# Shenzhen HI-Link Electronic Co.,Ltd

## HLK-RM58D User Manual

# Content

# 1. Product profile

## 1.1 Overview

HLK-RM58D is a new low-cost embedded UART-WIFI module (serial-Wireless network) developed by Shenzhen Hi-Link co., Ltd.

This product is an embedded module based on the serial interface in line with the network standard , built-in TCP/IP protocol stack, can realize the user serial port-wireless network (WIFI) conversion.

Through the HLK-RM58D module, the traditional serial device can transmit its own data through the Internet network without changing any configuration, which provides a complete and fast solution for the user's serial port device to transmit the data through the network.

## 1.2 Product Characteristics

- Compatible IEEE 802.11 a/b/g/n
- Dedicated high-performance 32-bit RISC CPU
- Support for 20 MHz and 40MHz bandwidth in the 2.4 GHz band
- Single frequency 1T1R mode, data rate up to 150Mbps
- Support for 2.4g/ 5 GHz band, dual frequency 1T1R
- Support two working modes of STA/AP
- Built-in TCP/IP protocol stack
- Support various AT instructions
- Support one-click configuration of intelligent networking features
- Support wireless upgrade (OTA)
- 5V single power supply, low power consumption
- More GPIO pins
- Fast transmission speed of serial port

## 1.3 Product Packaging
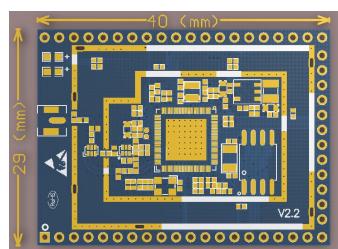


Figure 1. HLK-RM58D encapsulation size

## 1.4 Technical Specifications

Table 1    Product Technical specifications

| Module | Model | HLK-RM58D |
| --- | --- | --- |
| | Package | Plug-in |
| Wireless parameter | Wireless standard | IEEE 802.11 a/b/g/n |
| | Frequency range | 2.412GHz-2.484GHz          5.180GHz-5.825GHz |
| | Transmitting power | 802.11b: +16 +/-2dBm (@11Mbps) |
| | | 802.11g: +14 +/-2dBm (@54Mbps) |
| | | 802.11n: +13 +/-2dBm (@HT20,HT40- MCS7) |
| | | 802.11a: +15 +/-2dBm (@HT40,MCS7) |
| | Receiving sensitivity | 802.11b: -88.4 dBm (@11Mbps ,CCK) |
| | | 802.11g: -75.7dBm (@54Mbps, OFDM) |
| | | 802.11n: -73.6dBm (@HT20, MCS7) |
| | | 802.11a: -75.0 dBm (@MCS7) |
| | Antenna form | Outside: patch pad |
| | | External: I-PEX connector |
| | | Built-in: no built-in antenna |
| Hardware parameters | Hardware interface | UART, IIC, PWM, GPIO, SPI |
| | Working voltage | 5V |
| | GPIO drive capability | Max:16ma |
| | Working current | Continuous send=> Average value: ~100mA, peak value:120mA In normal mode => Average: ~100mA, Peak: 110mA |
| | Working temperature | -40℃~80℃ |
| | Storage environment | Temperature: <40℃, The relative humidity: <90% R.H. |
| Serial transmission | Transmission speed | 110-921600bps |
| | TCP Client | 2 |
| Software parameters | Wireless network type | STA/AP |
| | Security mechanism | WEP/WPA-PSK/WPA2-PSK |
| | Encryption type | WEP64/WEP128/TKIP/AES |
| | Firmware upgrade | Wireless, uart |
| | networking protocol | IPv4, TCP/UDP |
| | User configuration | AT+instruction, smart config |

## 1.5 Pins introduction

Table 2 Module pin interface

| Pin | Network Name | Type | Description |
|-----|-------------|------|-------------|
| 1 | NC | | NC |
| 2 | NC | | NC |
| 3 | NC | | NC |
| 4 | NC | | NC |
| 5 | NC | | NC |
| 6 | NC | | NC |
| 7 | NC | | NC |
| 8 | GND | Ground | GND |
| 9 | NC | | NC |
| 10 | 3V3 | P | External power supply pin: 3.3V@ 200mA |
| 11 | NC | | NC |
| 12 | NC | | NC |
| 13 | NC | | NC |
| 14 | NC | | NC |
| 15 | NC | | NC |
| 16 | GPIO0 | I/O | ES0 pin, pull down 1 second, serial 0 into AT command mode; Pull down ≥ 8 seconds, restore factory default parameter settings |
| 17 | NC | | NC |
| 18 | NC | | NC |
| 19 | NC | | NC |
| 20 | NC | | NC |
| 21 | NC | | NC |
| 22 | NC | | NC |
| 23 | NC | | NC |
| 24 | NC | | NC |
| 25 | NC | | NC |
| 26 | NC | | NC |
| 27 | NC | | NC |
| 28 | NC | | NC |
| 29 | NC | | NC |
| 30 | NC | | NC |
| 31 | NC | | NC |

| 32 | NC | | NC |
|---|---|---|---|
| 33 | NC | | NC |
| 34 | NC | | NC |
| 35 | GPIO59 | | SOCKET connection status indication |
| 36 | GPIO58 | | WIFI connection status indication |
| 37 | NC | | NC |
| 38 | UART_RXD0 | | Serial port 0 input for transparent transmission and at command setting |
| 39 | UART_TXD0 | | Serial port 0 output, used for transparent transmission and at command setting, need to be pulled low or left hanging |
| 40 | UART_RXD1 | | Serial port 1 input |
| 41 | NC | | NC |
| 42 | SYS_RST_N | I | RST pin, module reset, active low, reset time ≥ 500ms |
| 43 | NC | | NC |
| 44 | UART_TXD1 | | Serial port 1 output |
| 45 | NC | | NC |
| 46 | VDD_5V | P | 5V input |
| 47 | NC | | NC |
| 48 | NC | | NC |
| 49 | GPIO33 | | Wifi indicator |
| 50 | GND | Ground | Ground |
| 51 | NC | | NC |
| 52 | NC | | NC |

# 2. Functional Description

HLK-RM58D supports serial port to WIFI STA, serial to WIFI AP mode.

## 2.1 WiFi indicator flashing description

The module is flashed by the LED indicator in different modes, so that the module running status can be quickly and easily known. The WiFi indicator of the module mainly has the following status:

(1) The wifi indicator flashes twice periodically: indicates that the module is in the one-click distribution mode.

(2) The wifi indicator flashes thirdly periodically: indicates that the module is in the sta mode and the target ap hotspot is not connected.

(3) The wifi indicator flashes fourthly periodically: indicates that the module is in 2.4g ap mode, but it does not indicate whether there is a sta client device connected.

(4) The wifi indicator flashes periodically: indicates that the module is in the 5.8g ap mode, but it does not indicate whether there is a sta client device connected.

(5) The wifi indicator flashes quickly: indicates that the module is in the sta mode and is connected to the wifi hotspot. When there is data transmission, the module LED will flash quickly.

## 2.2 Wifi connection status indicator pin

GPIO58 pin is used as the indicator pin of the module's wifi connection status in sta mode. When the module's wifi is connected to the router, GPIO58 will output a high level, otherwise will output low level, and other modes will output low level.

## 2.3 Socket connection status indicator pin

The GPIO59 pin is used as the indicator pin of the module socket's connection status. When the socket connection is successful, the GPIO outputs a high level, otherwise outputs low level.

## 2.4 One-click distribution mode

For the IOT wifi module, based on cost and performance considerations, there is no touch screen interactive interface like a mobile phone. Users can see the ap list on the mobile phone and click the password to connect to the network. What should I do? One-click configuration is the wifi module in promiscuous mode (can capture all 802.11 frames in the air), APP sends the SSID and password to the wifi module through UDP broadcast or multicast through certain encoding rules, the module parses out, and then connects to the router. Install the Android app HLK-TCPdemo, then select Configure Networking, select the elian mode, then select V5, input the password, click to open the configuration and start the configuration. When the distribution network is successful, the module will change from double flash to quick flash, indicating network successful connected.

Figure 2. One-click distribution network

When the module is on the one-click distribution, you need to set the module to the one-click distribution mode. Serial configuration tool can be used to set the module to the one-click distribution mode.
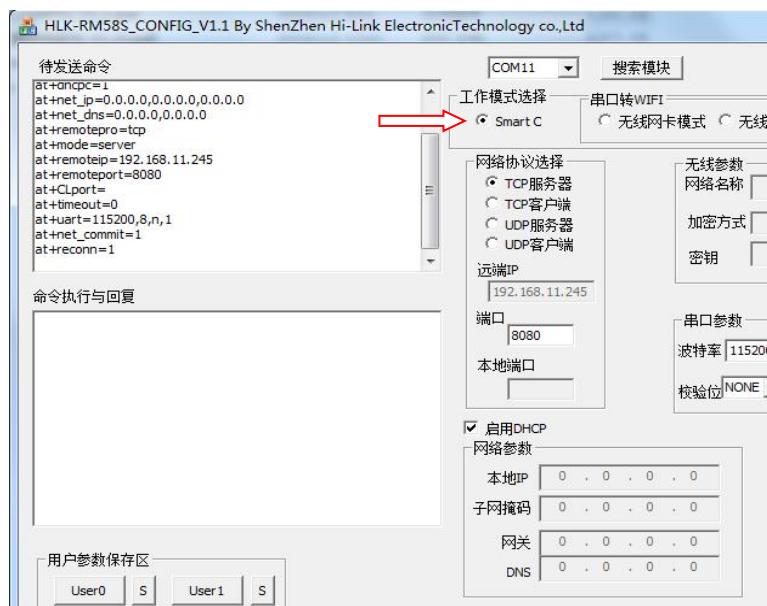


Figure 3. Set to one-click distribution mode

## 2.5 Web distribution function

When the module is in ap mode, input 192.168.16.254 in the browser, and then input the account and password admin, later enter the web page setting interface. (Default factory firmware is not supported)
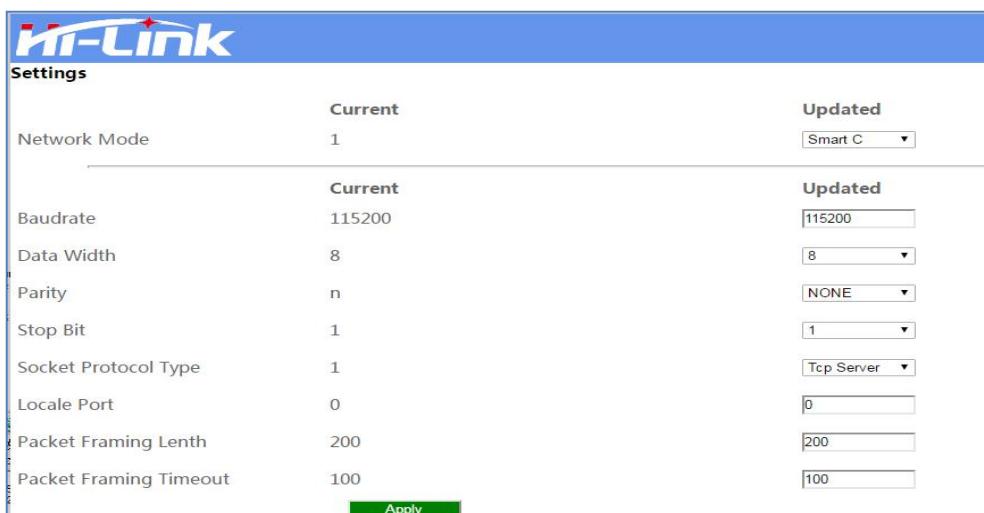


Figure 4. Module web page setting interface

When the module is in the sta mode, input the module's ip in the browser to access to the module's web page setup function.

## 2.6 Serial to WIFI STA
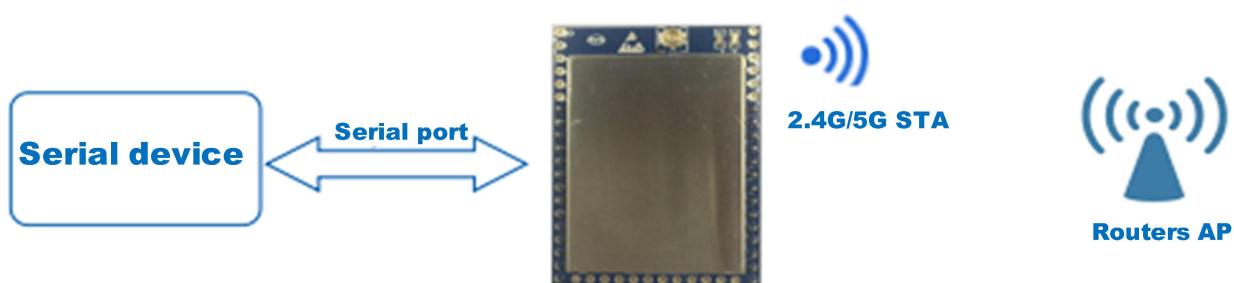


Figure 5. Module as STA

The module converts the serial port data into wifi data to achieve the purpose of networking.

## 2.7 Serial to WIFI AP
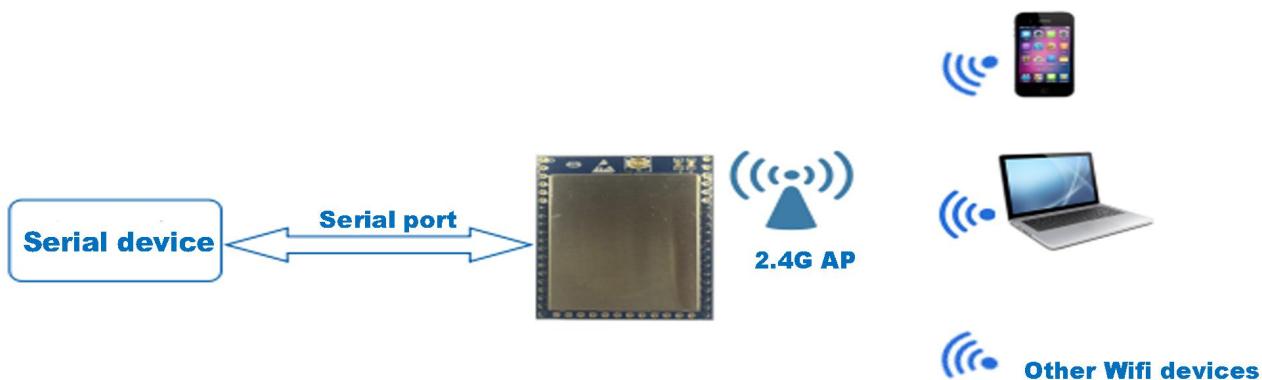


Figure 6. Module as ap

In AP mode, mobile phone, PC or other wifi devices can be connected to RM58D module through wifi, and serial port devices can transmit data through RM58D module and other wifi devices.

## 2.8 Serial port working state conversion

After the HLK-RM58D is powered on, the default mode is transmission mode. By pulling down the pin ES0 (GPIO0) to enter at instruction mode longer than 50ms, the module will process the received data as at instructions, send at instructions to let the module into transparent mode, After the network connection, the data received by the serial port will be transmitted as transparent data.
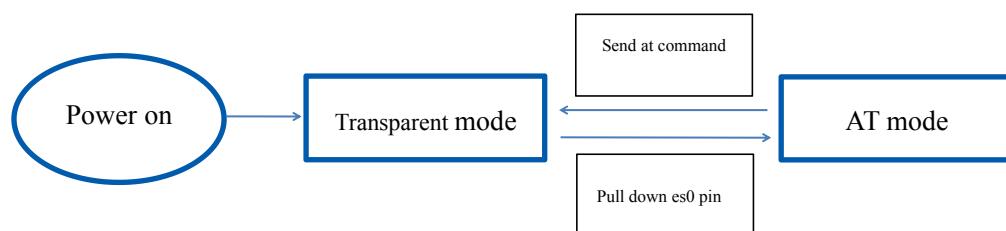


Figure 7. Serial port mode conversion

## 2.9  Serial port-network data conversion

### 2.9.1  Module as TCP Server
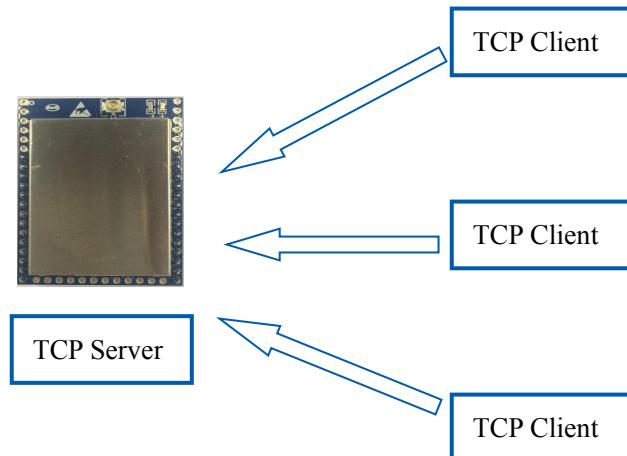


Figure 8. TCP Server

In this mode, the module listens to the specified port, waits for TCP Client connection, and after the connection, all TCP data is directly sent to the serial port end, and the data of the serial port end is sent to all TCP Client ends. When the module is used as the TCP server, the most supporting two TCP clients are connected to the TCP server.

### 2.9.2  Module as TCP Client
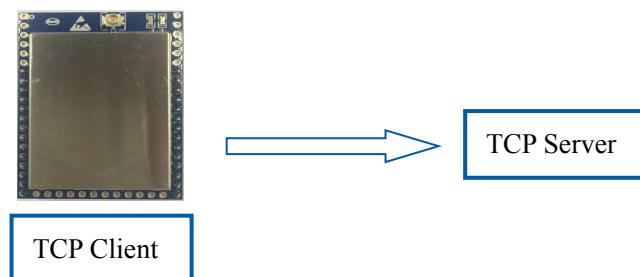


Figure 9. TCP Client

In this mode, the module will actively connect to the specified IP, port, all the data sent from the TCP Server end is sent directly to the serial port, and the data from the serial port to the TCP Server side. Abnormal network disconnection can result in active re-connection of the module.

### 2.9.3　Module as UDP Server



UDP Client
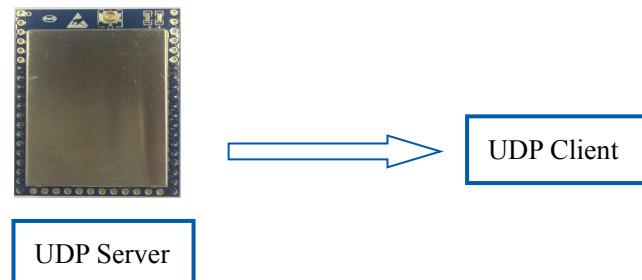
UDP Server

Figure 10. UDP Server

In this mode, the module opens the local designated port, once it receives the data sent to the port, the module sends the data to the serial port and records the remote ip, port. The module only records the remote information on the last connection, and the data sent by the serial port is sent directly to the recorded remote ip, port.

### 2.9.4　Module as UDP Client



UDP Server
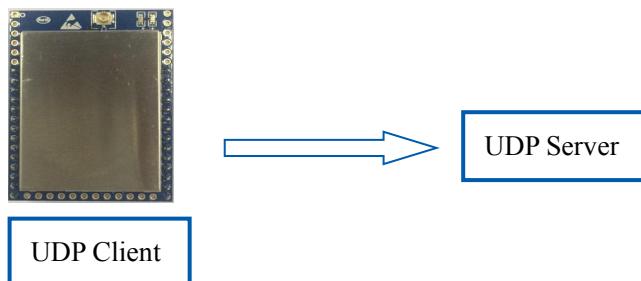
UDP Client

Figure 11. UDP Client

In this mode, the module sends the serial port data directly to the specified ip, port, and the data returned from the server will be sent to the serial port.

## 2.10    Application areas

♦    Smart home;
♦    Instruments and instruments;
♦    Wi-Fi remote monitoring / control;
♦    Toy field;
♦    Color LED control;
♦    Fire protection, security intelligent integrated management;
♦    Smart card terminals, wireless POS machines, handheld devices and so on.

# 3.    AT Instructions

Instruction format: in AT instruction mode, the system can be configured through the AT instructions of the serial port. The command format is as follows:

at+[command]=[value],[value],[value]......

All commands begin with "at" and "\ r" end. If the command is not encapsulated in this format, it will not be processed and will return a different return value depending on the command module.

For example:"at+ver=?"

Module will return: HLK-RM58D (V1.00 (Nov 30 2017)

Query instruction format: at+[command]=?

## 3.1    Query current module version: at+ver

Grammatical rules:

| Command type | Grammar | Return and description |
|---|---|---|
| EO | at+ver=? | at+ver=HLK-RM58D(V1.00(Nov 30 2017)): current version |

## 3.2    Local port operation: at+CLport

| Command type | Grammar | Return and description |
|---|---|---|
| EO | at+CLport=8080 | at+CLport=8080<br>Ok<br>Description: set the local port to port 8080 |
| | at+CLport=? | at+CLport=?<br>8080<br>Description: Query local port |

## 3.3    Set up serial Port: at+uart

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+uart=115200,8,n,1 | at+uart=115200,8,n,1<br>Ok<br>Description: Set up serial Port parameters |
| Query Command | at+uart=? | at+uart=?<br><br>115200,8,n,1<br><br>Description：query serial port parameters |

## 3.4    Set up DHCP: at+dhcpc

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+dhcpc=1 | at+dhcpc=1<br>ok |
| Query Command | at+dhcpc=? | at+dhcpc=?<br><br>1<br><br>Description: 1: dhcp mode,    0: static ip |

## 3.5    Set up wifi connection mode: at+netmode

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+netmode=3 | at+netmode=3<br>Ok<br>Description: set the module to ap mode |
| Query Command | at+netmode=? | at+netmode=?<br><br>3<br><br>Description: 1: One-click distribution network 2: sta<br><br>mode,    3: 2.4G ap mode,    4: 5.8G ap mode |

## 3.6    Set up tcp connection mode: at+mode

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+mode=client | at+mode=client<br>Ok<br>Description: set the module to client mode |
| Query Command | at+mode=? | at+mode=?<br><br>client<br><br>Description: client:    server: |

## 3.7    Set up remote IP when modules work as client: at+remoteip

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+remoteip=192.168.11.102 | at+remoteip=192.168.11.102<br>ok<br>Description: set the remote ip of the mode |
| Query Command | at+remoteip=? | at+remoteip=?<br>192.168.11.102<br>Description: query remote ip |

## 3.8    Set up remote port when module act as client: at+remoteport

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+remoteport=1234 | at+remoteport=1234<br>ok<br>Description: set the remote port of the mode |
| Query Command | at+remoteport=? | at+remoteport=?<br>1234<br>Description：query remote port |

## 3.9    Set parameter submission: at+net_commit

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+net_commit=1 | at+net_commit=1<br>Ok<br>Description: submit setup parameters |

## 3.10    System restart: at+reconn

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+reconn=1 | at+reconn=1<br>Description: Quit at command mode |
| EO | at+net_commit=1<br>at+reconn=1 | at+net_commit=1<br>ok<br>at+reconn=1<br>ok<br>Description: System restart |

## 3.11    Set the module's ssid and password: at+wifi_conf

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+wifi_conf=HI-LINK_5FE8,none,12345678 | at+wifi_conf=HI-LINK_5FE8,none,12345678<br>ok<br>Description: set the ssid and password of the module |
| Query Command | at+wifi_conf=? | at+wifi_conf=?<br>HI-LINK_5FE8,none,12345678<br>Description: Query the ssid and password of the module |

## 3.12    Set up socket connection Protocol: at+remotepro

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+remotepro=tcp | at+remotepro=tcp<br>ok<br>Description: set the module socket protocol to tcp |
| Query Command | at+remotepro=? | at+remotepro=?<br><br>tcp<br><br>Description: query module socket connection protocol |

## 3.13    Set network connection parameters: at+net_ip

| Command Type | Grammar | Return and description |
|---|---|---|
| EO | at+net_ip=192.168.16.254,255.255.255.0,192.168.16.254 | at+net_ip=192.168.16.254,255.255.255.0,192.168.16.254<br>ok<br>Description: set the ip, gateway, dns of the module |
| Query Command | at+net_ip=? | at+net_ip=?<br><br>192.168.16.254,255.255.255.0,192.168.16.254<br><br>Description: query module ip, gateway, dns |

## 3.14    Query network connection status in STA mode: at+wifi_ConState

| Command Type | Grammar | Return and description |
|---|---|---|
| Query Command | at+wifi_ConState=? | at+wifi_ConState=?<br><br>Disconnected<br><br>Description: in sta mode, the module wifi is not connected, and the<br><br>Connected indicates that the network is connected |

## 3.15    Query module MAC address: at+Get_MAC

| Command Type | Grammar | Return and description |
|---|---|---|
| Query Command | at+Get_MAC=?<br>40:D6:3C:15:5F:E8 | at+Get_MAC=?<br>40:D6:3C:15:5F:E8<br>Description: query module mac address |

## 3.16  Configuration Software Description
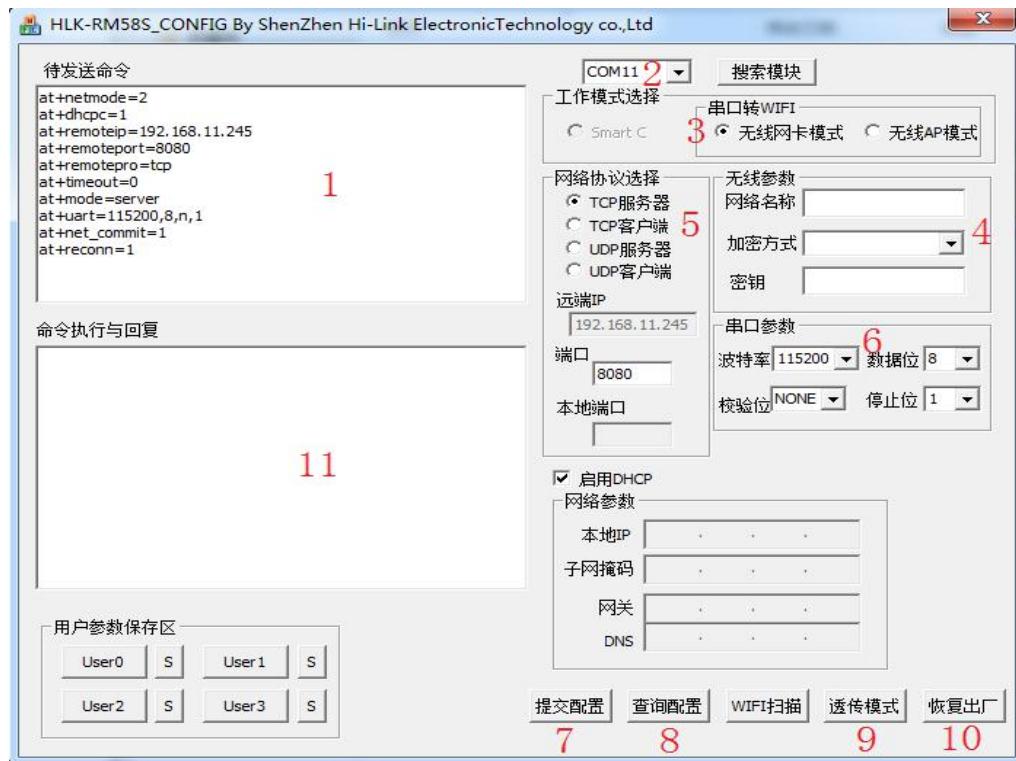


Figure 12. Serial port configuration interface

1: command window to be sent

2: serial port number selection

3: mode selection

4: wifi name and password

5: network protocol selection

6: serial port parameters

7: commit configuration

8: query configuration

9: enter transparent mode

10: restore factory setting

11: serial return command

# 4. Upgrade Introduction

The upgrade of HLK-RM58D module can be carried out through serial port or network, and the appropriate upgrade method can be selected according to the field environment.

## 4.1  Introduction of Serial Port Upgrade Method

In the upgrade folder there is a img file, upgrade software mainly read the files inside to upgrade; There are three files in the img folder, where HLK-RM58D.img and HLK-RM58D (b.1.00.1 20180611182552). Img file contents are the same, only file names are different, HLK-RM58D (b.1.00.120180611182552). Txt records the default parameter for this firmware; HLK-RM58D (b.1.00.120180611182) 552) "is the firmware version number, when the module runs this firmware query version number and this version number the same, each firmware has a unique version number, automatically generated by the compilation system; When there is a new firmware to upgrade, the three files can be overwritten.

| 名称 | 修改日期 | 类型 |
|---|---|---|
| HLK-RM58S(b.1.00.120180611182552).img | 2018/6/11 18:25 | 光 |
| HLK-RM58S(b.1.00.120180611182552).txt | 2018/6/11 18:25 | 文 |
| HLK-RM58S.img | 2018/6/11 18:25 | 光 |

Figure 13. Upgrade file list

### 4.1.1 Open Serial Port upgrade Software

Open serial port upgrade software HLK-RM58D_uart.exe, input lowercase string c, select serial port number, select the corresponding baud rate through digital key 1 / 2 / 3 / 4

Figure 14. Serial upgrade interface

## 4.1.2　Start to upgrade

Enter the space bar, press and hold the ES0 (GPIO0) and RST (SYS_RST_N) buttons at the same time, then release the button RST,0.5s then release the button ES0, computer side software will automatically upgrade the module.
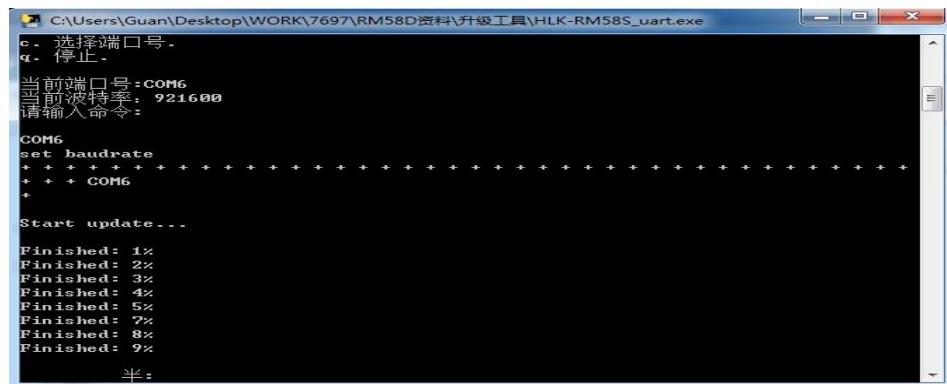


Figure 15. Serial port is upgrading

# 4.2　Introduction of Network upgrade methods

In order to realize the network upgrade of the module, it is necessary to connect the line module through wifi, and then to upgrade the data transmission according to the ip of the module.

## 4.2.1 Router Connection

Modules that need to be upgraded can be configured and connected to routers through serial port configuration tools, or ap mode can be used.

### 4.2.2 Lookup module ip

Because you need to input the ip, of the module when upgrading, you can go to the router to find the

corresponding ip, of the module or use HLK-RM58D_Discover to search the corresponding ip. for the module in

the local area network.



Figure 16. Lookup module ip

### 4.2.3 Program upgrades

Enter the module's ip address on the software HLK-RM58D_wifi.exe, and then enter:
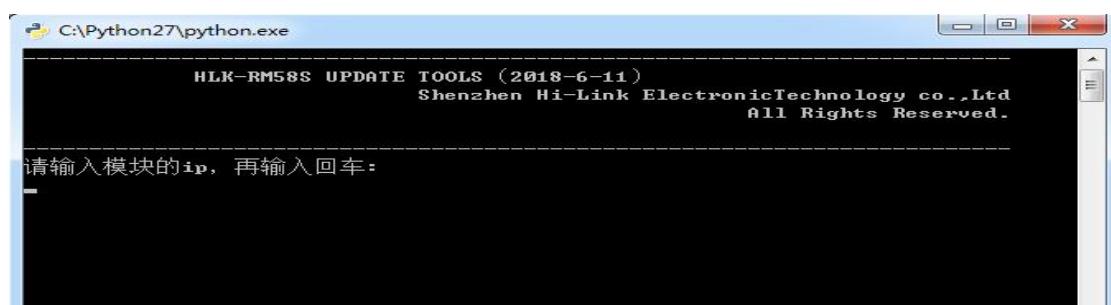


Figure 17. Open upgrade interface

Appears as shown in the figure to indicate that the upgrade is in progress
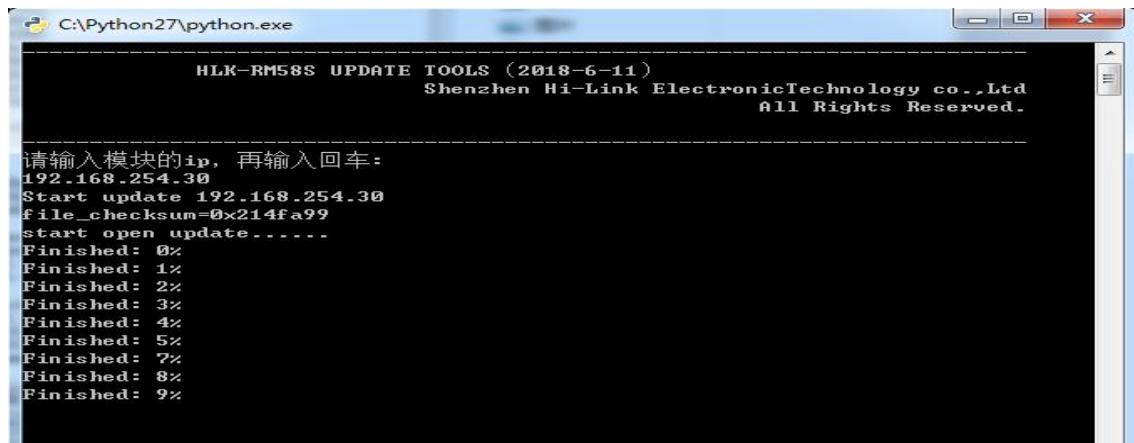


Figure 18. Upgrade in progress

Appears as Update finish!, indicates upgraded successfully.
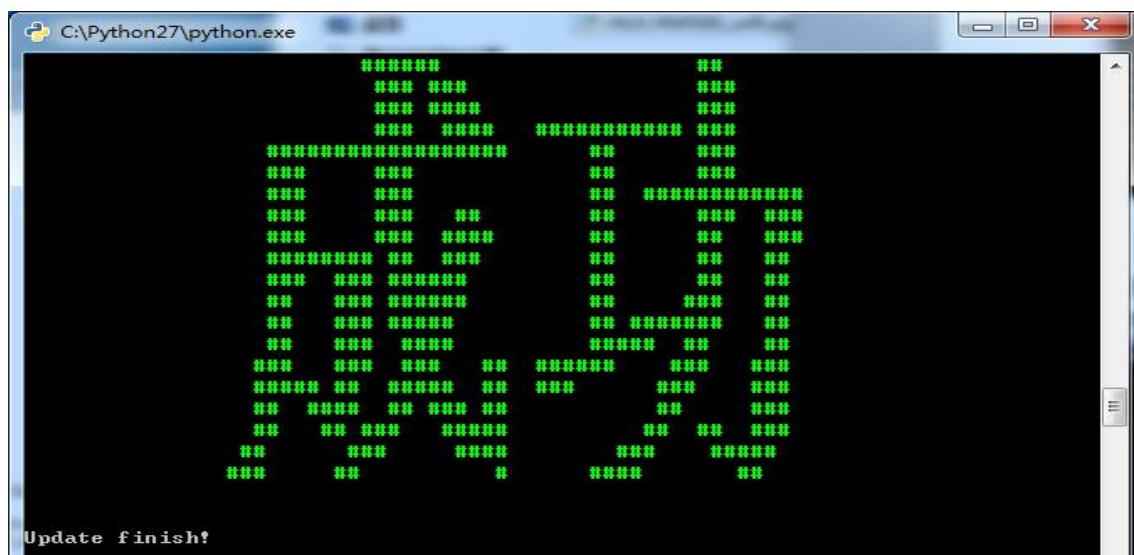


Figure 19. Upgrade completed

**(If your computer turns on a dual network card, you may not be able to upgrade and you will need to shut down a network card, if it is generated by the installation virtual machine.)**

# 5. Restoration of factory setting method

Press the ES0 button on the base plate for 6 seconds to restore the factory setting.

# 6. Bluetooth data transmission

Bluetooth data transmission is that after the Bluetooth connection is successful, the module will send out the data received from the Bluetooth from the serial port, and the data received by the module serial port will be sent out from the Bluetooth.

The module Bluetooth function only supports Bluetooth 4.2.

Before testing Bluetooth, you need to confirm whether the software version of the module has the Bluetooth function enabled. The recommended test version is HLK-RM58D (b.1.00.120190126094409). If it is not this version, you can upgrade the module to this version first.

Install the Bluetooth test software HLK-BLE.apk from mobile phone port, open the Bluetooth function of the mobile phone, and then open the app, it will search for the Bluetooth name with the start of HLK-BLE_ on the app.
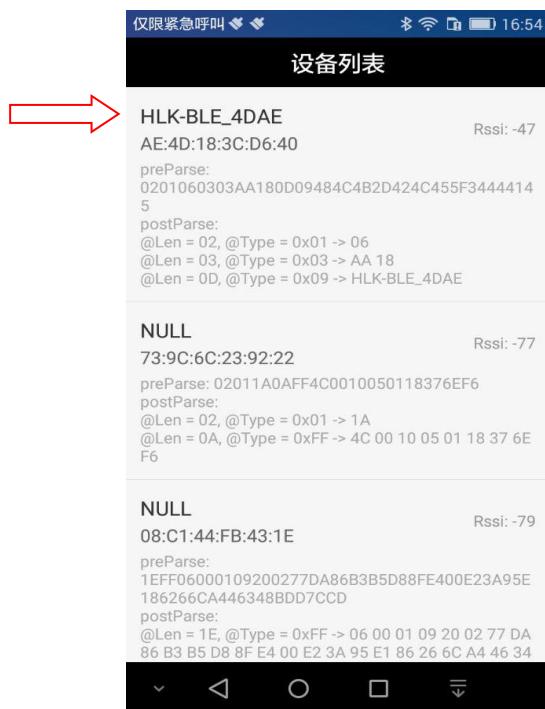


Figure 20. Bluetooth search list

Then select the last item
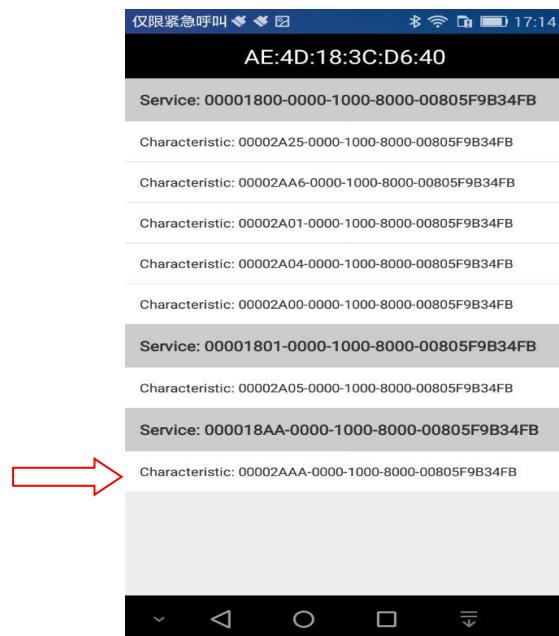


Figure 21. Bluetooth attribute list

Then input the data in the send box, and then click Send, the data will be received on the serial port, and the data sent by the serial port will be received on the app.
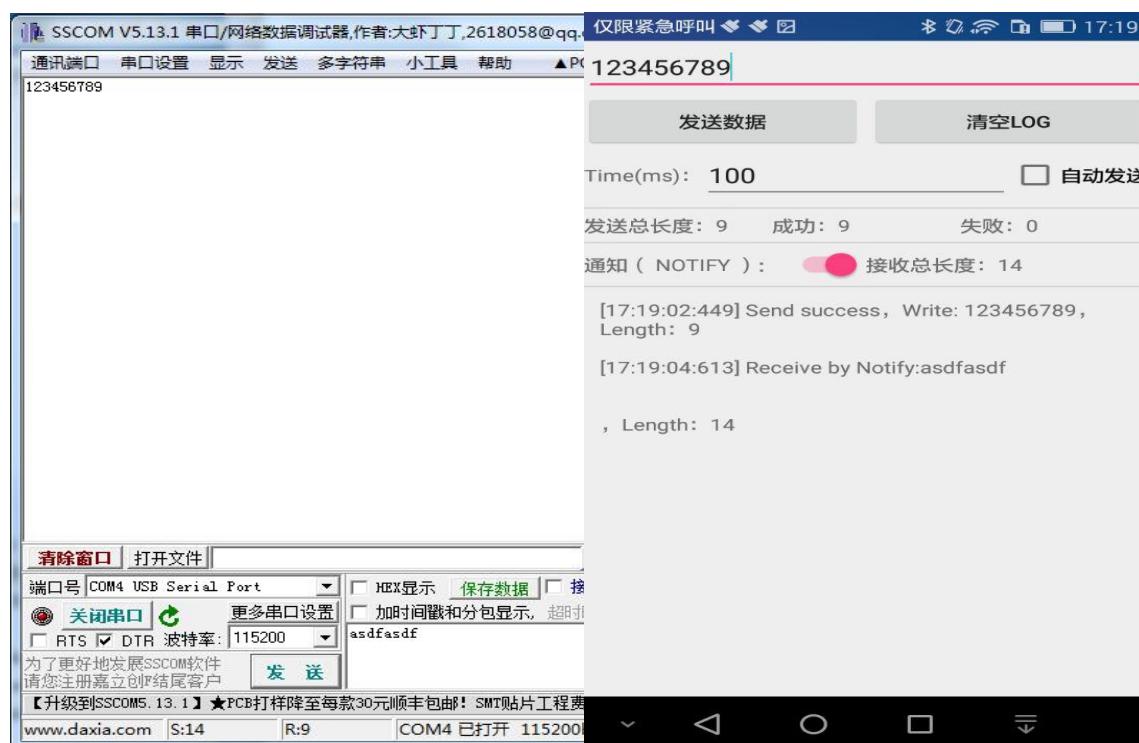


Figure 22. Bluetooth transmission test

# 7. Appendix A document revision

| Version No. | Revised scope | Date |
|---|---|---|
| V1.21 | Power supply changed from 3.3v to 5v | |
| V1.22 | Add upgrade function description | |
| V1.23 | Add the instruction of the at command netmode, update the picture of the serial port configuration tool<br>Add wifi, socket indicated pin description<br>Add one-click distribution description, web set description | |
| V1.24 | Add Bluetooth instructions | |