



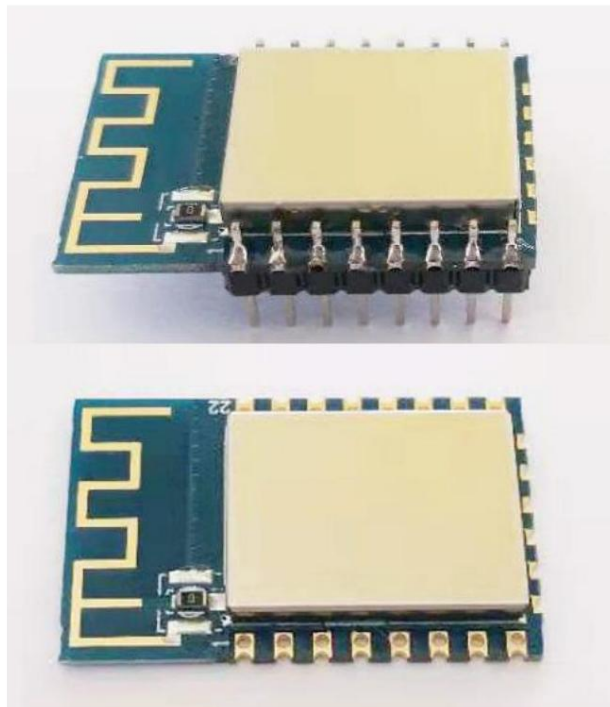
Shenzhen Hailingke Electronics Co., Ltd.

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## HLK-M20 Serial

### Port-WiFi Transmission

### Module User Manual



## Table of contents

<b>1</b>	<b>Product Introduction.....</b>	<b>1</b>
<b>2</b>	<b>Product Overview.....</b>	<b>2</b>
2.1	Technical Specifications.....	2
<b>3</b>	<b>Module Pin Definition.....</b>	<b>3</b>
3.1	Pin Definition Diagram.....	3
3.2	Default Pin Name Definition.....	3
<b>4</b>	<b>Functional Description.....</b>	<b>5</b>
4.1	Two working states of the module.....	5
4.2	Function buttons and status indicators.....	5
4.2.1	Status Output Pins.....	5
4.2.2	Function Key Input Pins.....	5
4.3	Switching between transparent transmission mode and AT command mode.....	6
4.3.1	Switching from transparent transmission mode to AT command mode.....	6
4.3.2	Entering transparent transmission mode from AT command mode.....	6
4.4	AT Commands.....	6
4.4.1	AT command format.....	6
4.4.2	AT command list and function description.....	7
4.5	LAN Search.....	8
<b>5</b>	<b>Module Testing Tools.....</b>	<b>9</b>
5.1	Module Test Board.....	9
5.2	PC Configuration Tool.....	9
5.3	PC-side TCP/UDP test tool.....	12
<b>6</b>	<b>Application Examples.....</b>	<b>13</b>
6.1	The module establishes a network connection with TCP SERVER in WIFI AP mode.....	13

6.1.1 Function Introduction.....	13
6.1.2 Typical Applications.....	13
6.1.3 Test Examples.....	13
6.2 The module establishes a network connection as a TCP SERVER in WIFI STA mode.....	15
6.2.1 Function Introduction.....	15
6.2.2 Typical Applications.....	15
6.2.3 Test Examples.....	15
6.3 The module establishes a network connection as a TCP CLIENT in WIFI STA mode.....	17
6.3.1 Function Introduction.....	17
6.3.2 Typical Applications.....	17
6.3.3 Test Examples.....	17
<b>7 Revision History.....</b>	<b>19</b>
<b>8 Technical Support and Contact Information.....</b>	<b>19</b>

Table Index

Figure 1. Basic functional diagram of the serial port to WiFi transparent transmission module.....1

Figure 2. Pin Definition Diagram..... 3

Figure 3. Transmission mode and AT command mode conversion ..... 6

Figure 4. LAN search function effect diagram..... 9

Figure 5. Test board diagram..... 9

Figure 6. PC configuration tool interface..... 10

Figure 7. PC-side TCP/UDP test tool interface diagram.....12

Figure 8. Functional effect diagram of serial port to LAN transparent transmission in WiFi AP mode..... 13

Figure 9. Functional effect diagram of serial port to LAN transparent transmission in WiFi STA mode.....15

Fig.10 . Functional effect diagram of serial port to remote network transparent transmission..... 17

Table 1 . Parameter Specification Table..... 2

Table 2. Pin Definition Table..... 4

Table 3. Output status definition table of status output pins ..... 5

Table 4 . AT Command List..... 8

## 1 Product Introduction

HLK-M20 is a cost-effective embedded serial port-WiFi transparent transmission module developed and produced by Hailingke Electronics.

This product is an embedded module based on a universal serial interface and compliant with network standards, with a built-in TCP/IP protocol stack.

It can realize the conversion between the user serial port and the wireless network (WiFi) interface, and can make the serial port and network TCP/UDP connection

Transparent data transmission between devices.

Through the M20 module, traditional serial devices can be connected through the Internet without changing any configuration.

The network transmits its own data. Through simple configuration, you can customize a variety of networking methods and network connection types to provide users with a series of

It provides a complete and fast solution for transmitting data through the network.

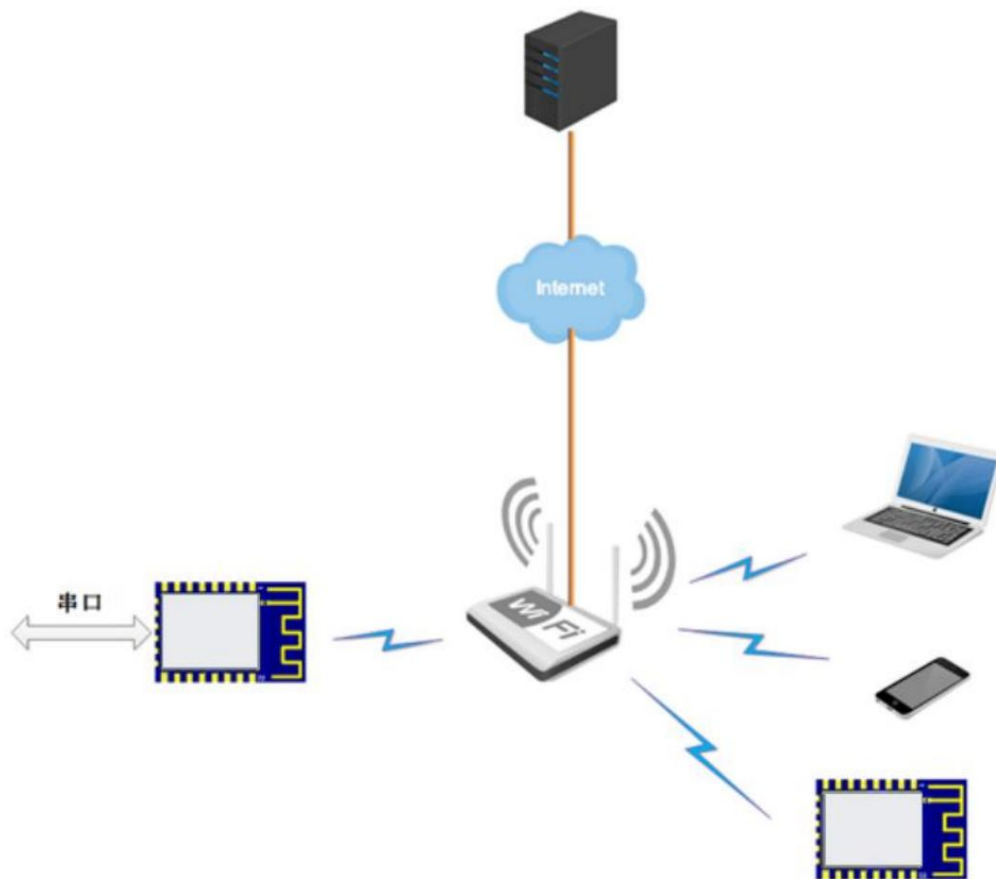


Figure 1. Basic functions of the serial port to WiFi transparent transmission module

## 2 Product Overview

### 2.1 Technical specifications

Network parameters	
Web Standards	Wireless standards: IEEE 802.11n, IEEE 802.11g, IEEE 802.11b
Wireless transmission rate	11n: up to 150Mbps 11g: up to 54Mbps 11b: up to 11Mbps
Number of channels	11
Frequency range	2.4~2.4835G
Transmit power	15~20 dBm
interface	Serial port, GPIO
antenna	
Antenna Type	Onboard antenna/External antenna
Function parameters	
WIFI WORKING MODE	STA/AP
Wireless Security	64/128/152-bit WEP encryption
	WEP, WPA, WPA2 (CCMP, TKIP) security mechanisms (only supported in AP mode)
	Support WPA2-CCMP)
Configuration	Serial port AT commands
Serial to Network	
Network connection type	TCP Server/TCP Client/ UDP Server/ UDP Client
Maximum number of connections under TCP Server:	5
Serial port baud rate	1200~500000bps
Other parameters	
Status indicator	1 status indication output
Environmental Standards	Working temperature: -20~70
	Working humidity: 10%~90%RH (non-condensing)
	Storage temperature: -40~80
	Storage humidity: 5%~90%RH (non-condensing)
Other features	Bandwidth: 20MHz, 40MHz, automatic

Table 1. Parameters and specifications

### 3. Module pin definition

#### 3.1 Pin Definition Diagram

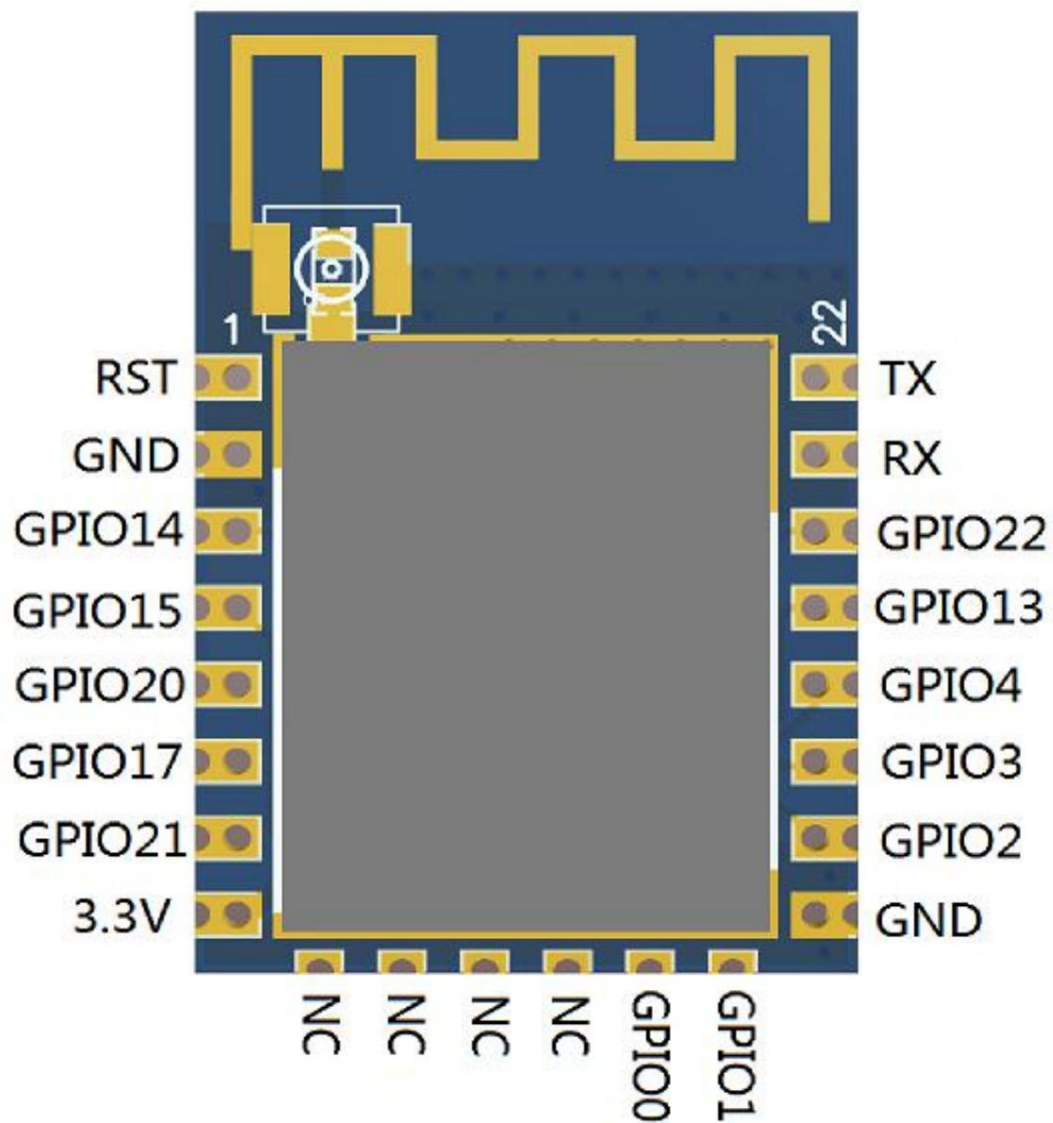


Figure 2. Pin definition diagram

Remark:

1. The figure shows the default definition, and the reuse function is not listed.
2. Please leave the pins unused and do not pull them up or down at will to avoid abnormal startup of the module.

#### 3.2 Default pin name definition

Pin No.	Pin Name	Type	Description
1	<b>RST</b>	I	RESET signal of the chip
2	GND	I/O	buck ground
3	GPIO14	I/O	General purpose input/output
4	GPIO15	I/O	General purpose input/output
5	GPIO20	I/O	General purpose input/output
6	GPIO17	I/O	General purpose input/output
7	GPIO21	I/O	General purpose input/output
8	3.3V	PWR	power supply
9	NC	I/O	
10	NC	I/O	
11	NC	I/O	
12	NC	I/O	
13	GPIO0	I/O	General purpose input/output
14	GPIO1	I/O	General purpose input/output
15	GND	GND	buck ground
16	GPIO2	I/O	General purpose input/output
17	GPIO3	I/O	General purpose input/output
18	GPIO4	I/O	General purpose input/output
19	GPIO13	I/O	General purpose input/output
20	GPIO22	I/O	General purpose input/output
21	RX	I/O	UART_RX
22	TX	I/O	UART_TX

Table 2. Pin definition table

Pin type definition:

I/O Digital input/output

I Digital input

O Digital output

PWR Power

GND Ground



## 4 Functional Description

### 4.1 Two working states of the module

The M20 WiFi module has two working states: transparent transmission mode and AT command mode.

In AT command mode, you can send AT commands to the M20 module through the serial port to configure the module's working parameters.

Query module information, etc.

In transparent transmission mode, the M20 module will automatically connect to the network according to the parameters configured by the user and establish TCP/UDP

Connect to the network and perform data transparent transmission between the serial ports. In transparent transmission mode, the AT command input into the serial port is invalid and will be

It is sent as transparent data to the corresponding TCP/UDP connection.

The module automatically enters transparent transmission mode when it starts.

### 4.2 Function buttons and status indicators

#### 4.2.1 Status output pins

The module's 16th pin is the status output pin (corresponding to the STA LED on the test board), which can be turned on and off by the LED

The status shows the current working status of the module. The following table shows the LED status of the test baseboard:

Always on in AP mode	
In STA mode	Not configured for networking: periodic slow flashing (on for 1s and off for 1s)
	Connecting to the network: Flashing periodically (100ms on, 100ms off)
	Connected to the network: long off short on (off for 3s and on for 100ms)

Table 3. Output status definition table of status output pin

The module's pins gpio1 and gpio0 are used to indicate the connection status of SOCKET and WIFI respectively, and output high level

Indicates successful connection, output low level indicates unconnected.

#### 4.2.2 Function key input pins

The 5th pin of the module is the function key input pin, namely the GPIO20 pin (corresponding to the ES0 button of the test baseboard).

Connect a button between this pin and GND. The functions of different button operations are as follows:

Short press (0.1~3s) to exit transparent transmission mode and switch to AT command mode;

Long press (6 to 20 seconds) to restore the default settings. The network configuration information and transparent transmission parameters are deleted.

### 4.3 How to switch between transparent transmission mode and AT command mode

#### 4.3.1 Switch from transparent transmission mode to at command mode

Key mode:

In any state, the time for pulling down the GPIO20 pin (corresponding to the ES0 button on the test baseboard) is greater than 0.5 seconds and less than 3 seconds, the module immediately enters the at command mode.

During transparent transmission, the serial port automatically exits the transparent transmission when receiving special format data:

When exiting transparent transmission mode, the serial port will pause inputting for 200ms to ensure that the data in the serial port is cleared.

Enter "+++", wait for the reply "a", then enter "a", and then pause for 200ms to ensure that there is no subsequent data input before exiting

Transparent mode. Exit transparent mode, the corresponding link will be closed, do not enter anything before and after "+++" and "a", including "\r\n".

To avoid misoperation as much as possible.

#### 4.3.2 Entering transparent transmission mode from AT command mode

Send at command: at+TS=1

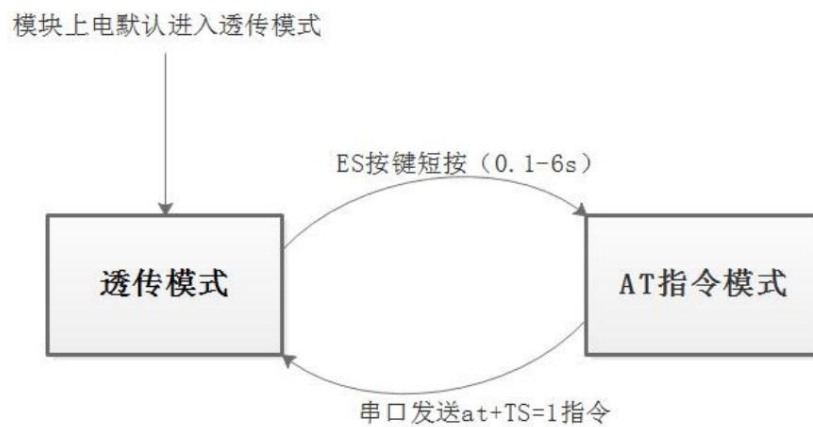


Figure 3. Transition between transparent mode and AT command mode

### 4.4 AT Commands

#### 4.4.1 AT command format

Set class command format:

**at+<X>=<...>**

x represents the parameter name to be set, and ... represents the parameter value.

Set the return value of success:

**at+<X>=<...>**

**ok**

Set the return value for failure or malformed format:

**at+<x>=<...>**

#### ERROR

For example:

Send: at+UType=2

Receive: at+UType=2

ok

Query command format:

**at+<x>=?**

x represents the query parameter name, and ... represents the parameter value.

Return value:

**at+<x>=?**

**<...>**

For example:

Send: at+WA=?

Receive: at+WA=?

0

#### 4.4.2 AT command list and function description

Parameter classification	Parameter name	Function
WiFi connection parameters	<b>WA</b> wifi network mode ap/sta	
	<b>WM</b> Wifista configuration method	
	<b>Sssid</b>	STA target AP ssid
	<b>Spw</b>	STA Target AP Key
	<b>dhcp</b>	STA ip address mode: static/dynamic
	<b>ip</b> static ip	
	maskStatic subnet <b>mask</b>	
	<b>gw</b> static gateway	
	<b>Asses</b>	Network name in softap mode
	<b>But</b>	Wireless channels in softap mode
	<b>Apw</b>	Secret key in softap mode
	<b>Aip</b>	IP in softap mode.
Serial port parameters	<b>Ub</b> serial port	baud rate

	<b>Ud</b> serial port data bit length
	<b>Up</b> serial port check digit
	<b>Us</b> serial port stop bit length
TCP/UDP connections parameter	<b>UType</b> transparent transmission function network mode
	<b>Ulp</b> transparent transmission function target ip
	<b>URPort</b> transparent transmission function remote port
	<b>ULPort</b> transparent transmission function local port
Other parameters	<b>Rb</b> restart module
	<b>Ver</b> module version
	<b>SAVE</b> save configuration
	<b>Df</b> factory reset
	<b>TS</b> transparent transmission state switching
	<b>macGet</b> MAC address

Table 4. AT command list

**WiFi** connection mode can be configured as AP or STA;

In STA mode, the encryption method will adapt to the AP to be connected, no settings are required, and it supports: WEP, WPA,

WPA2yCCMPyTKIPy

AP mode only supports WPA2-CCMP encryption (default, no need to set).

The minimum number of characters is 8, and the maximum number of characters for a secret key is 63;

**TCP/UDP** network connection can be configured as one of TCP Server, TCP Client, UDP Server, UDP Client;

After sending other commands, you must send the **at+SAVE=1** command to save the configuration information to the module. Otherwise,

The previous configuration will be lost after power failure;

For specific AT command descriptions, please refer to: "HLK-M20 WiFi Transparent Transmission Module AT Command Description".

## 4.5 LAN Search

The M20 module always opens UDP port 988 to listen for data. When receiving a data packet with the content "HLK", it will automatically

Reply "HLK-M20 + version number + module's MAC address", as shown in the figure below.

In actual use, you can send a subnet broadcast via UDP in the local area network where the module is located, and the broadcast content is "HLK".

The module is discovered based on the received reply information to achieve the purpose of searching the module.

Use the PC-side HLK\_Discover tool to search:

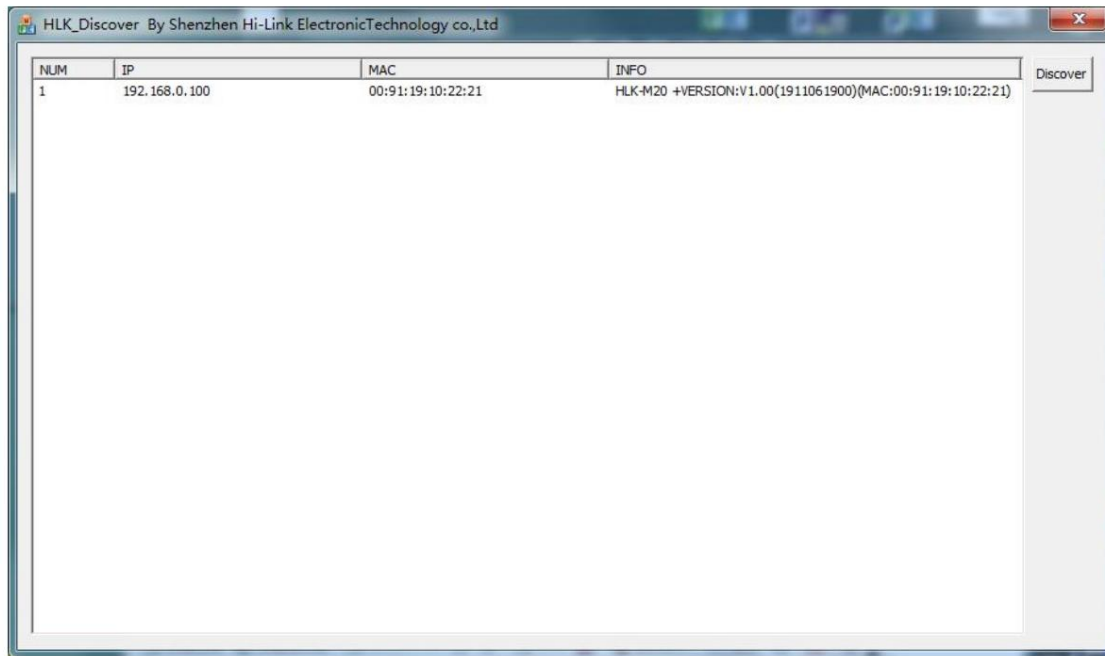


Figure 4. LAN search function effect diagram

## 5- module testing tool

### 5.1 Module Test Baseboard

Users can choose our dedicated test base to quickly start testing and using the M20 module.

USB power supply, built-in USB to serial port function, after connecting to the computer via USB cable, you can use USB to serial port

Connect to the serial port of the module, no additional serial line is required, and it is easy to use.

The test board looks like this:

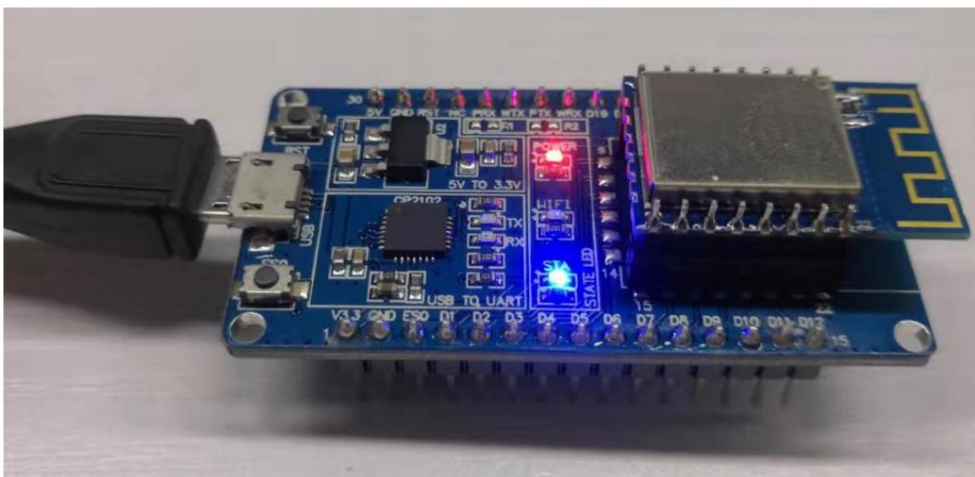


Figure 5. Test board diagram

### 5.2 PC Configuration Tool

To facilitate users to use the M20 module, our company provides a module configuration tool that runs on a PC:

HLK-M20\_CONFIG.exe.

This tool is still based on the serial port to send and receive AT commands, and provides a graphical interface based on this.

The settings on the interface will automatically generate the corresponding AT command content. Click the corresponding button to convert the generated AT command content into

The content is sent to the module through the serial port.

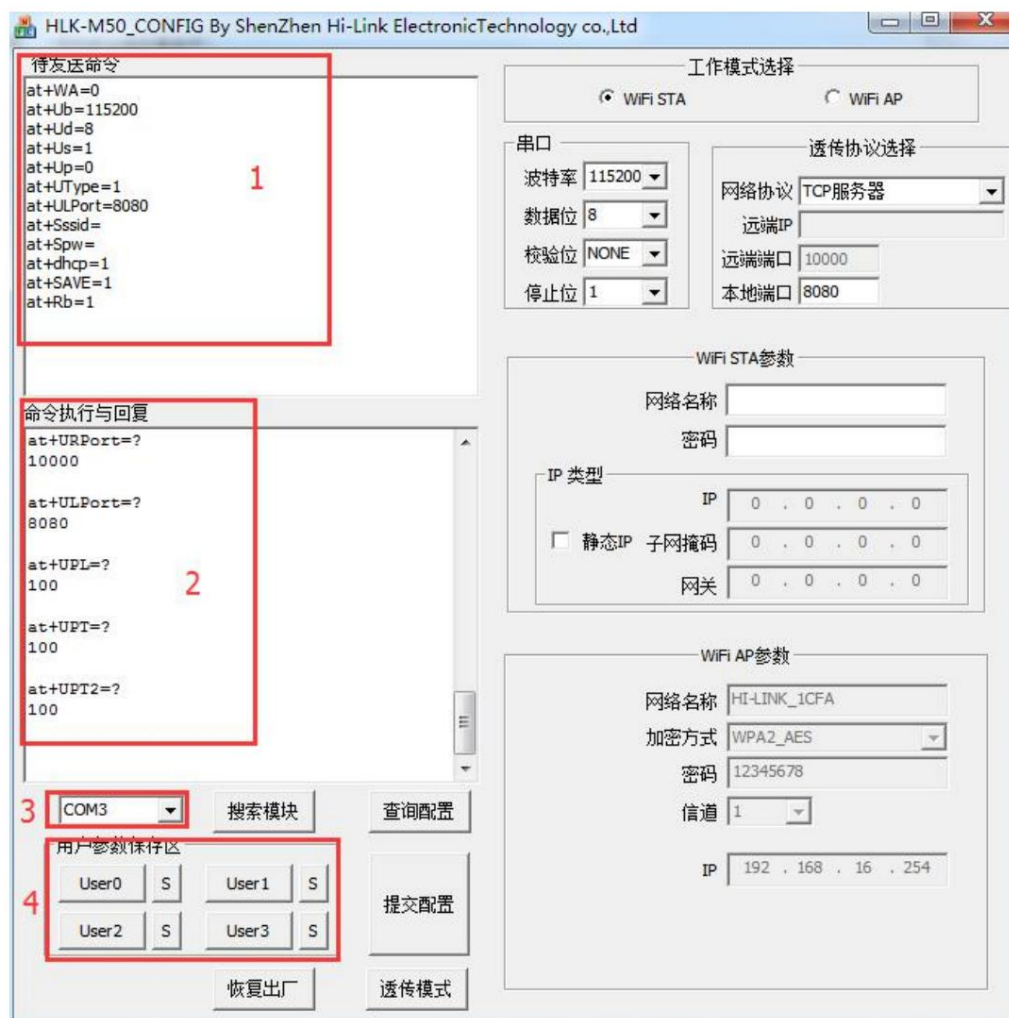


Figure 6. PC configuration tool interface

Steps:

- 1) Connect the serial port of the M20 module to the serial port of the computer, power on the module, and make sure the module enters the AT command mode.

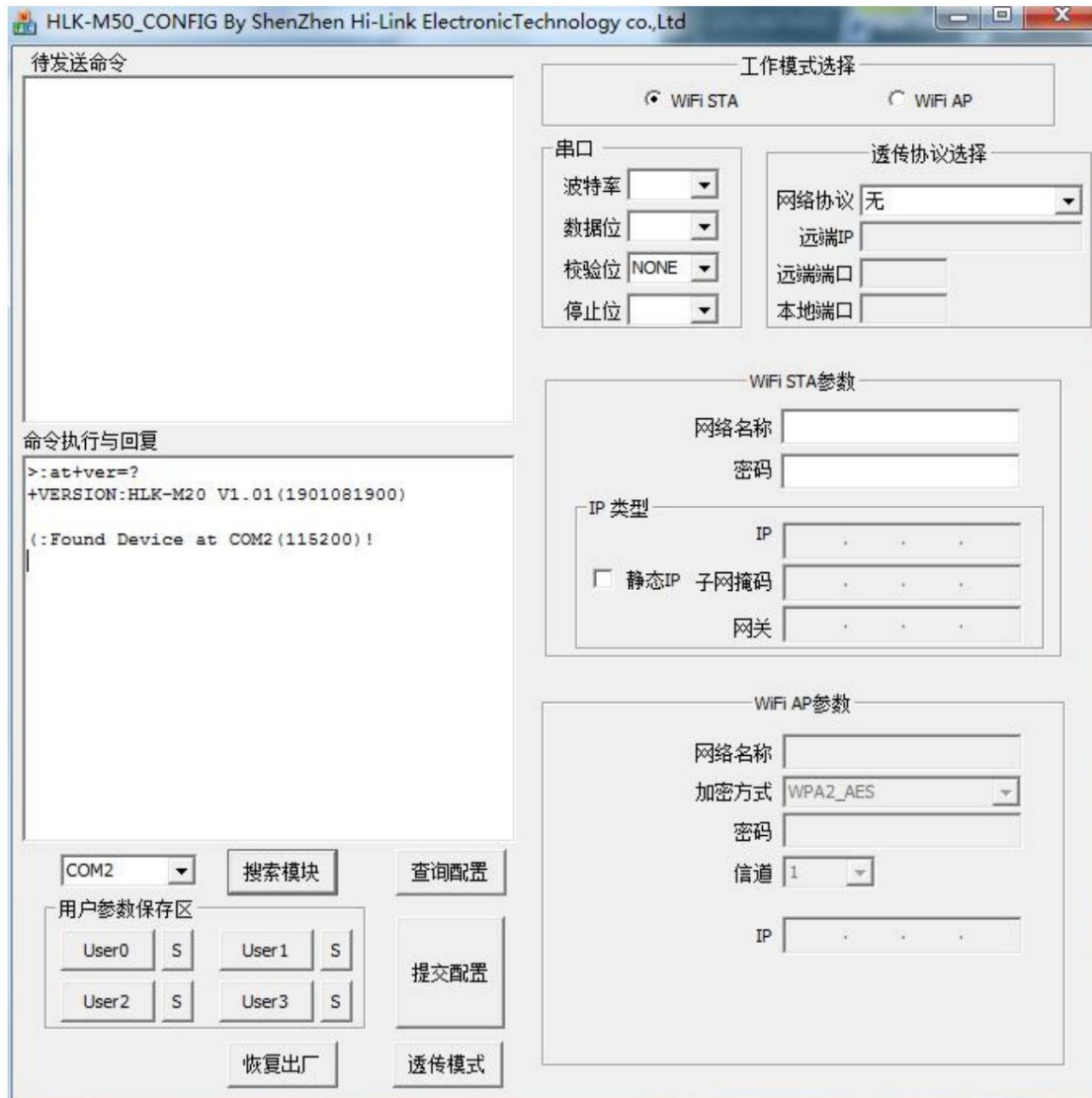
The following operations are only valid in AT command mode;

- 2) Open the HLK-M20\_CONFIG configuration tool and set the option in position 3 in Figure 6 to the serial port connected to the module.

Click the search module button, and the following content appears in the reply box at position 2 in Figure 6, indicating that the search is successful.

The configuration tool has been correctly connected to the module and can send and receive AT commands. You can proceed to the next step.

All of these must be performed on the premise that the search is successful; if the search is unsuccessful, please check the serial port connection until the search is successful;



3) Click the Query Configuration button, the configuration tool will automatically send AT commands to query the current configuration content of the module, and

The query results show the corresponding configuration values in the graphical interface on the right;

4) Modify the configuration values as needed in the graphical interface on the right. After modification, the waiting command at position 1 in Figure 6 will be

The corresponding AT command will be automatically generated in the command box;

5) After the modification is completed, click the Submit Configuration button, and the configuration tool will send all these AT commands to the module through the serial port.

The module is configured by the command execution and reply box at position 1 in Figure 6.

The reply content after that; the configuration process has been completed at this point;

5.3 PC TCP/UDP test tool

The "PC Serial Port & TCP/UDP Debug Tool" provided by our company combines the serial port transceiver tool and TCP/UDP test tool into a single tool.

The tools are combined into one software, which is convenient for debugging serial port and network communication at the same time.



Figure 7. PC- side TCP/UDP test tool interface

The left side shows the serial port settings and the serial port sending and receiving content. You can use a serial port on the computer to send and receive data.

The right side shows the network settings and network sending and receiving content. You can establish a TCP/UDP network connection on the computer, including TCP

ServerŸTCP ClientŸUDP ServerŸUDP ClientŸ

Can send and receive ASCŸ or Hex format data; please note: if the current display is ASCŸ, when receiving Hex

When receiving data in Hex format, the display may be abnormal. Please turn on Hex display to ensure that the received Hex format data is displayed correctly.

according to.



## 6 Application Examples

Through the flexible configuration of WiFi networking mode and transparent transmission connection type, the module can adapt to different working scenarios, as follows

Several commonly used applications, for more specific applications please consult our technical support.

### 6.1 The module establishes a network connection as a TCP SERVER in WiFi AP mode

#### 6.1.1 Function Introduction

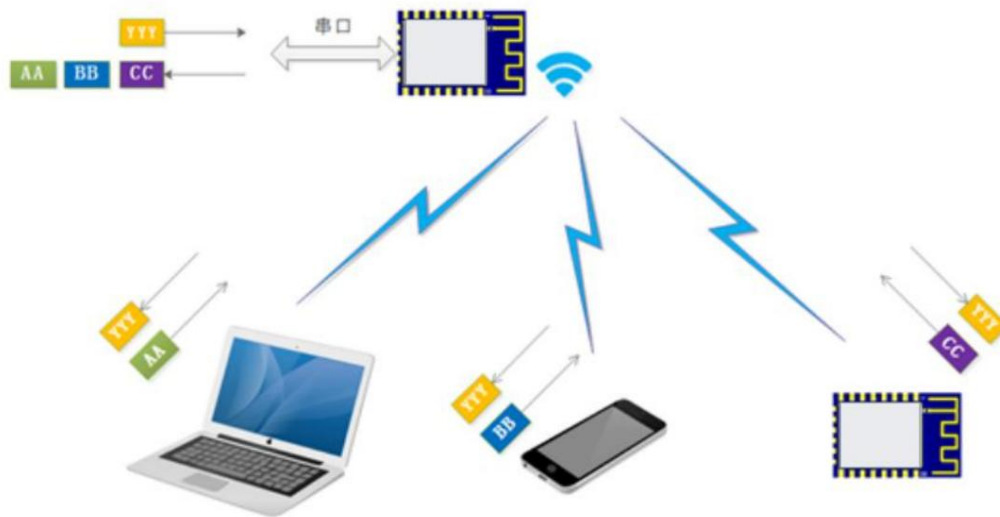


Figure 8. Functional effect diagram of serial port to LAN transparent transmission in **WiFi AP** mode

The M20 module acts as a WiFi AP. Other WiFi clients (laptops, mobile phones, etc.) connect to the module's AP.

TCP Client establishes a network connection with the module, and transparently transmits data between the module's serial port and all TCP Clients; connect to the module

All devices under the AP are in the same LAN.

#### 6.1.2 Typical applications

WiFi wireless access to serial devices, after the mobile phone is connected to the module AP, the APP on the mobile phone can directly communicate with the serial device

Send and receive data to realize status query or control functions, and multiple mobile phones can control one device; only LAN control, mobile

The machine cannot access the external network through WiFi.

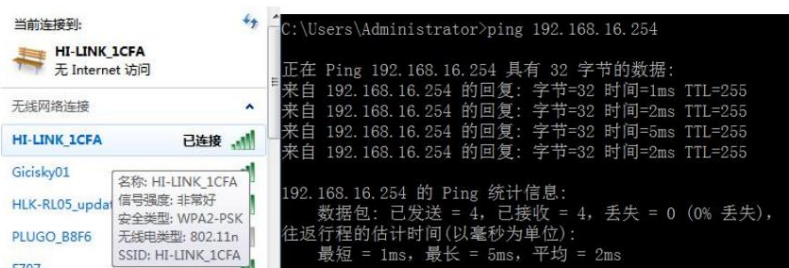
#### 6.1.3 Test Examples

1) The module parameters are configured as follows



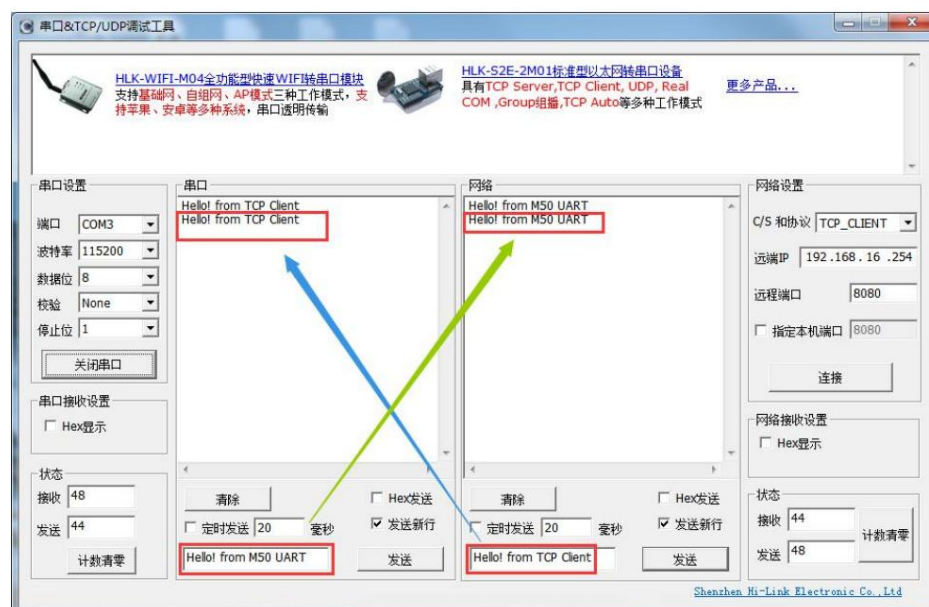
- 2) Connect the computer to the M20 AP hotspot. After the WiFi connection is successful, you can ping the module's IP on the computer.

As shown below:



- 3) Establish a TCP Client connection on the computer. After the connection is successful, you can use this network connection to communicate with the module's serial port.

Transfer data, the specific effect is as follows:



## 6.2 The module establishes a network connection as a TCP SERVER under WiFi STA

### 6.2.1 Function Introduction

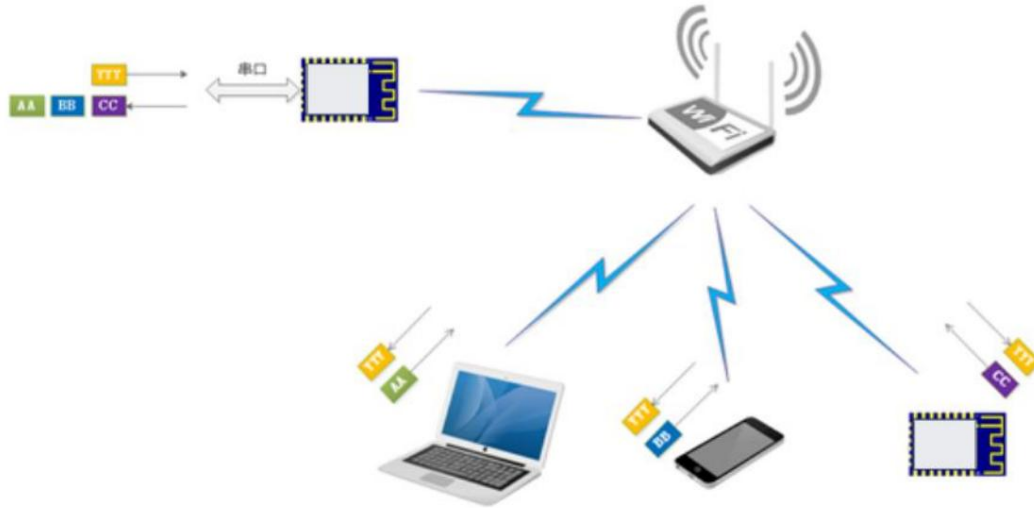


Figure 9. Functional effect diagram of serial port to LAN transparent transmission in **WiFi STA** mode

The M20 module is connected to the wireless router as a WiFi STA. Other devices connected to this wireless router can

TCP Client and module establish network connection, the module serial port and all TCP Clients transmit data transparently; the connection is not

All devices under the wireless router are in the same LAN.

### 6.2.2 Typical applications

In an environment with a wireless router, WiFi wirelessly accesses serial port devices. After the mobile phone is connected to the wireless router,

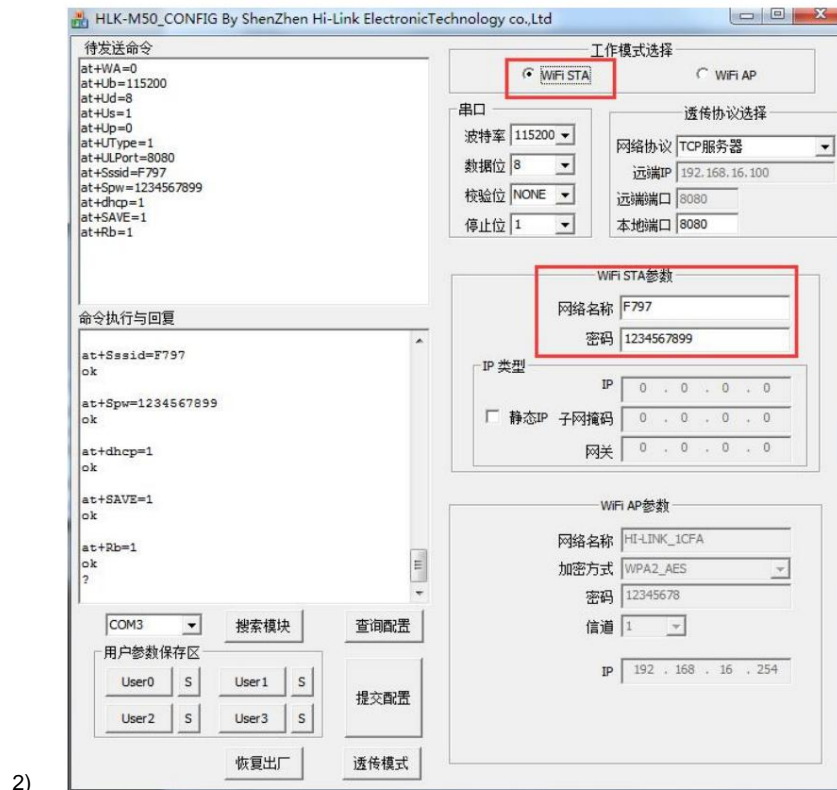
The APP can directly send and receive data between serial port devices to realize functions such as status query or control, and multiple mobile phones can control one

device; and the mobile phone can access the external network through the wireless router.

### 6.2.3 Test Examples

- 1) Configure the module parameters as follows, and connect the module as a WiFi STA to a SSID of "F797".

Under the online router:

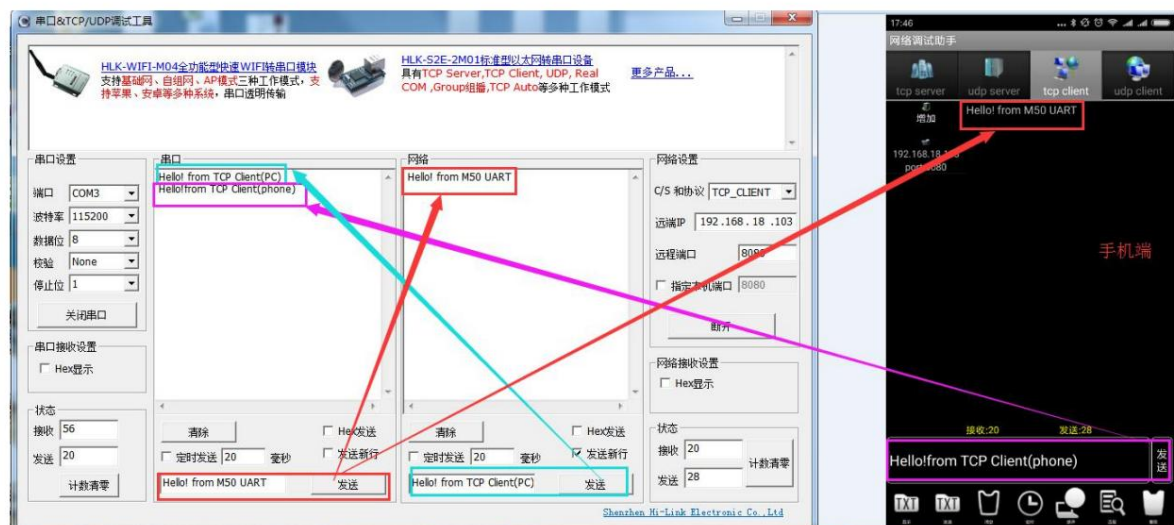


3) Connect your computer and mobile phone to the wireless router with SSID "F797"



4) Establish a TCP connection with the module on both the computer and the mobile phone. After the connection is successful, you can use this network connection to communicate with the module.

Data is transparently transmitted between serial ports. The specific effect is shown in the figure below.



## 6.3 The module establishes a network connection as a TCP CLIENT in WiFi STA mode

### 6.3.1 Function Introduction

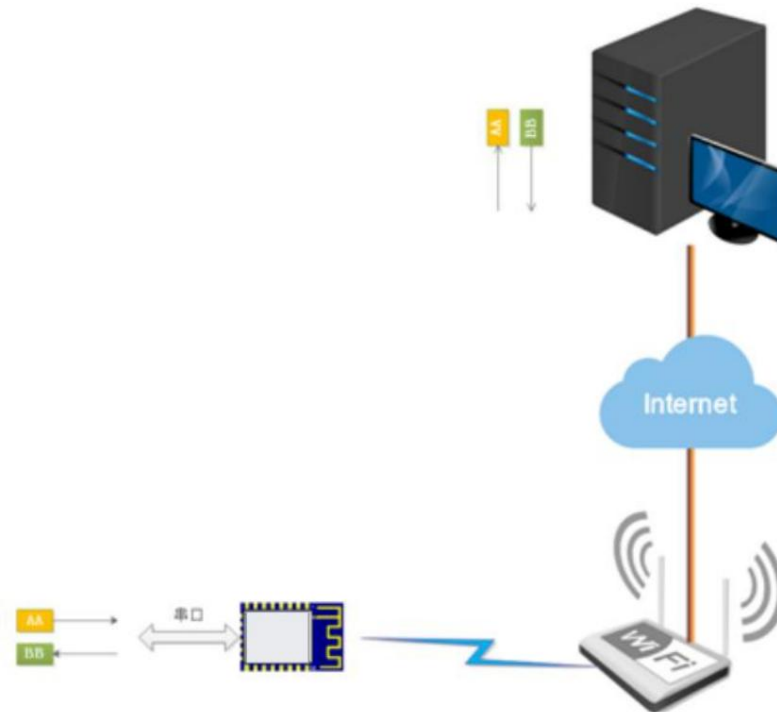


Figure 10. Functional effect diagram of serial port to remote network transparent transmission

The M20 module is connected to a wireless router connected to the Internet as a WiFi STA.

The module establishes a network connection with the remote server through TCP Client to realize the connection between the module serial port and the network.

Data transparent transmission between remote servers.

### 6.3.2 Typical applications

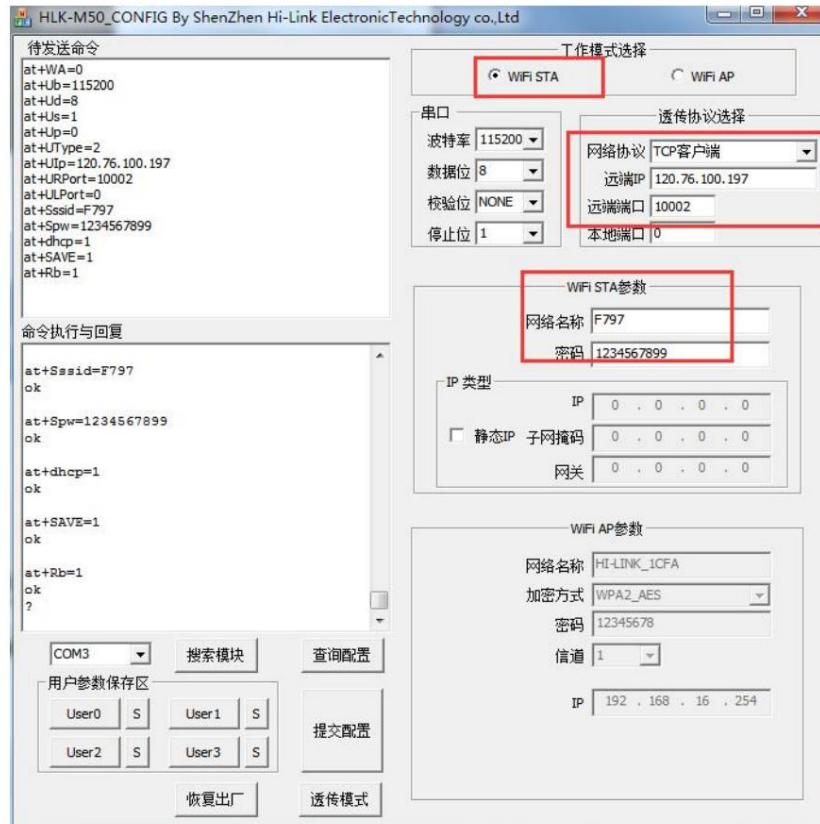
Remotely access serial devices via WiFi, and the data of the module serial port is directly transmitted to the remote server.

The device or mobile phone APP can directly send and receive data with the serial port device remotely to realize remote status query or control functions.

### 6.3.3 Test Examples

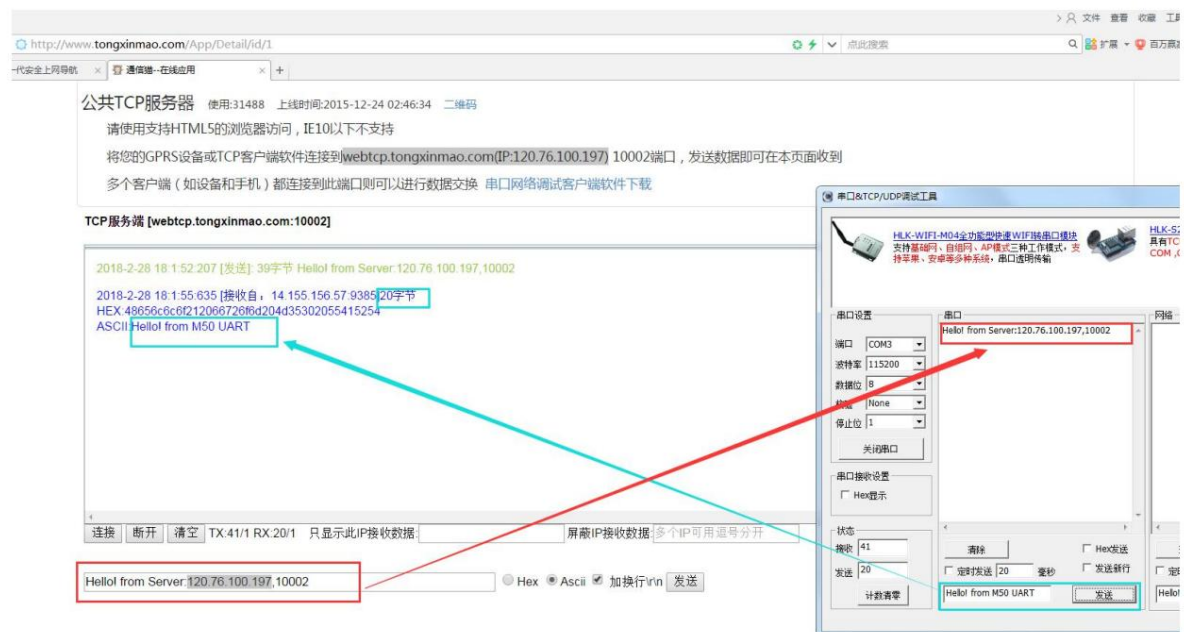
1) Configure the module parameters as follows, and connect the module as a WiFi STA to an SSID that can connect to the external network.

Under the "F797" wireless router, connect to a public TCP server on the external network as a TCP Client:



2) Access the public TCP server's sending and receiving page through the web. After the connection is successful, you can

The specific effect is as follows:





7Revision History

date	Version	Modifications
2020/4/13	1.0 Initial version	

8Technical support and contact information



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