EBYTE

Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

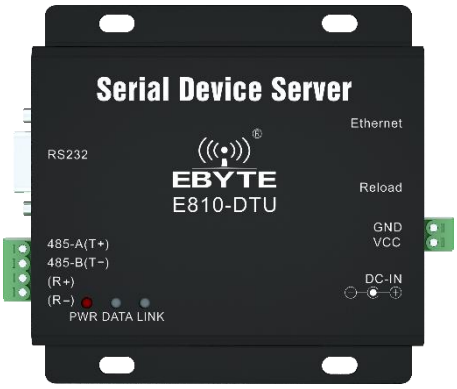
Ethernet to RS232/RS485/RS422

E810-DTU

Contents

1. Product overview

1.1.Product Introduction



E810-DTU (1RS1E) is a single serial port server that transfers RS232 & RS485 & RS422 to ethernet. It realizes data transparent transmission between RJ45 and RS232 or RS485 or RS422.

Equipped with M3 series 32-bit processor, it runs fast and has high efficiency. With adaptive network rate (up to 100M full duplex), TCP Server, TCP Client, UDP Server, UDP Client four communication mechanisms. It realizes two-way data transparent transmission between TCP/UDP and serial port. Built-in operating system, multi-task processing is stronger, at the same time with TCP/IP network protocol stack, more efficient and stable. Support two-way SOCKET working at the same time, WEB web page configuration.

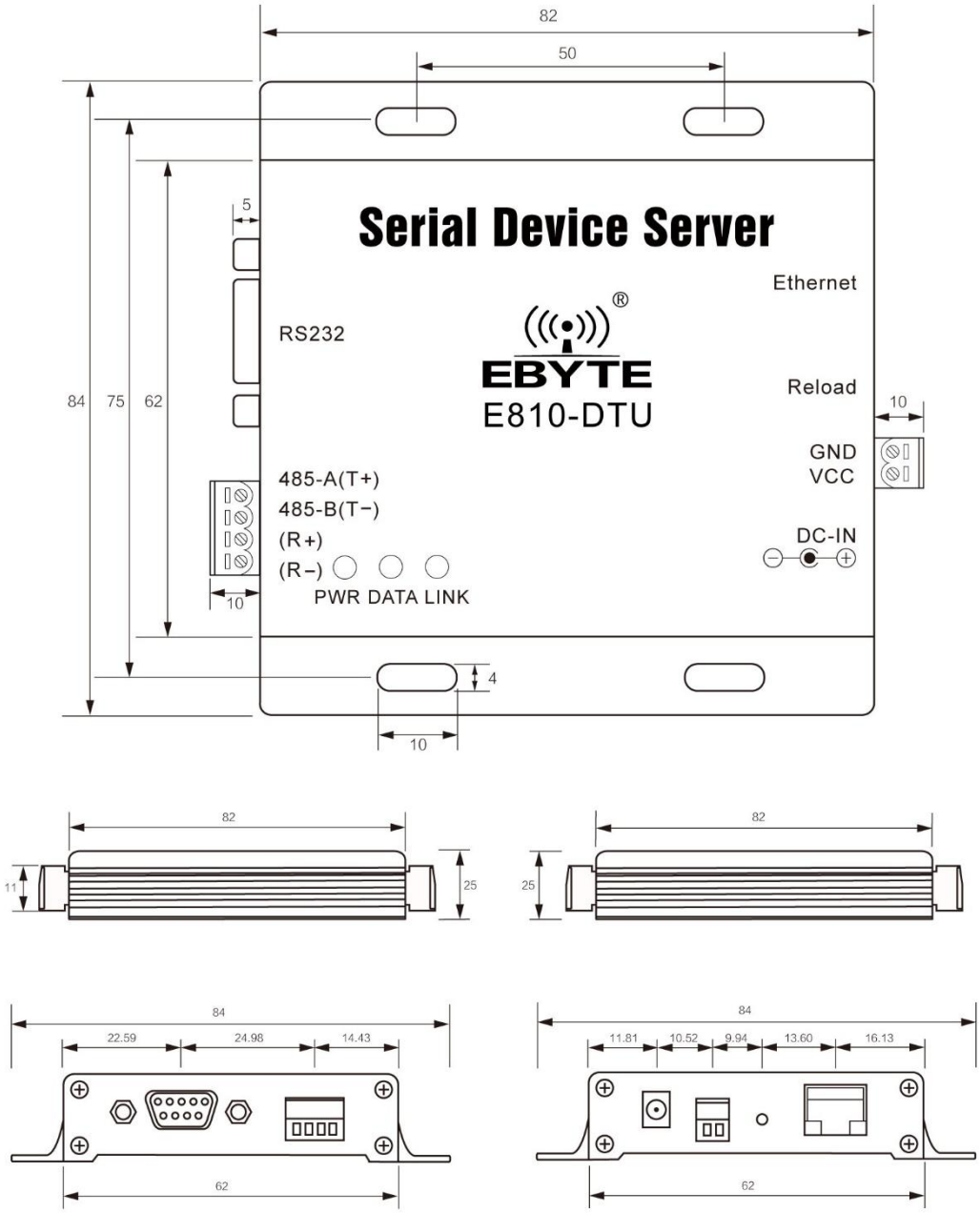
E810-DTU (1RS1E) is easy to operate. Users can directly configure the parameters through the web page. Easy to achieve data transmission.

1.2 Product specification

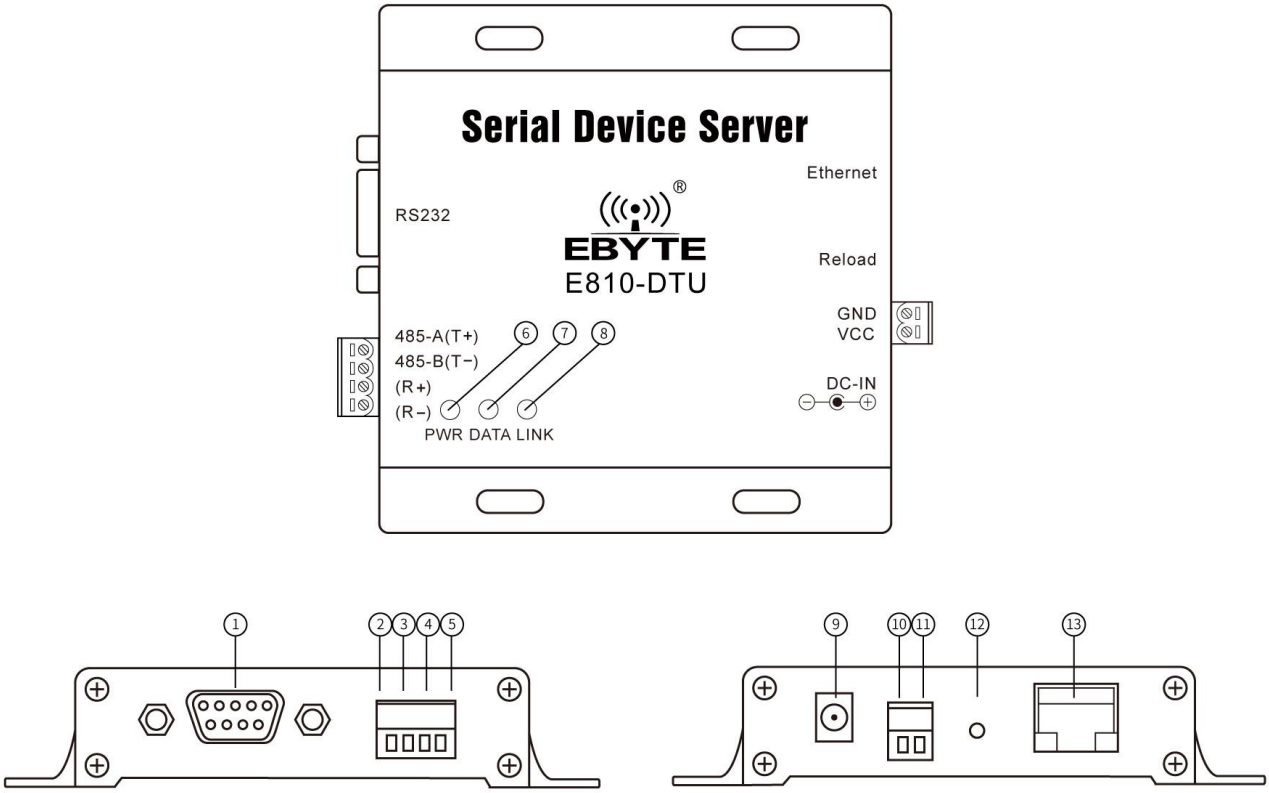
SN	Specifications	Description
1	Supply voltage	8V ~ 36V, more than 36V may burn, 12V or 24V power supply is recommended
2	Working current	74.66mA@12V(RS232) ，73.47mA@12V(RS485) ，73.64mA@12V(RS422)
3	Operation mode	Asynchronous half-duplex or asynchronous full-duplex
3	Interface mode	RS232:DB9 Pass Connector RS485/RS422:1*4*3.81,screwing way RJ45:Mesh port
4	Serial port standard	RS232:1200~115200bps ; RS485/RS422:1200~256000 bps; RJ45: 300bps~3Mbps
	Transmission medium	Wire/twisted pair or shielding wire
5	Mesh size	RJ45，10/100Mbps
6	Network protocol	IP、 TCP/UDP、 ARP、 ICMP、 IPV4
7	IP Acquisition Method	Static IP、 DHCP
8	DNS	Support
9	User configuration	Web page configuration
10	Simple transparent transmission	TCP Server 、TCP Client 、 UDP Server 、 UDP Client
11	TCP Server connection	Supporting up to 6 TCP connections
12	Packaging mechanism	0-1460 byte packing length
13	Operating temperature	-40 ~ +85℃
14	Working humidity	10% ~ 90%, relative humidity, no condensation
15	Storage temperature	-40 ~ +125℃
16	Average weight	130±5g
17	Size	80×62×25mm（same as E810-DTU(RS)）

2. Product design introduction

2.1. Dimensions



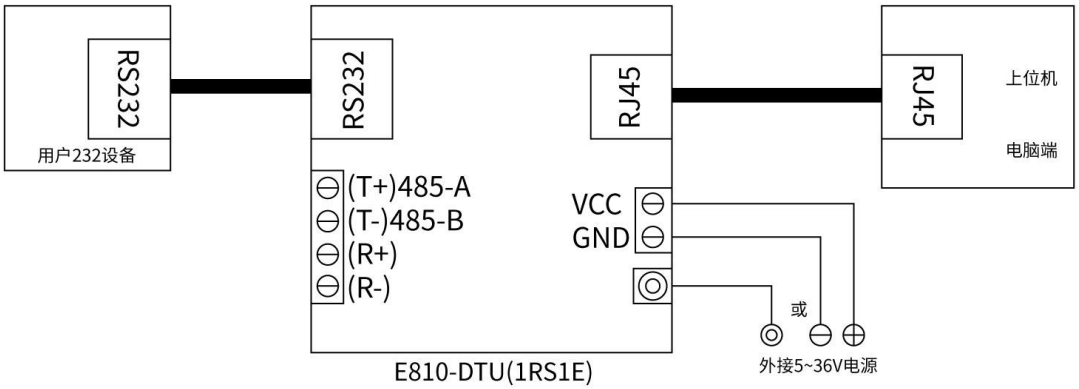
2.2. Identity definition



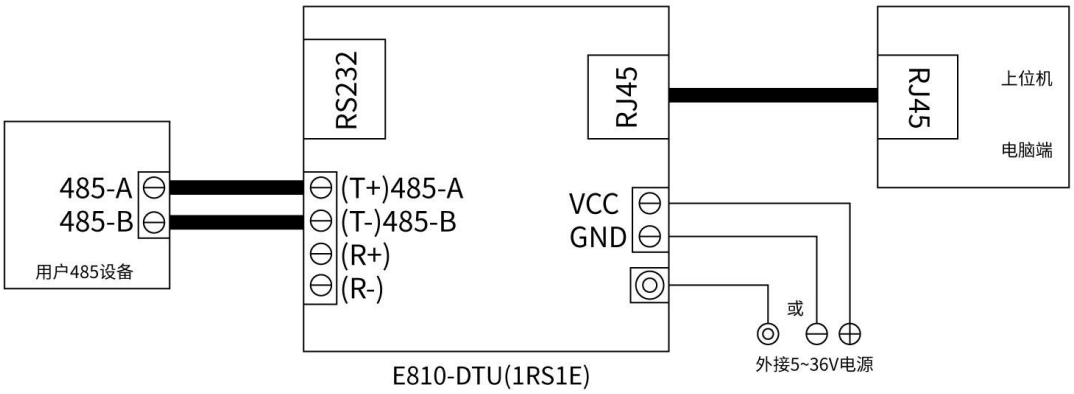
Pin No.	Pin Name	Pin usage
1	RS232	RS232 data interface (DB9 hole connector)
2	485-A(T+)	RS485 Data Interface A/RS422 Data Sending (A+) Interface (3.81mm Terminal)
3	485-B(T-)	RS485 data interface B/ RS422 data transmission (B -) interface (3.81mm terminal)
4	(R+)	RS422 Data Receiving (A+) (3.81mm Terminal)
5	(R-)	RS422 Data Receiving (B-) Interface (3.81mm Terminal)
6	PWR	power indicator light
7	DATA	Data transceiver indicator
8	LINK	Network Connection Indicator
9	DC-IN	Power socket, default 8 ~ 36V, 12V / 24V is recommended, can not be supplied with power socket at the same time
10	VCC	Power supply terminal, default 8~36V, recommended 12V/24V, can not be powered at the same time as the power socket (3.81mm terminal block)
11	GND	Power terminal block ground (3.81mm terminal block)
12	Reload	Restore the factory setting button, long press 5 to 10 seconds valid
13	Ethernet	RJ45 Network Interface

2.3. Communication connection diagram

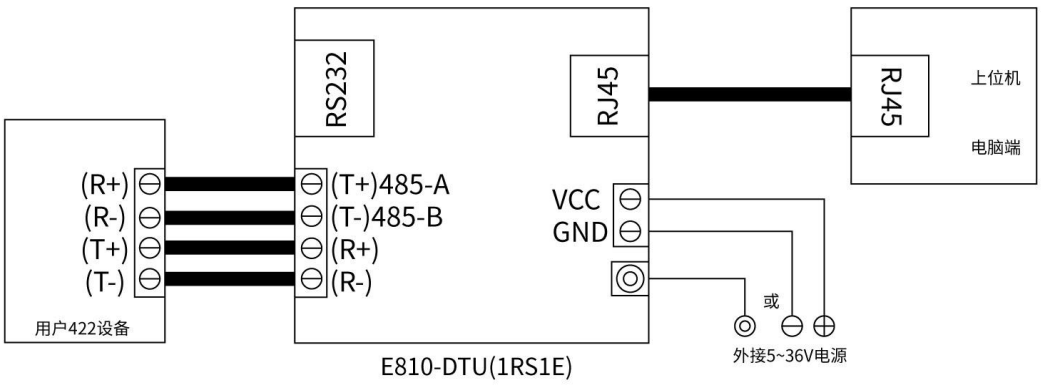
2.3.1 RS232 Communication Connection Method



2.3.2 RS485 Communication Connection Method



2.3.3 RS422 Communication Connection Method



Note: When wiring as full-duplex (RS422) or half-duplex (RS485), in order to prevent signal reflection and interference, a matching resistor (parameter 120 ohm 1/4W) must be connected at the end of the line!

3. Product function introduction

3.1. Network basic function

3.1.1 IP address introduction

The IP address refers to the Internet Protocol address, which indicates the identity of the module in the LAN. The IP address is unique in the LAN and therefore cannot be duplicated with other device addresses in the same LAN. The E820-TTL-02 module supports both static IP and DHCP IP acquisition methods.

- Static IP

The static IP is required to be manually set by the user. During the setting process, note that the IP, subnet mask and gateway are simultaneously written. Static IP is suitable for LAN communication without DHCP Server or fixed IP address.

- DHCP

The main function of DHCP is to dynamically obtain IP address, Gateway address and NDS server address information from gateway host (with DHCP server). By DHCP, users can save the tedious steps of setting IP address manually, and avoid the conflict of IP address in LAN caused by setting IP address manually.

Note: Usually the computer does not have the DHCP Server function. When the E820-TTL-02 is set to DHCP and is directly connected to the computer, it will not be able to transmit normally because it has been waiting for the IP address.

3.1.2 Subnet mask introduction

The subnet mask is used to indicate which network the host indicated by the IP address is on. The subnet mask cannot exist separately. It needs to be used together with the IP address. Its role is to divide an IP into two parts: the network address and the host address.

Subnet mask is a 32 bit address. For class A address, the default subnet mask is 255.0.0, class B 255.255.0, and class C 255.255.255.0. For example, for our commonly used class C address, the capacity of IP in the subnet is numbers, but because all 0 and all 1 are special IP addresses in the IP address, the number of IP available in class C subnet mask is 254.

3.1.3 Gateway introduction

Gateway, also known as Inter-Network Connector, realizes the interconnection between two networks. If the device is connected to a router, then the gateway is the router IP address. The device can access another network (or local area network) connected by the gateway through the gateway.

3.1.4 DNS introduction

DNS is called Domain Name System. The distribution of domain names and IP addresses on the World Wide Web (www) is a database. After the device has the correct DNS server, it can interact with the external network (World Wide Web) server through the network domain name.

3.2 Serial port function

3.2.1 Serial port parameter introduction

The basic parameters of the serial port include: baud rate, data bit, stop bit, check bit, flow control switch.

- Baud rate: The serial communication rate can be set from 300bps to 3Mbps. The baud rate supports the custom baud rate.
- Data bits: The length of the data bits, the range is: 7, 8, 9.
- Stop bit: The range can be set: 1~2
- Check bits: Check bits for data communication, supporting three kinds of check modes: None (none), Odd (odd), Even (even).
- Flow control switch: The serial port supports the flow control switch. When the flow control is turned on, the transmission and transmission of data are controlled by RTS/CTS.

Note: By setting serial port parameters, keeping the same parameters with serial port connection equipment can ensure the normal communication.

3.2.2 Serial Port Framing Mechanism

Because the data on the network end are transmitted by data frames, it is necessary to send the frame data through the serial port to the network end, so that the data can be transmitted more efficiently and quickly.

Serial port packing time: The default is 10ms, which can be set, the range is 0~255.

Serial port packing length: The default is 1460 bytes, which can be set. The range is from 0 to 1460.

Note: When the two parameters are not 0, the packing rule is to pack data to satisfy any one of them.

When one parameter is 0, the packing rule is another non-zero value.

When both parameters are 0, the packing rule is the default parameter value.

3.3 SOCKET function

The E810-TTL module can establish two Sockets, namely Socket A1 and Socket B1. Among them, Socket A1 supports all types of TCP Client, TCP Server, UDP Client, and UDP Server. Socket B1 only supports TCP Client, UDP Client, and UDP Server.

Two Sockets run simultaneously. It can connect to different networks for data transmission at the same time.

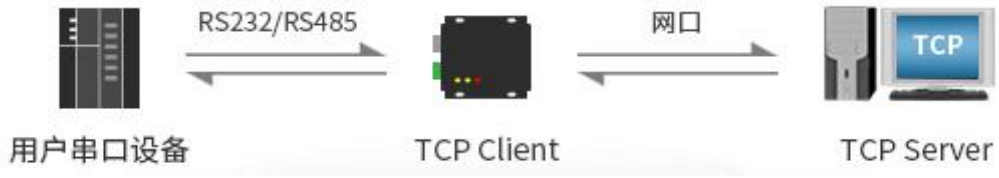
3.3.1 TCP Client Function

(1) The TCP Client provides a client connection for the TCP network service. Proactively initiate a connection request to the server and establish a connection for interaction between serial data and server data. According to the relevant provisions of the TCP protocol, the TCP Client has the difference of connection and disconnection, thereby ensuring reliable exchange of data. It is commonly used for data interaction between devices and servers and is the most commonly used method of networked communication.

(2) When the E810-TTL attempts to connect to the server in TCP Client mode and the local port is 0, the connection is initiated with a random port each time.

(3) This mode supports the short connection function.

(4) Under the same LAN, if the E810-TTL is set to static IP, please keep the E810-TTL IP and gateway in the same network segment, and set the gateway IP correctly, otherwise it will not communicate normally.



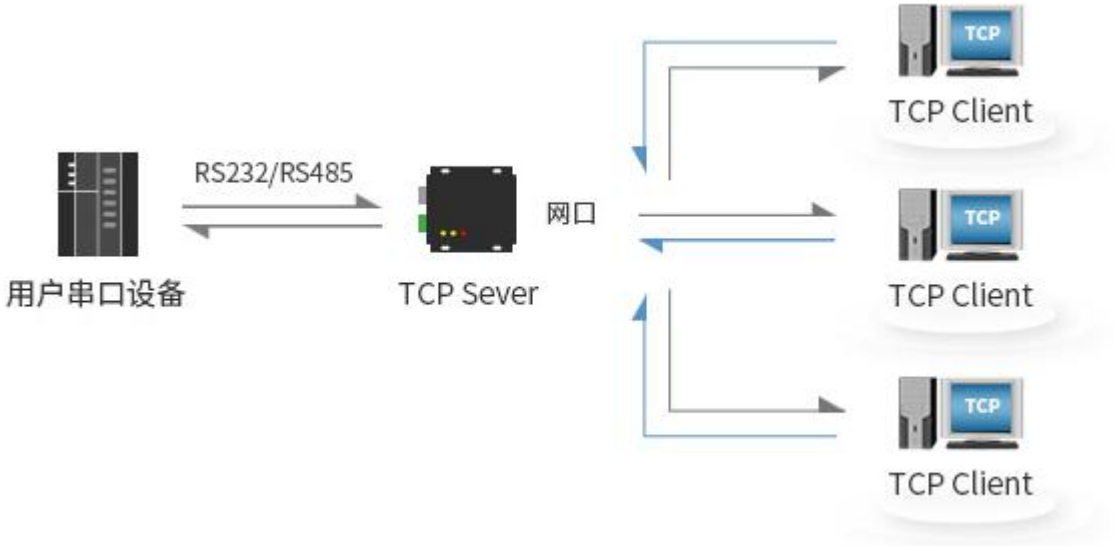
3.3.2 TCP Server Function

(1) TCP server is TCP server. In the TCP server mode, e810-ttl listens to the local port, accepts and establishes a connection for data communication when a connection request is sent. When the e810-ttl serial port receives the data, it will send the data to all client devices that establish a connection with e810-ttl at the same time.

(2) Usually used for communication with TCP client in LAN. It is suitable for the scenario where there is no server in the LAN and there are many computers or mobile phones requesting data from the server. Like TCP Client, there are differences between connection and disconnection to ensure reliable data exchange.

(3) When E810-TTL is used as TCP Server, it can accept up to 6 Client connections (the number of connections can be customized). The local port number is fixed and cannot be set to 0.

(4) TCP Server can set the maximum number of connections. When the number of connections reaches the maximum, it can choose to kick out the old connections or prohibit the establishment of new connections according to the configuration instructions.

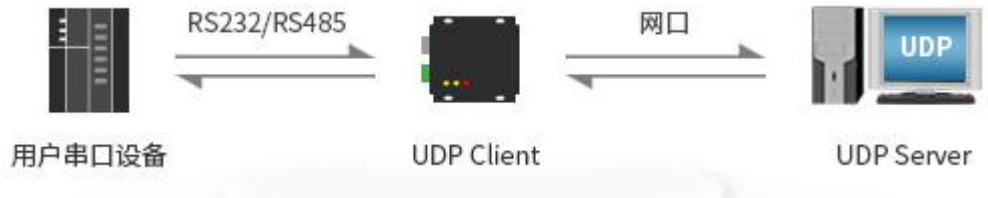


3.3.3 UDP Client function

(1) UDP Client is a connectionless transmission protocol that provides a transaction-oriented simple and unreliable information transmission service. Without the establishment and disconnection of a connection, only the IP and port need to be established to send data to the other party. It is usually used for data transmission scenarios where the packet loss rate is not required, the data packet is small and the transmission frequency is fast, and the data is transmitted to the specified IP.

(2) In UDP Client mode, E810-TTL will only communicate with the target port of the target IP. If the data is not from this channel, the data will not be received by E810-TTL.

(3) In the UDP client mode, the destination address is set to 255.255.255.255, which can achieve the effect of UDP full network segment broadcast, and can also receive broadcast data. The E810-TTL module supports broadcast in the supported network segment, such as the broadcast method of .xxx.255.

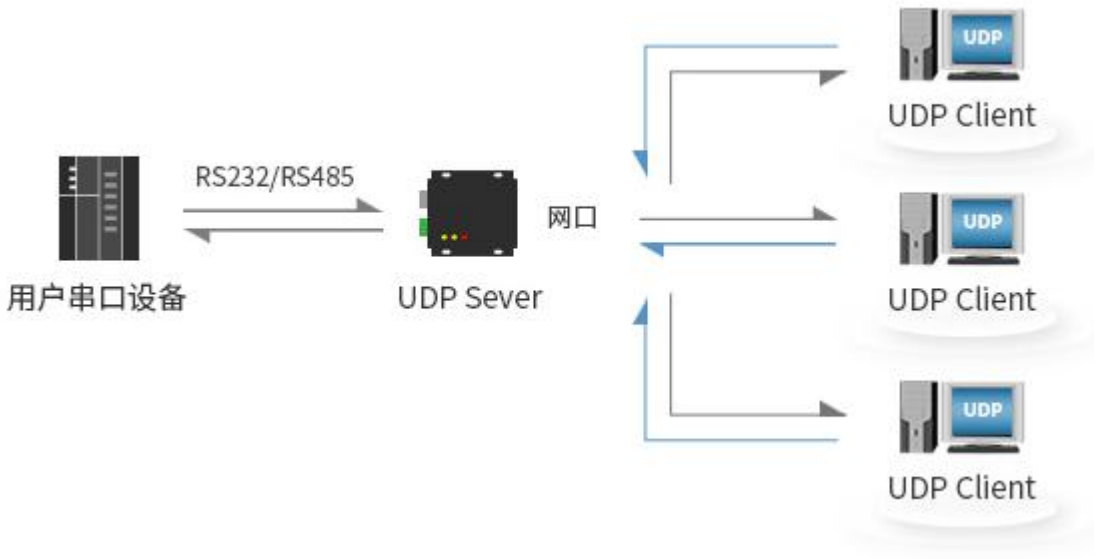


3.3.4 UDP Server function

(1) UDP Server means that the source IP address is not validated on the basis of ordinary UDP. After receiving a UDP packet, the target IP is changed to the data source IP and port number. When sending data, the IP and port number is sent to the nearest communication.

(2) This mode is usually used in data transmission scenarios where multiple network devices need to communicate with modules and do not want to use TCP because of its fast speed and frequency.

Note: UDP Server cannot send data on its own initiative. Only after receiving data can it send data to IP and ports that have recently interacted with data.



3.4 Special function

3.4.1 Web page configuration

The module can be accessed through a browser to configure the web page. When the web page is accessed, the access terminal and the module are in the same local area network, and after entering the user name and password, the web configuration page is entered.

3.4.2 Heartbeat package function

In the network transparent transmission mode, the user can choose to have the E810-TTL send a heartbeat packet. The heartbeat packet can be sent to the network server or sent to the serial device. It cannot be run at the same time.

The main purpose of sending to the network is to maintain a connection with the server, which only takes effect in the TCP Client and UDP Client modes.

In an application where the server sends a fixed query command to the device, in order to reduce the communication traffic, the user may select to send a heartbeat packet (query command) to the serial device to replace the query command sent from the server.

The E810-TTL module supports up to 40 bytes of custom heartbeat packets.

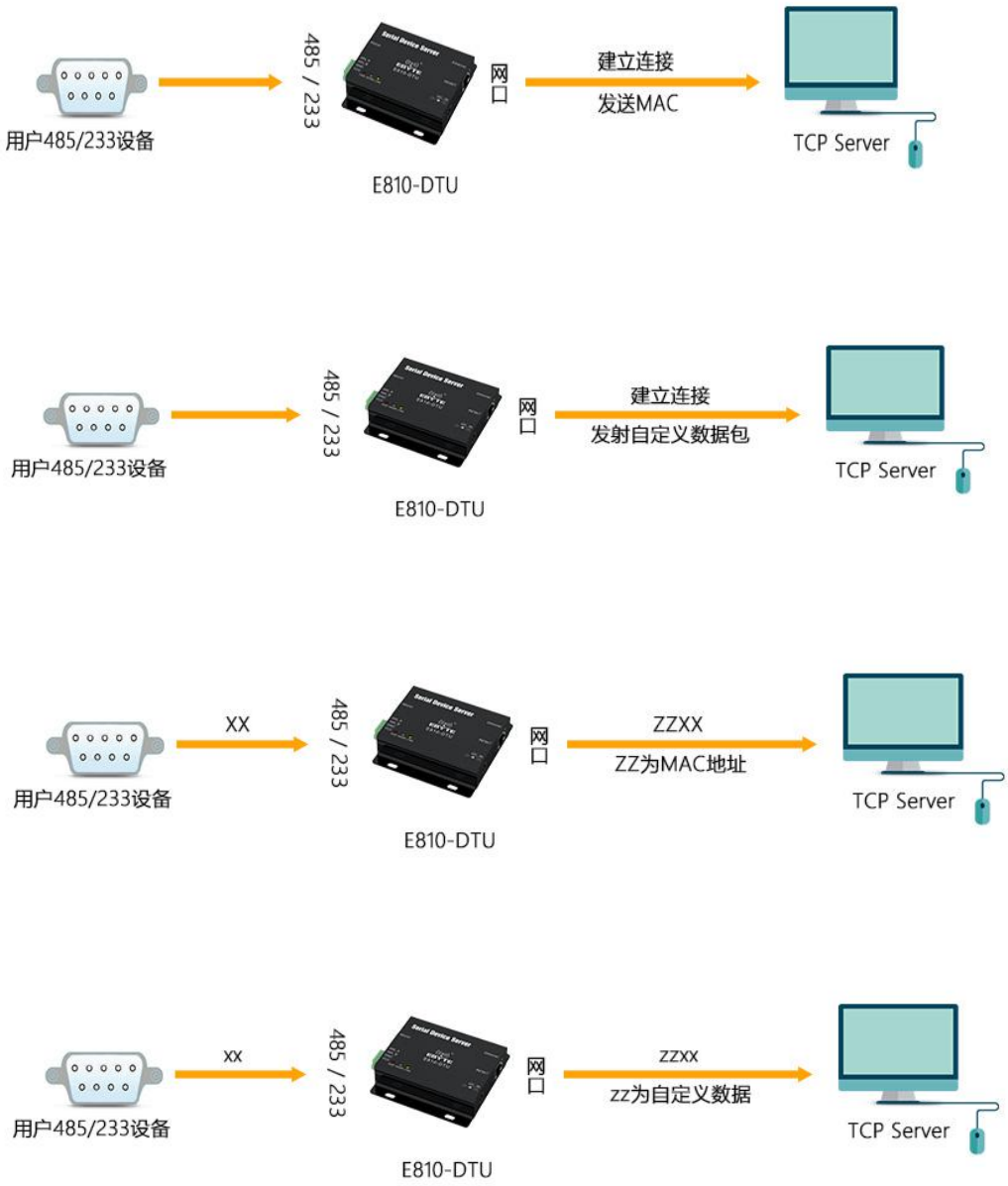
3.4.3 Registration package function

In the network transparent transmission mode, the user can choose to have the module send a registration package to the server. The registration package is for the server to recognize the data source device or as a password to obtain the server function authorization. The registration package can be sent when the module establishes a connection with the server, or can be spliced into the registration package data at the forefront of each data packet as a data packet. The data of the registration package can be a MAC address or a custom registration data, wherein the custom registration package setting content is up to 40 bytes.

The connection sending registration package is mainly used to connect the servers that need to be registered.

Data carrying registration package: The sending data accesses the registration package at the front end of the data, and is mainly used for protocol transmission.

The registration mechanism is only applicable to TCP client and UDP client, which is invalid under TCP server and UDP server.



3.4.4 Transparent cloud function

The transparent cloud function mainly solves the open platform of data interaction between devices and devices, devices and host computers, devices and servers. The user can enable the transparent cloud function through instructions, and register and exchange data according to the related usage methods of the Ebyte cloud platform. For details, please refer to the "Ebyte Cloud Platform Transparent Transmission Guide".

3.4.5 Short connection function

TCP short connection is mainly used to save server resources and is generally used in multi-point to one-point scenarios. With short connections, you can ensure that the existing connections are useful connections and do not require additional controls for filtering.

The TCP short connection function is applied to the TCP Client mode. After the short connection function is enabled, to send the message, If there is no data reception in the serial port or network port within the set time, the connection will be automatically disconnected. The short connection function is turned off by default, and the disconnection time can be set after the function is turned on. The setting range is 2~255S.

3.4.6 KeepAlive function

Keep-Alive is the mechanism for detecting dead connections in a TCP connection. When the user does not send any data, the "Keep-Alive" information is periodically sent on the TCP link to maintain the idle link, avoiding dead connections and consuming unnecessary system resources. This setting is valid under TCP and the user can customize the Keep-Alive switch and other parameters.

Keepalive parameter introduction:

Time: How many seconds after the TCP link does not receive data packet transmission to start the probe packet;

Intv: Time interval between the previous detection message and the next detection message;

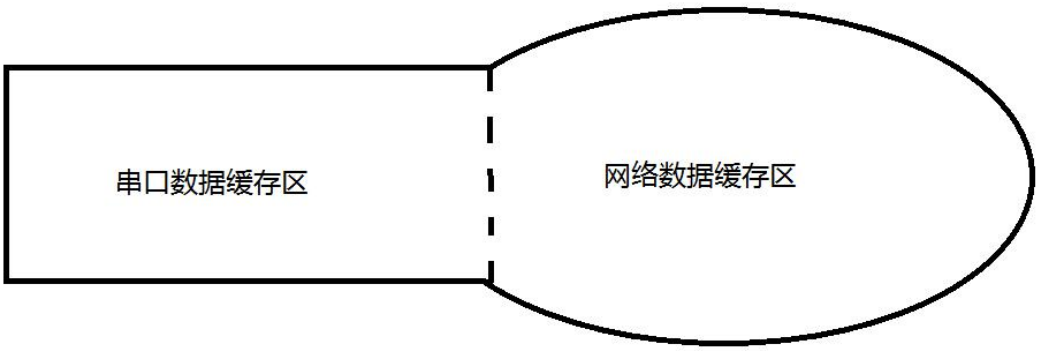
Probes: The maximum number of probe failures. When the sniffing fails to this number, the TCP connection will be disconnected.

3.4.7 Timeout restart function

The timeout restart (no data restart) function is mainly used to ensure long-term stable operation of the E810-TTL. When the network port or the network does not receive data for a long time, the E810-TTL will restart after the set time is exceeded to avoid anomalies affecting communications. The time of timeout restart can be set through the webpage. The normal working time of this function is set to 60~65535S, and the default value is 3600S. 0 is off, when the setting is out of range, it returns to the default value.

3.4.8 Clear cache

When the TCP connection is not established, the data received by the serial port will be placed in the cache area. The E810-TTL serial port receive cache is 2kbyte. After the TCP connection is established, the network cache data can be cleared according to the customer's requirements.



The device has two buffer areas, which are the serial data buffer and the network data buffer. When the SOCKET clear cache function is enabled, only the cache data of the relevant SOCKET link will be cleared, and the serial cache data will not be cleared.

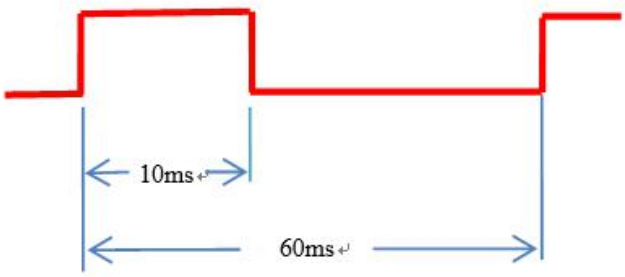
3.4.9 Modbus TCP to RTU function

The device supports Modbus RTU and Modbus TCP conversion function. After the function is enabled, the device receives the data and detects whether the data meets the Modbus RTU (Modbus TCP) protocol requirements. After the verification is successful, the Modbus RTU data is converted to Modbus TCP, and the Modbus TCP data is converted to Modbus RTU data.

3.4.10 Link/data transmission and reception indication function

Link indicates the network connection status of the module. In TCP mode, when the network is not connected, the Link is off, and when the connection is established, the Link is always on. The Link indicator is always on in UDP mode.

The other is the data transmission indication, which shows the transmission status of the serial port data of the module. When there is no data transmission on the serial port, the data transmission indicator is off. When there is data transmission on the serial port, the flashing indicates that the period is 60ms and the indicator is on for 10ms.



3.4.11 Restore factory settings

There are two ways to restore the factory settings of the module: software and hardware. In the hardware reset factory setting mode, pull down the factory default Restore pin for 5s to 15s, and then pull it high to restore the factory settings.

3.4.12 IoT Function

E810-TTL-ETH02 supports access to the MQTT platforms of Ali, Baidu, and ONENET, to establish a secure two-way connection between the device and the cloud, and then publish / subscribe transmission of messages to quickly implement the Internet of Things. Users do not need to care about the protocol itself, they only need to process the data transmission and reception.

Note: After the IoT platform is enabled, the parameters of socketA will be invalid and cannot be used. If the IoT platform is not used, please choose to turn off the IoT. The data communication between E810-TTL-ETH02 and cloud platform supports a maximum of 1000 bytes.

3.4.12.1 Ali Cloud

Log in to the web page, select Alibaba Cloud under the IoT platform under the main menu of advanced settings.

Product key: in the Alibaba cloud Internet of things platform console, you can create products and devices to obtain product keys. For example: a1ve0ijw6z1

Device name: The device name entered when adding the device. **Note: You can only enter numbers in English, and the length cannot exceed 20 bytes.**

Client ID: User-defined input. It is recommended to use the SN of the device. **Note: You can only enter numbers in English, and the length cannot exceed 20 bytes.**

Device key: In the Alibaba Cloud IoT platform console, create a product and device to get the device key. Such as: AHlmNjuaMCGJ1bFOjC4EZMZmHSUhzSEQ

Address: domain name connected to Alibaba Internet of things. For example: a1ve0ijw6z1.iot-as-mqtt.cn-shanghai.aliyuncs.com

Port: Alibaba Internet of things port. Such as: 1883

Subscription subject: such as / a1ve0ijw6z1 / mqtt_test / user / get

Release topic: such as / A1Ve0iJW6z1 / MQTT_TEST / user / update

Post message level: Qos: 0 or Qos: 1

3.4.12.2 Baidu cloud

Log in to the web page, select Baidu Cloud in the IoT platform under the main menu of advanced settings.

Device name: the name entered when creating a new object shadow. **Note: only digital English can be input, and the length cannot exceed 20 bytes.**

Username: name in the object shadow connection configuration. Such as: Un2d6cs / E810MQTT

Key: The key in the shadow connection configuration. Such as: s9mMzByp4Mpryphq

Address: domain name connected to Baidu Internet of things. Such as: un2d6cs.mqtt.iot.gz.baidu.com

Port: Baidu IoT port. Such as: 1883

Subscription subject: Such as: $Baidu / IOT / general / get

Release topic: Such as : $ baidu / iot / general / update

Post message level: Qos: 0 or Qos: 1

3.4.12.3 Ebyte Cloud

The transparent cloud function platform is mainly a platform for data interaction between equipment and equipment, equipment and host computer, equipment and server. The user can enable the transparent cloud function through instructions, and register the device and interact with the data according to the related usage method of the Ebyte cloud platform. For more details, please refer to the "Ebyte Cloud Platform Transparent Transmission Guide".

3.4.12.4 ONENET

Log in to the web page, select onenet from the Internet of things platform under the advanced settings main menu. Note: onenet creates products with multi protocol access.

Device ID: such as: 511986588

Product ID: such as: 286258

Authentication information: Custom input when creating a device. Such as: Ebyte

Address: domain name of onenet Internet of things. Such as: mqtt.heclouds.com

Port: ONENET IoT port. Such as: 6002

Subscription topics: such as IOT / general / get

Post a topic: such as: iot / general / update

Post message level: Qos: 0 or Qos: 1

4. Quick use

4.1 Introduction of upper computer

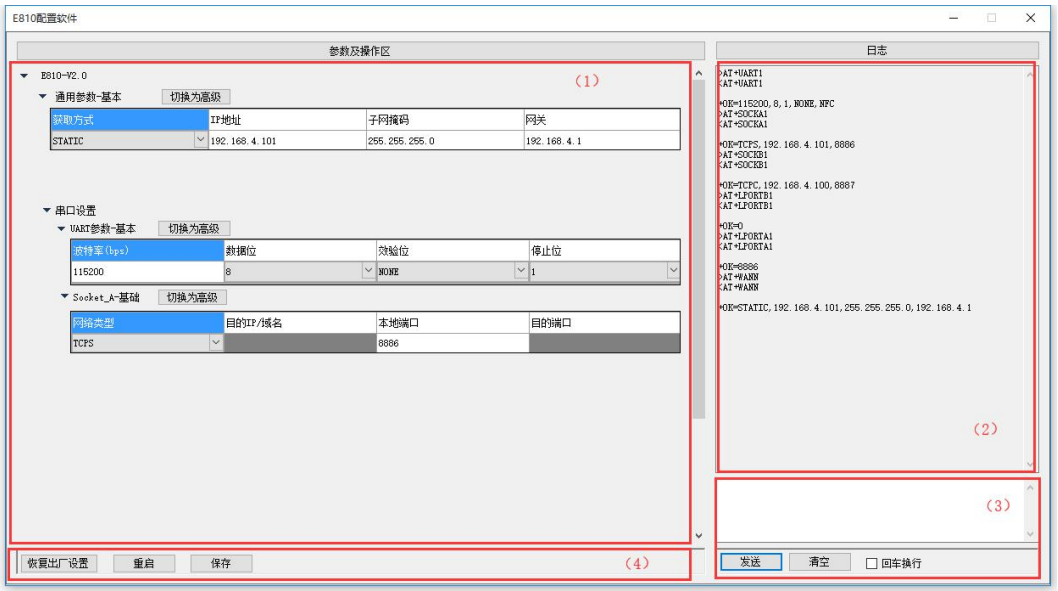
1. Search interface：

(1)Function menu area;

(2)Search device class table area.

Note: E810-TTL module supports cross network segment configuration. It is not necessary to set the PC side to be the same as the module IP address segment during configuration. However, when performing UDP/TCP communication on a LAN, the IP address segment must be the same, otherwise communication will fail.

2. Double-click the device to be configured and enter the parameter configuration interface.



(1)Parameter configuration area;

(2)Log display area;

(3)Custom data / command sending area;

(4)Special function operating area.

Note: After configuration of the upper computer, click Save to restart the module.

4.2 Default parameters

IP acquisition type	STATIC
IP address	192.168.4.101
Subnet mask	255.255.255.0
Gateway	192.168.4.1
DNS	61.139.2.69
Standby NDS	192.168.4.1
Serial port parameters	115200,8,NONE,1,NFC
Serial port packing time	10 （ms）
Package length of serial port	1460 （byte）
Socket A1 basic parameters	TCPS,192.168.4.101,8886
Socket A1 Heartbeat package mode	NET
Socket A1 Heartbeat package content	0（s), Turn off heartbeat package function
Socket A1 Registration package mode	heartbeat msg
Socket A1 Registration package time	Close
Socket A1 Register package content	regist msg
Socket A1 Short connection time	0（s），Turn off short connection
Socket A1 keepalive parameter	time/inteval/probes = 10（s）/5（s）/30（times）
Socket A1 Clear cache function	OFF，close
Socket B1 basic parameters	TCPC,192.168.4.100,8887
Socket B1 Heartbeat package mode	NET
Socket B1 Heartbeat packet time	0（s）,Turn off the heartbeat package function
Socket B1 Heartbeat package content	heartbeat msg
Socket B1 Registration package mode	close
Socket B1 Registration package content	regist msg
Socket B1 Short connection time	0（s）, Turn off short connection
Socket B1 keepalive parameter	time/inteval/probes = 10（秒）/5（秒）/30（次）
Socket B1 Clear cache function	OFF,close
Cloud transmission switch	OFF, close
Tcp server Maximum allowed connections	6
Intranet discovery port	1901
Intranet discovery password	www.cdebyte.comwww.cdebyte.com

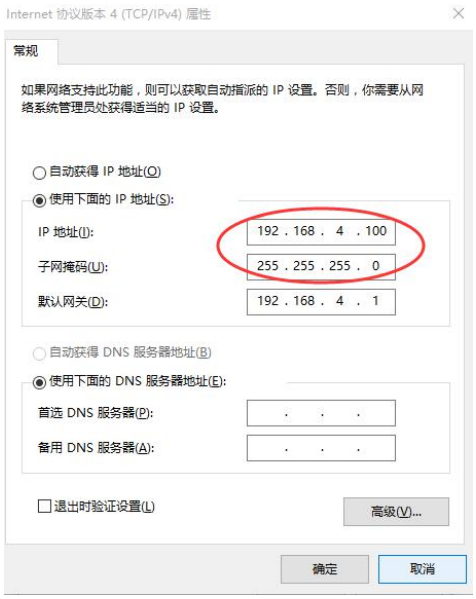
Web page port	80
Web login user name / password	admin/admin
Instruction echo display	OFF, close
Timeout restart time	3600（s）

4.3 SOCKET instructions

Preparation before use:

1. Set the IP address of the PC to be the same as the E810-TTL module and the PC. The subnet mask is the same. For example, the IP of the PC is 192.168.4.100, and the IP of the module is 192.168.4.101.

PC side configuration:



Module side configuration:

4.3.1 TCP Client Instructions

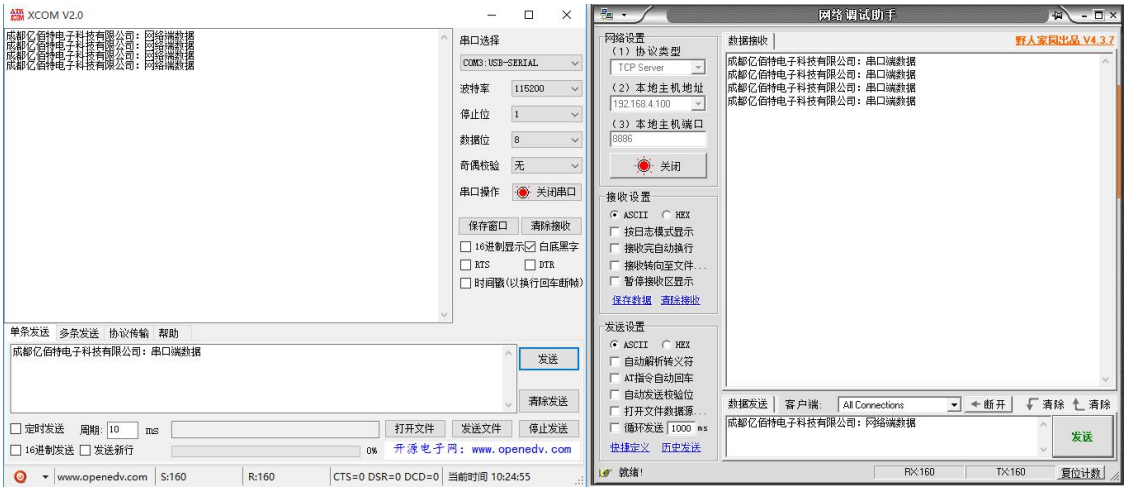
1. Open the PC network debugging assistant. Take "savage network debugging assistant" as an example, set the protocol type to TCP server, local IP and port to 192.168.4.1008886 respectively.

2. Set the device socket A1 network type to TCPC (TCP client), the destination IP is 192.168.4.100, the local port is 0 (random port), and the destination port is 8886. Click Save to restart the module.

Socket_A-基础 切换为高级

网络类型	目的IP/域名	本地端口	目的端口
TCPC	192.168.4.100	0	8886

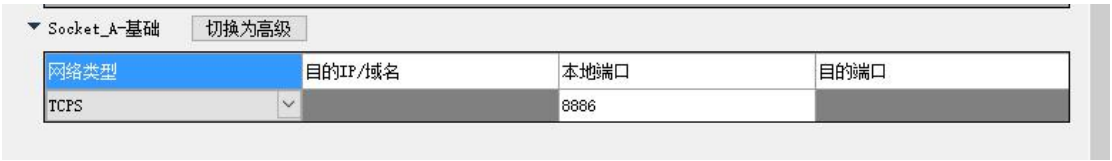
3. Open the serial port assistant, select the correct COM port and baud rate, wait for the device to connect to the TCP server, and conduct the communication test with the "network debugging assistant".



4.3.2 TCP server instructions

1. Set "network debugging assistant" to TCP client, remote host IP to 192.168.4.101, and remote host port number to 8886.

2.Set the device socket A1 network type to TCPS (TCP server) and local port 8886. Click Save to restart the module.



3. Open the serial port assistant, select the correct COM port and baud rate, and click "network debugging assistant" to connect. After connecting the device, carry out the communication test.

4.3.3 UDP client instructions

1. Set "network debugging assistant" to UDP (this upper computer does not distinguish between UDP client and UDP server), local host IP to 192.168.4.100, and local host port number to 8887.

2. Set the device socket A1 network type to udpc (UDP client), the target IP is 192.168.4.100, and the target port is 8887. Click Save to restart the module.

网络类型	目的IP/域名	本地端口	目的端口
TCPC	192. 168. 4. 100	8886	8887

3. Open the serial port assistant, select the correct COM port and baud rate, and click "network debugging assistant" to open it for communication test.

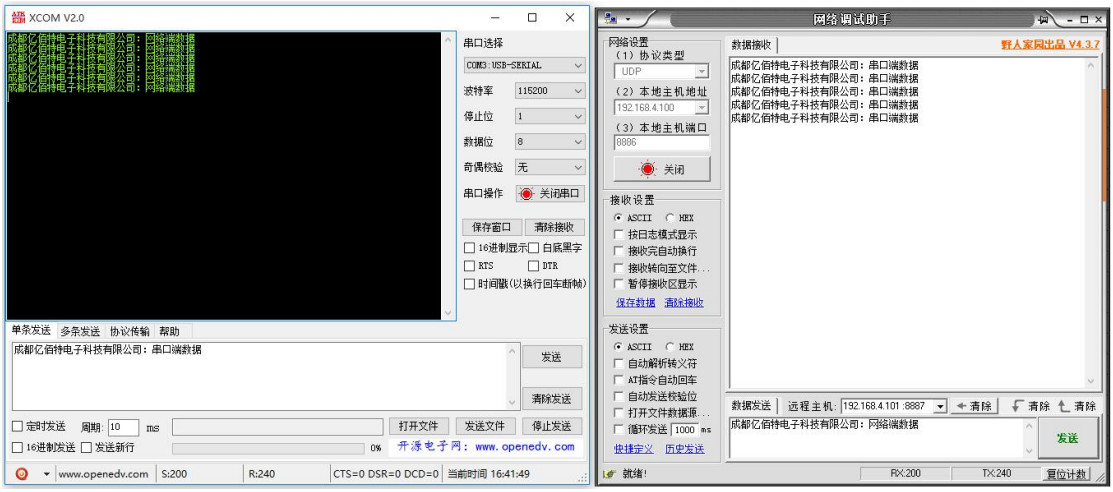
4.3.4 UDP Server Instructions

1. Set the "network debugging assistant" to UDP (this upper computer does not distinguish between UDP client and UDP server), the local host IP to 192.168.4.101, the local host port number to 8886, and the remote host to 192.168.4.101:8887.

2. Set the device socket A1 network type to UDPs (UDP server), local IP to 192.168.4.100, and local port to 8887. Click Save to restart the module.

网络类型	目的IP/域名	本地端口	目的端口
UDPS	192.168.4.100	8887	8886

3. Open the serial port assistant, select the correct COM port and baud rate, and click "network debugging assistant" to open it for communication test.

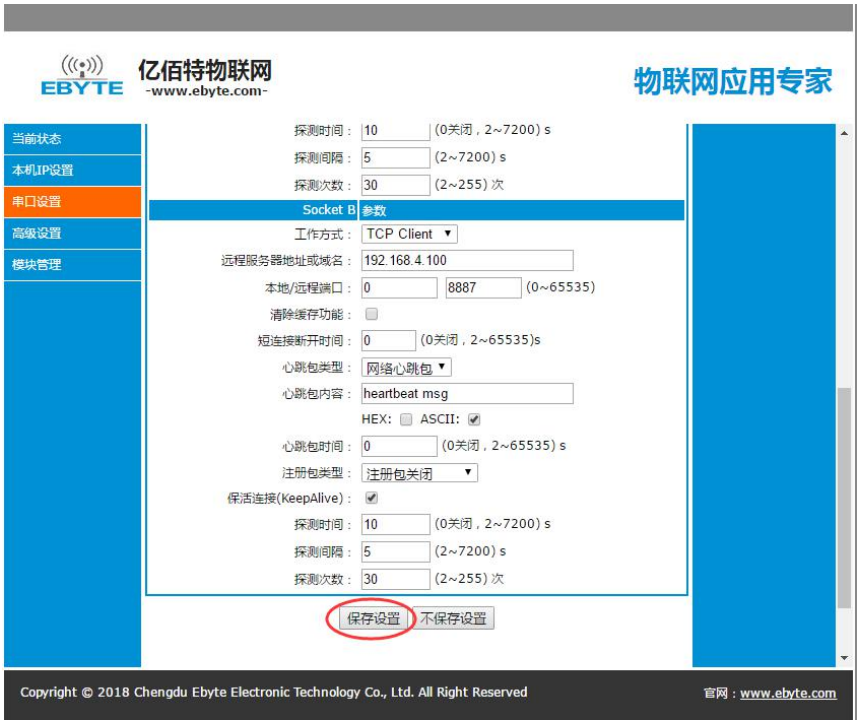


4.4 WEB introduction

The module supports web page configuration. The user can input the module IP address and port (the default port of the browser is 80) through any browser. After the login is successful, the web page is entered. as the picture shows:

Select one or more pages to browse and configure parameters according to specific needs (take serial port parameters as an example).

Once you have filled in the parameters correctly, click Save Settings.



The page will automatically jump to the module management page. After clicking restart module, the module will restart and the set parameters will take effect.

5. FAQ

5.1 Communication range is too short

- The communication distance will be affected when obstacle exists.
- Data lose rate will be affected by temperature, humidity and co-channel interference.
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground.
- Sea water has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea.
- The signal will be affected when the antenna is near metal object or put in a metal case.
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance).
- When the power supply at room temperature is lower than the recommended low voltage, the lower the voltage is, the lower the transmitting power is.
- Due to antenna quality or poor matching between antenna and module.

5.2 Module is easy to damage

- Please check the power supply and ensure it is within the recommended range. Voltage higher than the peak will lead to a permanent damage to the module.
- Please check the stability of power supply and ensure the voltage not to fluctuate too much.
- Please make sure anti-static measures are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range for some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

5.3 High bit error rate

- There are co-channel signal interference nearby, keep away from interference sources or modify frequency, channel to avoid interference.
- The clock waveform on the SPI is not standard. Check whether there is interference on the SPI line. The SPI bus line should not be too long.
- Unsatisfactory power supply may also cause garbled characters, and ensure the reliability of the power supply.
- If the extension cable or feeder is of poor quality or too long, the bit error rate will be high.

6. Revision history

Version	Date	Description	Issued by
1.0	-	Original version	huaa
1.1	2019-9-2	Content added	Lyl
2.0	2019-11-12	Product Upgrade	Blue

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