E103-W03 Instruction Manual

CC3220R 2.4GHz WiFi serial port module



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Chengdu Ebyte Electronic Technology Co.,Ltd.

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Chapter 1 Overview

1.1 Introduction



E103-W03 is an ultra-low power serial port to Wi-Fi module, SMD small-volume package, PCB antenna, working in the 2.4~2.484GHz frequency band. The module can use the serial port to send and receive data, lowering the threshold of wireless applications.

The E103-W03 module is developed by Chengdu Ebyte Electronic Technology Co., Ltd. based on TI's CC3220R chip. The module integrates the transparent transmission function, which can be used out of the box and supports the serial port AT command set. Users can use the network access function through the serial port. It is widely used in wearable devices, home automation, home security, personal health care, smart home appliances, accessories and remote controls, automotive, lighting, industrial Internet and other fields.

E103-W03 module supports standard IEEE802.11b/g/n protocol and complete TCP/IP protocol stack, supports STA/AP network role, supports multiple network working modes, supports SmartConfig, serial port transparent transmission, power-on transparent transmission and other functions , after a simple configuration, the network access function can be realized very conveniently, minimizing the developer's work and project development time.

1.2 Features

- Support IEEE802.11 b/g/n standard;
- Support AP, STA, WIFI Direct 3 working modes
- Support WEP/WPA/WPA2 multiple WIFI security authentication methods;
- Support TCP/UDP/HTTP/MQTT multiple network communication protocols;
- Support TSL/SSL secure transmission mode;
- Support up to 4 Socket connections;
- AP access point supports 4-way STA device connection;
- Support mDNS, DNS-SD, DHCP network service package;
- Support WEB page parameter configuration;
- Support NTP network time acquisition (under the premise of Internet access);
- Support disconnection automatic reconnection;
- Support high-speed transmission, the highest support serial port 3M baud rate transmission;
- Support multiple power consumption mode switching;
- Support WIFI idle connection (LDPS);
- Support MQTT network protocol (Alibaba Cloud, Baidu Cloud, OneNet)
- Support WebSocket connection;
- Support HTTP Client

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- Support TCP SERVER, TCP CLIENT, UDP communication mode;
- Support custom registration package, custom heartbeat package function;
- Support socket distribution protocol;
- AT command configuration;
- Support remote command configuration;
- Support Smartconfig fast distribution network;
- Support transparent multi-channel protocol transmission and broadcast transmission;
- Support pins to restore default parameters
- Support modebus protocol conversion (RTU and TCP)
- Support static IPv4 address allocation
- Support scanning nearby AP information

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Chapter 2 Specifications

2.1 Limit parameters

Main Parameters	Performance		Remark
	Min. Value	Max. Value	
Power supply voltage (V)	0	3.6	Exceeding 3.6V will permanently burn the module
Blocking power (dBm)	-	10	Less chance of burning when used at close range
Working temperature (℃)	-40	+85	Industrial Grade

2.2 Working parameters

Main Parameters		Performance			Remark
		Min.	Typical	Max.	
Working voltage (V)		2.3	3.3	3.6	Recommended 3.3V power supply
Communication level (V)			3.3		-
Working temperature (℃)		-40	-	+85	Industrial Design
Working frequency band (Hz)		2.412 G	2.442 G	2.472 G	2.4G frequency band
Power Consumption	Maximum transmit power (dBm)	17	18	18.5	Test 2.412GHz
	Maximum emission current (mA)	257mA	260mA	268mA	Instantaneous power consumption, DSSS 1Mbps, 3.3V power supply
	Receive current (mA)	-	78mA	-	Received average power consumption (2.412GHz)
	Sleep current (μA)	-	12uA	-	Sleep. SOP1 floating or pulled low

2.3 Electrical parameters

No.	Parameter Name	Parameter Value	Note
1	RF chip	CC3220R	TI
2	Module Size	27 * 19 * 2.7mm	
3	Average Weight	2.2g	
4	PCB technology	4 layers	Impedance debugging
5	Working frequency	2.4 ~ 2.484 GHz	
6	Production Process	Lead-free process, machine-mounted	Wireless products must be machine-attached to ensure batch consistency and reliability
7	Interface	1.27mm	SMD
8	Supply Voltage	2.3 ~ 3.6V DC	Note: Voltage higher than 3.6V will cause permanent damage to the

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			module
9	communication level	maximum 3.6	Recommended to be less than 0.3V from supply voltage to reduce power consumption
10	Measured distance	160m	Module to module communication, clear and open, maximum power, height 2m, PCB antenna
		180m	The module communicates with the mobile phone, clear and open, maximum power, height 2m, PCB antenna
11	Transmit power	18dBm	about 100mW
12	AT support	Built-in intelligent processing	Configuration parameters can be set or read through AT commands
13	Wi-Fi version	802.11 b/g/n	
14	Communication Interface	UART serial port	
15	Antenna form	PCB Onboard Antenna/IPX Socket	50Ω characteristic impedance, can be changed by yourself
16	Operating temperature	-40 ~ +85℃	Industrial grade (chip range, please modify according to crystal parameters)
17	Working humidity	10% ~ 90%	relative humidity, non-condensing
18	Storage temperature	-40 ~ +85℃	Industrial grade

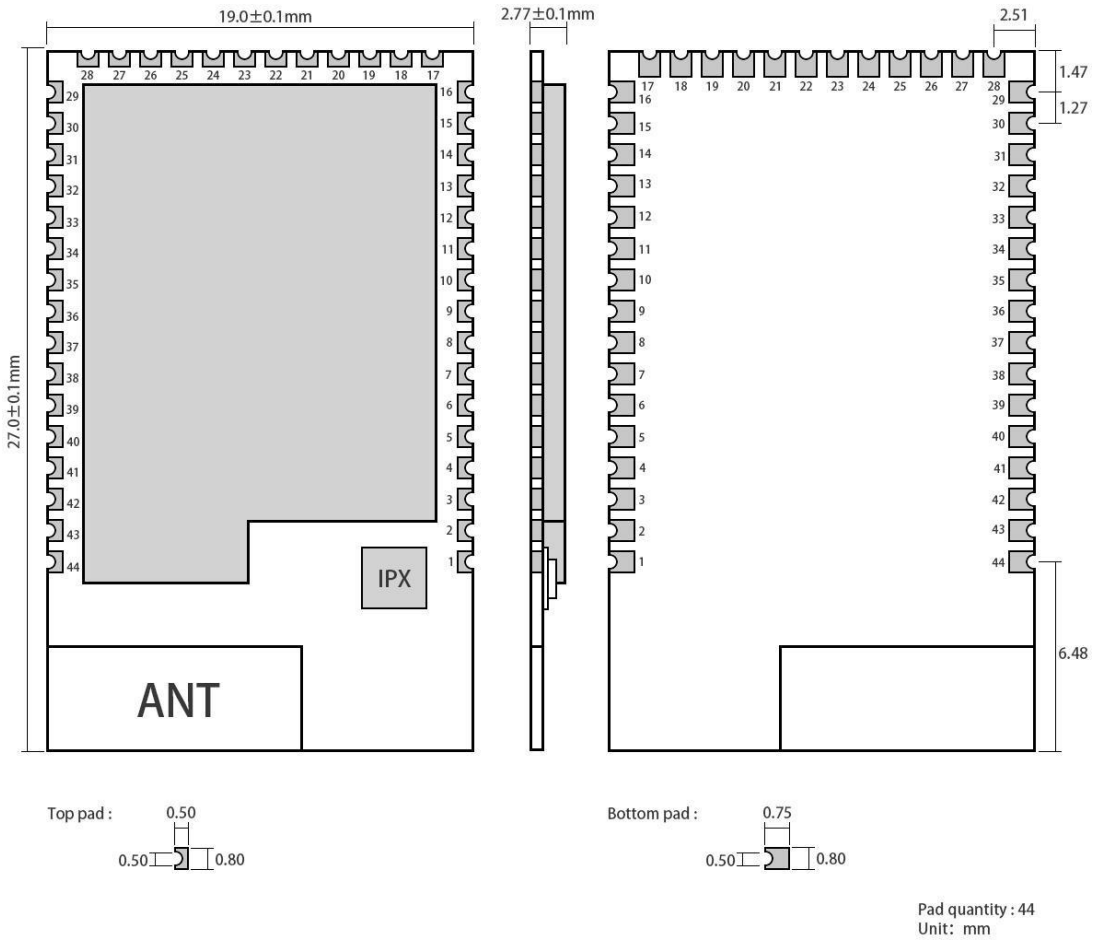
2.4 Electrical characteristics

Parameter		Min. Value	Typical value	Max. Value	Unit
Storage temperature range		-40	normal temperature	85	℃
working voltage		2.3	3.3	3.6	V
Any IO	VIL/VIH	-0.5/0.65VDD	-	0.35VDD/VDD+0.5	V
	VOL/VOH	N/2.4	-	0.4/N	
	IMAX	-	-	3.5	mA

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Chapter 3 Mechanical Dimensions and Pin Definitions



Pin number	Pin definition	I/O	Function and Instructions
1、8、9、11、12、13、16、17、28、29、44	GND		power ground
2	GPIO26	IO	Common IO port
3	GPIO27	IO	Common IO port
4	RST	I	Module reset pin, low level reset, low level duration greater than or equal to 2ms.
5	SOP2	I	Programming emulation mode selection. The SOP2 pin has a built-in 2.4K pull-down resistor; when in use, an external pull-up resistor 100R is required to pull the pin level high. Normal operation is low.
6	SOP1	I	Programming emulation mode selection. When in use, an external pull-up resistor 1M is required to pull the pin level high. Normal operation is low.
7	SOP0	I	Programming emulation mode selection. The SOP0 pin has a built-in 100K pull-down resistor; when in use, an external pull-up resistor 10K is required to pull the pin level high. Normal operation is low.
10	VCC		Device power supply VDC: 2.4V~3.6V (above 300mA)

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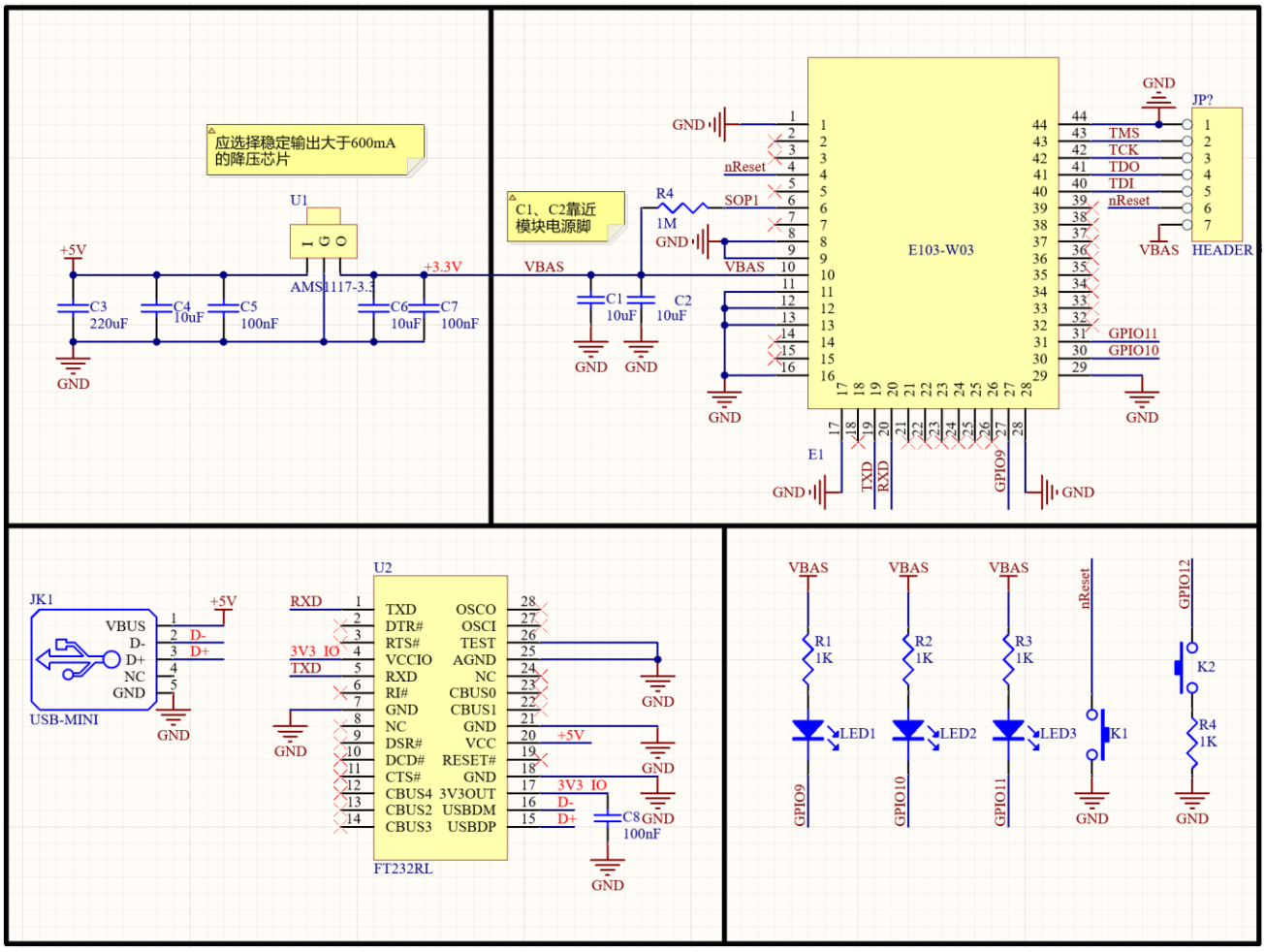
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14	GPIO31	IO	Common IO port
15	GPIO0	IO	Common IO port
18	GPIO30	IO	Common IO port
19	GPIO1	O	UART serial port output pin, support AT command
20	GPIO2	I	UART serial port input pin, support AT command
21	GPIO3	IO	Common IO port
22	GPIO4	IO	Common IO port
23	GPIO5	IO	Common IO port
24	GPIO6	IO	Common IO port
25	GPIO7	IO	Common IO port
26	GPIO8	O	Abnormal indicator light INDICATE, abnormal output low, normal output high.
27	GPIO9	O	Wifi connection status indicator, connected output is low, not connected output is high.
30	GPIO10	O	Network connection status indicator, the connected output is low, and the unconnected output is high
31	GPIO11	O	Smartconfig status indicator, low when entering the state, high when not entering the state
32	GPIO12	I	Restore factory settings pin, active low. Keep low level for 3 seconds or more when power on. No need to reboot again.
33	GPIO13	I	WAKEUP wakeup pin
34	GPIO14	IO	Common IO port
35	GPIO15	IO	Common IO port
36	GPIO16	IO	Common IO port
37	GPIO17	IO	Common IO port
38	GPIO22	IO	Common IO port
39	GPIO28	IO	Common IO port
40	TDI	I	JTAG emulation pin
41	TDO	O	JTAG emulation pin
42	TCK	I	JTAG emulation pin
43	TMS	IO	JTAG emulation pin

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Chapter 4 Recommended Connection Diagram



Notice:

1. The power supply must be guaranteed at 2.3V~3.6V. In order to ensure the stable operation of the module, the RF transmission power will be affected by factors such as the response speed of the LDO. If there is a high requirement for the communication distance, it is recommended to select an external LDO with a power supply capacity greater than 600mA powered by.

2. The RXD/TXD of E103-W03 are respectively connected to the MCU_TXD/MCU_RXD of the external MCU.

3. When powering on, the SOP1 pin needs to be connected to a 1M pull-up resistor, and SOP0 and SOP2 are connected to a pull-down resistor (the module has already connected SOP0 and SOP2 to the pull-down resistor, so it will not be processed here). Otherwise it will not work properly.

4. If secondary development is required, the connection mode of SOP0, SOP1, and SOP2 pins is also recommended to be 010. For other modes, please refer to the relevant development manual of CC3220R and choose the mode by yourself.

5. If there is a high requirement for low power consumption, it is recommended to cancel the pull-up of SOP1 and connect it to the IO port of the microcontroller. It only needs to pull the module high at the moment of power-on, and pull SOP1 low after the module works normally. At this time, the sleep current can be reduced by about 3.3uA when the power consumption is low.

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Chapter 5 Function Description

The working mode of this module is divided into three levels: working role; transmission mode; service category.
From the perspective of the role of the WiFi layer, it can be divided into Access Point, which is commonly referred to as an AP access point, Station, which is commonly referred to as a station, and WiFI-Direct is also called P2P or WiFi direct connection;
In terms of transmission mode, it is divided into single-mode transparent transmission and protocol transmission;
From the service category, it is divided into TCP Server, TCP Client, UDP, MQTT, HTPP client.

5.1 Job roles

Job roles are defined based on the perspective of the WiFi physical layer.

5.1.1 Access Point (AP mode)

Access Point, referred to as AP mode, is similar to a router, allowing wireless devices to connect and establish server, client, and UDP communications based on TCP/IP. In this mode, 4 stations are supported, and a maximum of 4 Tcp socket transmissions are supported. The command AT+MODE=1,x,x sets the first bit to 1 to configure the module to work in the role of AP.

5.1.2 Station (STA mode)

The Station mode is referred to as STA. The module under this role does not provide connection, but can only be connected to Access Point or router. This module under the role of Station supports TCP server, TCP client, UDP, and supports a maximum of 4 sockets. MQTT, WebSocket, HTTP clinet are also supported. The instruction AT+MODE=2,x,x sets the first bit to 2, to configure the module to work in the STA role.

5.1.3 WiFi Direct (P2P mode)

WiFi Direct mode is a way to directly establish a point-to-point connection without routing, also called P2P, which is similar to Bluetooth but the transmission rate is significantly higher than Bluetooth. The instruction AT+MODE=3,x,x sets the first digit to 3 to configure the module to work in WiFi Direct mode.
There are two roles in P2P mode: Client; GroupOwner.

5.2 Transmission mode

To be precise, the transmission mode refers to the number of sockets supported by the module under the TCP/IP protocol. When only one socket is supported, we define it as single-mode transparent transmission, and when it supports multiple sockets, we define it as protocol transmission. It should be noted that the transmission mode parameter does not take

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effect for WiFi-Direct.

5.2.1 Transparent transmission

Transparent transmission means that when only one socket is supported, data from either the serial port or the network is sent directly without any format. Instruction AT+MODE=x.1,x sets the second bit to 1 to configure the module to work in transparent transmission mode.

5.2.2 Protocol Transmission

When multiple sockets are supported, in order to distinguish the source and destination of data, we define it as protocol transmission, which includes designated sending and broadcast sending.

5.2.2.1 Specified sending

The specified sending means that the data packet input to the serial port contains a unique socked ID number, and the module transmits the data to the corresponding socket connection according to this ID number.

Fixed head	Socket ID	Data
3 Byte	1Byte	N Byte

Fixed head： 0xAA 0xFE 0x55

Socket ID：

0x00, representing the discovery of Socket 0 link

0x01, representing the discovery of Socket 1 link

0x02, representing the discovery of Socket 2 link

0x03, representing the discovery of Socket 3 link

Data： Application Payload

For example: AA FE 55 00 AA BB CC In protocol transmission mode, send AA BB CC to Socket 0 through the serial port

5.2.2.2 Broadcast sending

When the Socket ID is 0xff, it means broadcasting. If 4-way connections are established, the data will be sent to the 4-way sockets at the same time, otherwise, the data will be sent to the established connections.

5.2.2.3 Protocol reception

Fixed head	Socket ID	Length	Data
3 Byte	1Byte	2Byte	N Byte

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Fixed head:

0xAA 0xFE 0x55

Socket ID：

0x00, representing the discovery of Socket 0 link

0x01, representing the discovery of Socket 1 link

0x02, representing the discovery of Socket 2 link

0x03, representing the discovery of Socket 3 link

Length：

Application data actual length value, range: 0~1000

Data：

Application Payload

For example: AA FE 55 00 00 03 11 22 33 In protocol mode, the 3-byte data received from Socket0 contains: 0x11 0x22 0x33

Use the command AT+MODE=x.2,x to set the second bit to configure the module to work in the protocol transmission mode.

5.3 Service Mode

The service mode refers to the network protocol supported by the module and the role of the module under the network protocol, that is, the server (server) and client (client), which are often referred to as server (server) and client (client). Here, UDP, MQTT, HTTP client, WebSocket, etc. are all included to this mode. Note that the service mode has no effect on the WiFi-Direct(P2P) role. Service mode includes the following.

5.3.1 TCP server

Let the module work as a TCP server. Use the command: AT+MODE=x,x,1 to set the third bit to configure the module to work in TCP server mode.

5.3.2 TCP client

Let the module work as a TCP client. Use the command: AT+MODE=x,x,2 to set the third bit to configure the module to work in TCP client mode.

5.3.3 UDP

In UDP mode, there is no distinction between server and client. Use the command: AT+MODE=x,x,3 to set the third bit to configure the module to work in UDP mode. In addition, there is no concept of connection in UDP mode, so the S_LINK pin will not be operated in the status indication.

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5.3.4 MQTT

In the MQTT mode, the module supports Alibaba Cloud, Baidu Cloud, OneNet and other IoT platforms. Enter the service parameters created on the platform into the module to communicate.

5.3.4.1 Alibaba Cloud

For network communication based on the Alibaba Cloud platform, you need to log in to Alibaba Cloud to obtain relevant parameters, which mainly include product key, device name, client ID and other information. For details, see Chapter 7 Alibaba Cloud Configuration Tutorial.

5.3.4.2 Baidu Cloud

For network communication based on Baidu Cloud platform, you need to log in to Baidu Cloud to obtain relevant parameters, mainly including device name, user name, password, etc. For details, see Chapter 7 Baidu Cloud Configuration Tutorial.

5.3.4.3 Onenet

For network communication based on the OneNet cloud platform, you need to log in to OneNet to obtain relevant parameters, mainly including device ID, product ID, authentication information, etc. For details, see Chapter 7 OneNet Configuration Tutorial.

5.3.5 HTTP Client

When using this function, you only need to configure the corresponding server resource symbol URL, and start a trigger request to obtain the resource that the server responds to. You don't need to care about the complicated HTTP protocol layer. For details, see Chapter 6 HTTP Client Configuration Tutorial.

5.3.6 WebSocket

The traditional HTTP transmission protocol is based on access and response. In this way, the server is always passive and cannot be applied to the application where the web client and the WEB server frequently interact. The application of the WebSocket function allows the E103-W03 module to communicate through the serial port. Real-time interaction with the webpage saves the GET and POST request process initiated by the HTTP client during multiple interactions, improves the response speed, and the module side can actively push data to the webpage. See Chapter 7 WebSocket Configuration Tutorial for details.

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5.4 Parameter configuration

There are three ways to configure parameters: AT command configuration based on serial port, remote AT configuration based on UDP, and web page configuration based on browser. For detailed operation, see Chapter 6 AT Command Description and Chapter 7 Tutorial.

5.4.1 Serial port AT configuration

When you need to use the serial port AT command to configure parameters, first send "+++" to enter the AT mode, and then operate according to the AT command in Chapter 6. After the configuration is completed, some commands will take effect immediately, and some commands will take effect after restarting. According to the instructions in the AT command chapter prevail. To exit AT mode, send command: AT+EXIT. Sending "+++" command at any time will enter AT mode. But AT+EXIT can only be used in AT mode, otherwise it is used as transmission data.

5.4.2 UDP remote configuration

UDP remote configuration is parameter configuration performed under the same network using network debugging tools, which can also be called air configuration. There are two ways to enter remote configuration: when the module is in AP mode, the PC is connected to the module; when the module is in STA mode, the PC and the module are connected to the same router. The module will always listen to a fixed UDP port 8009. When the module and the terminal are in the same network, set the corresponding IP and port to configure parameters. Remote configuration must be in AP mode or STA mode, after the network connection has been established. P2P mode does not support this function.

5.4.3 Browser-based web page configuration

The webpage configuration must ensure that the PC and the module are in the same LAN. There are two ways to enter the webpage configuration: the module is connected to the module from the PC in AP mode; the module is in STA mode, and the PC and the module are connected to a router. The PC accesses the IP address of the module through the browser, and accesses the static web page for parameter configuration.

5.5 Status indication

Status indication is to display the working status of the module through serial port printing or pin output level status.
Serial port indication: print "Entered AT mode" when entering AT command, print "Exited AT mode" when exiting AT command, print "ERR=x" when AT command is wrong, and return the set value if AT command is correct.
Pin indications include WiFi connection status indication, socket connection status indication and module abnormality indication. When the WiFi connection is established, the W_LINK pin outputs a high level, and if the connection is disconnected, the W_LINK pin outputs a low level. When the socket connection is established, S_LINK outputs a high level, and if the connection is disconnected, S_LINK outputs a low level.
The INDICATE pin remains low when the module is working normally. If the INDICATE pin of the module outputs a high level abnormally, the module needs to be restarted at this time.

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5.6 Low power consumption

The low power consumption of the module enables the module to enter the dormant state through command operation. After entering dormancy, it can be woken up through the pin. The way of waking up is to give the WAKEUP pin (ie GPIO_13) a rising edge, or the serial port receives data.

5.7 serial port 3M high-speed sending

Regarding high-speed transmission, you need to pay attention to the following issues:

1. The serial port chip must be a model that can support up to 3M baud rate. The test board of our company uses FT232 series
2. The serial port assistant software must be able to support up to 3M baud rate. The software used by our company for testing is XCOM2.6
3. Try not to connect the module to the PC through the USB converter, but directly connect to the USB3.0 port of the PC, otherwise it is easy to lose packets
4. The module can be connected with a computer or a mobile phone to achieve 3M speed transmission. However, when the module is connected to the module, it may be necessary to reduce the baud rate of the sending end. The specific reduction is limited by the influence of the connection distance and requires actual testing.

5.8 Heartbeat package, registration package

The heartbeat packet registration packet is a function only available in the TCP client mode. This module supports custom heartbeat packet data and registration packet data content..

5.9 Modbus protocol

This module supports Modbus protocol, which can realize free conversion between RTU and TCP. When using it, you only need to pass in data from the serial port, and the module will automatically recognize and convert it into data that conforms to the Modbus specification, and upload it to the network. Or convert the received network end data into data that conforms to the Modbus specification and output it from the serial port.

Note:

1. The Modbus supported by this module is only for data conversion and does not support actual functional operation. If you need to use this part of the function, please cooperate with the actual PLC device.
2. If the Modbus function is turned on, the protocol transmission will be invalid, that is, the protocol transmission is no longer data with a fixed format, and will be converted into data that conforms to the Modbus protocol standard.
3. Only the TCP server, TCP client, UDP, MQTT, WebSocket and P2P modes support the Modbus protocol, and the HTTP client does not support it. The reason is that the HTTP client is a short-connection communication method, and the server cannot actively initiate data exchange.

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5.10 Static IP

In STA mode, it can support setting static IP, which is convenient for communication with fixed IP. It should be noted that the static IP address must be in the same network segment as the target router or target AP, otherwise the IP cannot be allocated and cannot work normally. For example, if the target AP address is 192.168.1.1, then the static IP address must be set to 192.168.1.x. Otherwise, the IP address cannot be assigned normally, and the module cannot work. Static IP related parameters can only be set or queried in STA mode, other modes do not support corresponding AT commands.

5.11 Restore factory parameters of pins

This module will only actively detect the level status of GPIO12 pin within 3 seconds when it is powered on, and if it is low, the parameters will be restored to the factory default parameters. There is no need to restart when using it, and the GPIO12 pin will be set to low level after the parameters are successfully restored.

5.12 Scan nearby AP information

When the module works in STA mode, you can use the AT command to scan the nearby AP information, if there is, print the AP information through the serial port, the format is as follows:

Fixed head	SSID	MAC(BSSID)	channel	rssi
+scan:	Maximum 32 bytes	17 bytes	Maximum 3 bytes	Maximum 3 bytes
+scan:	TEST_ZW	14:AD:CA:AA:91:D6	4	-69

1. Scanning for nearby APs will only take effect in STA mode, when the connection mode is manual connection, and no wifi connection is established, otherwise it will return ERR=-5, indicating that this operation is not supported in this state.
2. Each parameter is separated by a comma ',' and ends with a carriage return (\r\n). MAC addresses (BSSID) are separated by a semicolon ':'
3. The module can only scan the AP information in the 2.4G frequency band. The channel of 2.4G is [1,13].
4. A maximum of 30 AP information can be scanned at a time.

5.13 Default parameters

Parameter category	Parameter name	Parameter value	Related instructions
Serial port	baud rate	115200	AT+UART
	digit	8	
	stop bit	1	
	Parity	none	
	serial timeout	40（ms）	
	Serial frame length	1000	
	working frequency	2.4G	

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RF parameters	channel		1	AT+RADIO
	transmit power level		0	
	CountryCode		CN	
AP role SSID parameter	SSID		E103-W03	AT+SSID
	Whether to hide SSID		0 (no)	
	encryption type		2（WPA2）	
	password		12345678	
Operating mode	job role		1	AT+MODE
	transfer mode		1	
	service mode		1	
Network IP address	IP address		192.168.1.1	AT+NETIP
	subnet mask		255.255.255.0	
	gateway address		192.168.1.1	
	server address		192.168.1.1	
P2P connection parameters	P2P scanning gap		20	AT+P2PDEVINFO
	P2P Role		0（client）	
	P2P local name		E103-W03WiFiDirectClient	
	P2P target name		E103-W03WiFiDirectGo	
P2P socket	P2P port		4001	AT+P2PSOCKET
	P2P address		192.168.1.1	
STA connection parameters	Target SSID		E103-W03	AT+STACON
	Encryption type		2	
	Password		ebyteW03	
	Connection Type		1	AT+CONTYPE
Local socket parameters	Local port		4001	AT+SVRPORTIP
	Local IP		192.168.1.1	
Remote socket parameters	Socket1	Port	4001	AT+SOCKET
		IP	192.168.1.1	
	Socket2	Port	4002	
		IP	192.168.1.1	
	Socket3	Port	4003	
		IP	192.168.1.1	
	Socket4	Port	4004	
		IP	192.168.1.1	
Heartbeat parameters	4 sockets are the same	Heartbeat type	0 (off)	AT+HEARTBT
		Heartbeat timeout	5 (unit: second)	
		Heartbeat data type	1 (string)	
		Heartbeat data	CDEBYTE-E103-W03-STRHT	
Registry Package Parameters	4 sockets are the	Registry package type	0 (off)	AT+REGISTER
		Registry	1 (string)	

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	same	Packet Data Type		
		Registry Package Data	CDEBYTE-REGISTER-PACK-STR	
NTP time	NTP time zone offset		480 (unit: minute) Beijing time	AT+NTPTIME
Modbus	Modbus enable		0 (Modbus off)	AT+MODBUS
Static IP	IP address		192.168.1.2	AT+IPSTATIC
	subnet mask		255.255.255.0	
	Gateway address		192.168.1.1	
	Server address		192.168.1.1	

Chapter 6 Tutorial

This module has many functions, and it needs to configure relevant parameters before using it, and then it can work normally.
In the following tutorials, the operations marked with * are mandatory, and please set according to your own needs when using other modes. Please refer to Chapter 6 for specific AT commands.

6.1 Basic TCP/UDP data transmission

Why is it called basic TCP/UDP data transmission, because this kind of data transmission is based on the transport layer under the TCP/IP protocol, which is the most basic data transmission layer. The data at this layer is not like MQTT, HTTP and other protocols. Complex network packets. For detailed instructions on this piece, please study by yourself.
Both the AP role and the STA role support data transmission, provided that the mandatory module and the target are under the same LAN. There are some differences between AP mode and STA mode. For example, AP mode supports multi-connection protocol transmission. In AP mode, there is no need to set the remote IP address in advance. This tutorial is based on the AT command of the serial port. The operations with * in each step are necessary operations, and the operations without * are non-essential operations that can be omitted. After opening the serial port debugging assistant, operate.
Data transmission is further divided into: data transmission with PC and data transmission with modules.

6.1.1 Communication with PC

6.1.1.1 Communication with PC's TCP server under AP role

Here is just an example, the other two communication in TCP mode also refer to this example (TCP server, UDP), just set different modes by AT+MODE command.
1. *Enter AT command mode

+++

2.*Set module role: AP, transmission mode: transparent transmission, service mode: TCP server;

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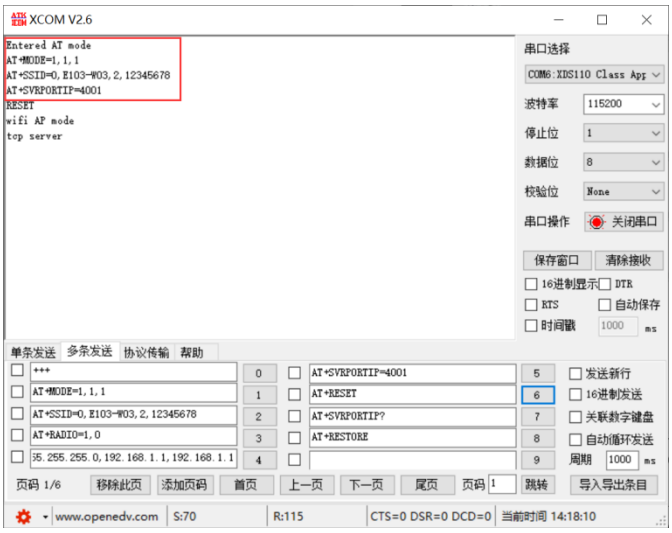
AT+MODE=1,1,1

3. Configure SSID related parameters (SSID is commonly known as WiFi name):

AT+SSID=0,E103-W03-TEST,2,12345678。

4. Set the port number:

AT+SVRPORTIP=4001



5. *After configuring the parameters, restart the module, find the SSID (WiFi hotspot name) set in the second step on the PC side called E103-W03 WiFi, enter the secret connection



6. *After the connection is successful, query the local IP and local port:

AT+ SVRPORTIP?

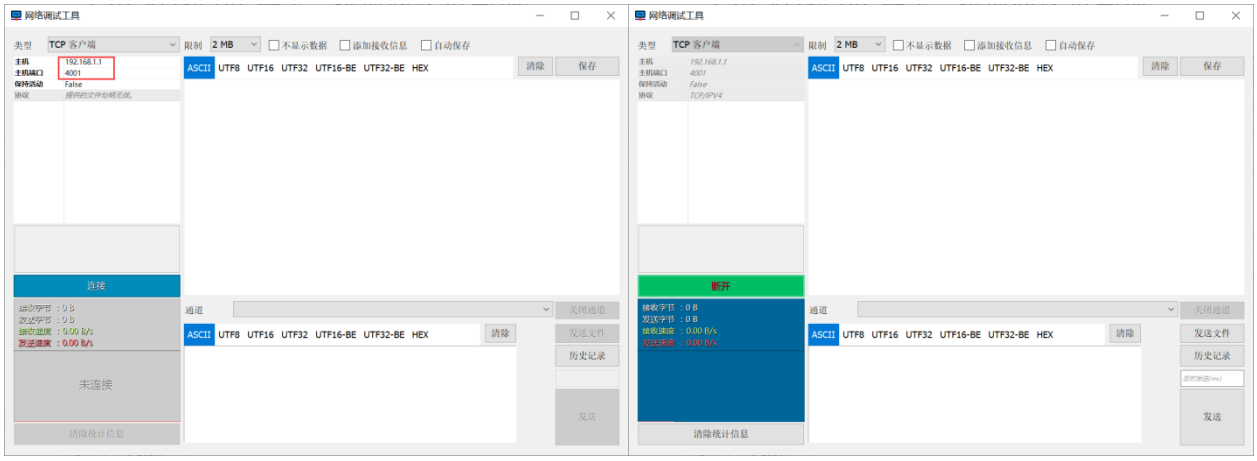
The return is as follows: AT+SVRPORTIP=4001,192.168.1.1



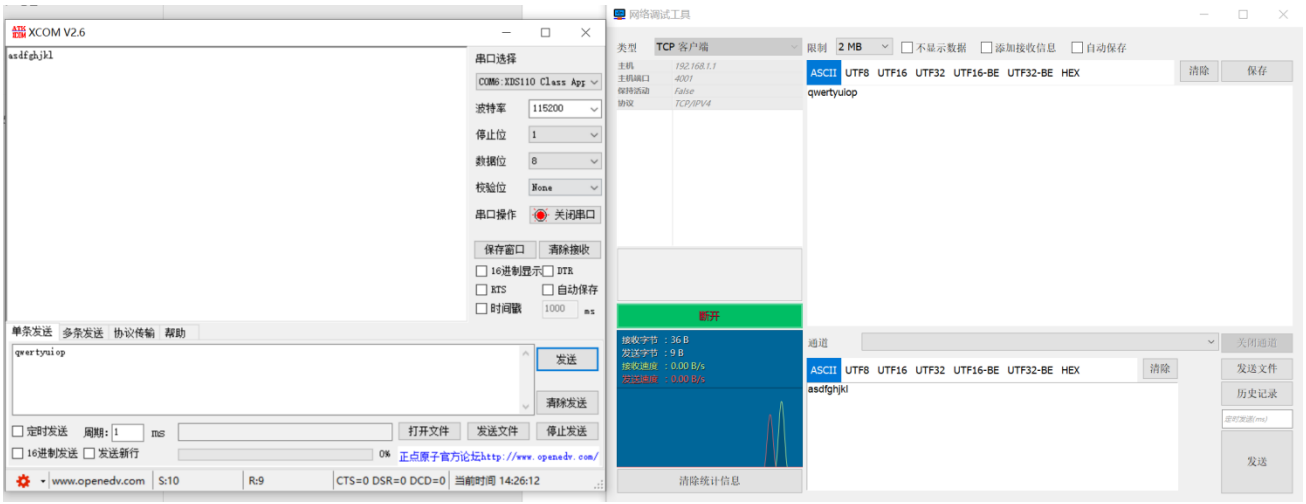
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7. * Open the TCP debugging assistant, because the module is a server, so create a client here, and enter the corresponding IP and port information in step 7, as shown in the figure:



8. * Communication, before communication, you need to pay attention that if the module is in AT mode, you need to exit the AT command, AT+EXIT



So far, the data transmission based on the AP mode is completed.

Other transmission modes and service modes are set based on this.

6.1.1.2 The STA role communicates with the TCP client of the PC

In order for the module to communicate with the PC under the role of STA, it is necessary to ensure that the PC and the module are in the same local area network. Here, the mobile phone hotspot is used as a tutorial, and a router can also be used. The other two TCP servers and UDP of STA also refer to this process, just set different modes through the AT+MODE command.

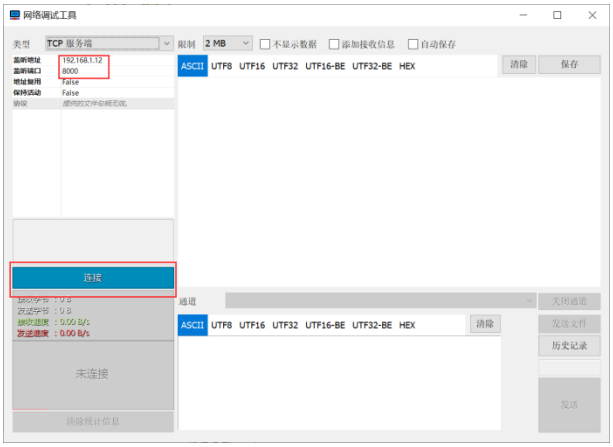
1. * Turn on the hotspot of the mobile phone, connect the PC to the hotspot, and find the IP address assigned to the PC by the hotspot. This step is very important. If the IP address is incorrect, communication will not be possible. (can also be connected to a router)

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2.* Open the TCP debugging assistant, create a TCP Server server, enter the IP address and custom port number of the PC, and start the server:



3.*Set the communication port and IP address (this step is very important, if the IP address is incorrect, you will not be able to communicate), fill in the remote IP address and port number, refer to the command: configuration, read SOCKET port, IP address:

AT+SOCKET=0,8000,192.168.1.12

4.* Set module role: STA, transmission mode: transparent transmission, service mode: client client

AT+MODE=2,1,2

5.* Set the connection target parameters. The parameters here are the hotspot name, password and encryption method set in the first step:

AT+STACON=ebyteW03,2,12345678

6.* Set the connection mode (connection is divided into manual, automatic, smartconfig), here choose automatic connection:

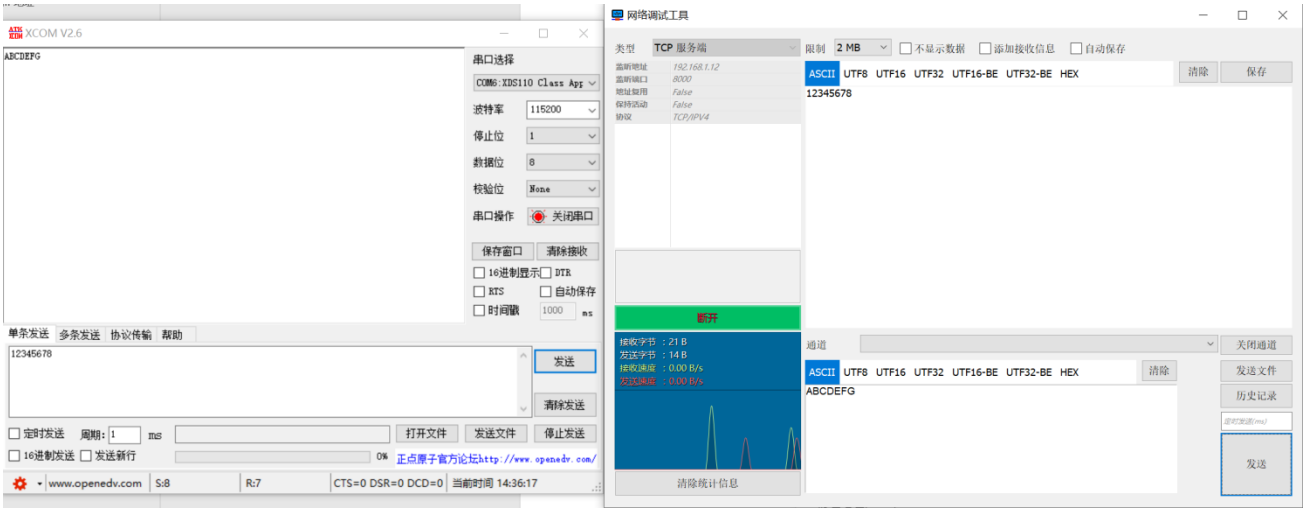
AT+CONTYPE=1

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7.Restart the module and wait for the module to connect to the hotspot and Tcp Server for data transmission



So far, the communication between the STA role and the PC has been established.

Note: Some mobile phones may not have the data forwarding function due to their own technical reasons, so you need to pay attention.

6.1.1.3 UDP protocol transmission under AP role

This example will demonstrate protocol transmission in AP mode.

1.* Set role: AP, transmission mode: protocol transmission, service type: UDP

AT+MODE=1,2,3

2.* Set the local port number

AT+SVRPORTIP=4001

3.* Set the UDP communication list, this step is to distinguish the source of UDP data, you can set 4 groups.

AT+SOCKET=0,4001,192.168.1.2

AT+SOCKET=1,4002,192.168.1.2

AT+SOCKET=2,4003,192.168.1.2

AT+SOCKET=3,4004,192.168.1.2

This is just for demonstration, and the actual value can be set according to the needs.

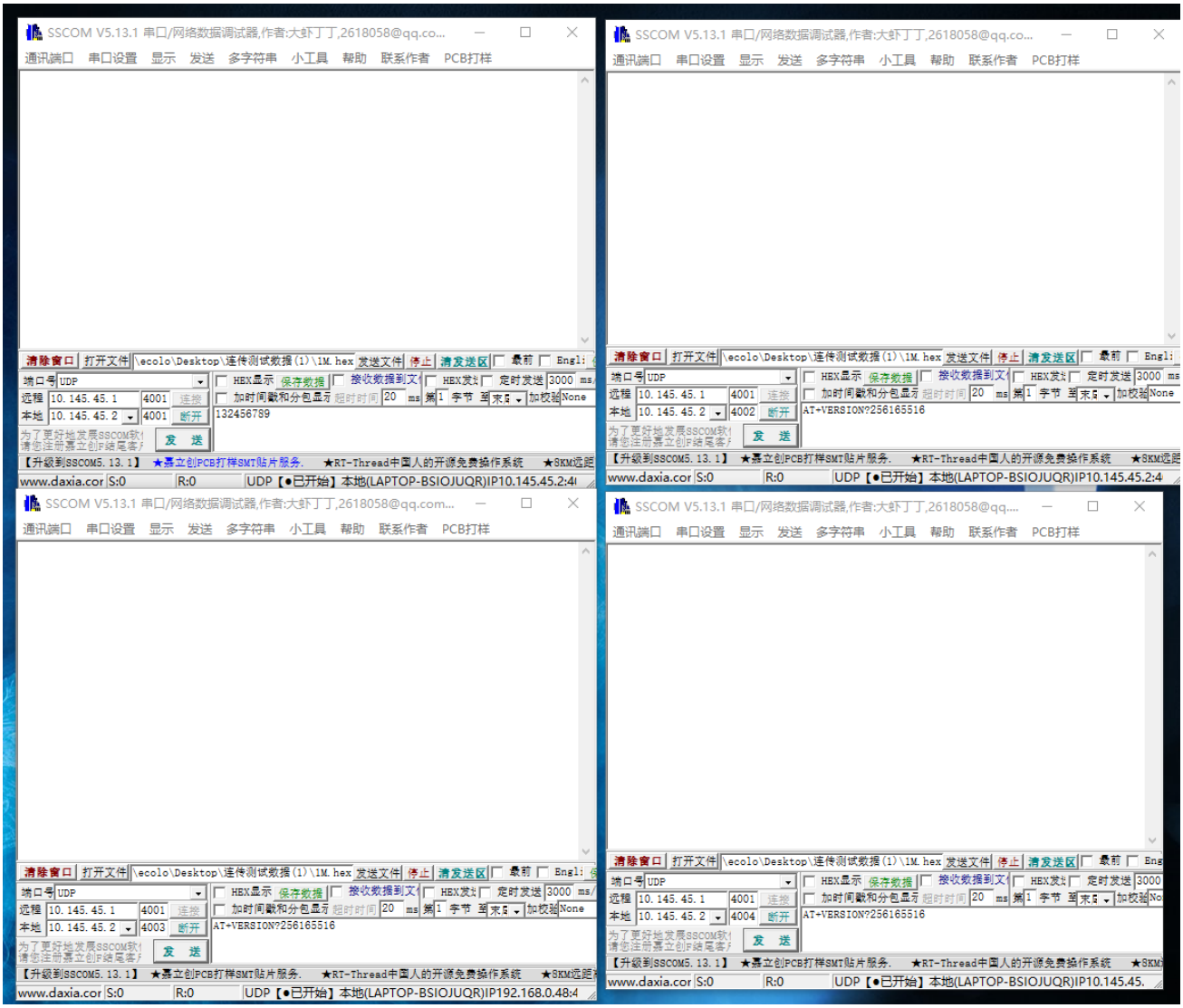
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4.* Reboot the module, connect to the module with PC

5.* Open the UDP assistant to establish UDP communication

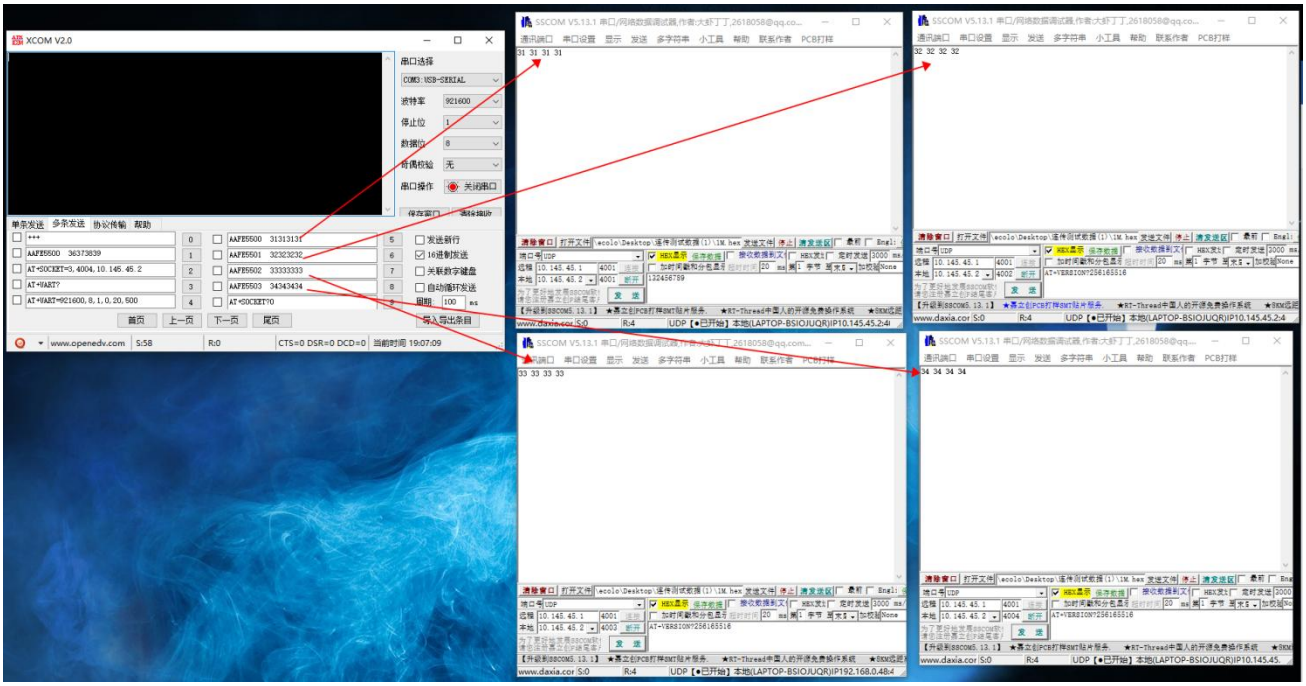


6.* Communication, because it is protocol transmission, so when sending data on the module side, it is necessary to input data according to the protocol transmission format, see, for details. The PC side does not need to add a format, but the module will print out the data according to the protocol format after receiving the data from the PC side.

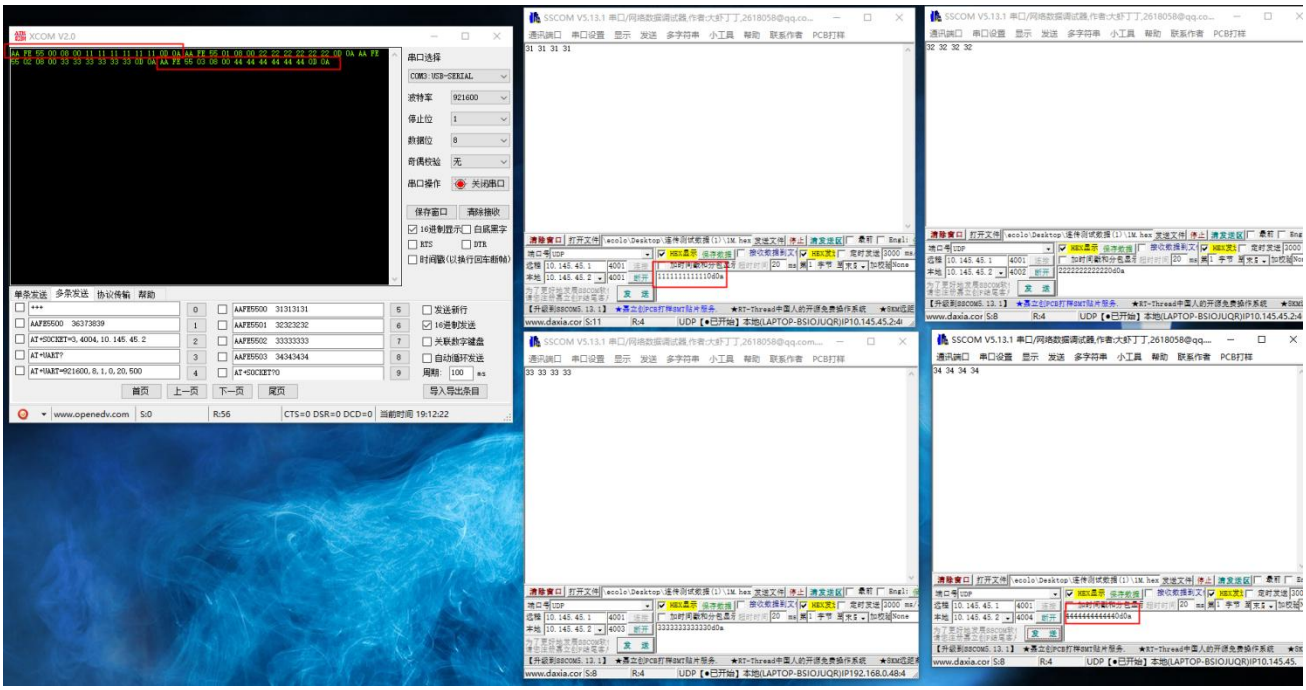
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The module sends:



The module receives:

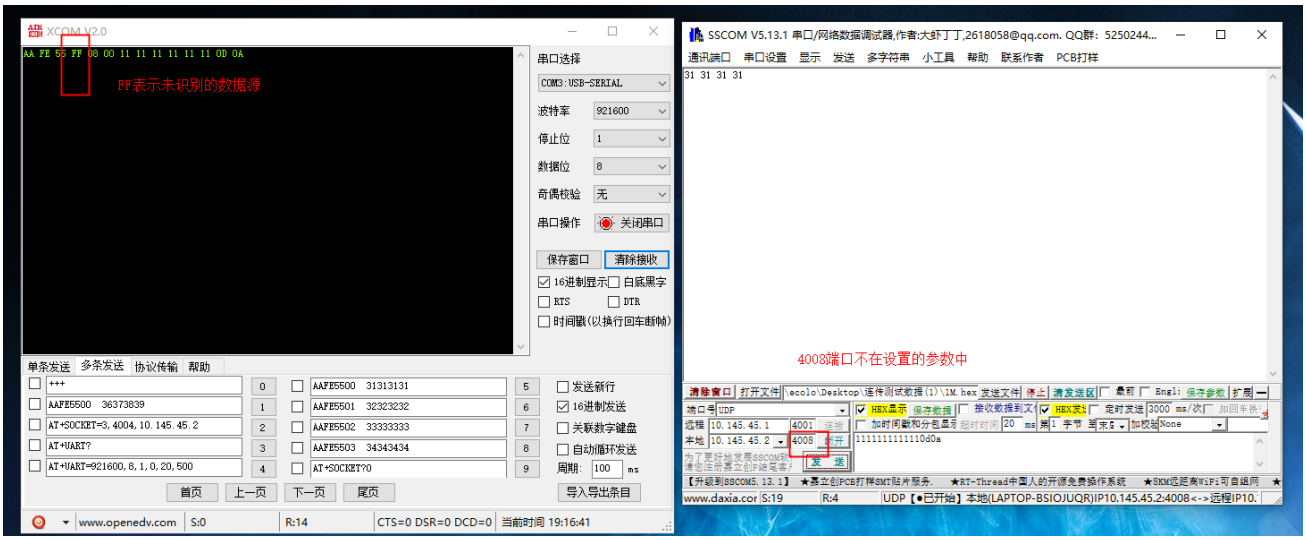


At this point, the communication between the module and the PC is completed. The two roles of AP and STA support TCP server, TCP Client, and UDP. The specific combination methods can be used in conjunction with these three tutorials.

It should be noted that if the source address and port of the received data are not in the parameters set in the third step, the number spit out by the serial port is 0xff, indicating an unrecognized data source.

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6.1.2 Communication between modules

There are three ways of communication between modules of this product: AP-STA-based communication; STA-STA communication; these two communication methods are one module as a TCP server and the other as a TCP client, the only difference is STA - The STA method requires connecting both modules to an external router.
Communication in P2P mode based on WiFi-Direct.

6.1.2.1 AP-STA TCP communication between modules

1、 * Set the working mode, set module A as the AP role, and module B as the STA role. In particular, it should be noted that in TCP mode, the service mode of the modules cannot be set to the same, that is to say, one of the two modules must be TCP Server and the other must be TCP Client, otherwise the connection and communication cannot be established normally.

AP configuration:

Mode: AT+MODE=1,1,1

SSID：AT+SSID=0,E103-W03,2,12345678

Get the local IP: AT+SVRPORTIP? (This operation must be performed here, and then the parameters are passed to STA, otherwise communication cannot be performed)

The return value is shown in the figure.

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STA configuration:

Mode: AT+MODE=2,1,2

Target: AT+STACON=E103-W03,2,12345678

Set the remote IP and port. Here, the local IP obtained in the AP configuration is passed in as the remote IP of the STA:

AT+SOCKET=0,4001,192.168.1.1



After the configuration is complete, restart the module, wait for the connection to complete, and then send data.

Special attention is required: before starting STA, the IP address of the AP connected to it must be passed in. Otherwise, a normal network connection cannot be established.

If the AP turns on the protocol transmission mode at this time, it can support the connection of 4 STAs, and the configuration method of the remaining STAs is the same.

For STA-STA communication, the two modules need to be connected to the same router. Here, the SSID of the target AP is E103-W03 for demonstration.

STA1 configuration process

Mode: AT+MODE=2,1,1

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Target: AT+STACON=E103-W03,2,12345678

Configure local port: AT+SVRPORTIP=4001

Get the IP address: AT+SVRPORTIP? Get the return: AT+SVRPORTIP=4001,192.168.1.21

STA2 configuration process:

Mode: AT+MODE=2,1,2

Target: AT+STACON=E103-W03,2,12345678

Set the remote IP and port, here the IP and port obtained by STA1 are passed in:

AT+SOCKET=0,4001, 192.168.1.21

Restart the module and wait for the connection to complete before communicating.

6.1.2.2 UDP communication between modules

UDP is a communication that does not establish a connection, and the core is the IP address and port. In this way, one communicates as an AP and the other as a STA.

1、 Configure the AP module:

Setting mode: AT+MODE=1,1,3

Set SSID: AT+SSID=0,E103-W03,2,12345678

Set local port: AT+SVRPORTIP=4001

Get local port local IP: AT+SVRPORTIP?. Get return: AT+SVRPORTIP=4001,10.145.45.1

Set remote port Set remote IP: AT+SOCKET=0,4002,10.145.45.2



2、 Configure the STA module:

Setting mode: AT+MODE=2,1,3

Set target SSID: AT+STACON=E103-W03,2,12345678

Set the connection mode: AT+CONTYPE=1

Set the local port: AT+SVRPORTIP=4002 (note that the local port here is the remote port in the previous step)

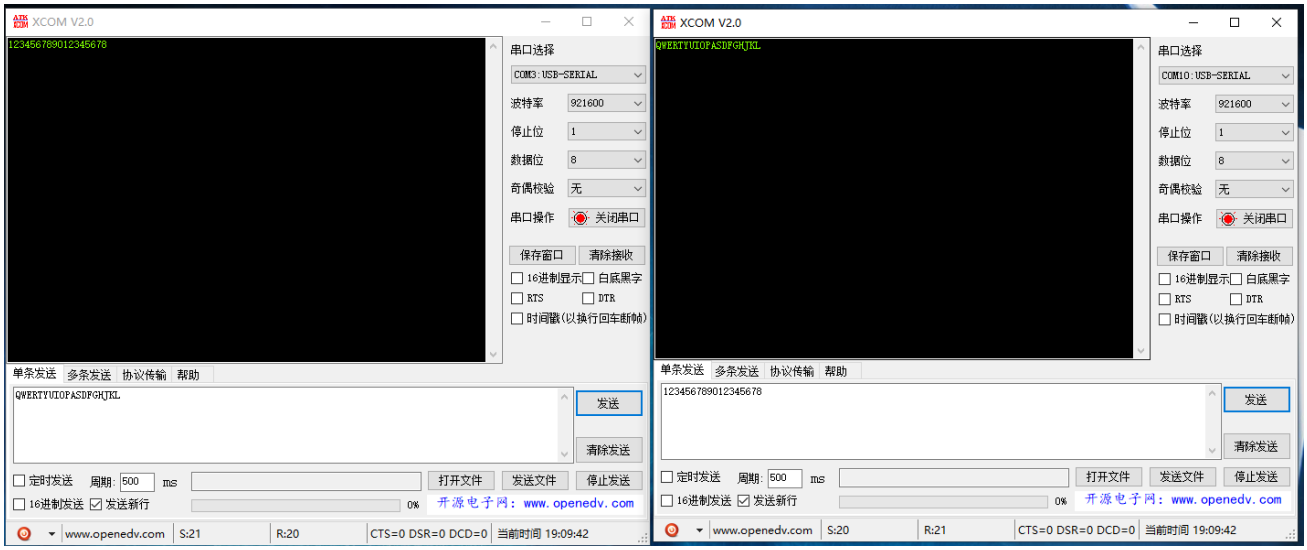
Set remote port remote IP: AT+SOCKET=0,4001,10.145.45.1 (the remote port IP here is the local port IP in the previous step)

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3、* Restart the module, wait for the connection, and communicate.



6.1.2.3 P2P communication of WiFi-Direct

WiFi-Direct is a point-to-point connection, the configuration process is as follows.

1、* First configure to P2P mode, the two modules send AT command at the same time: AT+MODE=3,1,1

2、*Then select one of the modules to be configured as GroupOwner, and send an instruction to set the connection parameters (see configuration, read WiFi-Direct(P2P) connection parameters for instruction description):

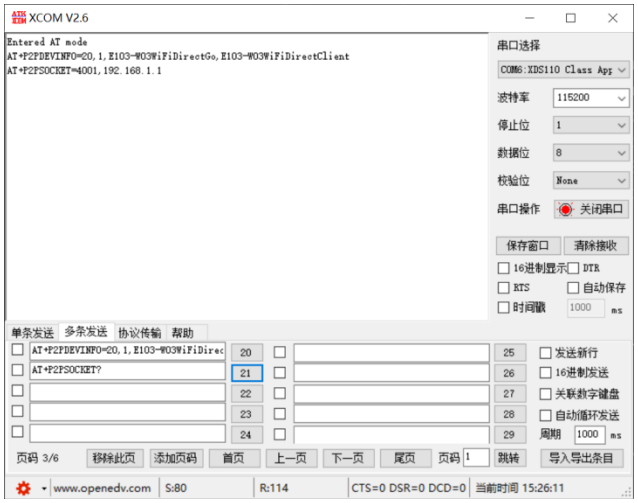
AT+P2PDEVINFO=20,1,E103-W03WiFiDirectGo,E103-W03WiFiDirectClient

3、Query the socket local port and IP address (or):

AT+P2PSOCKET?

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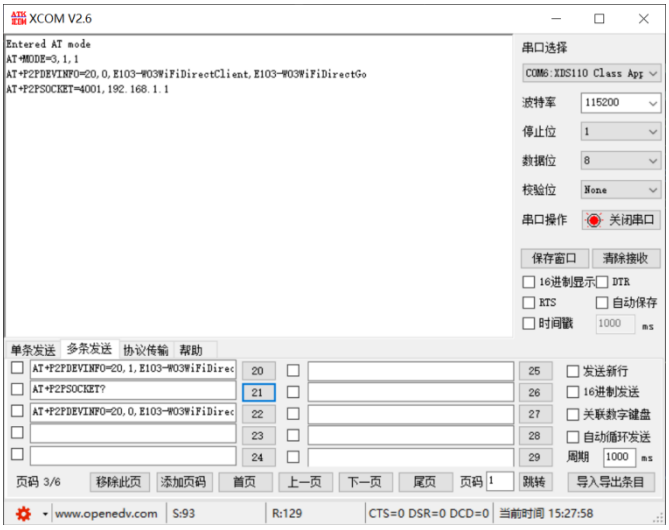


4、* Finally, configure another module as Client, and send commands to set connection parameters:

AT+P2PDEVINFO=20,0,E103-W03WiFiDirectClient,E103-W03WiFiDirectGo

5、* Configure the remote port and address, and set the IP address and port of the GroupOwner queried in the previous step to the Client (the IP address and port of this part must be obtained after querying the GroupOwner, otherwise communication cannot be established)

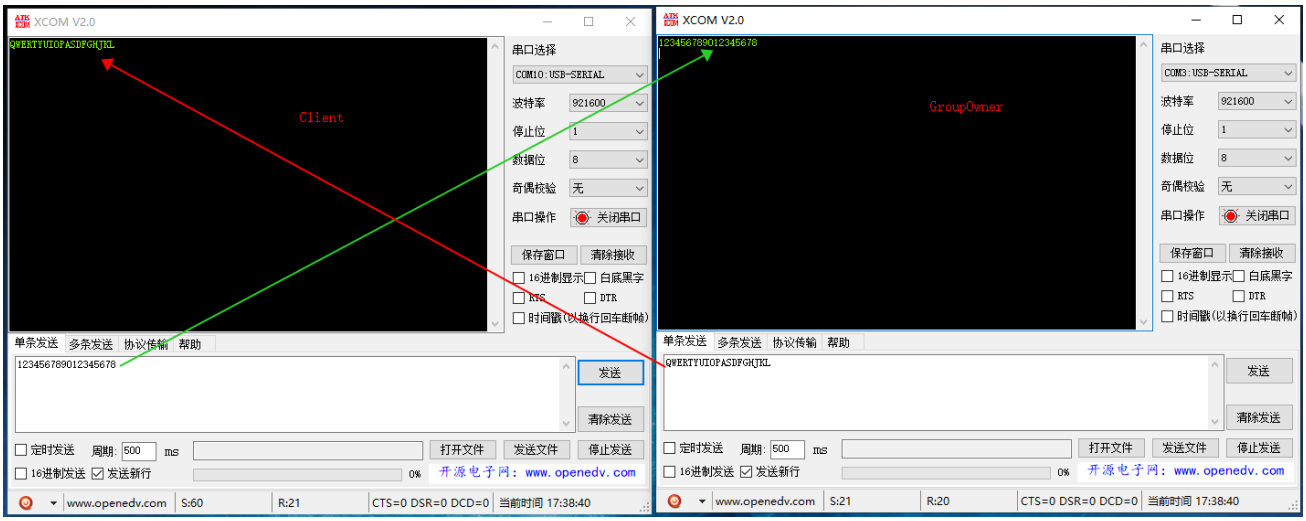
AT+SVRPORTIP=4001,192.168.1.1



6、* Restart and wait for the connection to be established before communicating

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6.2 Network communication

Network communication is based on the role of STA to communicate with various cloud platforms, including MQTT-based Alibaba Cloud, Baidu Cloud, OneNet; HTTP servery and WebSocket.

6.2.1 MQTT

Under MQTT, three kinds of transmission are supported, Alibaba Cloud, Baidu Cloud, and OneNet.
The configuration process is as follows. According to the platform you use, register to obtain relevant parameters, and finally add it to the web page window. You can also use AT commands to configure.
Special note: For users of self-built mqtt servers, use this module to access, you can choose Baidu cloud or onenet, and fill in the corresponding parameters.
When the self-built mqtt server uses Baidu Cloud, the device name is the Client ID, and the user name and password correspond. When using onenet, the device ID is the Client ID, the product ID is the user name, and the authentication information is the password.

6.2.1.1 Alibaba Cloud

1、 Log in to the web page, in the mode setting menu, select the job role as Station, select the service mode as MQTT, and save the settings.
2、 In the parameter setting menu, select Alibaba Cloud.
3、 Product key: In the Alibaba Cloud IoT platform console, create a product and device to obtain a product key. Such as: A1Ve0iJW6z1
4、 Device name: the device name entered when adding a device. Note: You can only enter numbers in English, and the input length cannot exceed 10 bytes
5、 Client ID: User-defined input. Note: Only digital English can be entered, and the input length cannot exceed 12 bytes
6、 Device key: In the Alibaba Cloud IoT platform console, create a product and device to obtain the device key. Such as:

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AHlmNjuaMCGJ1bFOjC4EZMZmHSUhzSEQ

7、 Address: the domain name connected to Ali IoT. For example: A1Ve0iJW6z1.iot-as-mqtt.cn-shanghai.aliyuncs.com

8、 Port: Ali IoT port. Such as: 1883

9、 Subscribe to topics: such as: /A1Ve0iJW6z1/MQTT_TEST/user/get

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

11、 Subscribe and publish message levels: Qos:0, Qos:1, Qos:2





6.2.1.2 Baidu Cloud

1、 Log in to the web page, in the mode setting menu, select the job role as Station, select the service mode as MQTT, and save the settings.

2、 In the parameter setting menu, select Baidu Cloud.

3、 Device name: the name entered when creating a new object shadow. Note: You can only enter numbers in English, and the input length cannot exceed 15 bytes

4、 User name: the name in the object shadow connection configuration. Such as: Un2d6cs/E810MQTT

5、 Key: the key in the physical shadow connection configuration. Such as: s9mMzByp4Mpryphq

6、 Address: The domain name connected to Baidu Internet of Things. Such as: Un2d6cs.mqtt.iot.gz.baidubce.com

7、 Port: Baidu Internet of Things port. Such as: 1883

8、 Subscribe to topics: such as: $baidu/iot/general/get

9、 Release topic: such as: $baidu/iot/general/update

10、 Subscribe and publish message levels: Qos:0, Qos:1, Qos:2

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6.2.1.3 OneNet

1、 Log in to the web page, in the mode setting menu, select the job role as Station, select the service mode as MQTT, and save the settings.

2、 Log in to the web page again, and select ONENET in the parameter setting menu. Note: onenet creates products and selects multi-protocol access.

3、 Device ID: eg: 511986588

4、 Product ID: eg: 286258

5、 Authentication information: Custom input when creating a device. Such as: ebyte

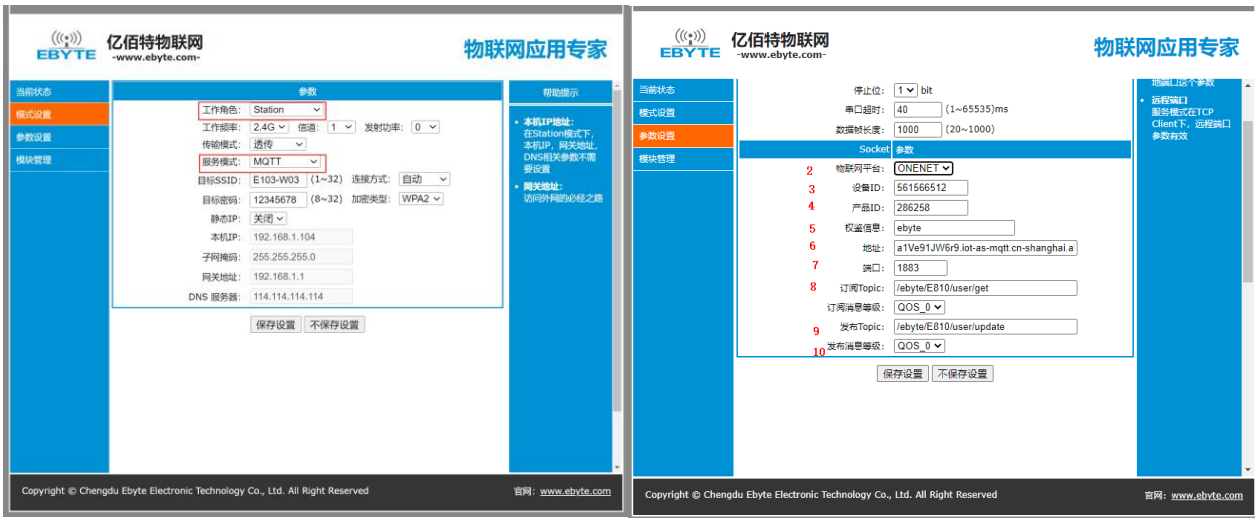
6、 Address: The domain name for accessing ONENET IoT. For example: mqtt.heclouds.com

7、 Port: ONENET IoT port. Such as: 6002

8、 Subscribe to topics: such as: iot/general/get

9、 Release topic: such as: iot/general/update

10、 Subscribe and publish message levels: Qos:0, Qos:1, Qos:2



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6.2.2 HTTP Client

1、 Log in to the web page, select the job role as Station in the mode setting menu, select HTTP Client as the service mode, and save the settings.

2、Log in to the web page again, and fill in the HTTP server address in the parameter setting menu.

3、Fill in the HTTP server port number.

4、The request method can choose post or get.

5、Select all output as the output mode, and all the content replied by the server will be output through the serial port. If you select valid output, the serial port will only output valid data.

6、Enter the header URL path.

7、User-defined input protocol header, multiple items must be added directly\r\nThe last one should not be added.



If the user passes parameters through GET, the following explains how to use GET in detail. as follows:

GET /request/login.do?name=test&userpwd=123456 HTTP/1.1

Host: 192.168.4.10:8080

Among them, /request/login.do? is the content set in the URL of the header path (note that ? should be added after the URL), and name=test&userpwd=123456 is the data received by the serial port of the module. 192.168.4.10:8080 is the HTTP server address and port.

Custom protocol header: the default is Connection: keep-alive, the user can modify it, if more than one is needed, add \r\n between the commands, and not add the last one.

If the user passes parameters through POST, the following describes how to use POST in detail. as follows:

POST /request/login.do HTTP/1.1

Host: 192.168.4.10:8080

(This is a blank line, which cannot be deleted, and the contents of the parentheses in the final release must be deleted, and the blank line is reserved)

username=test&userpwd=123456

Among them, /request/login.do is the content set in the header path URL, and name=test&userpwd=123456 is the data received by the module serial port. 192.168.4.10:8080 is the HTTP server address and port.

Custom protocol header: the default is Connection: keep-alive, the user can modify it, if more than one is needed, add \r\n between the commands, and not add the last one.

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6.2.3 WebSocket

1、 Log in to the web page, select the job role as Station in the mode setting menu, select websocket as the service mode, and save the settings

2、 In the parameter setting menu, configure the required parameters.





6.3 Parameter configuration

6.3.1 Serial port AT command configuration

Serial port AT command configuration, directly open the serial port debugging assistant, set the corresponding baud rate, data bits, etc.



Configure according to the AT command in Chapter 6, it should be noted that the command must follow the specification.

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6.3.2 UDP remote configuration

During remote configuration, it is necessary to ensure that the module and the PC are in the same LAN. For the configuration method, see the communication with the PC (either make the module in AP mode and connect the PC to the module, or make the module in STA mode and connect the PC to the same router) to obtain the IP After the address, directly enter the IP address and UDP port number 8009 (this port number is a fixed value and cannot be changed). Remote configuration is essentially an AT command operation, see AT commands for specific commands. The following figures are the remote configuration based on AP mode and STA mode respectively.

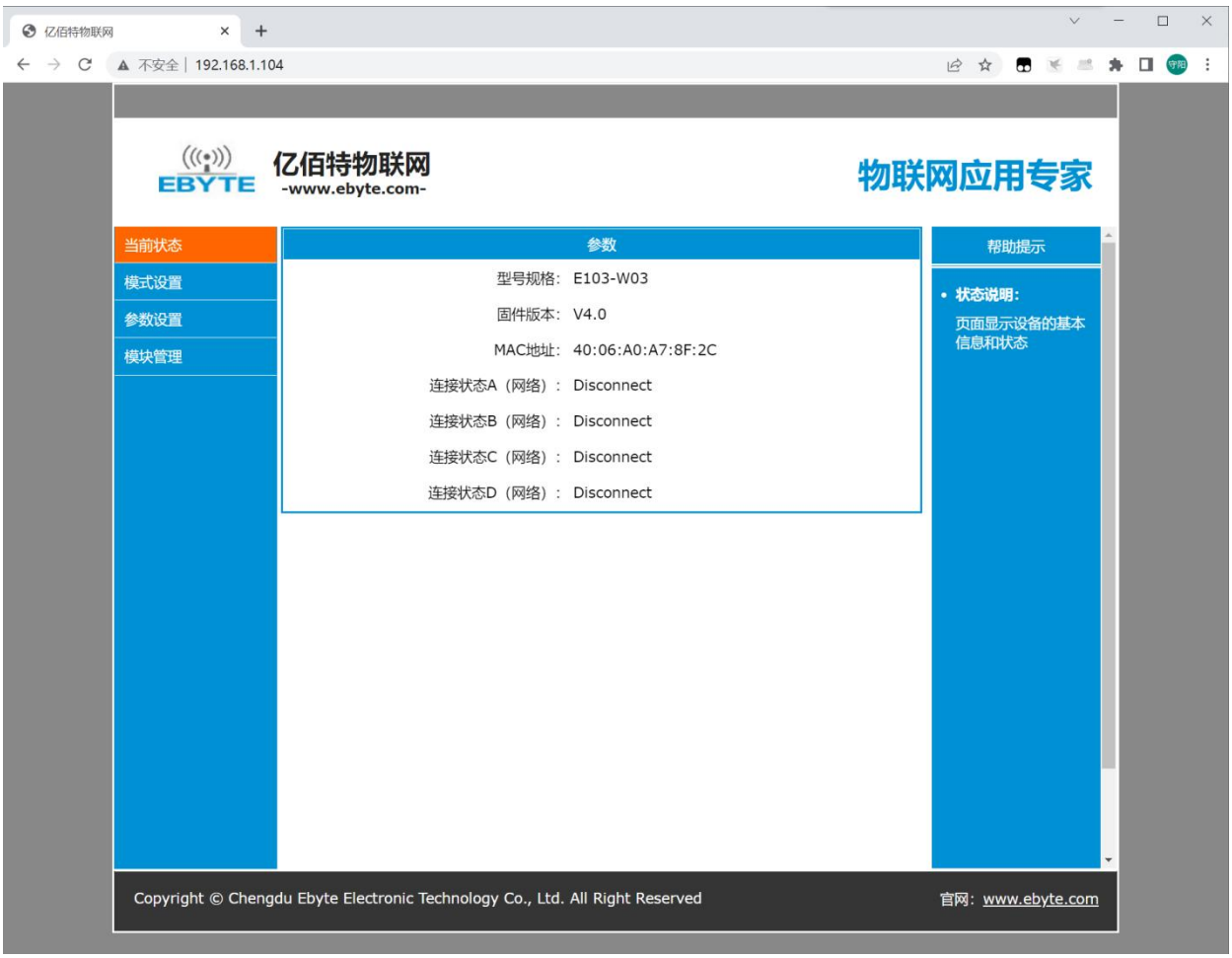


6.3.3 Web page configuration

When configuring the webpage, it is also necessary to ensure that the module and the PC are in the same LAN, find the corresponding IP address of the module, and enter this IP address on the browser. The 192.168.1.104 here is just the IP address used for demonstration. Please refer to the specific IP address. Use the command: AT+SVRPORTIP? to query and enter the correct IP to enter the configuration interface. The IP address is set according to the feedback result of the module, and other parameters are set according to their own needs.

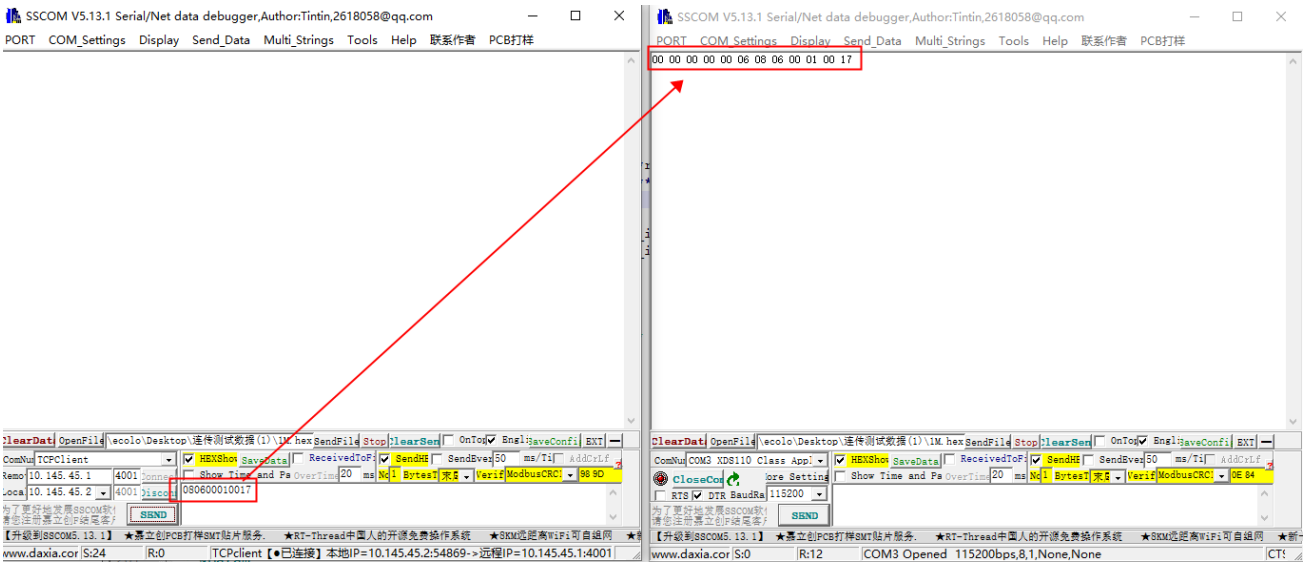
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6.4Modbus usage

After setting the working parameters according to the above chapters, enter the AT command and open the modbus protocol: AT+MODBUS=1. Communicate after establishing a connection



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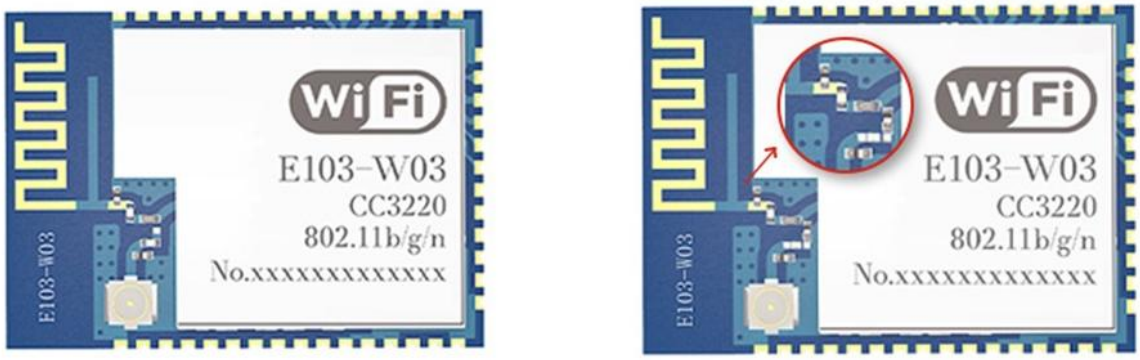
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The Modbus protocol of this module only supports data conversion and transmission, if necessary, please operate it with the actual control.

6.5 Static IP usage

1、 Set the module to STA client mode. AT+MODE=2,1,2
2、 Set static IP related parameters. AT+IPSTATIC=1,192.168.1.9,255.255.255.0,192.168.1.1,192.168.1.1
3、 According to Section 6.1.2.1, set the target AP, socket port and address. Restart the module to establish a connection for communication.

Chapter 7 Antenna selection mode



The default factory setting for the OR resistor is soldered as shown in the left picture above. The antenna interface type is PCB. If you need to change the antenna interface type to IPEX, please modify the OR resistor as shown in the right picture above.

Chapter 8 Revision History

Version	Revision date	Revision Notes	Maintainer
1.0	2022.06.21	Initial version	M.T.
1.1	2023.1.12	Corrected pin description	Hao
1.2	2025.3.12	Added the antenna selection mode	Hao

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