HX-DU2017
Frequency-Hopping Radio

Operating Instructions

Version: V1.0

FCC ID: 2ACRAHX-DU2017D-900

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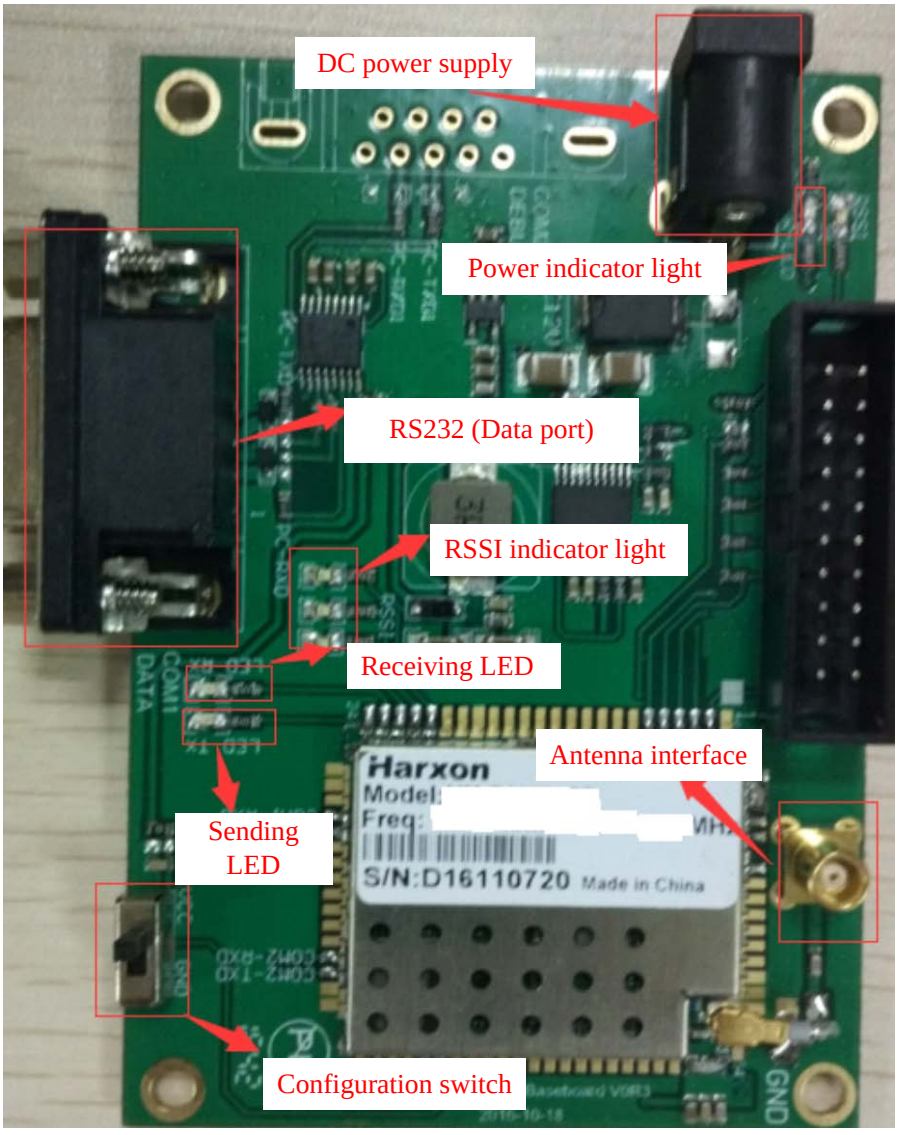
1 Preparatory Work

DC power supply (two units, with the maximum current of 2A), power line (two pieces), serial port line or USB-to-serial port line (two pieces), computer (one unit), and serial port debugging assistant (sscom32);

2 Operation Steps

2.1 Environment Setup

First, connect the power line of the baseboard, with supply voltage 8-30 V(the supply voltage is usually chosen to be 12 V). Then, set the configuration switch to the VCC terminal (left). Next, connect the baseboard to the computer with RS232 DB9 serial port line or USB-to-serial port line (**Special notes: Connect the baseboard to the computer through RS232 data port; this port has a level of 232 rather than TTL level**). Open the serial port debugging assistant (sscom32), select the serial port number, and configure the baud rate of the serial port to be 115200, and correctly install the radio module antenna (frequency band: 902.6M-927.8M), as shown in the figure below:



2.2 Powering Up the Baseboard by Switching on the Power Supply

After the power supply is switched on, **the power indicator light is on**. In the operating mode of the **master** radio, LED TX indicator light flickers once two seconds on a PP (point to point) basis, and constantly flickers on a PMP (point to multipoint) basis. In the operating mode of the **slave** radio, **RSSI indicator light** flickers like a waterfall light before the synchronization of the master and the slave. Such RSSI indicator light stops flickering when **this synchronization is completed**. **This synchronization is indispensable for transmission of user data**. As data is sent, TX LED red indicator light illuminates; as data is received, RX LED green indicator light illuminates **(Remarks: The red indicator light replaces the green one temporarily since the latter does not have enough luminance)**.

2.3 Modifying Radio Parameters

(1) First, set the configuration switch to the right (**close to the silk-screen GND terminal**) or send the character string "+++" (pay attention to the sending method: Within one second before sending "+++", make sure that no data is available; within one second after sending "+++", make sure that no data is available; no codes of carriage returns and line feeds follow such character string sent), namely, the radio goes into the parameter configuration mode (showing "NO CARRIER OK");

(2) Then, input the parameter modification command (see Appendix I "List of AT Commands of the Radio");

(3) After modifying a parameter, input the parameter saving command (AT&W); otherwise, that parameter is not saved in the case of power failure;

(4) Finally, set the configuration switch to the left (silk-screen VCC terminal) or run the command ATA, namely, allow the radio to work in a normal mode (other than AT command configuration state);

(5) Restart the radio.

Notes: (1) Any AT commands must be followed by carriage returns and line feeds (In the serial port assistant tools, choose "Send the New Line". Sending the new line indicates that software automatically adds *two characters* of carriage returns and line feeds); (2) if the current configuration pin is grounded, sending "+++" and running the ATA command are invalid.

3 Appendixes

3.1 List of AT Commands of the Radio

Format of the AT command

Format of the parameter configuration command: **ATS + register number = value + carriage return and line feed; for example, ATS103=7**

Format of the parameter query command: **ATS + register number?+ carriage return and line feed; for example, ATS103?**

Remarks:

(1) After modifying the parameter by the AT command, surely save this parameter by the AT&W command;

(2) **Black bold font** indicates the ex-work default value;

(3) AT commands without special instructions apply to both the narrow band mode and the frequency-hopping mode.

The first category of commands: special AT commands

(1) Parameter saving command

Send the command: AT&W+ carriage return and line feed

Set successful return to "OK".

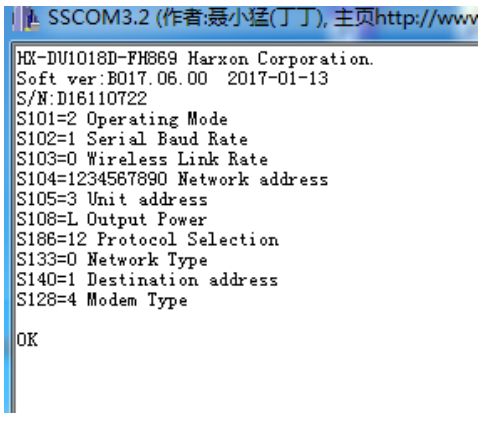
Notes: If a user modifies the radio parameter, and desires to save it upon power failure, he must send the parameter saving command AT&W upon modification. Otherwise, such parameter will become missing upon power failure.

(2) Display of the current working parameters of the radio

Send the command: AT&V+ carriage return and line feed

Set successful return to "OK".

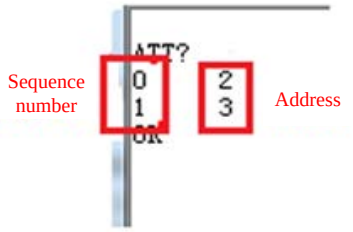
After this command is executed, most parameters of the radio appear; for example:



(3) Display of the current address list of the slave

Send the command: ATT?+ carriage return and line feed

The currently supported address information of the slave is displayed, for example:



(4) Configuration of the address list of the slave

Send the command: ATTn=xxx+ carriage return and line feed

Configure the slave address of the currently designated sequence;

For example, ATT0 = 120, denoting that the slave address with the sequence number being 0 is 120.

Remarks: (1) Range of sequence numbers: 0-254. Range of slave addresses: 0-254. If the address is configured to be 0, this indicates the deletion of the current slave node. (2) When the radio address is 255, no address configuration is required. (3) This configuration command applies to the PMP master mode (the address configuration does not help configure the slave address list from the slave mode terminal), but is not appropriate for other modes. (4) You can query the slave address of the corresponding sequence number by the command ATTn?;

The second category of commands: configuration of common AT commands

(1) Modification of the operating mode

Send the command: ATS101=value+ carriage return and line feed

Set successful return to "OK".

Values are as follows:

0- denote the master.

1- denote the relay(**not supported temporarily**)

2- denote the slave.

Set successful return to "OK".

(2) Modification of the baud rate of serial port

Send the command: ATS102=value+ carriage return and line feed

Set successful return to "OK".

Values(bps) are as follows:

1-115200; 2-57600; 3-38400; 4-28800; 5-19200; 6-14400; 7-9600;

For example, ATS102=1, denoting that the serial port of the current radio has a communication baud rate of 115,200 bps.

(3) Modification of the RF baud rate

Send the command: ATS103=value+ carriage return and line feed

Set successful return to "OK".

1) In the frequency-hopping mode

Values(bps) are as follows:

0-19200,1-115200;2-172800;3-230000**;7-38400**;8-57600;

2) In the narrow band mode

Values(bps) are as follows:

0-4800; 1-8000; **2-9600;** 3-16000; 4-19200;

(4) Modification of network ID (frequency-hopping mode)

Send the command: ATS104=value+ carriage return and line feed

Set successful return to "OK".

Range of values: 0-255. The valid value of network ID is related to the number N of frequency-hopping channels. 900M-FH:N=64; 400M-FH:N=64; 840M-FH:N=16; 869M-FH:N=8. When the network ID value is greater than or equal to N, the actual network ID is the modulo value of N.

(5) Modification of the local address

Send the command: ATS105=value+ carriage return and line feed

Set successful return to "OK".

Range of values: 1-254

Remarks: The radio address is 255; the local address is, by default, configured to be 1 in the master mode, and be 2 in the slave mode.

(6) Modification of the transmitting power

Send the command: ATS108=value+ carriage return and line feed

Set successful return to "OK".

Values are as follows:

H: 1W, M:1W, L:0.5W

Remarks: Only 840M and 869M support 2W, others support 1W at most.

(7) Modification of frequency-hopping interval (frequency-hopping mode)

Send the command: ATS109=value+ carriage return and line feed

Set successful return to "OK".

Values(ms) are as follows:

1-20ms; 2-30ms; 3-40ms**; 4-50ms**;

For example, ATS109=1, denoting that the radio changes the frequency point once every 20 MS.

(8) Query of frequency band range (this command supports query only)

Send the command: ATS128?+ carriage return and line feed

Set successful return to "OK".

Values are as follows:

1-900MHz Frequency Hopping (FH);

2-400MHz Frequency Hopping (FH);

3-840MHz Frequency Hopping (FH);

4-865MHz Frequency Hopping (FH);

(9) Modification of frequency band range

Send the command: CMD=HX+ carriage return and line feed

Set successful return to "PROGRAMMED OK".

Send the command: modem value + carriage return and line feed (Pay attention to one blank space after the modem, for example, modem 1)

Set successful return to "PROGRAMMED OK".

Send the command: CMD MH+ carriage return and line feed

Set successful return to "OK".

Values are as follows:

1-900MHz Frequency Hopping (FH);

2-400MHz Frequency Hopping (FH);

3-840MHz Frequency Hopping (FH);

4-865MHz Frequency Hopping (FH);

(10) Network mode (frequency-hopping mode)

Send the command: ATS133=value+ carriage return and line feed

Set successful return to "OK".

Values are as follows:

0-Point to Multipoint (PMP);

1-Point to point (PP);

(11) Modification of the destination address

Send the command: ATS140=value+ carriage return and line feed

Set successful return to "OK".

Range of values: 1-255

Remarks: The radio address is 255; the local address is, by default, configured to be 1 in the master mode, and be 2 in the slave mode.

The third category of commands: configuration of AT commands to restore the ex-work default value in various modes

1. AT&F1 (frequency-hopping mode)

   High speed mode of the master on a PMP basis (Link rate=115200bps, Serial rate=115200), default parameter configuration

2. AT&F2 (frequency-hopping mode)

   High speed mode of the slave on a PMP basis (Link rate=115200bps, Serial rate=115200), default parameter configuration

3. AT&F4 (frequency-hopping mode)

   Low speed mode of the master on a PMP basis (Link rate=38400bps, Serial rate=115200), default parameter configuration

4. AT&F5 (frequency-hopping mode)

   Low speed mode of the slave on a PMP basis (Link rate=38400bps, Serial rate=115200), default parameter configuration

5. AT&F6 (frequency-hopping mode)

   High speed mode of the master on a PP basis (Link rate=115200bps, Serial rate=115200), default parameter configuration

6. AT&F7 (frequency-hopping mode)

   High speed mode of the slave on a PP basis (Link rate=115200bps, Serial rate=115200), default parameter configuration

7. AT&F8 (frequency-hopping mode)

   Low speed mode of the master on a PP basis (Link rate=38400bps, Serial rate=115200), default parameter configuration

8. AT&F9 (frequency-hopping mode)

   Low speed mode of the slave on a PP basis (Link rate=38400bps, Serial rate=115200), default parameter configuration

3.2 Handling of Abnormalities

(1) The master and the slave fail to implement synchronization.

1) Fail to set the configuration switch to the left;

2) The antenna interface has poor contact;

3) The power supply has limited current or too small power;

4) It is recommended to power up the radio again from the configuration mode to the data mode.

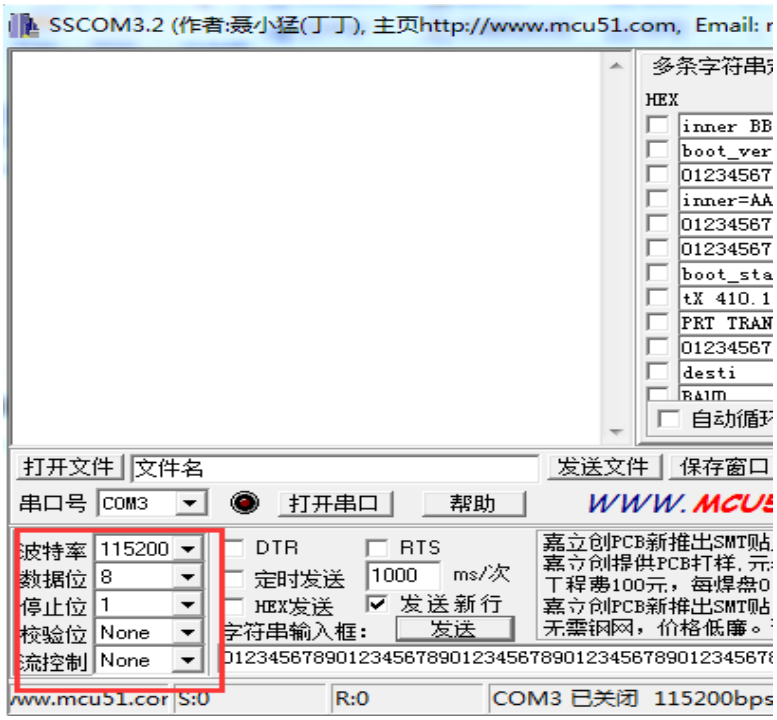
(2) Failure to receive or send data

1) The baud rate of serial port is 115200 (8 data bits, stop bit: 1, without odd-even check);

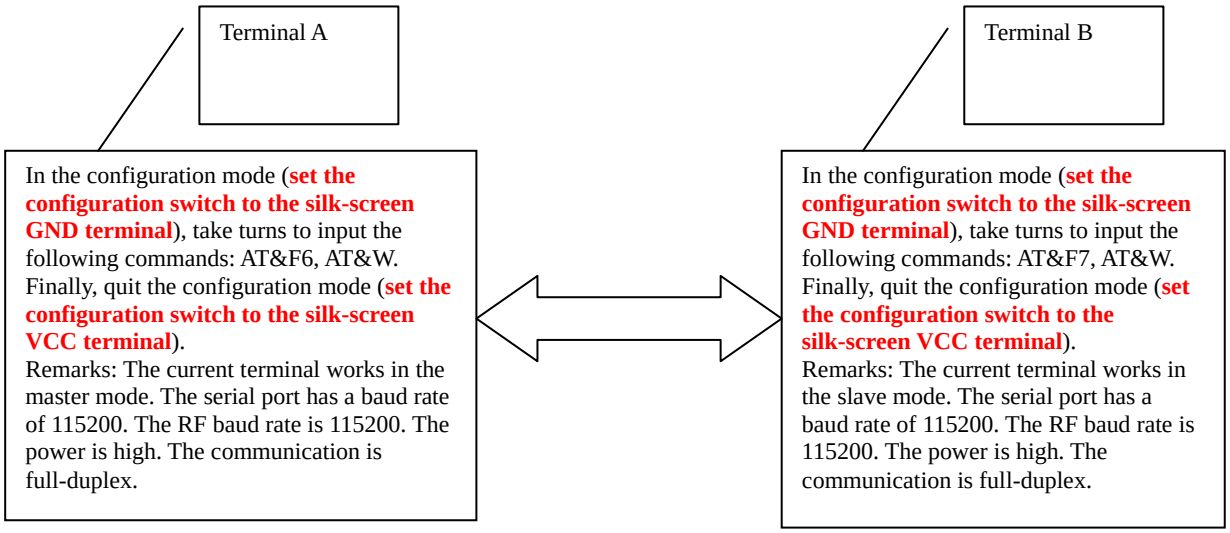
2) The serial port tool have poor contact (if the USB-to-serial port is used, check whether the driver of the USB-to-serial port is set up);

3) The serial port number is not correctly selected (ports No.1-9 are recommended);

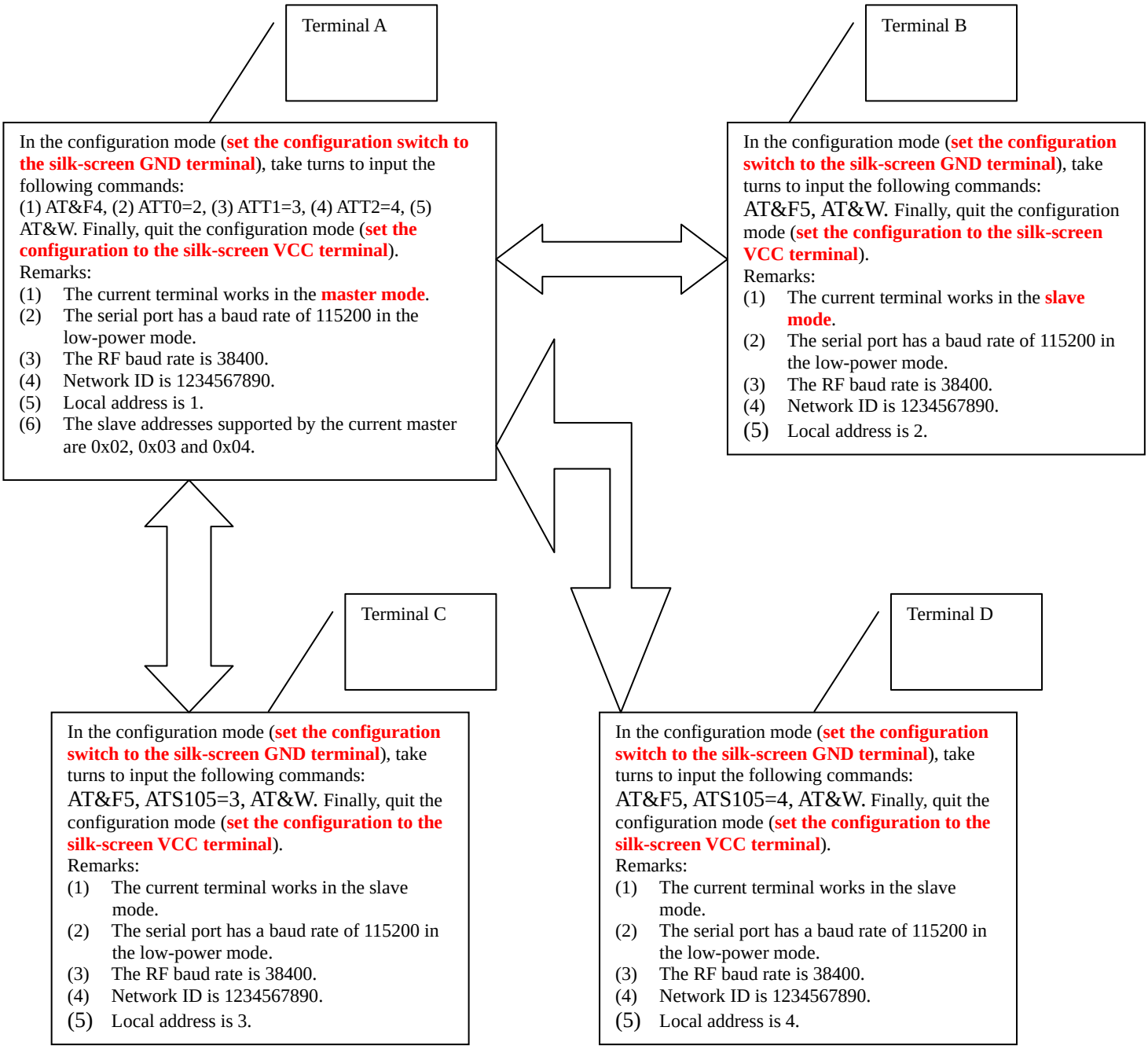
(3) Attached figure of the serial port tool



3.3 PP Communication Example of the Frequency-hopping Radio



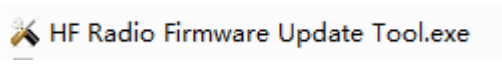
3.4 PMP Communication Example of the Frequency-hopping Radio



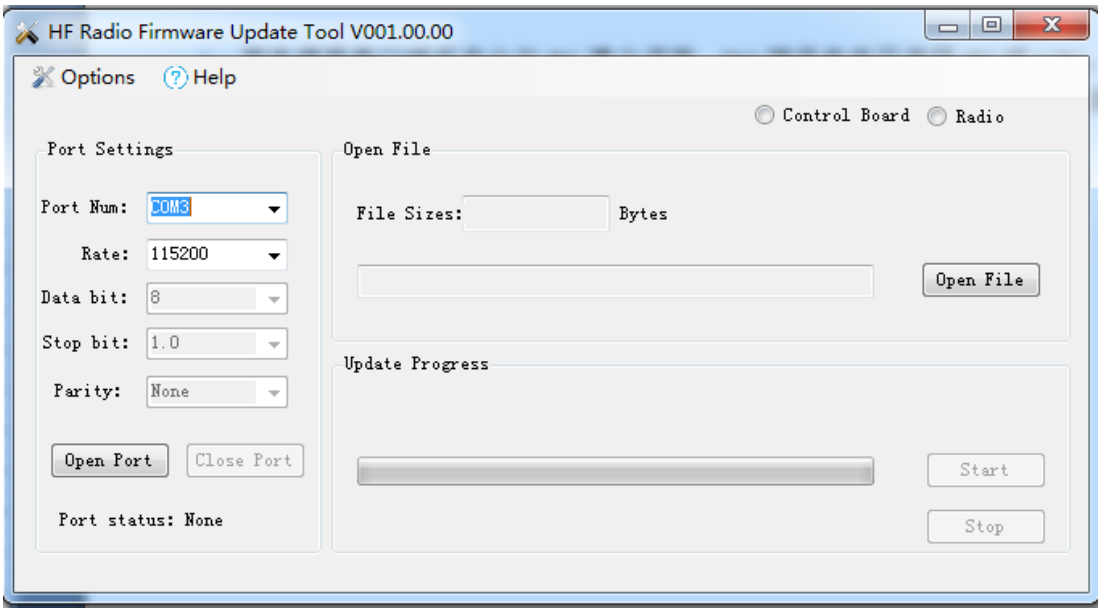
4 Update of the Built-in Radio

1. First, connect the radio to the PC with a serial port line. Select 9 V or 12 V as the supply voltage of the DC terminal.

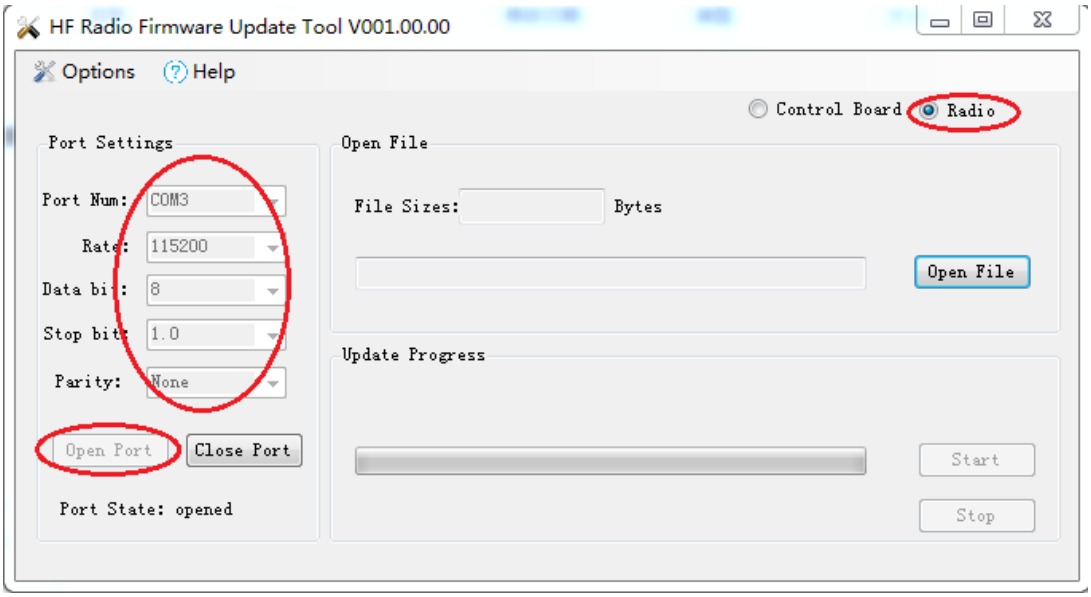
   Notes: "RS232 interface" is based on the 232 level rather than TTL level. Use the USB-to-serial port line or RS 232 serial port line to connect the PC device.

2. Find the update tool 

, and open this software:

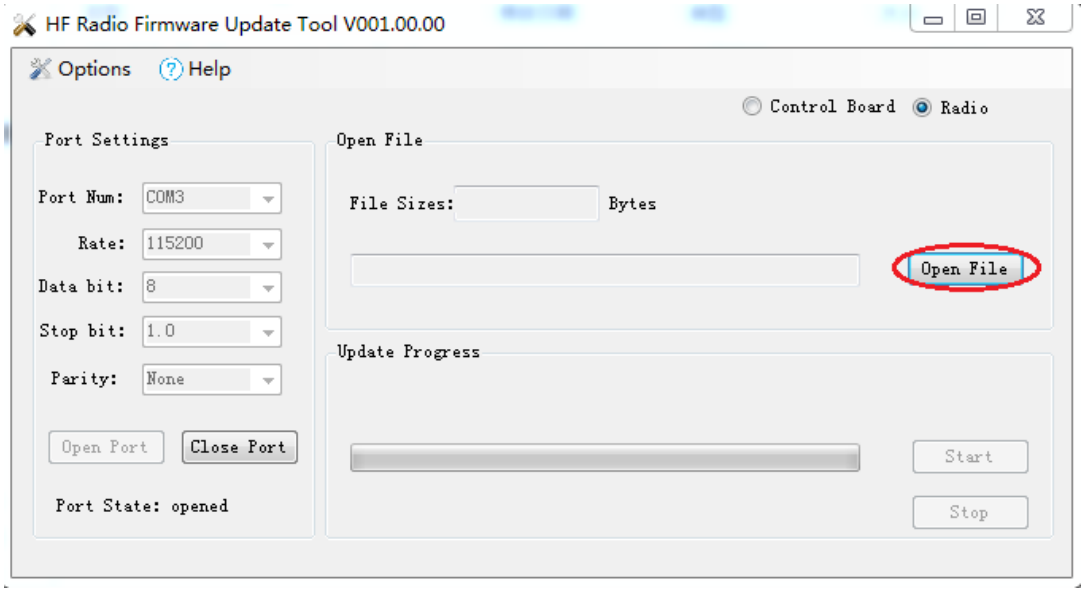


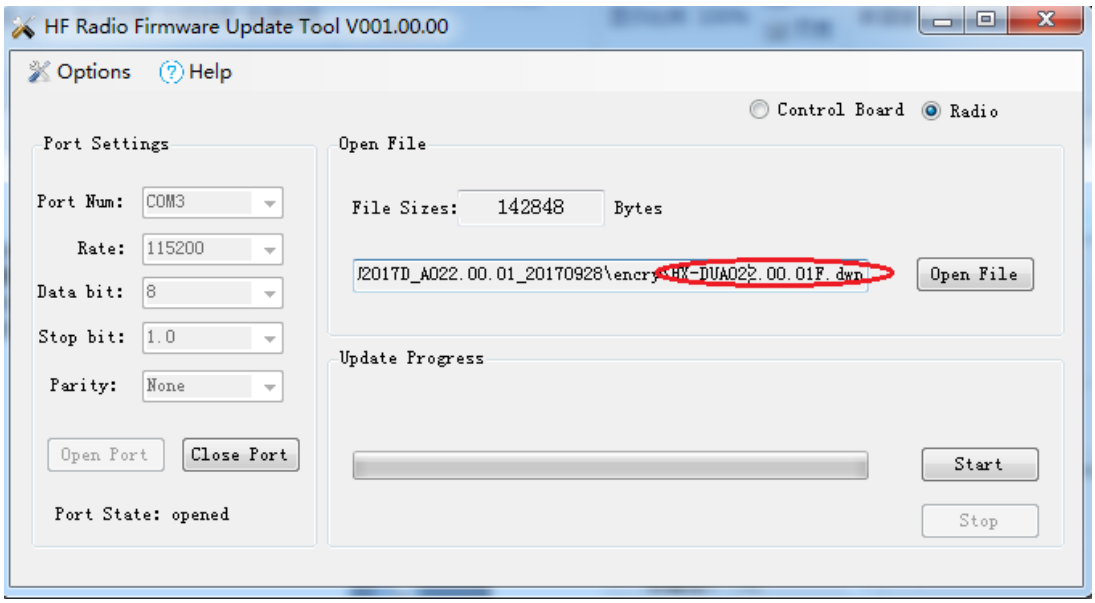
3. Select the right serial port number and baud rate, open the serial port, and select the built-in radio.



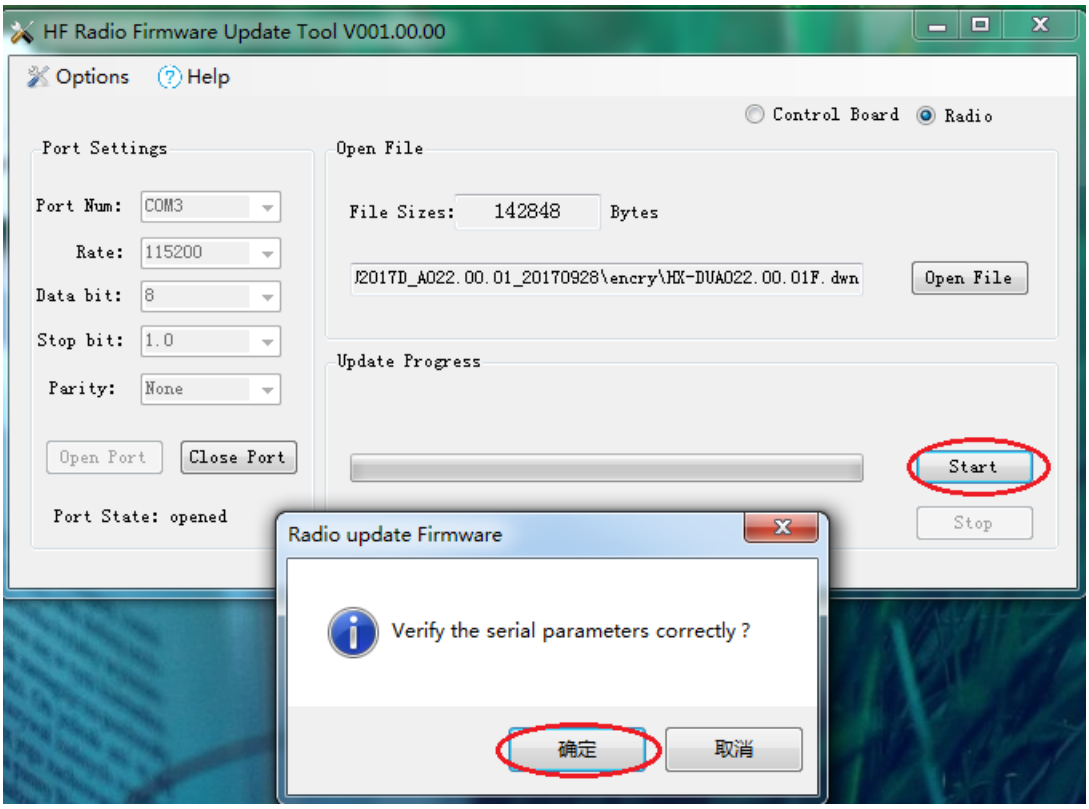
Remarks: The serial port number selected is **smaller than 10**; here, the baud rate of serial port is the communication baud rate of the serial port of the current radio, which is 115200 by default (the specific baud rate is subject to the actual situation). 115200 is recommended to update the radio.

4. Select the file to be updated (for example, HX-DUA022.00.01F.dwn)

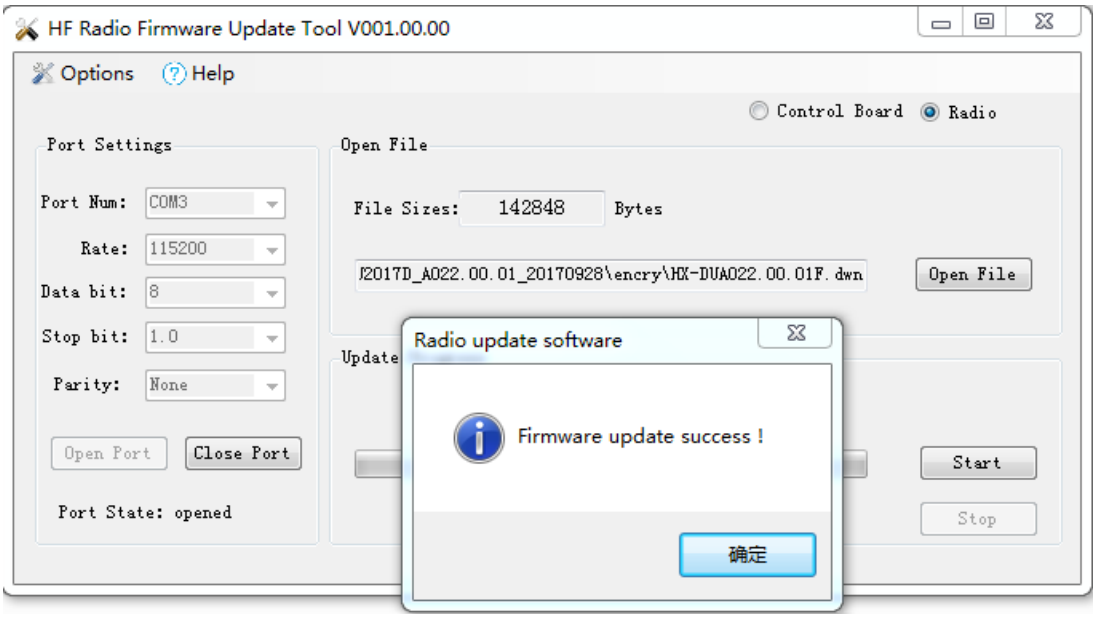




5. Click the **Start** button (When you click the **Start** button, a prompt box pops up to display "Verify the serial parameter correctly?". In this case, you should click **OK**. After that, the system immediately starts updating).



6. The update is followed by a prompt showing "Firmware update success!" Then, click **OK**, and thus complete the current update.



Manual Information To the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The distance of module for mobile device use must be more than 20cm from user.

OEM installation only, not sold to general end users.

Users only can use approved antenna type.

antenna type: whip antenna

antenna gain: 2dBi