



USER MANUAL

 ONE-STOP SOLUTION

 ONE-STOP SERVICE

Contents of User Manual for MSR103 Series Wireless Data Transmission Terminal

1. MSR103 Series Product Profile.....	1
2. Introduction to MSR103 Series Configuration Tool.....	2
3. Connecting Example of MSR103 Series DTU via MODBUS RTU Protocol.....	6
3.1. Enter the Macsensor platform.....	6
3.2. Create device.....	6
3.3. Set Connection Protocol.....	7
3.4. Configure MSR103 DTU Parameters.....	9
4. Macsensor Connecting Example of MSR103 Series DTU via TCP Protocol.....	11
4.1. Create device.....	11
4.2. Set Protocol Label.....	11
4.3. Configure MSR103 DTU.....	12
5. Remote Configuration of MSR103 Series DTU on Macsensor Platform.....	14
6. Server Connecting Example of MSR103 Series DTU.....	17
7. Common Failure Analysis.....	19
8. Appendix.....	20
Appendix 1: The diagram of the communication line ports of the product.....	20
Appendix 2: DTU Dimensions.....	20
Appendix 3: Protocol Label Description.....	21

1. MSR103 Series Product Profile

MSR103 series product is a wireless data transmission terminal equipment for the Internet of Things, which can be used for real-time data wireless transmission in industry, agriculture, environment, etc.



The convenient way of accessing the network makes it a wide range of application prospects. With the rise of mobile internet, the measured data can be remotely monitored or analyzed through mobile phones, IPAD, and PC.

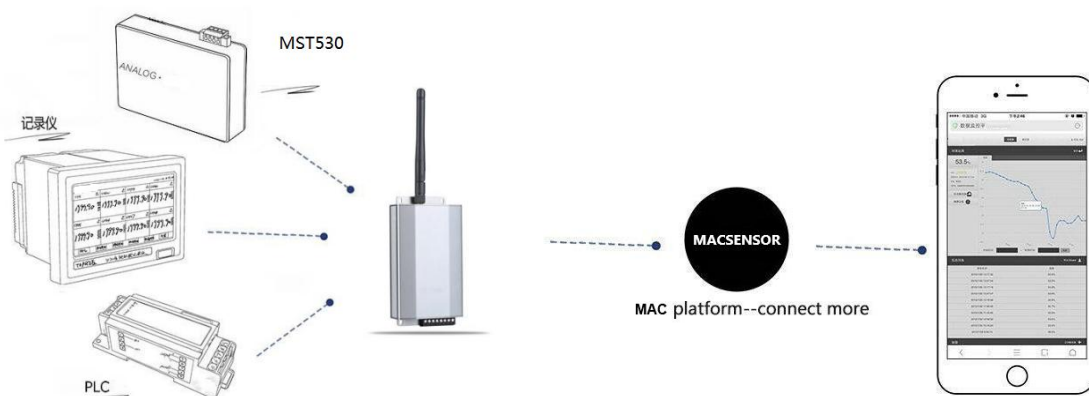


Figure 1 Networking System Diagram

MSR103 series provides three communication interfaces: RS232, RS485 and TTL, and supports point-to-point data transmission. Parameter configuration is done through USB communication port, using the same configuration software to configure the device, with great convenience to users. After configuration, the 3 communication ports keep the same parameter configuration. Compared with its old version, GPS positioning function has been newly added, which realizes real-time monitoring of device location information through the cloud platform.

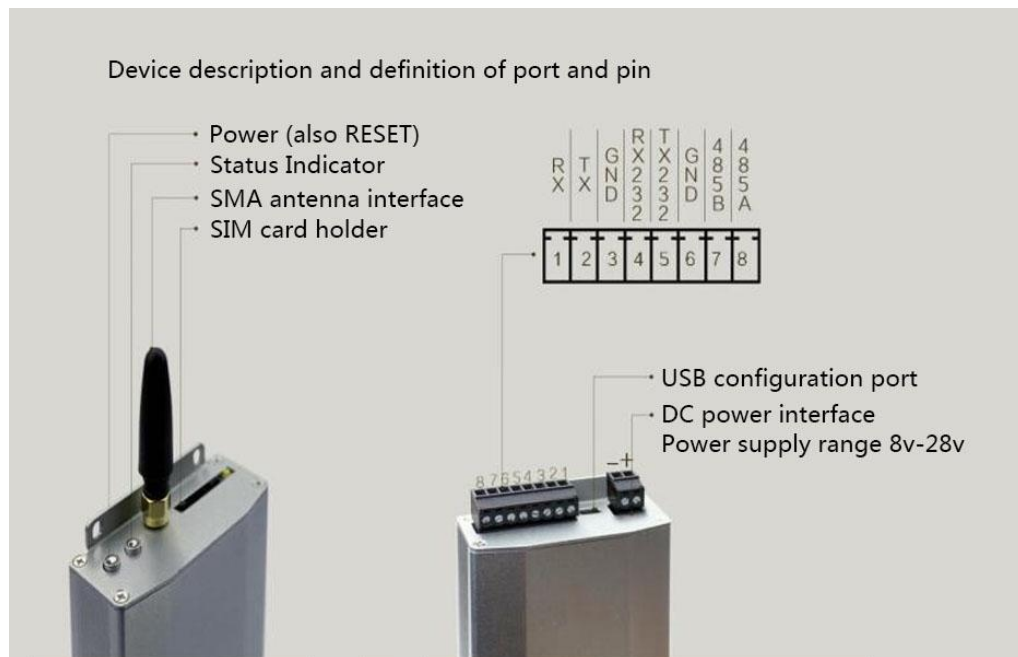


Figure 2 Device Appearance (It may vary for different models, and refer to the actual product)

DC power supply interface: power supply range 8V~28VDC;

USB configuration interface: connected to a computer, using configuration tool to configure (the USB port has no data sending function);

SIM card holder: where phone card is installed. MSR103V2 supports 2G network of China Mobile & China Unicom's SIM card ; MSR103V4 is the full Netcom version, and it can be used on other networks except Telecom 2G and 3G networks. (Hong Kong, Macau, Taiwan and foreign customers need to use special communication modules);

SMA antenna interface: connected to GPRS antenna;

Power: Long press to restart the device;

Status indicator: Under normal conditions, the green light is always on; 6 colors are displayed, and the operating status of the equipment can be analyzed according to the colors. (For details, see failure analysis)

2. Introduction to MSR103 Series Configuration Tool

Open the product information of MSR103 series and install the driver CH340. After the installation is successful, open the device manager interface of the computer, and the COM port corresponding to the USB port connected to the DTU of MSR103 series will appear in the option of device manager port:

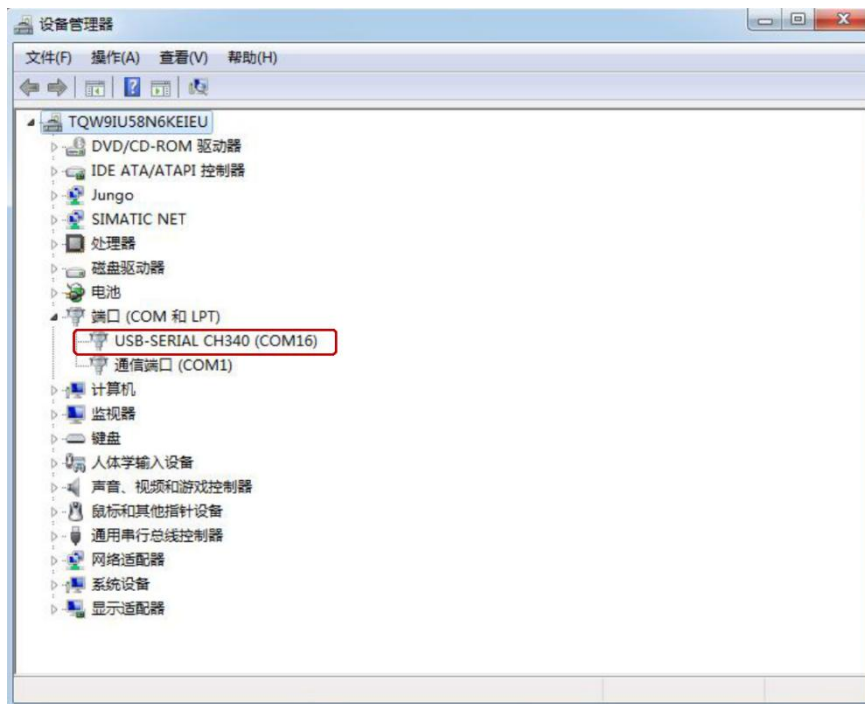


Figure 3 Device Manager Interface

※Note: The serial port information of the USB port of DTU MSR103 series products is fixed at 115200, no parity, 8 data bits, and 1 stop bit to facilitate customers to configure the device.

Open the configuration tool, click the first option in the menu bar of the configuration tool-communication settings, select the COM port corresponding to the USB CH340 port used for configuration in the serial port settings, and set the communication baud rate to 115200:

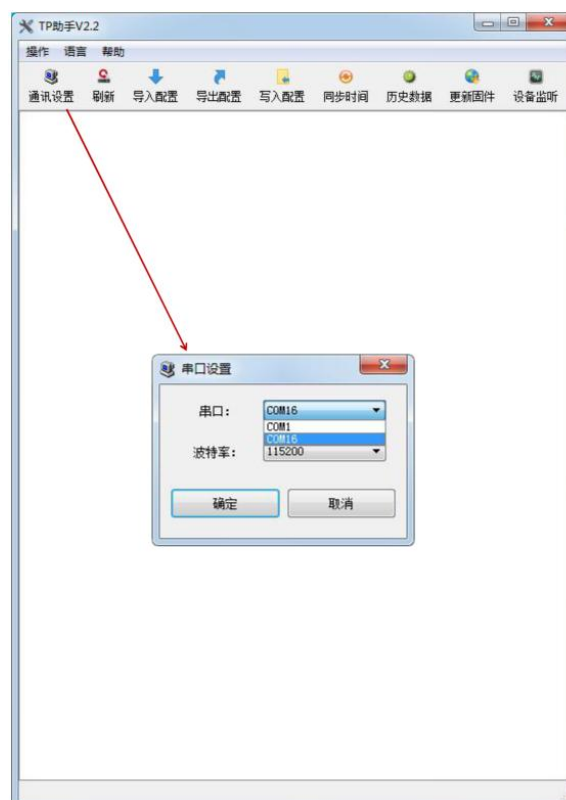


Figure 4 Communication Setting Interface

After the communication serial port is set up, click “Refresh” in the menu bar to display device information and configuration options (due to software version changes, the specific configuration interface is based on the version used):



Figure 5 Offset Tool Interface

The configuration options of MSR103 series configuration tools are described as follows:

01. Save configuration: Click to save the configured option information.
02. Restart: Click to restart the device.
03. Device name: display of device name (no configuration required).
04. Device model: display of device model (no configuration required).
05. **Login package (serial number)**: the necessary configuration option when connecting to the Macsensor platform, and set according to the specific conditions of other servers when connecting to other servers.
06. **Server address**: configure the domain name or IP address of the target server, which is mandatory.
07. **Server port number**: configure the port number for connecting to the target server, mandatory.
08. **Heartbeat package content**: Heartbeat package data sent periodically according to the time interval of "heartbeat package reporting time" set , the default is Q.
09. **Heartbeat package reporting time**: If there is no data upload within this time period, a heartbeat package will be sent to the server (recommend 45S).
10. Hexadecimal login packet and heartbeat package (yes/no): configure the format of the login package.

11. Disconnection self-detection [change the heartbeat package to Q] (on/off): When the disconnection self-detection is enabled, the heartbeat package of the terminal device must be set to Q. After enabling the terminal device, the false connection judgment function will be added. When the terminal device sends a heartbeat package Q to the server, if the server does not reply to A within the detection time, the mid-range device will determine that it is offline and reconnect. If the reconnection fails, it will automatically restart (Note: Both Q and A data formats are a string).
 12. Disconnection self-detection time (0-1800 seconds): Set the time for disconnection self-detection, within which time it judges whether data A has been received.
 13. **Serial port baud rate**: set the baud rate of the device connected to the serial port, necessary when the device is connected.
 14. **Serial port check bit**: Set according to the serial communication parameters of the connected device.
 15. **Serial port data bit**: set according to the serial communication parameters of the connected device.
 16. **Serial port stop bit**: set according to the serial communication parameters of the connected device.
 17. Current working temperature: The operating temperature of the single-chip microcomputer. If it exceeds 50°C, the CPU will have problems. (No need to configure)
 18. Wireless signal intensity: This is a fixed option and no configuration is required.
 19. Detect SIM card: This option can be used to determine whether there is a card in the device (please use manual refresh when checking, otherwise the card may not be detected) , no need to configure.
 - 20-22. APN setting: necessary for users who use APN private network.
 23. IMEI: Network access license number (No configuration is required under normal circumstances, and the user who needs to use can configure the corresponding IMEI number).
 24. Version number: the device name and firmware compilation date, used to check whether the program needs to be updated.
 25. Operator: Information of the operator of the card used.
 26. Wireless network: The information of the network used can be viewed.
- (Note: After the configuration is completed, you need to click to save the configuration and then restart the device)

3. Connecting Example of MSR103 Series DTU via MODBUS RTU Protocol

3.1. Enter the Macsensor platform

The Macsensor platform is a professional IoT platform that can online monitor the status of the equipment. Log in to the IoT platform at www.mac-smart-iot.com. If you have an account, you can log in directly. Users without a Macsensor account can register with their mobile phone number or email address.

3.2. Create device

Log in to the registered Macsensor platform account, click on “device” - “add device” on the left toolbar, and the device creation interface will pop up. Users can set relevant parameters according to their requirements. In the example, MSR103 DTU is connected

to the MST530 product in the data acquisition module MST530 series. This product is an 8-channel analog data acquisition module for RS485 communication, which can directly collect analog signals, thermocouple output signals, PT100 and Cu50 thermal resistance sensor output signals. The sensor connected this time is PT100 thermal resistance. Because when MST530 communicates with modbus protocol, the data of PT100 is enlarged by 100 times. On the platform, it is necessary to add mapping for each sensor to reduce the data by 100 times, as shown in the following figure:



Figure 5 Device Creation Interface Figure

Mark the location of the device on the map provided by the platform, configure the relevant parameters, and click "Create Device" below to complete the device creation.

After the device is created, it will jump directly to the "Device list", you can see all the devices created under the registered account (click "Device" on the left toolbar also jumps to "Device list"), click the corresponding icon to achieve the relevant operations. The specific interface is shown in Figure 6 below:



Figure 6 Device List Interface

3.3. Set Connection Protocol

Click “Connection settings” to enter the protocol setting interface which contains two information columns of “Device Information” and “All Sensors”. The device information contains the serial number of the device and the IP and port number of the server where it is located. “All Sensors” column contains the name of all the sensors and their read-write command settings. As shown in Figure 7:

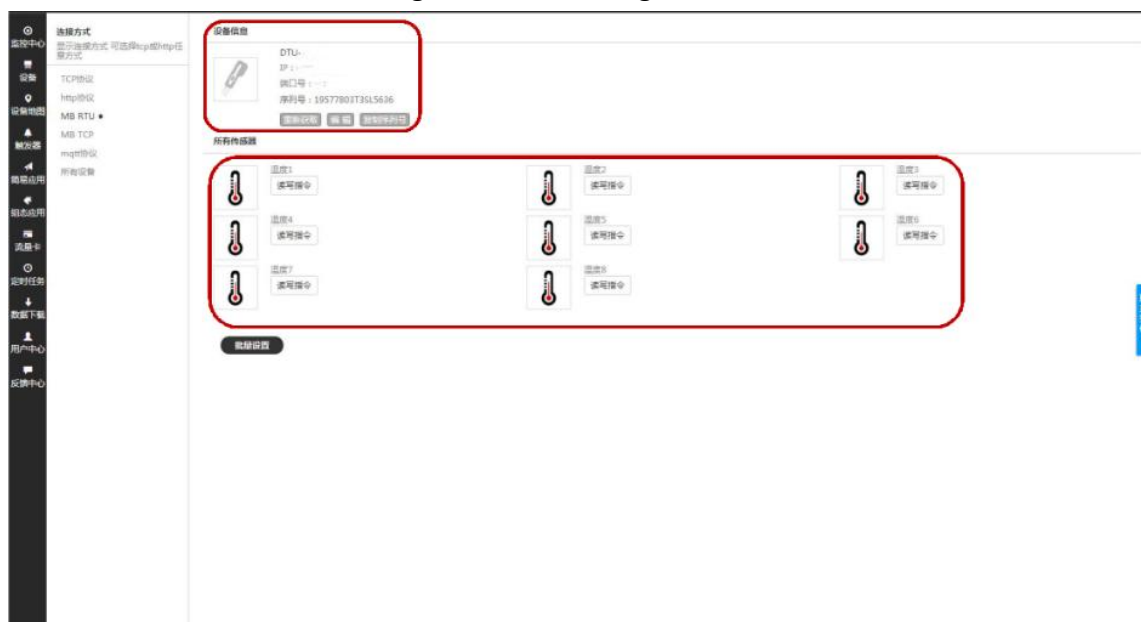


Figure 7 Connection Settings Interface

Click the read/write command to set the read/write command of the corresponding sensor. Since the device connected to DTU is MST530, MST530 is the slave station, its slave station address is 1, the supported function code is 03 function code, the data type is 16-bit unsigned number, and the register address from 0 to 7 corresponds to the data of Channel 1 to Channel 8(the device's register address corresponds to the offset in the Macsensor platform, but because Macsensor platform cannot set the offset to 0, the register address needs to be increased by 1, that is, offset 1 corresponds to register address 0 , offset 2 corresponds to register address 1, offset 3 corresponds to register address 2……). The read and write command interface of temperature 1 (channel 1) and temperature 2 (channel 2) is shown in Figure 7:

Figure 7 shows two side-by-side software configuration windows. The left window is titled 'Modbus 设备从站地址' (Modbus Device Slave Address) and the right window is titled '寄存器地址' (Register Address). Both windows have a similar layout with fields for '从站地址' (Slave Address), '功能码' (Function Code), '偏置' (Offset), '数据格式' (Data Format), and '采集周期' (Sampling Cycle). The right window also includes a '写入' (Write) button. The '从站地址' field in the left window is set to '1' and the '功能码' field is set to '03 读写'. The '偏置' field in the left window is set to '1' and the '数据格式' field is set to '16位 无符号数'. The '采集周期' field in the left window is set to '10'. The '从站地址' field in the right window is set to '1' and the '功能码' field is set to '03 读写'. The '偏置' field in the right window is set to '2' and the '数据格式' field is set to '16位 无符号数'. The '采集周期' field in the right window is set to '10'.

The settings of other sensors can follow like this. Due to the large number of sensors, each sensor needs to set a unique read and write command. When setting read and write command, you can click the batch setting at the bottom of the sensor information column to set the read and write commands in batches. The setting interface is shown in Figure 8:

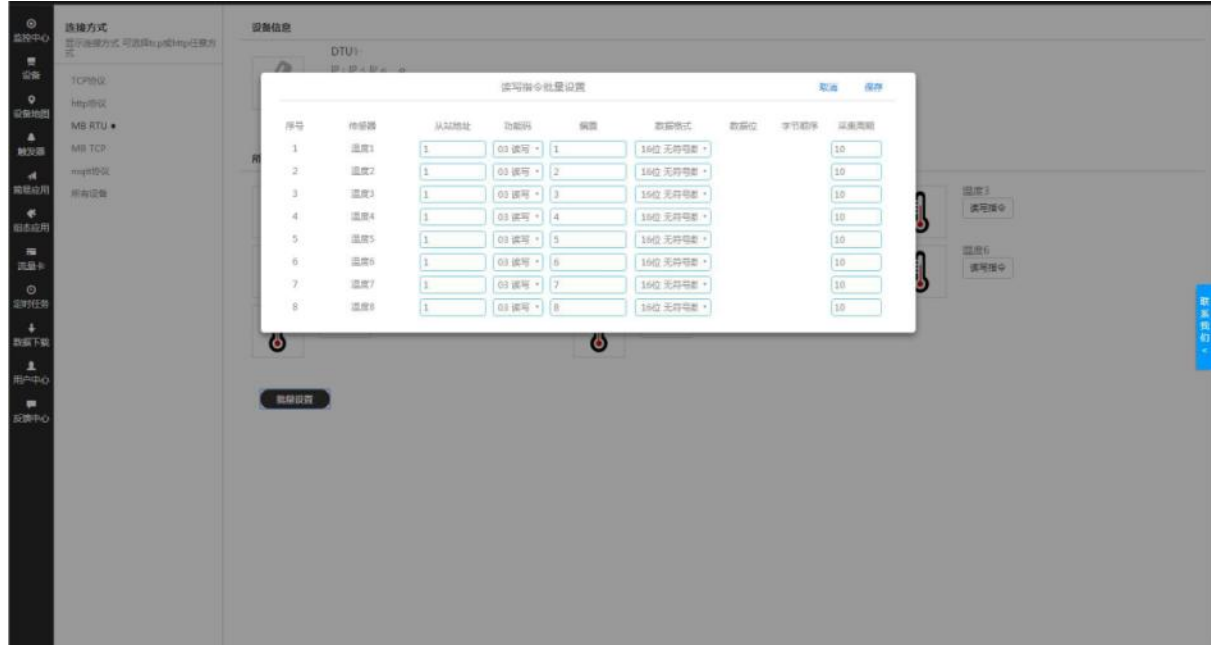


Figure 8 Read and Write Command Batch Setting Interface

3.4 Configure MSR103 DTU Parameters

Configure the login packet and server information of the DTU according to the Macsensor device information column, and configure the serial port parameters to be consistent with that of the device connected to the DTU (namely, the serial port parameters of MST530, the serial port parameters of MST530 are: 8 data bits, 1 stop bit, no check). The configuration interface is shown in Figure 9:



Figure 9 Configuration Tool Interface

After the configuration is complete, click Device Monitoring in the upper right corner to display the device information printed by the USB port, as shown in the figure:

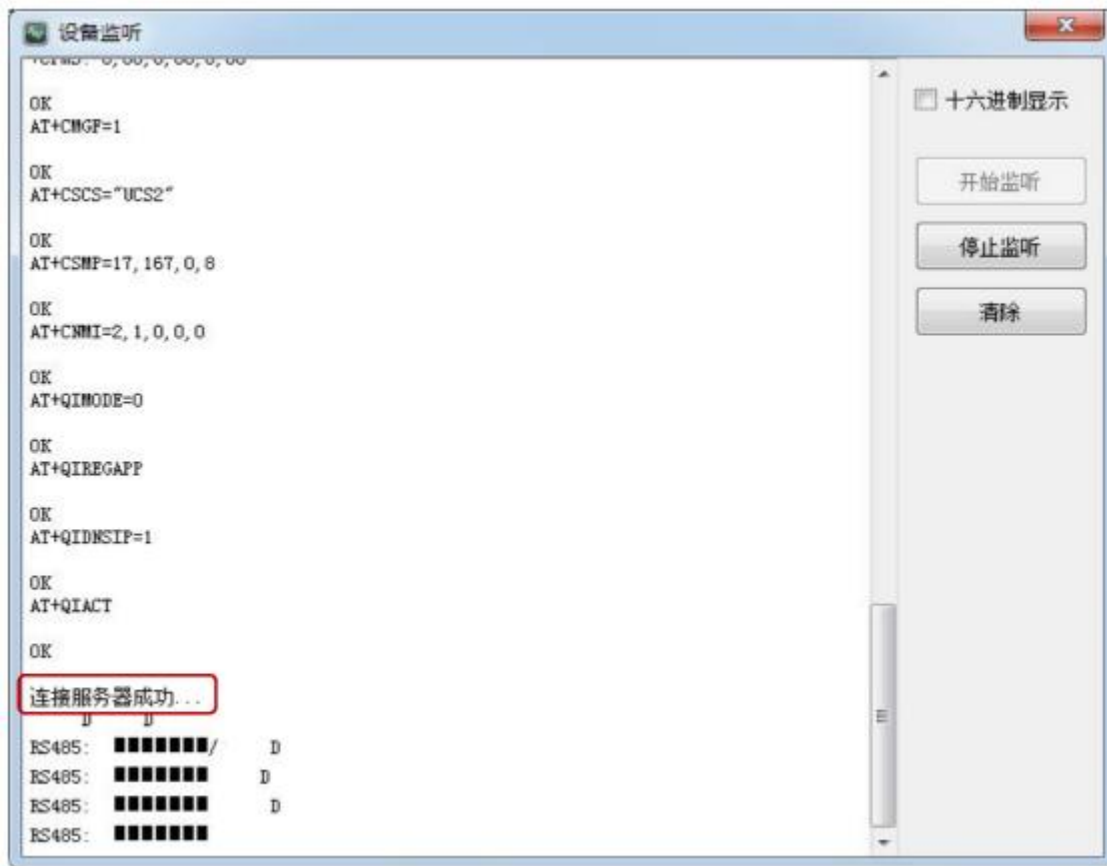


Figure 10 Device Monitoring Interface

After successfully connecting to the server, click Monitoring Center in the left menu bar to display the remote data monitoring interface, as shown in Figure 11. (The data can be displayed on the Macsensor platform in the form of a table, or historical curves, configuration and etc. Refer to application display and help center on Macsensor for details)

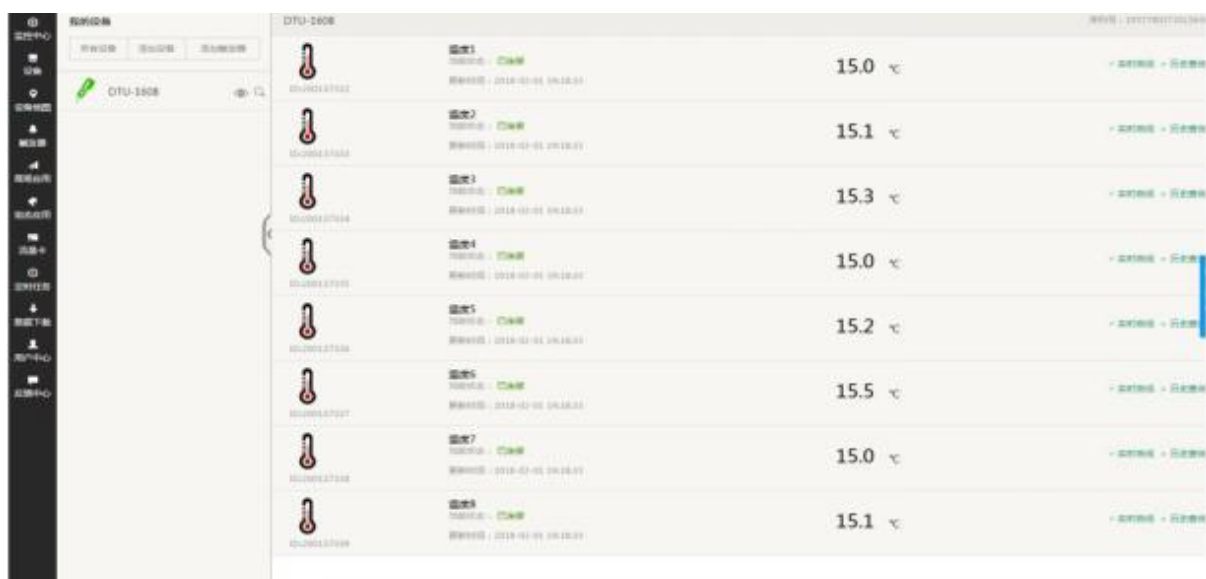


Figure 11 Data Monitoring Interface

4. Macsensor Connecting Example of MSR103 Series DTU via TCP Protocol

4.1. Create device

The creation steps are similar to that via modbus rtu protocol. The specific information is shown in the following figure:



Figure 12 Create TCP Device Interface

4.2. Set Protocol Label

In this case, the 485 port of MSR103 DTU is connected to the computer using a 485-to-USB device, and the serial port tool is used to send data to Macsensor. Because the TCP protocol is a user-defined protocol, and the MSR103 DTU is a transparent transmission mode (UDP is not supported), so as long as the data format sent by the serial port tool is consistent with the data protocol label on Macsensor. Here we define the content of the protocol:

#DTU,30.2, 30.2, 30.2(0D0A)

The data header #DTU 30.2 as data, a total of three groups the separator is the English comma and the terminator is ENTER

※Note: The protocol label is just an example, you can customize your own protocol content. Just set the protocol label consistent with the customized protocol on the Macsensor platform, and then the data can be parsed out.

Click “Set connection” in the device menu bar to enter the protocol label configuration interface, and define the content of the protocol label according to the custom protocol, as shown in Figure 13.



Figure 13 TCP Protocol Label Setting Interface

4.3 Configure MSR103 DTU

After completing the settings of the Macsensor platform, open the MSR103 DTU configuration tool and configure according to the relevant information in the device information bar of the Macsensor platform. The serial port parameters can be configured according to the parameters of the serial tool that sends the data. The specific serial tool sending interface and configuration tool configuration interface are shown in Figure 14, 15:

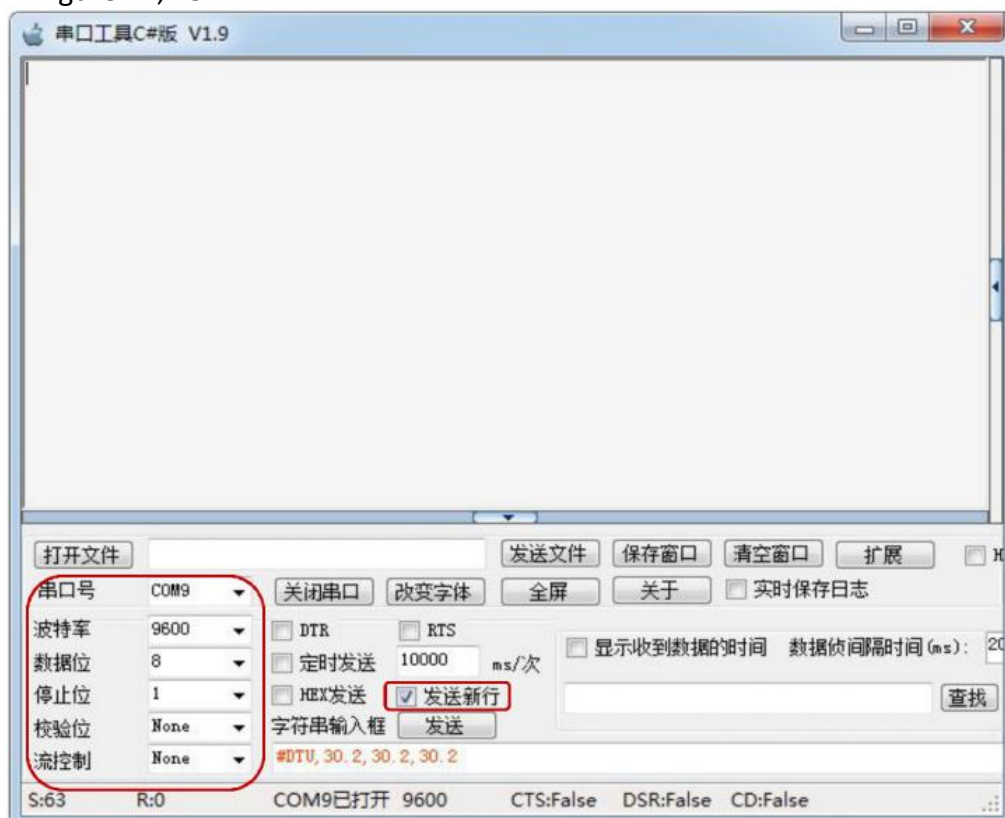


Figure 14 Serial Port Tool Interface

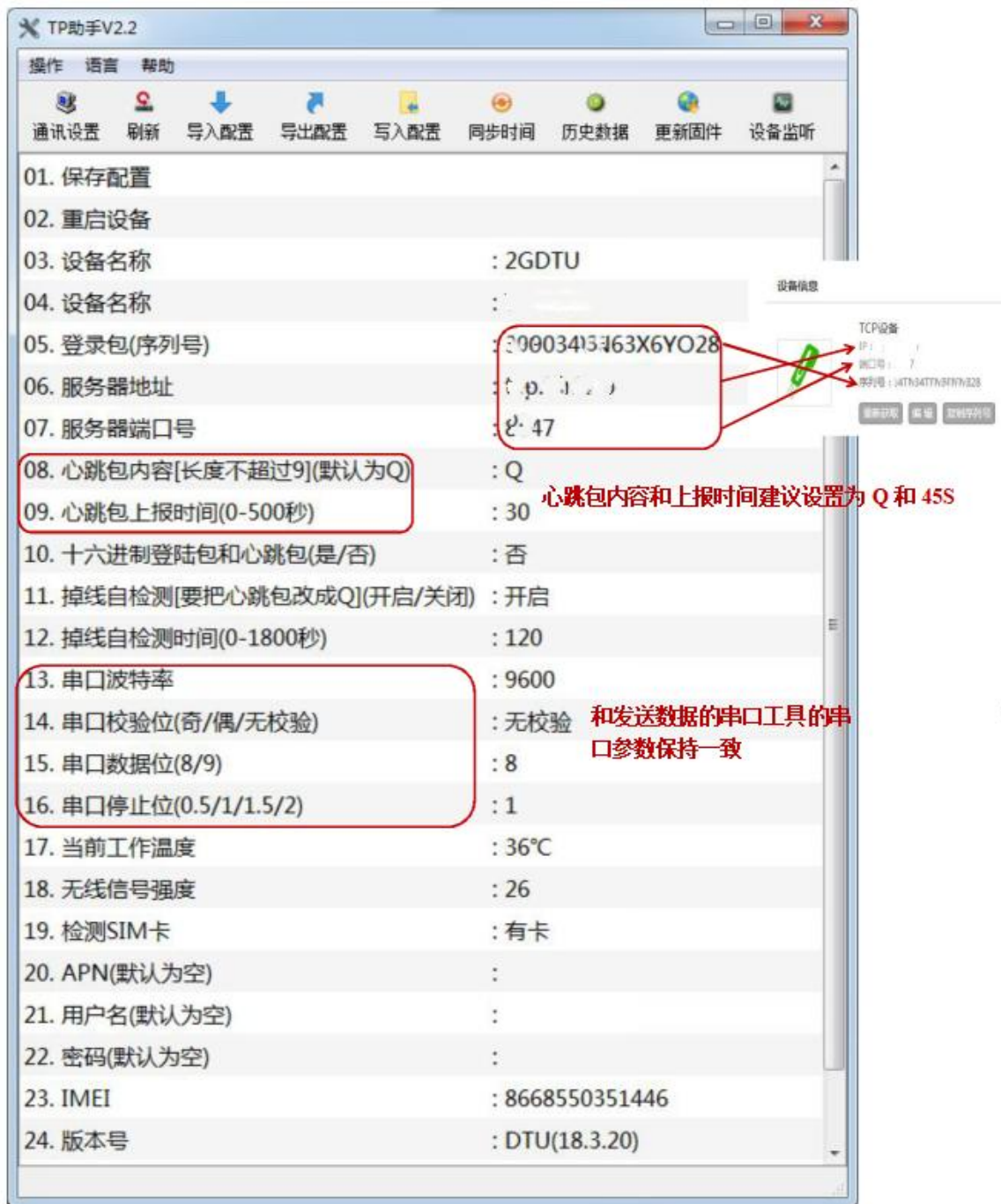


Figure 15 Configuration Tool Interface

Click the send button of the configuration tool and open the monitoring center of the Macsensor platform to see the data information sent by the configuration tool, as shown in Figure 16.

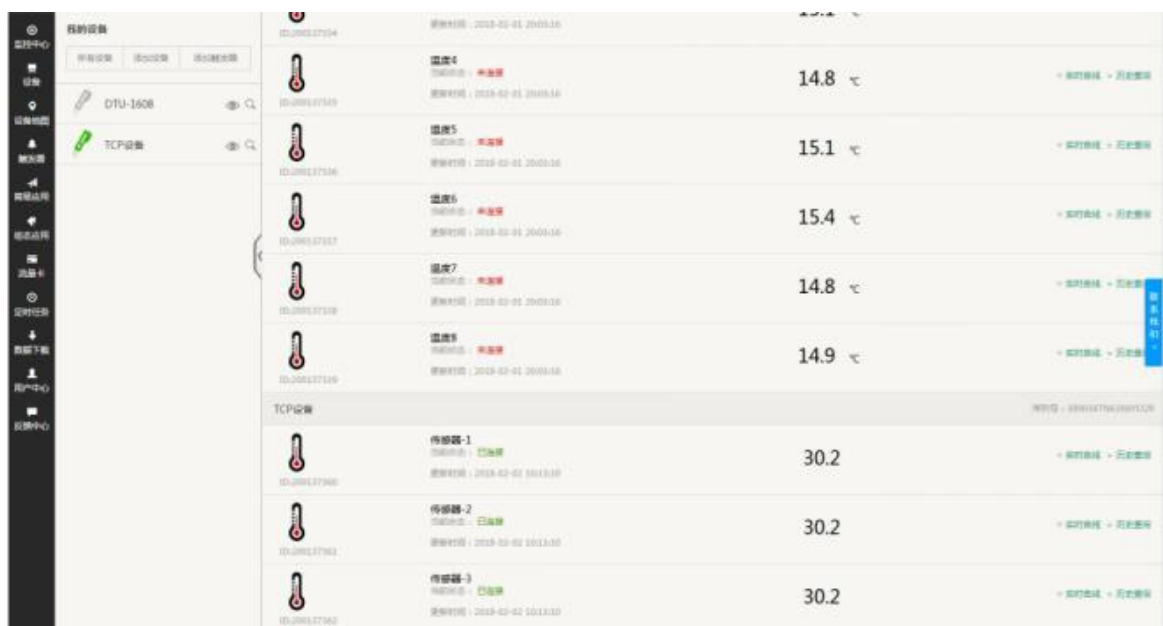


Figure 16 Monitoring Center Interface

5. Remote Configuration of MSR103 Series DTU on Macsensor Platform

Log in to the Macsensor platform and click “Flow card” to enter the flow card interface:

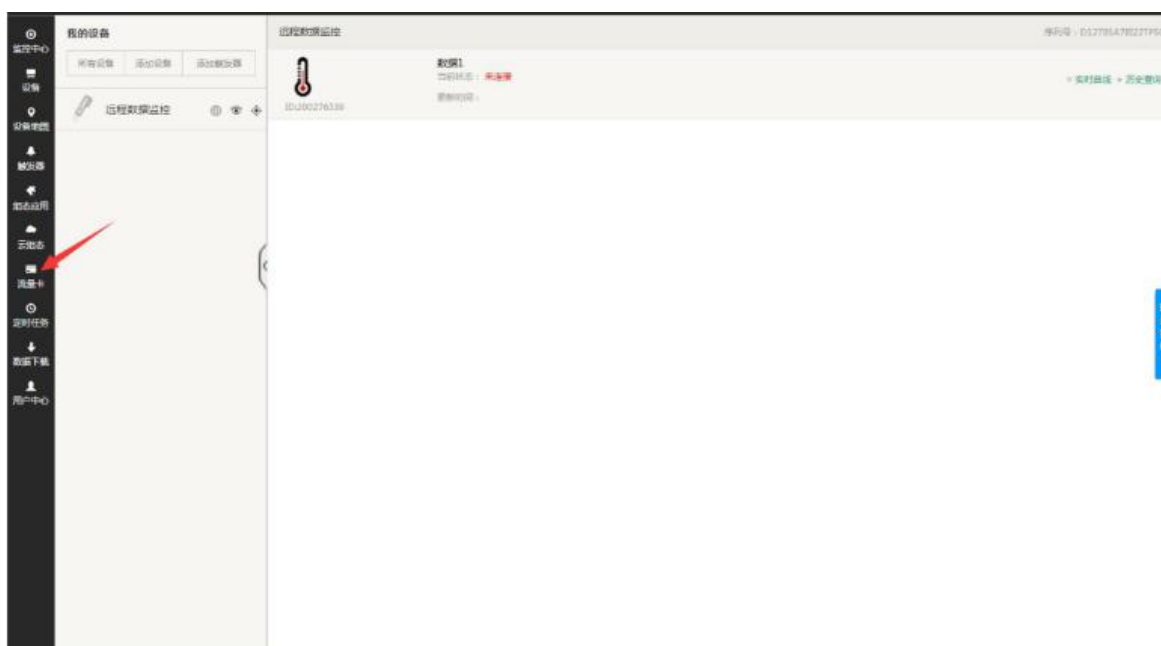


Figure 17 Macsensor Monitoring Center Interface

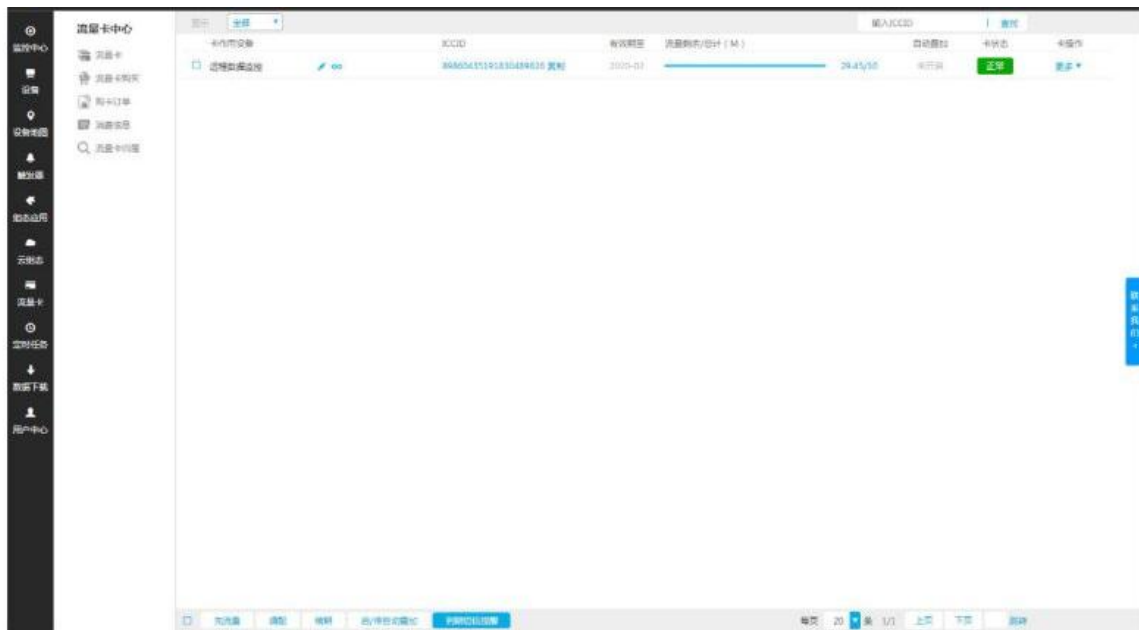


Figure 18 Flow Card Interface

Click the option of sending a SMS to the device in the drop-down box of “More” of the data card, and the text message interface will appear. (Note: The card number of the flow card can be viewed on the back of the card, and corresponds to the device using this card) as shown in the figure below:

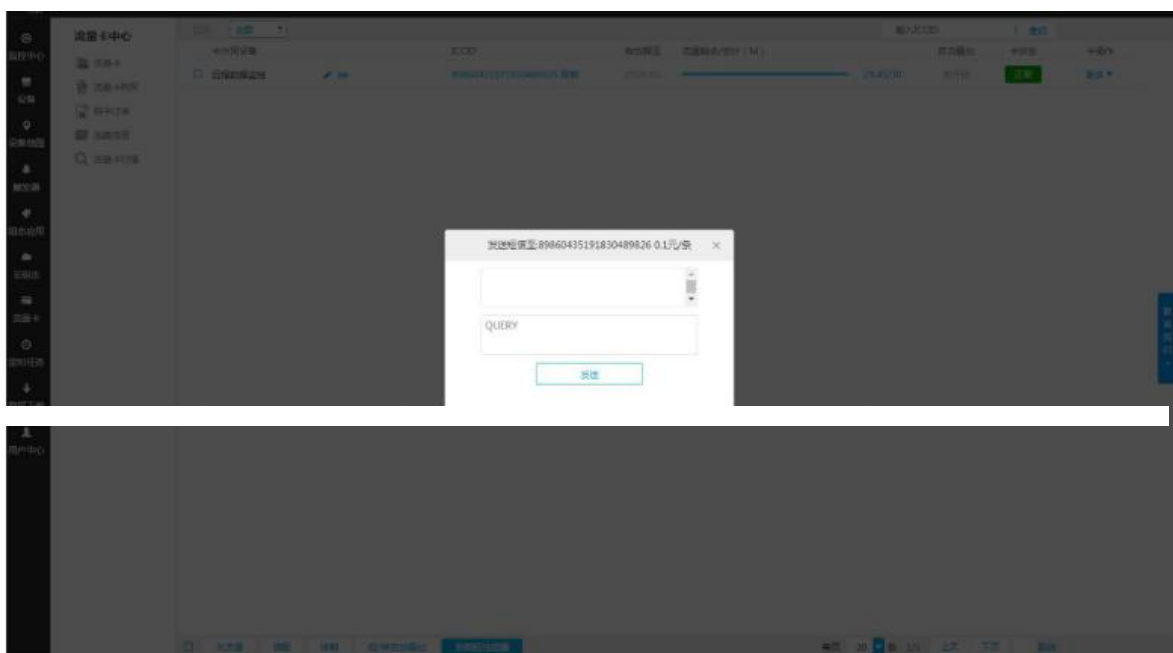


Figure 19 Flow Card Interface

The related SMS commands are as follows:

Query: send QUERY

Restart: send RESTART

Configuration: LOGIN1:240Q059J7T32Q621, //Setup the login package of Link 1 (all commas are those in English input mode)

LOGIN2:5429369J7T32Q356,	//Setup the login package of Link 2
IP1: mbrtu.Macsensor.io,	//Setup the login package of Link 1
IP2: link.Macsensor.io,	//Set the server IP address of Link 2
PORT1:8651,	//Set the server port number of Link 1
PORT2:1500,	//Set the server port number of Link 2
SIGNAL:18,	//signal intensity

Click “Send QUERY” (Note: this option exists in the default sending box, and the MSR103 series DTU needs to be connected to Macsensor when sending). After the successful sending is displayed, the queried configuration information appears in the receiving column above the sending column, and after modifying the content required, click send. When the interface prompts that the sending is successful, the remote configuration of DTU is completed.

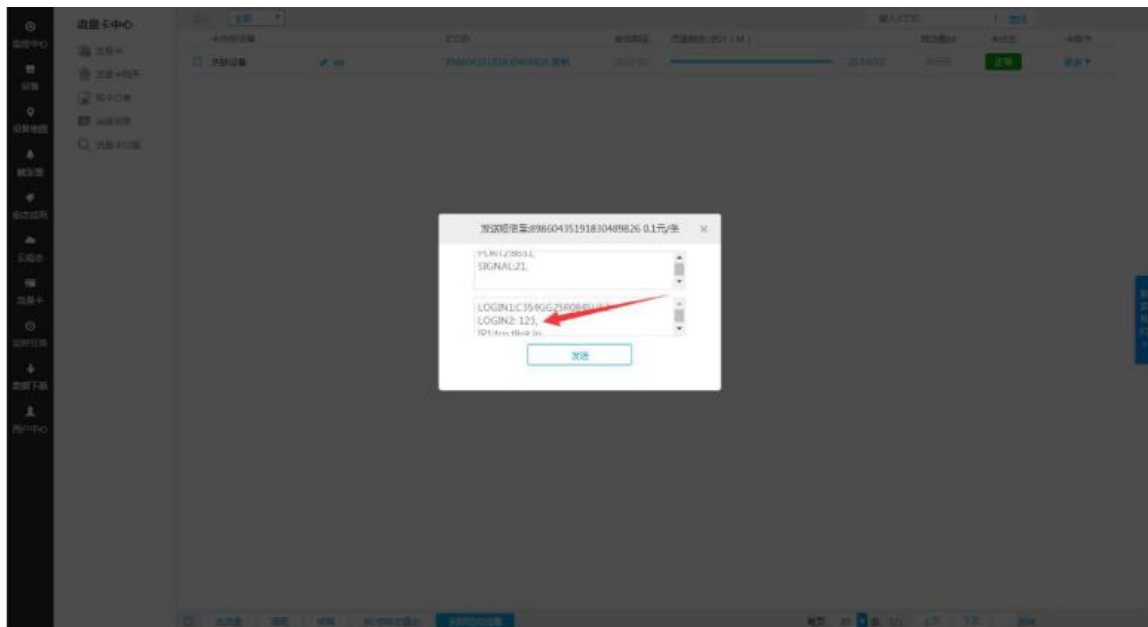


Figure 20 Send Configuration Information Interface

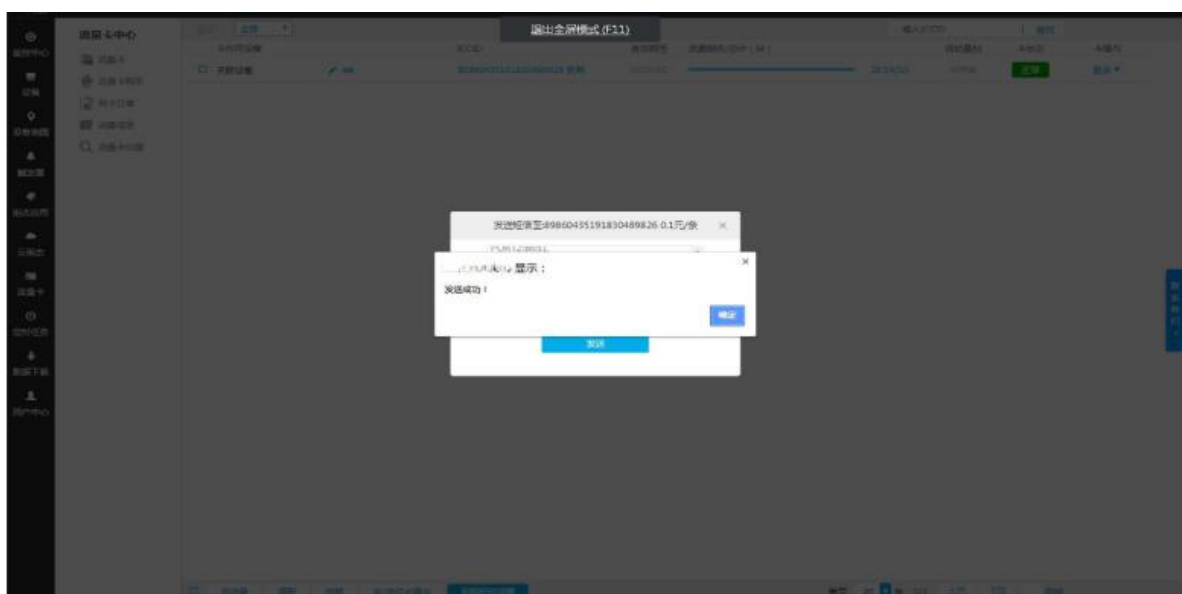


Figure 21 Successful Sending Interface

6. Server Connecting Example of MSR103 Series DTU

The server in the example is a virtual server simulated by Serial Port Utility. MSR103 DTU is connected to the acquisition module MST530. The acquisition module collects the data of the PT100 thermal resistance sensor (the same as the device connection in Section 3, refer to Section 3).

When MSR103 DTU is connected to Serial Port Utility for debugging, you first need to map a port number to the local computer on the router. For the specific operation steps, please refer to the online course (the port number is 9116). Set the serial port of Serial Port Utility as the TCP/UDP server, and the port number is 9116. Configure the GPRS DTU server information as the public network IP and port number of the machine. The specific configuration interface is shown in Figure 17,18:

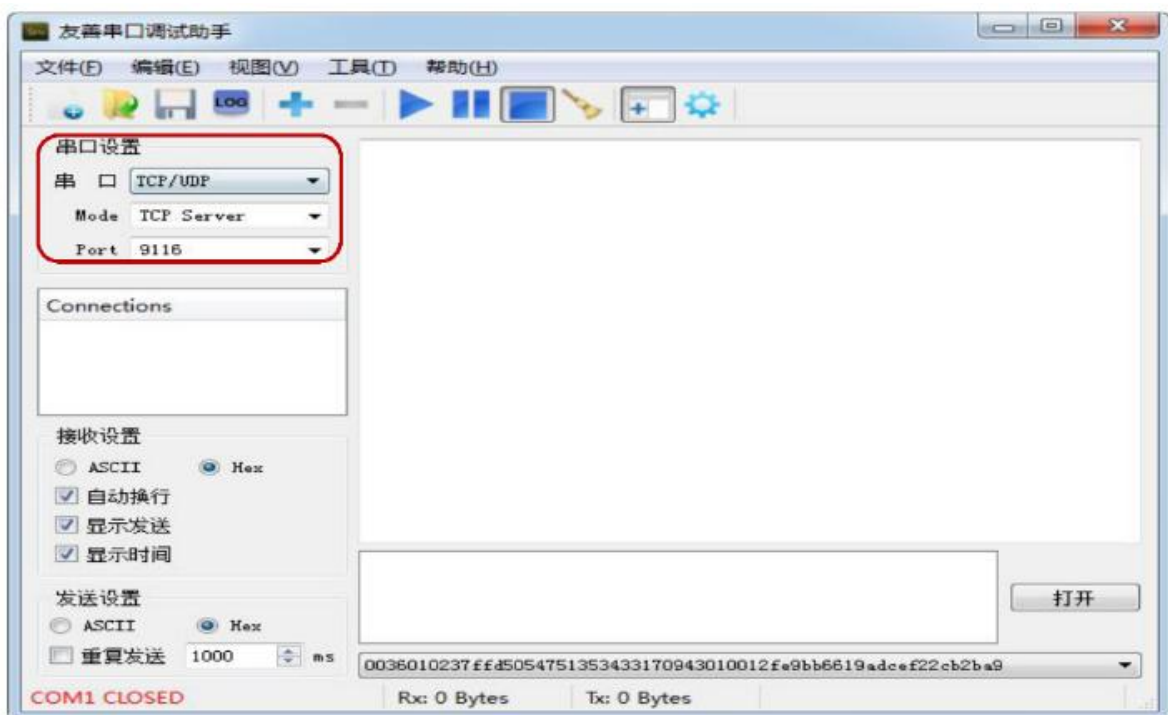


Figure 22 Serial Port Utility Interface



Figure 23 Configuration Tool Interface

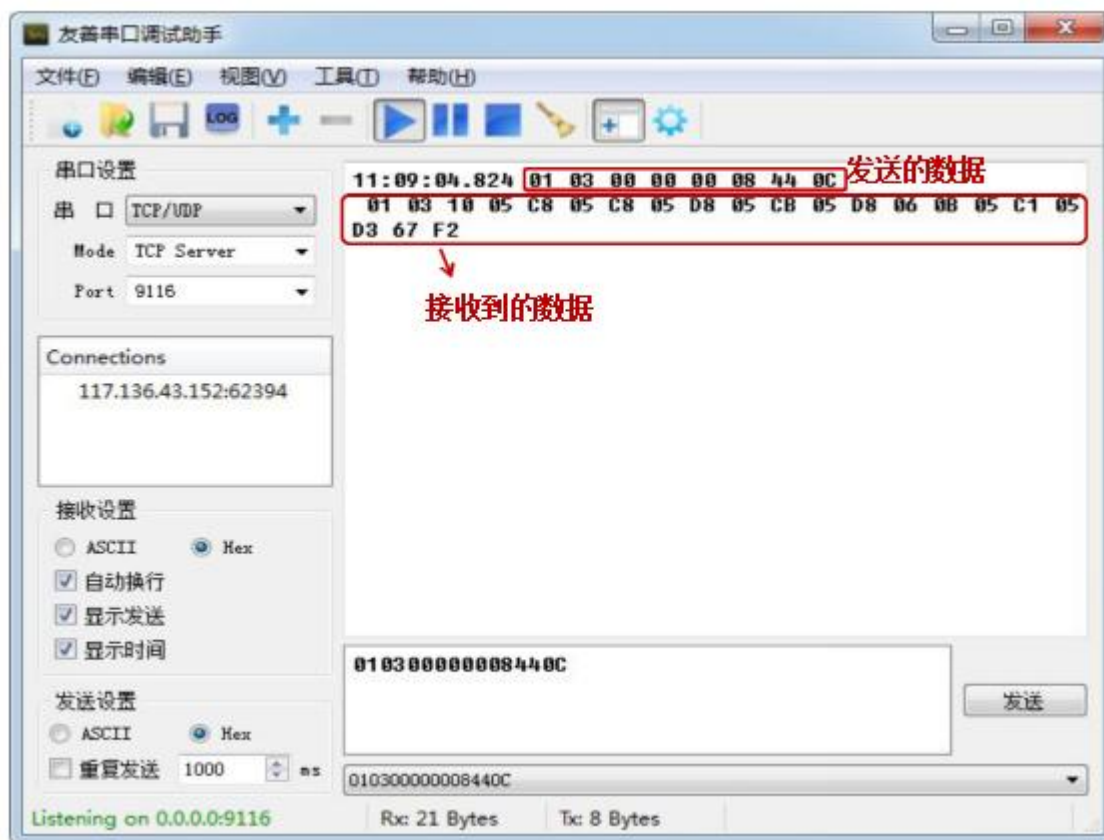


Figure 24 Data Display Interface

After setting, click to send the 010300000008440C command, MST530 will reply the command via DTU: 01031005C805C805D805CB05D8060B05C105D367F2. The data obtained after parsing in accordance with the modbus rtu protocol is: 1480, 1480, 1496, 1483, 1496, 1547, 1473, 1491 (for specific analysis methods, please refer to Modbus rtu protocol description). Since the data sent by MST530 expands the actual temperature data by 100 times, the actual temperature data obtained are: 14.8°C, 14.8°C, 14.96°C, 14.83°C, 14.96°C, 15.47°C, 14.73°C, 14.91°C.

7. Common Failure Analysis

1. The module fails to start

The device monitoring interface prints the module startup failure message, and the signal light is always red. The module may be damaged, please contact After-sales.

2. Network startup fails

The device monitoring interface prints a network startup failure message, and the signal light flashes purple. It may be that the SIM card is in arrears, or there is no signal at the place of use.

3. Failed to access SIM card

The device monitoring interface prints a SIM card access failure message, and the signal light flashes light green. Check whether the card is inserted.

4. Weak signal

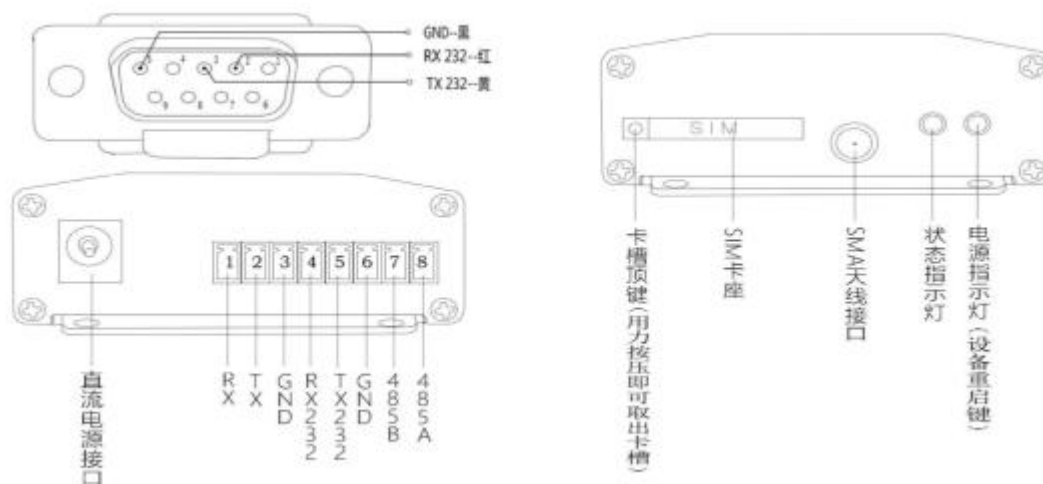
The device monitoring interface prints a weak signal message, and the signal light flashes sky blue. Check whether the antenna is used or move it to an open area.

5. Server connection fails

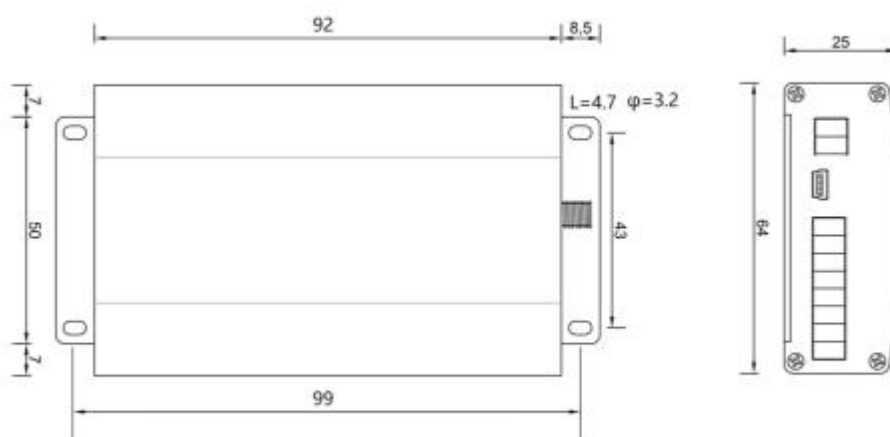
The device monitoring interface prints the server connection failure message, and the signal light flashes red. Check whether the configuration options of the server and the port number are configured correctly and whether the server is turned on.

8. Appendix

Appendix 1: The diagram of the communication line ports of the product



Appendix 2: DTU Dimensions



Appendix 3: Protocol Label Description

Data head:	
[H:data] -----	String header
[HE:data]-----	Hexadecimal data header
Separator:	
[S:data] -----	String separator
[SE:data] -----	Hexadecimal separator
[SN[length]]-----	Known length separator
Data:	
[D?] -----	Unknown length string value
[D[length]] -----	Known length string value
[DE[length] ABCD] -----	Known length hexadecimal value
[DEC[length] ABCD] -----	Known length hexadecimal string value
[DF[length] :data]-----	Known length hexadecimal value, return floating point value returned
Terminator:	
[T::data] -----	String Terminator
[TE::data] -----	Hexadecimal terminator
[CRC16] -----	CRC16 CRC16 check code terminator
[CRC8] -----	CRC8 check code terminator

Note: For the end type that does not appear in the terminator (such as sum check), you can use [SN[] length] as the terminator, and users can define the length according to their own needs.

※ For more protocol label description, please refer to the platform www.mac-smart-iot.com