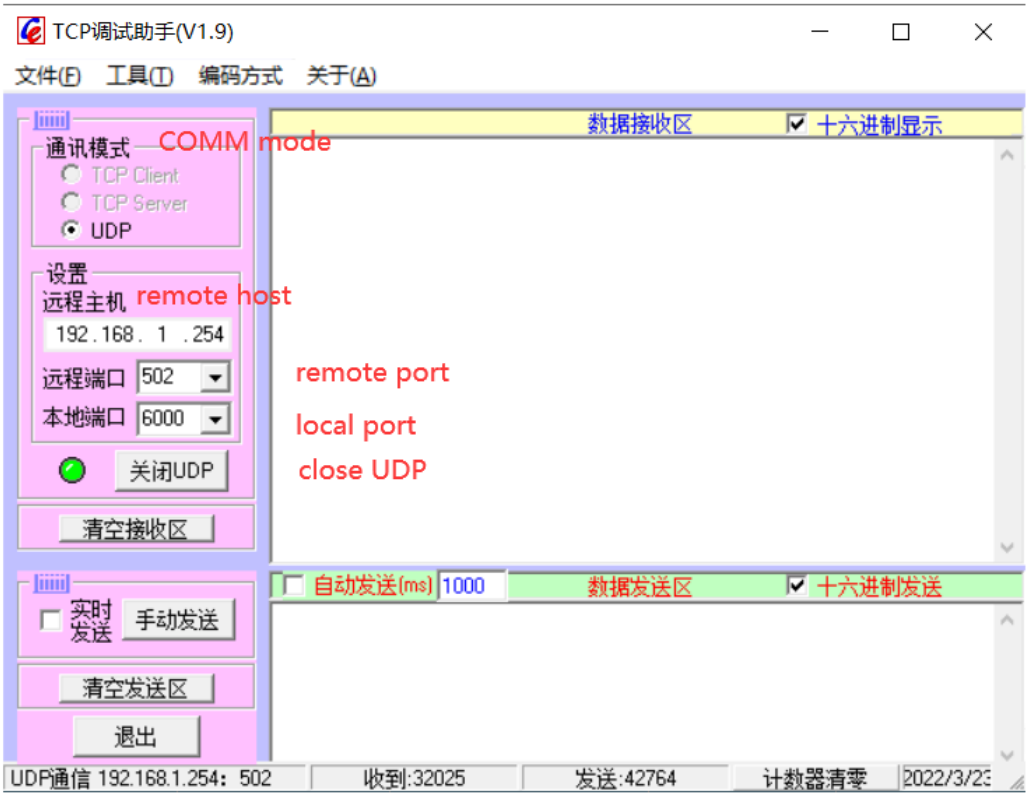
Network config: IP address 192.168.1.254, device port: 502, work mode: UDP, set the destination IP/DNS to the server IP address to be connected: 192.168.1.51 (IP address of the local NIC), and remote port number 6000. And it could use TCP debugging assistant to simulate test for TCP side.

Serial port config: serial port parameters: 19200bps, N81.The Serial Port test tool Serial Port Utility is used to simulate Serial Port devices.

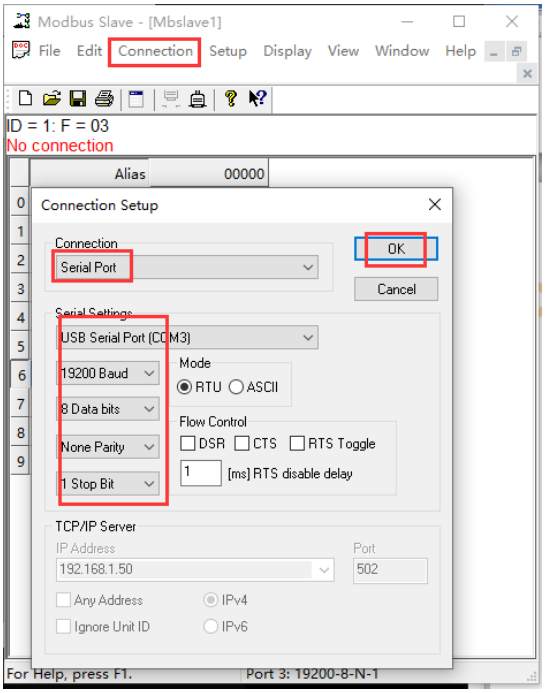
Multiple Host Config: Select Modbus TCP to RTU mode as the conversion protocol. Click Submit when the Settings are completed.

TCP debugging assistant simulates UDP client, Modbus Slave simulates serial port device, and it connects to S1E1 serial port through computer serial port USB to 485 converter.

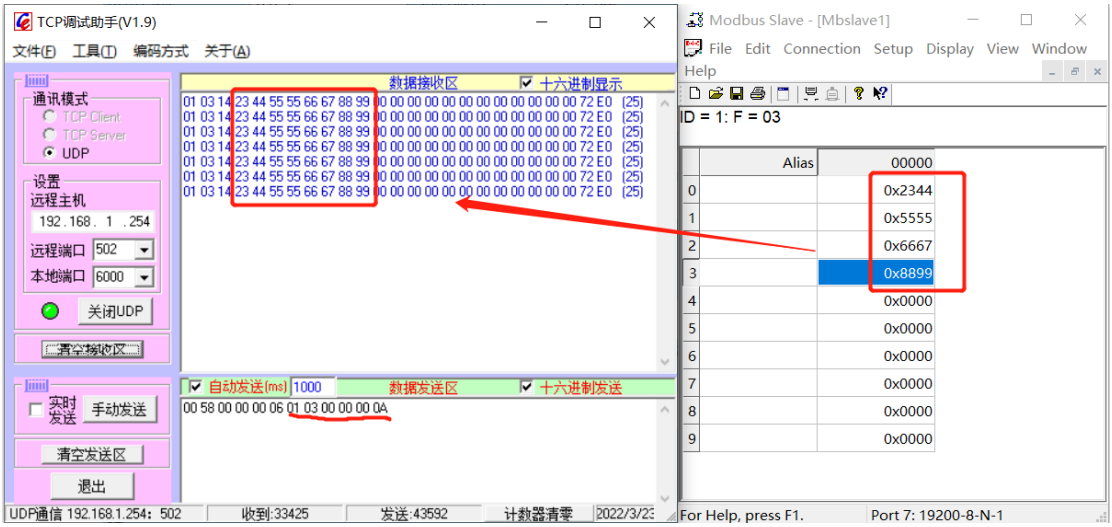
Open TCP Debugging Assistant, select UDP, and set the remote host IP address: 192.168.1.254, remote port: 502, and local port: 6000. Click to enable UDP.



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



After the Settings, MODBUS master message is sent in the TCP debugging Assistant sending window, and Automatic Sending is selected to collect MODBUS Slave data.



3.2 None protocol data transmission

3.2.1 TCP_SERVER pattern

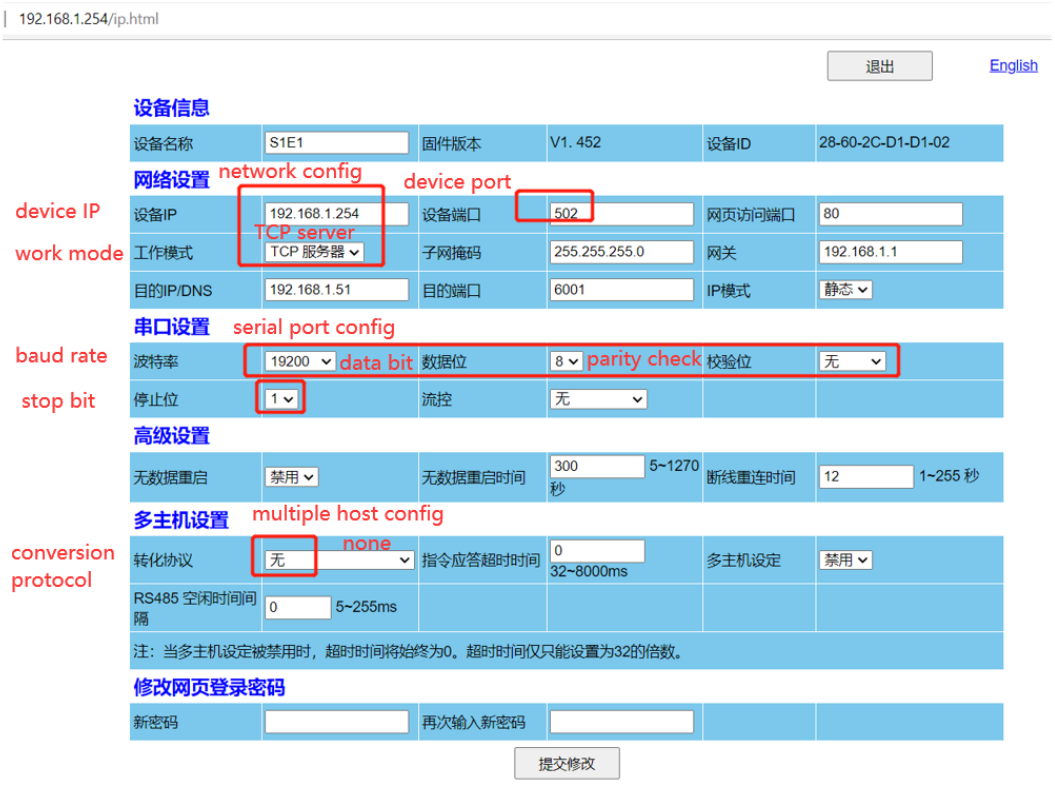
1. Open Google browser, and enter 192.168.1.254 to log in to the webpage configuration interface.

Network config: IP address 192.168.1.254, device port: 502, work mode: TCP server.

Serial port config: serial port parameters: 19200bps, N81.The Serial Port test tool Serial Port Utility is used to simulate Serial Port devices.

Multiple Host Config: Select the conversion protocol as none.

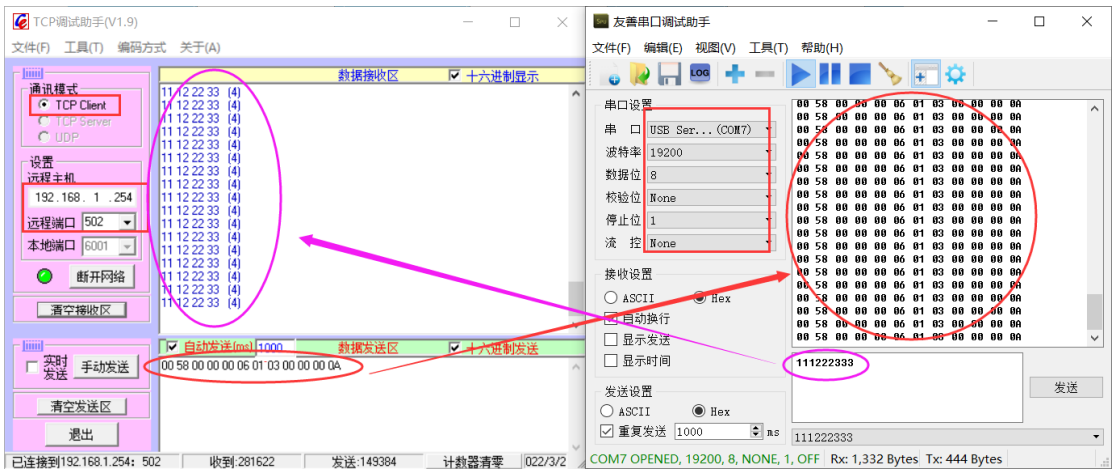
Click Submit when the Settings are completed.



Open the TCP debug assistant, simulate the TCP Client, and access the 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.

Network Setting: IP address 192.168.1.254, Device port: 502, Wok mode: TCP client, set the Destination IP/DNS to the server IP address to be connected: 192.168.1.51 (IP address of the local NIC), and remote port number: 6004.

Serial port device parameters: 19200bps, N81.The Serial Port test tool Serial Port Utility is used to simulate Serial Port devices.

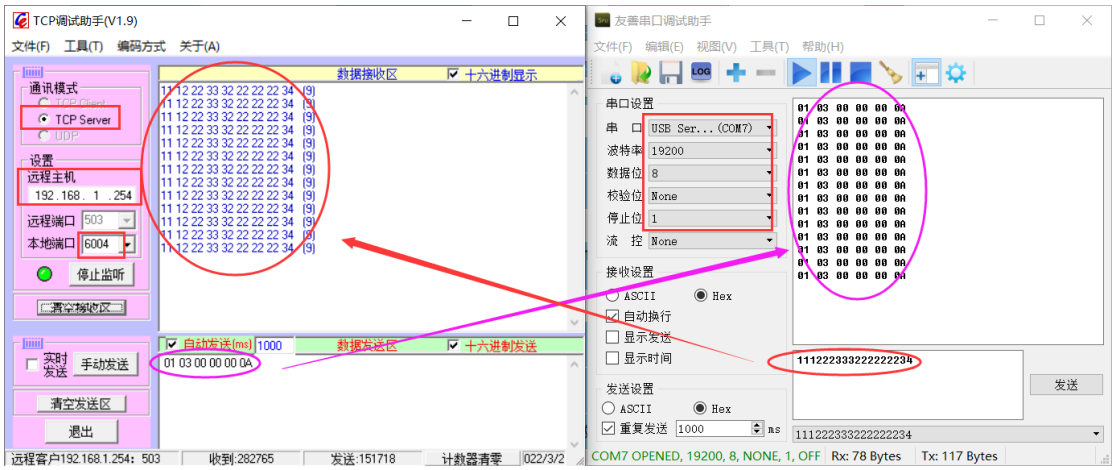
Multiple Host Config: Select the conversion protocol as None.

Click Submit when the Settings are completed.

Open the TCP debugging assistant, and it simulates THE TCP Server (local IP address 192.168.1.51, port number 6004), and wait for the protocol converter to be actively connected.

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.

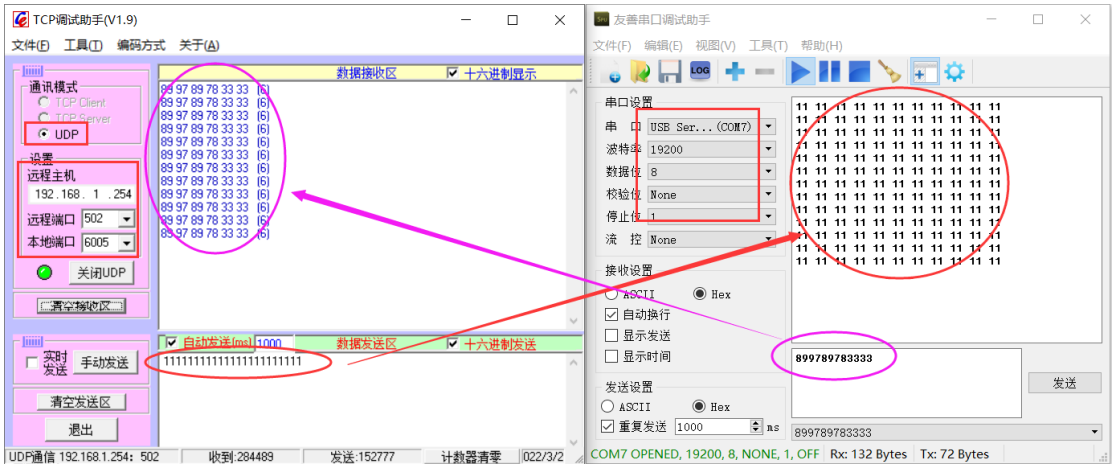
Network config: IP address 192.168.1.254, device port: 502, work mode: UDP mode, set the Destination IP/DNS to the server IP address to be connected: 192.168.1.51 (IP address of the local NIC), and remote port number: 6005.

Serial port config: serial port parameters: 19200bps, N81.The Serial Port test tool Serial Port Utility is used to simulate Serial Port devices.

Multiple Host Config: Select the conversion protocol as none.

Click Submit when the Settings are completed.

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:

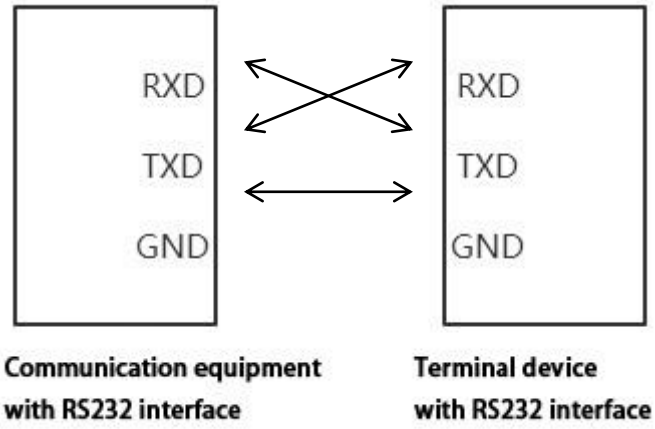
DB9 header interface

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.

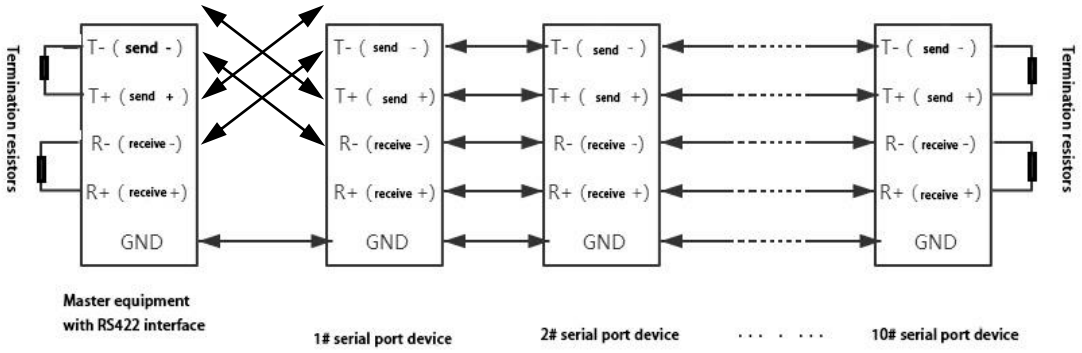
In a master multi-slave network connection, all the sending terminals of the slave connect to the receiving terminals of the master station by daisy-chain. All the receiving ends of the slave stations are connected by daisy-chain to the sending end which is finally connected to the master station.

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".

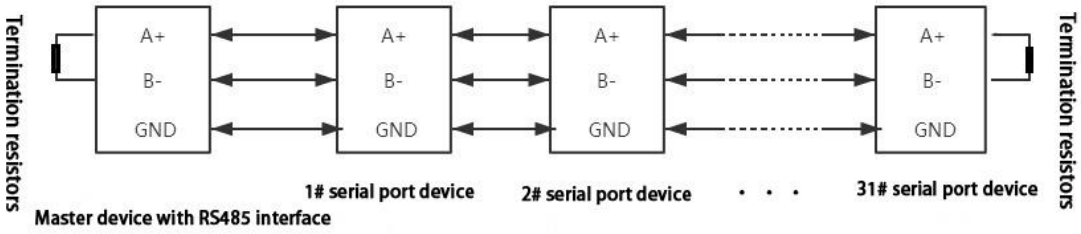
RS485 signal transmission distance is related to communication baud rate, the higher the baud rate, the shorter the transmission distance, under the condition of the baud rate is not higher than 100 KBPS, theory of the maximum communication distance is about 1200 meters, in the process of practical application, 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:



Odot Automation System Co., Ltd.

Add: Plant No. 204 MianYang Comprehensive Bonded Zone, Eastern section of FeiYun Avenue, MianYang,Sichuan Province,China.621000

Tel: +86-0816-2538289

Zip Code: 621000

Email:sales@odotautomation.com

Web: www.odotautomation.com